

**Preliminary Report**



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# Preliminary Report



October – November 2003

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## A Dutch invasion in Brazil

Brazil, discovered by the Portuguese centuries ago, did not make a friendly acquaintance with Western civilization. Upon discovery, Portugal occupied the country to draw resources from it like gold and most important, slaves. It was not until 1888 that slavery was abolished in Brazil. While the country was under Portuguese control, the Dutch have more than once tried to invade this country, hunting for its resources and slaves.

This year, another group of Dutch people will invade the Brazilian shores. Not to conquer and enslave this time, but to explore the culture and richness of this beautiful country. Starting in the big city of São Paulo and ending in Rio de Janeiro, they will see a lot of different aspects of the country. Aside from their interest in the real Brazil of today, they will orientate on the virtual aspects of reality found there.

“Virtual Reality” is a collective for technologies that offer a three-dimensional digital representation of a real concept. Probably the most well-know virtual reality is found in the science-fiction series “Star Trek”, the holodeck. In this small room, whole worlds can be displayed and the crew members can interact with the entities inside this virtual world. The holodeck is not yet a reality. But more and more companies are investing in this technology, both in Brazil as in the Netherlands.

There are many fields in which virtual reality will have impact, for example the field of education. Virtual reality offers an excellent training facility for many skills that normally have to be acquired at a high cost or with some risk. Suppose you want to learn a complex medical procedure, using virtual reality you can practice this procedure in a virtual operating room on virtual patients. If the procedure fails the program can be reset to start practicing all over again. This is just an example of the many application areas. Our group will investigate the influence of virtual reality on Brazils industry.

Inter-*Actief* has a longstanding tradition in organizing inter-continental study tours. Past couple of years, Inter-*Actief* went to Mexico to study artificial intelligence, South Africa in search of e-commerce, and last year South East Asia to research the use of embedded systems.

The members of the organizing committee have worked very hard to accomplish this tour; coming up with the idea, preparing the tour program, obtaining the needed funds through contract researches and a lot more, all needed to facilitate this expedition. I would like to thank them for their perseverance and dedication to make this tour a success.

On behalf of the board of study-association Inter-*Actief*, I wish all the participants a pleasant and interesting journey.

Ruben Smelik  
Chairman of study-association Inter-*Actief*





## Brazil, the right choice

October 10th 2003 a memorable journey to Brazil will begin for 26 students and two teachers from the University of Twente. The combination of travel and research promises to become a lifetime experience.

Working rapidly towards this moment, we notice how prominent Brazil is in our lives. During our summer we spot many shiny yellow T-shirts of the Brazilian national soccer team, worn by people who hardly know that the land covered by The Netherlands easily fits two hundred and fifty times into that covered by Brazil. Honestly, I never realised it myself before we started to work on this study tour.

Another thing is that we hear a lot of music related to Brazil. And it is popular too. Dutch mega charts include multiple Brazil related hits like for example “E Samba”! Which some sources suggest is in the charts because travelers from the S@mba study tour declared it their theme song.

Goosebumps appeared out of nothing when I was watching the news on Monday 28<sup>th</sup> of July and heard the following report:

“Who wants to find kind people should go to Rio de Janeiro. Nowhere on earth you will find people as nice as in the best known city of Brazil. At least that is the conclusion of research done by an American psychologist. He tested 23 major cities all over the world on how kind its inhabitants were. The outcome was not very positive for the capital of Holland. According to the studies, nobody in Europe is as unfriendly as people from Amsterdam. Compared to them Cariocas (the inhabitants of Rio) are nothing less than good samaritans. According to the research, in Brazil being kind and being liked are important, often more important then arriving on time or even making money. In countries like the Netherlands people help strangers mainly because they think it’s their citizen duty. But hope remains. Send a hurried self-pleased Dutchman in Rio and after a while even he transforms himself into an altruistic mediating benefactor, the research predicts.”

*NOS Journaal, July 28th, 20:00 hours*

Nothing more is needed to confirm we made the right choice to go and travel through Brazil.

In this preliminary report several macro aspects are described and at a meso level five sectors of Brazilian industry are explored. This will form a basis which will help us to research Virtual Reality on a micro level during our tour through Brazil. We are looking forward to discover first hand how Virtual Reality is used and what challenges exist. We will compare assumptions and expectations to what we see in reality. The results will be in our final report.

Thanks go out to everyone who contributed to this report. We hope you will enjoy reading it and that you will look forward to our final report afterwards.

Johan Kuperus  
Chairman of the study tour committee S@mba



# Table of contents

A Dutch invasion in Brazil	v
Brazil, the right choice	vii
Table of contents	viii

<b>1</b>	<b>About the tour</b>	<b>1</b>
1.1	Evolution of S@mba	3
1.2	Study association 'Inter-Actief'	6
1.3	University of Twente	6
1.4	Participants	7
1.5	Tour details	13
1.6	Partners of S@mba	22
<b>2</b>	<b>Research project</b>	<b>25</b>
2.1	Introduction	27
2.2	Research question	27
2.3	Approach	28
2.4	Supporting course	29
2.5	Virtual Reality	30
<b>3</b>	<b>Geography, history, technology &amp; socio-cultural aspects</b>	<b>33</b>
3.1	Introduction	35
3.2	Geography	36
3.3	History of Brazil	39
3.4	Socio-cultural	45
3.5	Technology	53
3.6	References	59
<b>4</b>	<b>National political aspects</b>	<b>63</b>
4.1	Introduction	65
4.2	Political history until today	66
4.3	Political stability	70
4.4	Fiscal policy	73
4.5	Environmental protection	77
4.6	Bureaucracy	79
4.7	Privatisation	81
4.8	Employment laws	84
4.9	Corruption	88
4.10	Conclusion	90
4.11	References	95
<b>5</b>	<b>International political aspects</b>	<b>99</b>
5.1	Introduction	101
5.2	History	102
5.3	Current situation	106
5.4	Conclusion	120
5.5	References	123

<b>6</b>	<b>National economical aspects</b>	<b>127</b>
6.1	Introduction	129
6.2	Brazil	130
6.3	The Netherlands	147
6.4	Conclusion	154
6.5	References	156
<b>7</b>	<b>International economical aspects</b>	<b>161</b>
7.1	Abstract	163
7.2	Introduction	164
7.3	International economic relations	165
7.4	Brazil compared to the Netherlands	181
7.5	Conclusion	187
7.6	References	188
<b>8</b>	<b>Aircraft</b>	<b>191</b>
8.1	Introduction	194
8.2	Sector definition	195
8.3	Demand conditions	196
8.4	Factor conditions	201
8.5	Firm strategy, structure and rivalry	204
8.6	Related and supporting industries	210
8.7	Government	213
8.8	Chance	217
8.9	Aircraft industry & the Netherlands	218
8.10	Government	220
8.11	Comparison	221
8.12	Strengths and weaknesses	222
8.13	Virtual Reality	224
8.14	Conclusion	227
8.15	References	228
<b>9</b>	<b>Architecture</b>	<b>233</b>
9.1	Summary	235
9.2	General introduction	237
9.3	Porter applied to Brazil	242
9.4	Porter applied to the Netherlands	257
9.5	Similarities and differences	264
9.6	Virtual reality in Brazil	266
9.7	Conclusion	269
9.8	References	270
<b>10</b>	<b>Human health activities</b>	<b>273</b>
10.1	Abstract	275
10.2	Introduction	276
10.3	Brazil	280
10.4	The Netherlands	294
10.5	Comparison	303
10.6	Conclusion	308
10.7	References	311

<b>11</b>	<b>Higher education</b>	<b>316</b>
11.1	Introduction	318
11.2	Education in Brazil	319
11.3	Porter Analysis	325
11.4	The Netherlands	344
11.5	Comparison	348
11.6	Conclusion	350
11.7	References	352
<b>12</b>	<b>Motion picture, video &amp; computer game production and distribution</b>	<b>356</b>
12.1	Introduction	358
12.2	Research question	359
12.3	Sector definition	360
12.4	Video game industry	362
12.5	Motion picture industry	370
12.6	References	379
<b>13</b>	<b>Contract research</b>	<b>382</b>
13.1	Introduction	384
13.2	Companies and assignments	385







# 1 About the tour



## Chapter contents

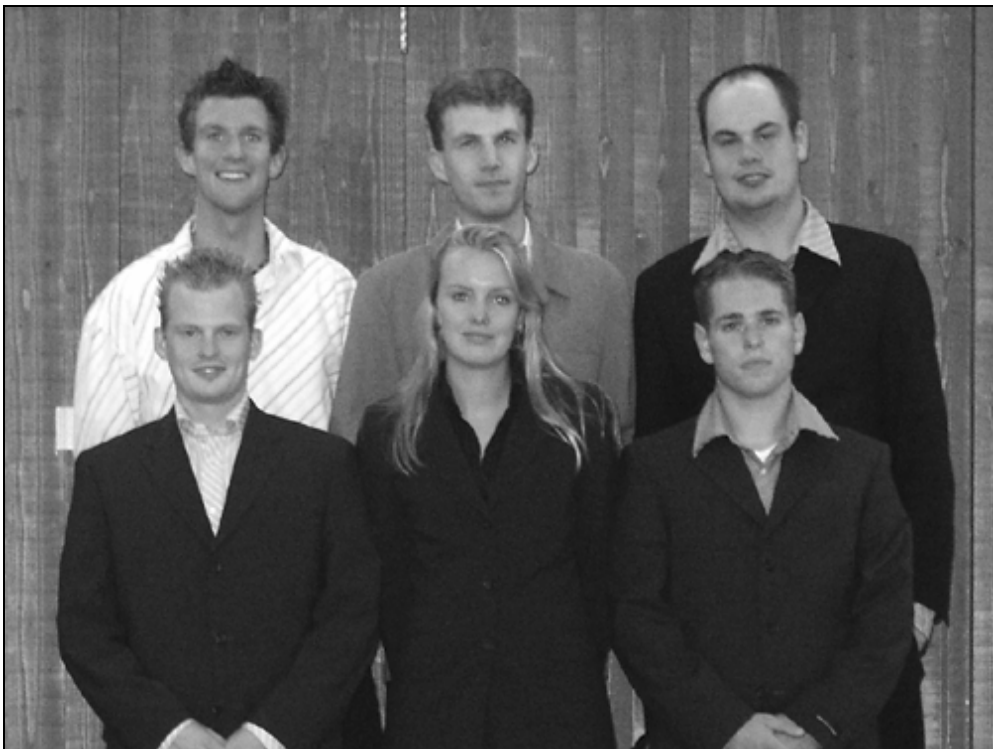
<b>1.1</b>	<b>Evolution of S@mba</b>	<b>3</b>
1.1.1	The committee	3
1.1.2	The destination	4
1.1.3	The name	4
1.1.4	The research	4
1.1.5	The participants	4
1.1.6	The funding	4
1.1.7	The travel scheme	5
<b>1.2</b>	<b>Study association ‘Inter-Actief’</b>	<b>6</b>
<b>1.3</b>	<b>University of Twente</b>	<b>6</b>
<b>1.4</b>	<b>Participants</b>	<b>7</b>
<b>1.5</b>	<b>Tour details</b>	<b>13</b>
1.5.1	São Paulo State	14
1.5.2	Minas Gerais State	14
1.5.3	Rio de Janeiro State	15
1.5.4	Travel scheme	15
<b>1.6</b>	<b>Partners of S@mba</b>	<b>22</b>

## **1.1 Evolution of S@mba**

This chapter describes what work was carried out for this preliminary report.

### **1.1.1 The committee**

The study tour committee of S@mba was formed at the end of 2002, when the committee of 2002 has almost finished their job and the study association was looking for new successors. In relation to other committees in recent years, the committee of S@mba has six members. The last member, Bart Geerdink, enjoyed the group in January 2003, when he was made enthusiast by stories of other members.



Above, from left to right:  
Bart Geerdink (Research Coordinator)  
Johan Kuperus (Chairman)  
Erwin Velthuis (Secretary)

Below, from left to right:  
Yvo Steenberg (Treasurer)  
Pieterneel Kuiper (Travel Coordinator)  
Jeroen Steenbergen (Public Relations)

### **1.1.2 The destination**

In recent years, the study tour of *Inter-Actief* had some interesting destinations, like South East Asia, Mexico and South-Africa. It would be hard to decide where to go this year. Not a single moment is thought of staying in Europe, although it was once a general rule to stay in Europe one year and go inter-continental in the other. Countries like Australia, Japan, India, China and Canada were mentioned, but the final decision was Brazil. Brazil is a country in a different part of the world in relation to recent tour of the association and it is not yet a high-tech western country.

### **1.1.3 The name**

Another important issue was the name of the new study tour. It took almost no time to come up with *S@mba*, because it is a short and powerful word which is closely related to Brazil. Because of the ICT context of the study tour it was chosen for an '@'-sign in the word.

### **1.1.4 The research**

The expectation of Brazil was an Eastern oriented country with many influences of Western countries in the big cities. Besides the interest in the difference in culture between Brazil and our home country, The Netherlands, there was chosen for an ICT related subject: Virtual Reality.

There was chosen to split the research in three parts: a macro analysis about factors like the economic situation, politics and socio-cultural aspects, a meso analysis on five different sectors like aircraft, healthcare and higher education, and a micro analysis that is to be done in organizations and universities in Brazil. The macro and meso assignments are part of the preparations and therefore take place before the tour.

### **1.1.5 The participants**

The study tour would be nowhere without participants. In order to find twenty students who would like to join the tour, a gathering was organized by the committee. Here, everyone received information about the destination and the way the tour would be organized. After this gathering, twenty students have been assigned to participate. From this moment on, the organizing could really begin.

### **1.1.6 The funding**

Travelling far abroad costs a lot of money, so sponsors had to be found. Although a part of the total costs is paid directly by the travellers, more than half of the costs are covered by executing a so-called *Contract Research* assignment. This means that each participant has to spend one hundred hours on working for a company in The Netherlands to complete a computer science-like assignment. This way, the companies get in touch with student and vice versa.

In contrast to previous study tours, direct sponsoring has drastically declined. It seems that the decline in the economy has not passed the

ICT-sector. This is also a reason why committee had to put a lot of effort in finding companies to facilitate the Contract Research.

### **1.1.7 The travel scheme**

As can be read in the following chapters, a lot of interesting companies will be visited and some time is planned for excursions. Quite some time has been spent on finding interesting companies to pay a visit to. The contacts with companies in the focus country, mostly by email, as well as the information on the internet and directly contacted by our supervisor Pires, have made the travel scheme as it is now.

## **1.2 Study association 'Inter-Actief'**

The full name of the association is I.C.T.S.V. *Inter-Actief*, which means Information and Communication Technological Study Association. The association's goal is to organise activities for students of the Computer Science department of the University of Twente.

*Inter-Actief* currently has over 1000 members: a mix of students of Computer Science, Business Information Technology and Telematics. An all-volunteer force consisting of about 100 active members takes care of organizing a wide range of activities, some serious and some for fun.

For instance, our own café basement is open for a round of drinks every two weeks. *Inter-Actief* also frequently have lunch lectures. Furthermore, the association has two frequent publications and the association has a number of large activities organised each year. Examples are an all-day-long symposium with well-known speakers and an intercontinental study tour.

To be able to do everything right, there is a lot of collaboration with other parties. Of course with the students, the department and the university, but also with companies and other associations. *Inter-Actief* will try to develop and maintain a better cooperation with all these parties.

## **1.3 University of Twente**

The University of Twente (UT) is a university for technical and social sciences. Teaching and research is carried out in five faculties of which four are related to engineering and one to social sciences. The motivation for this structure is that the modern engineer should not focus on technical aspects involved in problem solving. The UT has gained a reputation in fundamental research as well as in research with the purpose of specific applications. By carrying out contract research and by transfer of technical knowledge the UT has become an important partner of government, trade and industry.



## 1.4 Participants

A total of 26 students participate in the study tour, committee and participants. They all follow the MSc course in Computer Science or Business Information Technology and are in the final stage of their course. Two members of the scientific staff of the University of Twente, Luis Ferreira Pires and Dick Quartel, accompany the group during the tour as well as during the preparations.



**Figure 1-1: The whole S@mba group**

Below, a picture and some information of each participant as well as the two supervisors can be found.

---

Name: Reinder Attema  
Education: Business Information Technology





Name: Herbert Beltman  
Education: Computer Science

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Name: René Bloemberg  
Education: Business Information Technology

---



Name: Michel Boedeltje  
Education: Computer Science

---



Name: Erwin Elling  
Education: Business Information Technology

---



Name: Luis Ferreira Pires  
Function: Supervisor  
Specialization: Telematics

---



Name: Bart Geerdink  
Function: Research Coordinator  
Education: Business Information Technology

Name: Ron Hakvoort  
Education: Business Information Technology



---

Name: Menno Holtkamp  
Education: Business Information Technology



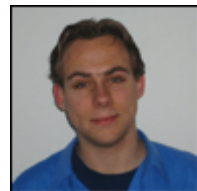
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Name: Hugo Janssen  
Education: Computer Science



---

Name: Jorik Jonker  
Education: Computer Science



---

Name: Mischa Jonker  
Education: Computer Science



---

Name: Pieterneel Kuiper  
Function: Travel Coordinator  
Education: Business Information Technology





Name: Johan Kuperus  
Function: Chairman  
Education: Computer Science

---



Name: Matthijs van der Kooij  
Education: Computer Science

---



Name: Henk-Jan Linthorst  
Education: Business Information Technology

---



Name: Karel-Henk Nijhuis  
Education: Computer Science

---



Name: Mark Olthof  
Education: Computer Science

---



Name: Dick Quartel  
Function: Supervisor  
Specialization: Telematics

Name: Kenneth Rovers  
Education: Computer Science



---

Name: Laurens Satink  
Education: Computer Science



---

Name: Maarten van Schagen  
Education: Computer Science



---

Name: Johan Smit  
Education: Business Information Technology



---

Name: Yvo Steenberg  
Function: Treasurer  
Education: Business Information Technology



---

Name: Jeroen Steenbergen  
Function: Public Relations  
Education: Business Information Technology





Name: Bram van Twist  
Education: Business Information Technology

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Name: Erwin Velthuis  
Function: Secretary  
Education: Business Information Technology

---



Name: Arno Wellink  
Education: Computer Science

## 1.5 Tour details

The study tour to Brazil will take three weeks. During this period the group will visit the South-East of Brazil, the most important region from an economic point of view, which also contains the highest concentration of population (42,63%) and industrial production. The South-East of Brazil is made up of four states, Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo, and presents major differences in relation to its physical aspect, with a coastal strip, mountains and plains.



**Figure 1-2: Map of Brazil**

During the studytour the group will visit the states Minas Gerais, Rio de Janeiro and São Paulo. In each state companies and universities will be visited in five different sectors: Aircraft, Architecture, Higher education, Health activities, and Video industry. Most of these visits will be related to Virtual Reality. Besides this, there will also be enough time for cultural events and sightseeing.



Below follows a short description of the focus states and cities as well as the travel scheme.

### **1.5.1 São Paulo State**



The state São Paulo is Brazil's principal port and the country's leading manufacturing and financial center. The capital of the state São Paulo, the richest state of Brazil, is São Paulo city. The state has a population of 32.697.101 people and includes an area of 248.808,8 km<sup>2</sup>. The main economy consists of agriculture, cattle raising, services, industries, and commerce.

#### **São Paulo city**

São Paulo is the largest city of both South America and Brazil and is a city of immigrants and ethnic neighborhoods. In the city live about 17 million people, many of them descendants of Italian and Japanese migrants. These Paulistas (inhabitants of São Paulo city) are lively and well informed. Founded by Jesuits in 1554, São Paulo served during the 17<sup>th</sup> and 18<sup>th</sup> centuries as a base for Portuguese settlement of the interior. In 1822 it was the city in which Emperor Pedro I proclaimed Brazil's independence from Portugal.

#### **Ubatuba**

Ubatuba is situated on the northern shores of São Paulo state. Over a hundred beaches, each with its distinctive personality, stretch along this the coast. The foundation of the Village of the Exaltation of the Holy Cross of Ubatuba occurred on October 28, 1637. Nevertheless the local history goes back to the beginning of the Christian era. By the time of Brazil's discovery, Ubatuba was known by the Tupinambá Indians as Iperoig. Over here a fundamental diplomatic battle was held over Brazil's future. The Tupinambás, the French and the Portuguese fought over this stretch of the Brazilian coast.

### **1.5.2 Minas Gerais State**



The capital of the state Minas Gerais is Belo Horizonte. The state has a population of 16.143.322 people and includes an area of 588.383,6 km<sup>2</sup>. The main economy consists of agriculture, industries, and cattle raising. The state is the distribution and processing centre of a rich agricultural and mining region and the nucleus of a burgeoning industrial complex.

#### **Belo Horizonte**

Belo Horizonte is a relatively quiet but populous town in the country's interior. It has a population of about 2.5 million inhabitants, and covers an area of 333 sq. km. The first major city in Brazil to be planned, Belo Horizonte was designed to be the state's capital and was originally modelled after Washington, D.C., with precisely laid out streets and avenues. Besides its architectural significance, Belo Horizonte is also noteworthy for its cultural offerings. Over 50 colleges and three universities contribute to the

intellectual life of the city, and numerous museums, theatres, libraries, sport stadiums and cultural centres provide artistic stimulation.

### **Ouro Preto**

Shortly after its founding in 1698, Ouro Preto became the center of the greatest gold and silver rush in the Americas to that date and is one of the principal mineral extracting regions of Brasil. Ouro Preto today lives largely in the past. In 1933 it was declared a national monument and the surrounding region a national park, so that the city's elaborate (mostly late 18th-century) public buildings, churches, and houses might be preserved or restored. The city has many extremely ornate (gold leafed) Baroque churches. Most recently Ouro Preto was used for the signing of the new economic treaty linking Brazil, Argentina, Uruguay, and Paraguay, known as Mercosul.

## **1.5.3 Rio de Janeiro State**



The capital of the state Rio de Janeiro is Rio de Janeiro city. The state has a population of 13.064.296 people and includes an area of 43.909,7 km<sup>2</sup>. The main economy consists of industry and tourism.

### **Rio de Janeiro city**

Rio de Janeiro is also called the Cidade Maravilhosa (marvellous city). It has a population of about 7.0 million Cariocas, as Rio's inhabitants are called. These Cariocas pursue pleasure like no other people: samba and beer; beaches and a beautiful body; and football and cachaça (the local firewater). The beach, a ritual and way of life for the Cariocas, is Rio's common denominator.

Unfortunately there is also a downside: a third of the inhabitants live in favelas (shanty towns) crowd against the hillsides on both sides of the town; the poor have no jobs, schools and doctors; there is drug abuse and violence; and police corruption and brutality are commonplace.

## **1.5.4 Travel scheme**

The study tour, day by day.

### **Friday, 10<sup>th</sup> October**

Study Tour, day 1. Departure to Brazil from Schiphol International Airport, Amsterdam (AMS) at 15:50 with Continental Airlines. After a flight of approximately 10 hours and 30 minutes we will arrive in Houston, at George Bush Airport (IAH), at 17:20. We will head for São Paulo Airport (GRU) at 21:05 with Continental Airlines.

### **Saturday, 11<sup>th</sup> October**

After a flight of approximately 9 hours and 50 minutes we will arrive at 8:55 at São Paulo airport. A whole day ahead of us, only if it wasn't for the jetlag! After getting our luggage, we will go to the Normandie Design Hotel where we will stay for six nights. After arriving at the hotel, we will depart

for our first visit; the Dutch Consulate. At the house of the Consulate-General we will enjoy a typical Brazilian lunch "feijoada" and receive some information about the current situation in Brazil.

### **Sunday, 12<sup>th</sup> October**

Today we will go to the soccer match between São Paulo and Corinthians in the famous soccer stadium of São Paulo, the Cicero Pompeu de Toledo (Morumbi) stadium. Morumbi stadium is located in the center of São Paulo city. The match will start at about 16:00 and we will leave around 19:00.

### **Monday, 13<sup>th</sup> October**

In the morning we will visit the UNIMEP, the Methodist University of Piracicaba. UNIMEP is located in Piracicaba about 130 km from São Paulo city. It has four campuses, with over 14 thousand students, approximately 600 professors, 700 employees and a wide community that builds, through daily interaction, a universe of knowledge, science, technology and, above all, commitment to the contexts in which they are inserted. UNIMEP is inserted within a plural context that points to multicultural, international, solidary and ecumenical experiences that go beyond Piracicaba and Brazil.

After leaving the UNIMEP we will have some time to lunch. After lunch we will visit the UNICAMP, the University of Campinas, located in Campinas about 30km from Piracicaba. The subject of the visit will be telemedicine. UNICAMP was founded on October 5, 1966. In relation to the Brazilian university setting, the oldest university has been operating for less than 70 years, Unicamp may be considered a young institution. Nevertheless, it has already earned a strong reputation for education and technological research.

After leaving the UNIMEP we will head for Holambra, a typical Dutch village, 20km from Campinas, where we will have dinner and some time to look around. Holambra is established by settlers from The Netherlands and retaining to this day a great deal of its Dutch character.

### **Tuesday, 14<sup>th</sup> October**

The visits of today both relate to Health activities. First we have arranged a visit to HC, the Clinical Hospital of the Department of Medicine of the University of São Paulo. HC is a part of the University of São Paulo (USP). USP is the largest institution of higher education and research in Brazil, and the third in size in Latin America. USP evolves in the areas of education, science, technology, and the arts. After leaving HC we will visit the Instituto do Coração, a Heart Institute, it is also a part of USP.

### **Wednesday, 15<sup>th</sup> October**

Today we will pay a visit to Interlagos, home of the Brazilian Grand Prix of Formula One.

### **Thursday, 16<sup>th</sup> October**

This day will start with a visit to a company in the area. After leaving this company visit we will pay a visit to the EP, the Polytechnic school of the University of São Paulo (USP).



**Figure 1-3: The city of Sao Paulo**



**Figure 1-4: A part of the Pampulha Art Museum complex in Belo Horizonte**

### **Friday, 17<sup>th</sup> October**

The visits of today both relate to the Aircraft industry. Early in the morning we will leave the Normandie Design hotel in São Paulo and travel to São José dos Campos by bus, which is located 97km from São Paulo. In São José dos Campos we will pay a visit to the ITA, the Technological Institute of Aeronautics. ITA is a part of the CTA, the Technical Aerospace Center. Our visit to Embraer, the Brazilian company of Aeronautics, which is also located in São José dos Campos, will start at approximately 14:00. Embraer has become one of the largest aircraft manufacturers in the world by focusing on specific market segments with high growth potential in regional, military, and corporate aviation. It develops and adapts successful aircraft platforms and judiciously introduces new technology. Embraer was Brazil's largest exporter from 1999 to 2001 and the second largest in 2002. It currently employs more than 12,000 people, and contributes to the creation of more than 3,000 indirect jobs. The visit will end at approximately 16:30.

After leaving Embraer we will continue our journey by bus to Ubatuba, 150km from São José dos Campos. At the beginning of the evening we will arrive at Wembley Inn Hotel in Ubatuba.

### **Saturday, 18<sup>th</sup> and Sunday, 19<sup>th</sup> October**

The whole weekend we will stay at Wembley Inn Hotel in Ubatuba. The hotel is located at the beach Praia das toninhas, 6km from the center of Ubatuba. Here we'll have time to relax after a busy week in São Paulo and enjoy the beach and the sun!

### **Monday, 20<sup>th</sup> October**

In the morning we will leave Wembley Inn and head for Belo Horizonte by bus, which is located 563km from Ubatuba. In the afternoon we will reach Wimbledon Hotel in Belo Horizonte. In the evening there will be enough time to explore the town.

### **Tuesday, 21<sup>th</sup> October**

Today we will pay a visit to UFMG, the Federal University of Minas Gerais. In the morning we will visit PRJ, the department of Projects. PRJ was constituted in 1992 from the fusing of two old Departments of the School of Architecture of UFMG: PLQ, the Department of Planning Architectural and REA, the Department of Graphical Representation and Expression Architectural. PRJ deals with architectural design and planning. Their undergraduate and graduate students use Virtual Reality to develop building concepts and design. After lunch we will visit DCC, the department of Computer Science.

### **Wednesday, 22<sup>th</sup> October**

Today we will start our day with a visit to VETTA technologies. Vetta Technologies is a software development consulting company based in Belo Horizonte. It was incorporated in August 2001, with a mission to provide high quality software development and consulting services to clients in Brazil and around the world. Contract outsourced programming is part of their core business.

### **Thursday, 23<sup>rd</sup> October**

Today we will leave for Ouro Preto, one of the principal mineral extracting regions of Brasil, which is located about 90km from Ouro Preto. On our way to Ouro Preto we will get to know more about Ouro Preto as a mining region. Today we will visit an old mine in the neighborhood and try to learn about gold extraction. For two nights we will stay at Pousada Recanto das Minas in Ouro Preto.

### **Friday, 24<sup>th</sup> October**

Today we will have a tour around the city. We will visit the Nossa Senhora do Pilar. This church has approximately 400kg of gold ornaments and is one of the most colorful churches of Brazil.

### **Saturday, 25<sup>th</sup> October**

In the early morning we will leave for Rio de Janeiro by bus, which is located 415km from Ouro Preto. On the way we will make a stop at Petropolis. Petropolis is known as the Imperial city as this was where the Emperor, his family and his court went to escape the summer heat in the 1800's. It is located in the mountains about two hours east of Rio by bus and has a European feel about it. After our visit to Petropolis we will arrive at Hotel Copa Sul in Rio de Janeiro, where we will stay the rest of the studytour.

### **Sunday, 26<sup>th</sup> October**

Today we will visit two landmarks of Brazil; Pão de Açúcar (Sugar loaf mountain) and Corcovado (Christo Redentor statue). We will pay a visit to Pão de Açúcar. Pão de Açúcar is shaped like a Victorian sugar loaf and 396m tall and stands high above the city of Rio de Janeiro. The mountain is one of the most famous in the world and is a spectacular backdrop to Brazil's most lively city. From the top of the mountain you will have an excellent panoramic view of Rio de Janeiro and Guanabara Bay. Cable cars will take us to the top of the mountain. For the more adventurous students it is also possible to make the steep climb on foot. We will also pay a visit to the Corcovado. The Corcovado belvedere is set 709 meters above sea level, at the very top of the mountain with the same name. From there you can see nearly the entire city of Rio de Janeiro. The Cristo Redentor statue is also located on the Corcovado, a project of the French Paul Landowsky, which stands 38 meters high. We will take a train from Cosme Velho to the Corcovado. This train will take us through the Parque Nacional de Tijuca to the top in only 17 minutes.

### **Monday, 27<sup>th</sup> October**

Today we have arranged a visit to Paralelo Computação. Paralelo Computação is a Computer Graphics and Design company located in Niterói, Rio de Janeiro. Its business activities divide into three main solution providence fields, which correspond to the three departments into which the company is divided; the Department of Architecture, the Department of Design, and the Department of Software Technology. After our visit at Paralelo we will pay a visit to Petrobras. Petrobras, based in Rio de Janeiro, was founded in October of 1953 to operate in the Brazilian oil sector. Over more than four decades the company has become the

country's leader in the distribution of oil products and is now internationally acknowledged as one of the largest twenty major oil companies in the world today.

### **Tuesday, 28<sup>th</sup> October**

This day will start with a visit to PUC-Rio, Catholic Pontifical University of Rio De Janeiro. The PUC-Rio is created in 1941 and their strong academic fields include business administration, computer science, economics, engineering, letters, mathematics, philosophy, physics and theology. The subject of the visit will have to do with multimedia. After this visit we will pay a visit to Casa das Canoas, a museum of Oscar Niemeyer. Oscar Soares Filho Niemeyer founded and designed the new capital of Brazil in 1957 and is Brazil's best-know architect.

### **Wednesday, 29<sup>th</sup> October**

The visits of today both relate to the Video industry. At approximately 10:30 we will pay a visit to Endemol, based in Rio de Janeiro. The company was established in 1994 as the result of a merger between the two TV producers in the Netherlands: Joop van den Ende Productions and John de Mol Produkties. The company, with its head offices in the Netherlands, has subsidiaries and joint ventures in 21 countries, including the one we will visit in Brazil. In August 2001, TV Globo and Endemol started a 50/50 joint venture named Endemol Globo. The company produces entertainment programmes for the entire free and pay television market in Brazil. We will have a tour around the studios and have lunch. After lunch we will pay visit to Globo till approximately 16:30.

### **Thursday, 30<sup>th</sup> October**

It is almost the last day of our studytour. This day we will start with a visit to Unisys. Unisys is a worldwide information technology services and solutions company, which serves six primary vertical markets worldwide. These markets contain financial services, the public sector, communications, transportation, commercial, and media. They combine expertise in systems integration, outsourcing, infrastructure, server technology, and consulting. After our visit to Unisys we will pay a visit to the tropical island Ilha de Paqueta along the cost of Rio de Janeiro. This small, picturesque island in Guanabara Bay is a very tranquil place with the feel of another century; a great place to relax! It's a good spot for a walk or a picnic (no cars are allowed on the island) and consists of only one square kilometer. Horses and bicycle are the primary means of transportation on this island. We will reach the island by catamaran. This will take an hour and a half.

### **Friday, 31<sup>th</sup> October**

This is our last day in Rio de Janeiro. Unfortunately the studytour reaches its last day. But the last day of the studytour does not mean the last of our stying in Brazil. Today you can start with the extension of your tour!





**Figure 1-5: The city of Ouro Preto**



**Figure 1-6: A view over Rio de Janeiro from the Sugar Loaf mountain**

## **1.6 Partners of S@mba**

The S@mba committee would like to thank all the companies and institutions that made it possible to turn this study tour into a success.

Research sponsors

- CLM Solutions
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We would also like to thank the following people for their contribution.

Dr. Ir. S.J. de Boer (Technology and Development Group of the faculty of Technology and Management)

Dr. L. Ferreira Pires (Telematics Systems & Services Group of the Electrical Engineering, Mathematics & Computer Science)





## **2 Research project**



## Chapter contents

<b>2.1</b>	<b>Introduction</b>	<b>27</b>
<b>2.2</b>	<b>Research question</b>	<b>27</b>
<b>2.3</b>	<b>Approach</b>	<b>28</b>
<b>2.4</b>	<b>Supporting course</b>	<b>29</b>
<b>2.5</b>	<b>Virtual Reality</b>	<b>30</b>

## **2.1 Introduction**

The overall goal of a study tour is to provide an extra dimension to the regular curriculum. This means participants will learn how things work in their future profession at the other side of the world. In an unique opportunity to broaden their view on the developments of IT in Brazil, S@mba provides this extra dimension.

In order to give research a focus, a few options were considered. Given the interests of the participants, the recent developments in the IT, and the researches of the last study tours of the study association, the study tour committee decided to focus on Virtual Reality.

Next, an explanation of the research project is given, followed by a description of every part of the research.

## **2.2 Research question**

The main objective of the S@mba research project 2003 to acquire insight a clearer view into the Virtual Reality developments in Brazil. Typical features of Brazil include its geographically position as well as the national fragmentation of the national markets and industrial areas. The overall research question therefore reads:

*What is the influence of Virtual Reality on the development of Brazilian industry?*

## **2.3 Approach**

In order to answer this question, three sub studies are executed. First the macro characteristics of Brazil will be investigated in order to establish the general political, economic, socio-cultural, technological and geographic situation. A comparison will be made with the Netherlands.

*Which macro factors and/or actors will stimulate or inhibit the development and application of Virtual Reality?*

Next, five economic sectors will be analyzed in more detail to gain insight in how the factors influence the way Virtual Reality is being used in those sectors. These studies will lead to provisional conclusions.

*What are strong and weak aspects of the different market sectors and what could Virtual Reality contribute to the development of these sectors?*

Finally, companies in these sectors will be visited in Brazil, to gain “first hand” with the current situation and to assess the way Virtual Reality is applied and/or developed. The findings and final conclusions will be published in a next report.



## 2.4 Supporting course

The research of the course is embedded in the course *Industrial development in worldwide perspective*. In consultation with the professor for this course, dr. S.J. de Boer, the participants were divided into five groups of four participants each. These groups were assigned to the macro assignment, meso assignment and micro assignment of this research project.

The first report deals with relevant macro characteristics of Brazil and in what way(s) they differ from the characteristics in The Netherlands. Each group had to investigate one of the following macro characteristics:

- National political aspects
- International political
- National economical aspects
- International economic aspects
- Geographical, historical, technical & Socio-cultural aspects

For the second assignment, each group was assigned to an industrial sector. The groups had to describe their sector, investigate the main challenges in that sector and show how Virtual Reality may support in dealing with these challenges. The chosen sectors are:

- Aircraft
- Architecture
- Human health activities
- Higher education
- Motion picture, video & computer game production and distribution

The third and final assignment has to be written during and after the the tour in Brazil. It will be the result of a comparison between the situations figured in this preliminary report and the real situation in Brazil.

Before departure, the group of participants will be divided in ten groups of two persons each. Each group will be in charge during two days of company visitings. Before leaving The Netherlands, they have to do some research on the companies, which will be visited in Brazil. At the end of the day of the day, an informal report of the day will be written as well as a formal report of the company visits.

After returning to The Netherlands, conclusions have to be drawn by all participants. These conclusions and reports will be published in the final report of the S@mba Study Tour 2003.

## **2.5 Virtual Reality**

In order to answer the questions of the different assignments, the following definition of Virtual Reality was given:

*Virtual Reality is defined as a way for humans to visualize, manipulate and interact with computers and extremely complex data.*

Virtual Reality can be done through a synthetic, computer generated three-dimensional environment. Although the entertainment industry is widely known for its use of Virtual Reality, many other industries also use the technology on a large scale. Modern meteorologists, for example, use computer modelling and Virtual Reality technology to predict weather. By simulating weather conditions they can predict the weather much more accurately than before.

The scientific world uses Virtual Reality to simulate a variety of complex situations. One of the largest single simulations currently in use is the simulation of the universe. Scientists are using the technology to vary the mix of stellar gas, ordinary matter, and dark matter created soon after the Big Bang in an effort to discover the formula needed to create a universe.

Chemical and molecular modelling is often done through Virtual Reality as well. In an effort to design cooler more efficient car engines, researchers are using Virtual Reality to model over 400 hydrogen-nitrogen chemical reactions in an internal combustion engine. Biologists are using Virtual Reality to discover the mechanisms through which proteins are able to communicate with each other.

The area that benefits the most from Virtual Reality, however, is education. With the advent of computers simple lessons like reading and mathematics could easily be taught using computers. More advanced topics, however, weren't possible because of their inability to provide hands-on experience. Today, driving simulators are often used to teach people how to operate an automobile. More complicated subjects such as biology and chemistry can now be taught through Virtual Reality.

Virtual Reality can also help the physically challenged learn to cope with their environment. Orthopaedically impaired children at the Oregon Research Institute learn the skills necessary to operate their motorized wheel chairs through Virtual Reality. The children advance through different virtual worlds as their skill increases. The most difficult world requires that the child successfully cross the street using the pedestrian signals and avoiding traffic. Completion of each world not only gives the child the skill he/she needs but also gives them the satisfaction and confidence that they desperately need.

The medical industry also utilizes Virtual Reality a great deal. Doctors are using it to treat diseases more effectively. They can study images of a cancer patient's body structure to plan an effective radiation therapy

technique. Doctors also commonly use surgical modelling to learn how an organ responds to a given surgical instrument. This allows doctors to master surgical procedures without having to endanger anyone by learning "on-the-job". Some doctors even use Virtual Reality to cure patients of certain "phobias". For example, people with acrophobia (the fear of heights) are often treated with Virtual Reality. The patient is subjected to a virtual world that exercises their fear. In the acrophobia example, they could be looking over the side of a cliff in their simulation. The patient is usually able to overcome their fear due to the fact that they know the situation is only computer simulated and can not actually harm them.



# **3 Geography, history, technology & socio- cultural aspects**

Ron Hakvoort  
Menno Holtkamp  
Matthijs van der Kooij  
Karel-Henk Nijhuis



## Chapter contents

<b>3.1</b>	<b>Introduction</b>	<b>35</b>
<b>3.2</b>	<b>Geography</b>	<b>36</b>
3.2.1	Geographical characteristics	36
3.2.2	Conclusion	37
<b>3.3</b>	<b>History of Brazil</b>	<b>39</b>
3.3.1	Brazilian Indians	39
3.3.2	Discovery of Brazil	39
3.3.3	The colonial period	39
3.3.4	Independence from Portugal	41
3.3.5	The Empire	42
3.3.6	The Republic	43
3.3.7	Post War Brazil	44
3.3.8	Conclusion	44
<b>3.4</b>	<b>Socio-cultural</b>	<b>45</b>
3.4.1	Population demographics	45
3.4.2	Income distribution	46
3.4.3	Social mobility	46
3.4.4	Work attitudes	47
3.4.5	Doing business	47
3.4.6	Consumerism	47
3.4.7	Levels of education	47
3.4.8	Diversity of religions	48
3.4.9	Culture	48
3.4.10	Comparison	49
3.4.11	Conclusion	51
<b>3.5</b>	<b>Technology</b>	<b>53</b>
3.5.1	Research and development policies	53
3.5.2	IT and electronics	55
3.5.3	Virtual Reality in both countries	56
3.5.4	Comparison	57
3.5.5	Conclusion	58
<b>3.6</b>	<b>References</b>	<b>59</b>

### 3.1 Introduction

This chapter will cover the socio-cultural, technological, geographical and historical aspects at macro level of Brazil and The Netherlands. A clear comparison between these countries will be made in order to get a good overview of the current issues and challenges. To do this, the following question has to be answered:

*What geographical, historical, socio-cultural and technological factors will stimulate or inhibit the development and application of Virtual Reality?*

To do this, one should first look at the geography of Brazil (See Figure 3-1). Then history, socio-cultural and technological characteristics of Brazil will be compared with the situation for The Netherlands. Finally, comparison conclusions are made between Brazil and The Netherlands.



Figure 3-1: Map of Brazil

## **3.2 Geography**

The country of Brazil and a transcript of its geographical aspects will be introduced to give you a background for the upcoming chapters describing the socio-cultural, technological and historical aspects. Current developments in Virtual Reality applications will be related to the research.

### **3.2.1 Geographical characteristics**

*Country name:* República Federativa do Brasil

*Area:* 8,511,965 sq km

Brazil is the world's fifth largest country, occupying almost half the South American continent and bordering every country on it except Chile and Ecuador. Much of Brazil is scarcely populated, although some regions with previously low population densities, such as the Amazon, are being rapidly settled, logged and depleted.

Brazil can be divided into four major geographic regions. The long, narrow Atlantic seaboard has coastal ranges between the Rio Grande do Sul and Bahia, but is flatter north of Bahia. The large highlands - called the Planalto Brasileiro, or central plateau - which extend over most of Brazil's interior south of the Amazon Basin are punctuated by several small mountain ranges and sliced by several large rivers. There are also two great depressions: the Parana-Paragui basin in the south, which is characterized by open forest, low woods and scrubland; and the huge, densely forested Amazon basin in the north. The Amazon, 6275km (3890mi) long, is the world's largest river, and the Amazon forest contains 30% of the world's remaining forest.

The richness and diversity of Brazil's fauna - much of which is endemic - is astounding, and the country ranks first in the world for numbers of species of mammals, freshwater fish and plants; second for amphibians, third for bird species; and fifth for species of reptiles. Despite its natural riches, Brazil is renowned for the destruction of its environment. All of Brazil's major ecosystems are threatened, not just the well-known Amazonia. Many species are under threat because of the continued depletion of rainforests, desertification in the northeast, poaching in the Pantanal region and coastal pollution.

Most of the country has noticeable seasonal variations in rain, temperature and humidity, but only the south of Brazil has large seasonal changes. The Brazilian winter is from June to August, with the coldest southern states receiving average winter temperatures of between 13°C and 18°C (55°F and 64°F). In summer (December to February), Rio is hot and humid, with temperatures in the high 30'sC (80'sF) common; the rest of the year, temperatures usually hover around 25°C (77°F). The northeast coast gets as hot as Rio in the summer but tropical breezes make it less humid and stifling. In general, the Planalto Brasileiro is less hot and humid, and is prone to summer rainfalls. The Amazon basin is the rainiest part of Brazil



(the term 'rainforest' is a bit of a giveaway), and while it is humid, temperatures average a reasonable 27°C (80°F). [LPW03]

### 3.2.2 Conclusion

In this paragraph you will be presented with the Geographical indices of The Netherlands and Brazil and try to assess the differences and similarities between these countries.

	<b>BRAZIL</b>	<b>THE NETHERLANDS</b>
<b>Geographic coordinates</b>	1000 S, 5500 W	5230 N, 545 E
<b>Area (land, water)</b>	Land 8,456,510 sq km, Water 55,455 sq km, Total 8,511,965 sq km.	Land: 33,883 sq km, Water: 7,643 sq km, Total: 41,526 sq km.
<b>Land border neighbouring country</b>	Argentina: 1,224 km, Bolivia 3,400 km, Colombia 1,643 km, French Guiana 673 km, Guyana 1,119 km, Paraguay 1,290 km, Peru 1,560 km, Suriname 597 km, Uruguay 985 km, Venezuela 2,200 km, Total: 14,691 km.	Belgium 450 km, Germany 577 km, Total: 1027 km.
<b>Coastline</b>	7,491 km	451 km
<b>Climate</b>	mostly tropical, but is temperate in southern portion, rainfall: moderate rainfall of 1000 millimetres a year, in the upper regions of Amazonia around the mouth of the Amazon 2000 millimetres	temperate; marine; cool summers and mild winters moderate rainfall of 1100 millimetres
<b>Terrain</b>	flat to rolling lowlands in north, with some plains, hills, mountains, and narrow coastal belt	mostly coastal lowland and reclaimed land (polders); some hills in southeast
<b>Natural resources</b>	bauxite, gold, iron ore, manganese, nickel, phosphates, platinum, tin, uranium, petroleum, hydropower, and timber	natural gas, petroleum, arable land
<b>Land use</b>	5% arable land; 1% permanent crops; 22% permanent pastures; 58% forests and woodland; and 14% other	arable - land: 25%, permanent crops: 3% , permanent pastures: 25% , forests and woodland: 8% , other: 39%
<b>Environment</b>	considerable air pollution problems, especially in its larger cities	water pollution in the form of heavy metals, organic compounds, and nutrients such as nitrates and phosphates; air pollution from vehicles and refining activities; acid rain

**Table 3-1: Geographical indices; Brazil and The Netherlands compared**

As these facts show, Brazil is a huge country compared to The Netherlands, the latter 250 times smaller in size. The country is facing a lot of problems on the front of pollution prevention, one can imagine that it's hard to fight this, when you experience problems in all eco systems. Depletion of rainforests may be called cause number one. Brazil is just starting to pay some more attention to this. The CETESB governmental institution for Environmental Technologies is trying to increase the awareness of the national catastrophes going on. [CET03] [NPP03]

To overcome geographical distances and to better explore the Brazil richness of natural resources, in 2001, The Universidade Federal do Rio Grande do Norte opened a Virtual Reality laboratory for for 3D visualization of geographical data. This initiative was taken to facilitate the exploration of oil. [SGIO1] This is not the only initiative which relates to the geographical distances in the country of Brazil, the Brazilian Government for example also subsidizes Virtual Education and Distance Learning, like Projeto E, and several other projects focussing on Teleconferencing and Telecommunication. [PRE01] [ENG01] [DEM01] [PTV03]

## **3.3 History of Brazil**

History of Brazil will be described in this chapter, in chronological order. This will include the following subjects: the original inhabitants, the discovery and colonization by the Portuguese, the independence, the Empire and Republic and the most recent history.

### **3.3.1 Brazilian Indians**

The original inhabitants of what is now Brazil were Indians who had lived there for 30,000 years. In contrary to the Inca and Maya however the Brazilian Indians never developed a centralized civilization. Therefore very little evidence is left for archaeologists to study: just some pottery, shell mounds and skeletons. [LON03]

At the time the Brazil was discovered by the Europeans, there lived an estimated 2 to 6 million Brazilian Indians. This population was quite diverse and consisted of several groups: Arawak and Carib groups in the north, the Tupí-Guaraní of the east coast and the Amazon River valley, the Ge of eastern and southern Brazil, and the Pano in the west. Most of them lived in a semi-nomadic way and survived by hunting, gathering and simple agriculture. Nowadays there are probably less than 200,000 original inhabitants, living in the hidden jungles of the Brazilian interior. [HOB03] [LIB03] [LON03]

### **3.3.2 Discovery of Brazil**

In 1500 the Portuguese navigator Pedro Álvares Cabral set sail from Lisbon with 13 ships and 1200 crewman. He arrived at the Brazilian coast near present-day Porto Seguro and formally claimed the surrounding region in the name of Portugal. This territory was named “Terra da Vera Cruz”, which is Portuguese for “Land of the True Cross”. [HOB03]

A year later the Portuguese government sent the Italian navigator Amerigo Vespucci to explore “Terra da Vera Cruz”. Vespucci gave names to many capes and bays, including one bay he called “Rio de Janeiro”, Portuguese for “River of January”. He chose this name because he discovered the bay in January and mistakenly thought the bay was a huge river mouth. [RIO03]

To show that Brazil was commercially interesting, Vespucci sent a ship with brazilwood back to Portugal. This valuable hardwood produced a reddish-purple dye, highly valued by European cloth makers. Soon brazilwood became an important export product. Indians of the coastal rain forests cut brazilwood logs in exchange for pots, axes, hatchets, knives and other European goods. From then on “Terra da Vera Cruz” was called Brazil. [BWO03]

### **3.3.3 The colonial period**

As part of a systematic colonization program, King João III sent the first Portuguese settlers to Brazil in 1531. He divided Brazil into 15 districts and

granted the districts to friends of the Portuguese court. The grantees, known as donatarios, got extraordinary powers over their domains.

Several years later, King João III revoked the powers held by the donatarios because of the dangers of the French depredations along the Brazilian coast. He placed Brazil under the rule of a governor-general. The first governor-general was Thomé de Souza in 1549. He organized a central government and chose the newly founded city of Salvador, or Bahia, as his capital. Furthermore he instituted comprehensive administrative and judicial reforms and established a coastal defense system.

On the shores of Rio de Janeiro Bay the French founded a colony in 1555. The Portuguese destroyed this colony in 1560 and in established the city of Rio de Janeiro in its place in 1567. Sao Paulo was founded in 1554 by the Jesuits as a mission centre. [LON03] [HOB03] [SAO03]

### **Trade of slaves**

Around 1530 the colonists discovered that the land and climate were very suitable for growing sugar cane. Enslaving the Indian population solved the following labour requirements. Despite resistance of the Indians, the capture and trade of slaves soon became very lucrative.

Because Indian slaves were very vulnerable to European diseases, they were replaced by African slaves by the end of the 16<sup>th</sup> century. The African slaves didn't live much longer though. Runaway slaves formed communities, called Quilombos. These communities varied in size from small groups hidden in the forests to the republic of Palmares, which lasted till the end of the 17<sup>th</sup> century. [LON03] [HOB03]

### **The Dutch Incursions**

The Dutch originally were business partners of the Portuguese. This changed when Sebastian, King of Portugal, died in 1578. Leaving no clearly defined successor, Philip II of Spain claimed the Portuguese crown in 1580. The Dutch, being traditional enemies of Spain, now started to act aggressively against Brazil.

In 1624 a Dutch fleet seized Bahia but they lost it a year later due to a combined attack of Spaniards, Portuguese, and Native Americans. Sponsored by the Dutch West India Company, the Dutch attacked again in 1630 and captured Pernambuco, now Recife, and Olinda. In subsequent operations most of the territory between Maranhão Island and the lower course of the São Francisco River fell to the Dutch.

The Dutch-occupied part of Brazil prospered for several years under the governorship of Count Johan Mauritz van Nassau-Siegen.. He resigned in 1644 in protest against the exploitative policies of the Dutch West India Company. After his departure the Portuguese colonists rose in rebellion against the Dutch supported by their mother country. In 1654 the Dutch capitulated and in 1661 renounced their claims to Brazilian territory.

In 1640 there was a successful revolt in Portugal against Spanish lordship. Brazil then reverted to Portuguese sovereignty and was made a viceroyalty. [HOB03] [HIS03]

### **Discovery of gold**

Early 17<sup>th</sup> century the colonists expanded Brazil southward and entered the large sections of the interior. The Paulistas, people from São Paulo, had reached the upper course of the Paraná River around 1650. The main purpose of their expeditions was to enslave Native Americans. By then however the Paulistas encountered heavy opposition from the Jesuits, who were against the enslavement of Indians. Many Paulistas then became prospectors and a big hunt for valuable minerals followed.

In 1693 rich gold deposits were discovered in the region of present-day Minas Gerais. This discovery was followed by a gold rush which in turn brought tens of thousands of Portuguese colonists to Brazil. Countless slaves were brought from Africa to dig and die in the mines. In 1721 diamonds were discovered which further stimulated the economic expansion. It is estimated that nearly 1,000 tons of gold and 3 million carats of diamonds were extracted from the region between 1700 and 1800. [HOB03] [HIS03]

The boom in gold and diamond mining, was followed by the rise of coffee cultivation, another important source of wealth. The early plantations were in regions with readily-available slave labor in Rio de Janeiro. In the late 19th century the abolition of slavery and European immigration, caused coffee growing to move southward to the region where soil conditions, climate, and altitude provided a suitable environment. [HIS03]

## **3.3.4 Independence from Portugal**

### **Restrictions**

Portugal acted essentially as an intermediary between the colony's products and the European market. They raised taxation and restrictions on trade and industrial activities, to which the colonists increasingly objected.

To keep in power, the Portuguese monarch José I, under the leadership of his minister the marquês de Pombal, ordered more restrictions. The marquês de Pombal restructured the military and the bureaucracy and strengthened Portuguese monopoly with further restrictions on commerce and industrial development. In 1785, the Portuguese government decrees that the metallurgical factories, textile manufacturing, and gold-working be discontinued in Brazil. The Brazilian elites increasingly adopted liberal ideas because they saw that greater profit could be gained through free trade.

The religious order of the Jesuits was particularly affected during this period. By 1759, they were expelled from Portugal and the colonies, resulting in the closure of many institutions of learning and basic civil administration. The education system was replaced by Pomba with a

system under the control of the vice-royalties. These reforms caused civil unrest and led to the resignation of the marquês de Pombal in 1777.

The urge to gain political freedom began in the second half of the 18th century. The concept of independence was generally shared and some actions were taken. However, none of them was strong enough to undermine the Portuguese domination at that time. [HIS03]

### **Transfer of the Portuguese court**

When Napoleon's army marched on Lisbon in 1807, the decision was made to transfer the monarch, Queen Maria I, the prince João VI, and their court to Brazil. Soon after arriving, Rio de Janeiro was made the capital of the United Kingdom of Portugal, Brazil and the Algarve. João VI, became king after the death of Maria I in 1816. Although Napoleon's dominance was ended in 1815, he chose to remain living in Rio de Janeiro. However, in 1821 he was forced to return to Lisbon under pressure of politicians of Portugal.

The establishment of the royal administration in the colony changed the economic environment significant, through the increased import of foreign goods and the beginning of industrialization. João VI nullified the royal decree of 1785, which had prohibited local manufacturing of textiles, gun powder, and glass, as well as the building of wheat mills. [LON03] [HIS03]

### **Independence in 1822**

Barely a year after the return of João VI to Portugal, the Crown Prince proclaimed the independence of Brazil on September 7, 1822, as an Empire. He had himself crowned Emperor Pedro I on December 1, 1822. After a relatively short war of independence, from 1822 till 1824, Brazil became an empire under Dom Pedro I. [HIS03]

## **3.3.5 The Empire**

### **Pedro I (1822-1831)**

After the death of João VI, Dom Pedro inherited his father's kingdom and introduced important political and economical changes. However, he abdicated the Portuguese throne in favour of his infant daughter, Maria da Glória, who became Queen Maria II. In 1831, he abdicated the throne of Brazil in favour of his son, Dom Pedro II, who was still a minor.

The economy after independence remains the same as it was before, based on agrarian products and slave labour. In the 1820's coffee comprised 44% of Brazil's exports. [HIS03]

### **Pedro II (1831-1889)**

During the rule of Pedro II, Brazil reached political and cultural maturity. Political and social institutions developed peacefully and attained stability. A competent administration was created, slavery was progressively eliminated. European immigration was actively promoted and health and welfare schemes were planned on a national scale. [HIS03]

### **Rubber export**

The Amazon had an important era of its own from the 1880s to 1919, when it was the world's major source of rubber. Rubber drew world attention to the region and lured thousands of rubber tappers. When the massive British, Dutch, and French plantations in Southeast produced much more, rubber production in Brazil decreased. [LIB03]

## **3.3.6 The Republic**

### **Abolition of Slavery in 1888**

The abolition of slavery is usually regarded as the most immediate cause for the fall of the monarchy. With the Emperor away in Europe, his daughter, Princess Isabel, acted as Regent. On May 13, 1888, responding to the collapse of slavery, she signed the so-called "Golden Law", which abolished slavery in Brazil.

The "Golden Law" set off a reaction among slave owners which rapidly eroded the political foundations of the monarchy. After a few months of parliamentary crises, the Emperor was deposed on November 15, 1889, by a military movement that proclaimed the establishment of the Republic. This transformation was carried out without bloodshed. The Emperor and his family went into exile in France. [HIS03]

### **A federative presidential System**

The newborn republic adopted a federative system and so the provinces of the Empire were transformed into States. The parliamentary system was replaced with a presidential one, a bicameral Congress with a Chamber of Deputies and Senate was created, as well as a completely independent Supreme Court. [HIS03]

### **The Revolution of 1930**

This Republic lasted until 1930 when, for the first time, the government was overthrown by force. The revolutionary movement was headed by Getúlio Vargas and had the main aim the reform of an electoral and political system. This was because the absence of strong national parties had led to the practice of electing presidents supported by the governors of the leading states of São Paulo and Minas Gerais.

Getúlio Vargas, who was to govern Brazil for the next 15 years, came to power at a troubled time. The country was feeling the effects of the world depression which drastically reduced the price of coffee. The political scene was affected not only by the resultant financial crisis, but also by militant minorities inspired by ideas from Nazi Germany, Fascist Italy and the Communist ideology from the Soviet Union.

Vargas' first acts were to unite Brazil. He replaced all of the state governors, which were extremely powerful people, with intervenors. These intervenors reported directly to Vargas and could be replaced at the President's will. In 1934 Vargas wrote and ratified a constitution that further limited states' powers. Some important policies were adopted by Vargas which included the introduction of advanced social welfare legislation, a reform of the

educational system, and substantial progress in industrialisation. [HOB03] [HIS03]

## **World War II**

When World War II started, the Vargas government could not ignore the spontaneous preference of the majority of Brazilians for the Allies. The hostile actions of German U-boats off the Brazilian coast forced the President to abandon the neutral stance. Brazil equipped a 25,000-man strong Expeditionary Force which fought in Italy. Also, Brazil became an important supplier of raw materials to the Allied war effort.

In return for the raw materials, the United States invested huge sums of money in Brazil's infrastructure. Highways, railroads, ports, and airports were constructed almost entirely from United States' funds. The United States also created the Brazil steel industry by funding Brazil's first steel mill. Because of these improvements, industry in Brazil quickly grew, although coffee still remained the biggest of the exports. [VAR03] [HIS03]

### **3.3.7 Post War Brazil**

#### **Vargas, Kubitschek and Quadros**

By the end of the war, Vargas was forced to resign and elections were held for the first time in 15 years. General Eurico Gaspar Dutra who had been Vargas' Minister of the Army, was chosen as president. A new democratic constitution was approved in 1946 which remained until 1967. Dutra's term came to an end in 1951.

Meanwhile Vargas, who had sat out his exile at his ranch in Rio Grande do Sul, had prepared for the elections. At the conclusion of Dutra's term, Vargas was constitutionally elected president of the republic. In 1954, in the middle of a political crisis, Vargas committed suicide.

Kubitschek became president in 1956 and founded Brasília. Brazil experienced five years of economic expansion. Kubitschek was followed by President Jânio Quadros, who resigned after less than a year. Quadros' vice president was Goulart and he was able to persuade the voters to restore the old presidential system. Heavy inflation and political issues led to two years of social unrest and economic crisis. The military overthrew Goulart in a coup on March 31, 1964 because of his Marxist leanings. From then on Brazil was ruled by several military generals until 1985. [HIS03]

### **3.3.8 Conclusion**

The main conclusion is that the Europeans, mainly the Portuguese, have heavily influenced the history of Brazil. Wood, sugar, gold, rubber and coffee have all been very important export products for Brazil and attracted large amounts of immigrants. Until 1888 an estimated 750,000 Europeans had immigrated to Brazil. In 1888 slavery was abolished, causing a peak in immigration: nearly five million immigrants came to Brazil from 1884 to 1963. Since colonization the country has gone from Monarchy to Empire to Republic and has had periods of military regimes in which democracy was not strongly present. [IMM03]



### 3.4 Socio-cultural

This chapter focuses on the socio-cultural differences between Brazil and The Netherlands. First some demographical data will be discussed and remarkable issues will be explained. Then income, social mobility, work attitude, the way of doing business, education and religion and the Brazilian culture will be discussed.

#### 3.4.1 Population demographics

The most important demographic aspects of the Brazilian population compared with the Dutch population are represented in the table below:

	BRAZIL	THE NETHERLANDS
<b>Population</b>	176 million	16 million
<b>Age Structure</b>		
0 – 14 years	28% (male 25,140,954; female 24,199,276)	18.3% (male 1,502,687; female 1,437,141)
15 – 64 years	66.4% (male 57,424,151; female 59,409,928)	67.9% (male 5,548,188; female 5,362,412)
65 years and over	5.6% (male 3,992,017; female 5,863,234)	13.8% (male 913,020; female 1,304,306)
<b>Population Growth Rate</b>	0.87%	0.53%
<b>Birth rate</b>		
births/1,000 population	18.08	11.58
<b>Death rate</b>		
deaths/1,000 population	9.32	8.67
<b>Life expectancy at birth</b>		
Total population (years)		
Female (years)	63.55	78.58
Male (years)	67.91	81.59
	59.4	75.7
<b>Net migration rate</b>		
migrants/1,000 population	-0.03	2.35
<b>Sex ratio</b>		
Males/Females	0.97	0.98
<b>Ethnic groups</b>		
White (Port,Germ,Ita,Spa, Polish)	55%	-
Mixed Black/White		
Black	38%	-
Dutch	6%	-
Other	-	91%
	1%	9%

**Table 3-2: Brazil’s most demographic aspects compared with The Netherlands [CIA03a, CIA03b]**

Remarkable is the difference between the Dutch and the Brazilian birth rate. The birth rate in Brazil is 56% higher than in The Netherlands. The Brazilian birth rate began to decline in the seventies, because of socioeconomic changes. Large families were less affordable in traditional and economic structure in rural areas. In the past, children started working early and supported their parents in old age. In that way, the children did not cost much to raise. But, nowadays, children are going to school for longer periods and cost more to support. [FRD03]

Another noteworthy difference is the life expectancy at birth. Dutch citizens grow fifteen years older compared with the Brazilian population. Although, the Brazilian life expectancy is expected to increase to 75.5 years in 2020. A reason for that is the improved healthcare. Most of the diseases are brought under control. [FRD03]

### 3.4.2 Income distribution

Income inequality can usually be determined by the Gini coefficient. It contrasts actual income and property distribution with perfectly equal distribution. The value of the Gini coefficient can vary from 0 (complete equality) to 1 (complete inequality) [FRD03]

The Gini coefficient for Brazil increased from 0.50 in 1960 to 0.6366 in 1991. [FRD03] The last few years the coefficient decreased to 0.59 [CIA03b] So, the national income becomes more distributed over the Brazilian population. The GDP (Gross Domestic Product) per capita is \$7,400 (2000 est.) [CIA03b]

Also the regional income inequality can be studied. The Southeast and South regions, which occupy 17.6 percent of Brazil's total territory, had 58.7 percent of the total population and generated 74.3 percent of the GDP, in 1985. By great contrast, the Northeast, which occupies 18.3 percent of Brazil's area, had 28.5 percent of the total population and generated only 13.1 percent of the GDP (1985). All regional data are summarized in the table below. [FRD03]

According to an Income Distribution report written by the International Monetary Fund, can up to 50% of the income inequality be explained by differences in educational levels. [CLE97]

	% of Brazil's area	% of total population	% of Brazil's GDP	Urbanization rate
<b>South(east)</b>	17.6	58.7	74.3	88.3
<b>Northeast</b>	18.3	28.5	13.1	41.6
<b>North and Center-West</b>	64.1	12.8	12.6	43.9

**Table 3-3: Regional income distribution [FRD03]**

### 3.4.3 Social mobility

Definition of social mobility according to economist Stephen Aldridge: "Social mobility describes the movement or opportunities for movement between different social groups, and the advantages and disadvantages that go with this in terms of income, security of employment, opportunities for advancement etc." [ALD01]

The Brazilian class structure cannot be reduced to a wealthy landed elite versus masses of poor peasants and workers, like most of the Latin American societies. The middle sectors or classes have been significant at least since the nineteenth century. Sectors of Brazil's population that were neither slave owners nor slaves began to grow in the colonial period.

Shopkeepers, small farmers, freed slaves, and persons of mixed racial origin began to outnumber slave owners and eventually slaves.

The middle class continued to grow during the twentieth century. Nowadays, the present middle class consists largely of a technical work force (clerks, professionals, teachers, salespersons, public servants, and highly skilled workers). Its position is based more on knowledge and skills than on property. A surge of upward mobility strengthened the middle class during the "economic miracle" in the late 1960s and early 1970s. Blue-collar workers with middle to low levels of skills are a significant part of the lower middle class. [FRD03]

#### **3.4.4 Work attitudes**

Brazilians live their daily lives calmly and at ease. The whole country of Brazil doesn't live by strict time schedule. The saying 'Time is money' does not apply in Brazil. Brazilians also are always looking for a job that pays better and is easier than their present job. If they find one, they change jobs immediately. Employees are less bounded to their employers. [TSU00]

#### **3.4.5 Doing business**

Doing business in Brazil requires an understanding of that country's differing work ethics. There are even regional differences. You should wear a suit and necktie in the south region of São Paulo at a business meeting, but not in the north of Brazil. Because São Paulo is more affected by European immigration. The best times for a business appointment are from 10 a.m. to noon and from 3 to 5 p.m. It is also very important to know that meals are for a socializing purpose, not for doing business. During the meal, it is usual to talk about the countries' two cultures and your family. [HUG03]

Brazilians usually greet each other with long handshakes and noticeable eye contact; close friends will often embrace. During conversations, Brazilians tend to stand very close to each other. Brazilians are very fast talkers, so non-Brazilian businessmen have to expect fast-paced conversations. It is also normal for a conversation to be highly animated, with frequent interruptions, exclamations of 'no!', and a tremendous amount of physical contact. [EXE03]

#### **3.4.6 Consumerism**

Brazilian's are seen to be intense consumers, much like Americans. However, Brazilians demand quality and brand name products. Taking advantage of this consumerism, like in most western retail environments, Brazilian retail sales flourish around commemorative dates. [TPU01] Brazilian people measure their success by the things that they own (materialistic). [FLE01]

#### **3.4.7 Levels of education**

In Brazil, there are basically three levels of education. The primary and secondary schools and higher education (the universities and colleges). In the 1970s and 1980s the primary and secondary schools are restructured

to eight years of basic (fundamental) education and three years of secondary school. [FRD03] Most of the primary and secondary schools are handled by the state and municipal governments. [CLE97]

Education in Brazil is marked by great inequalities; A highly developed university system at one extreme and widespread illiteracy at the other. The federal government spends compared to other Latin American countries a relatively high share of the budget on primary and higher education. In 1990 4.2 percent of Brazil's GDP was spent on education. 41.3 percent of the expenditures on education were allocated to primary education, 8.6 percent to secondary education and 26.7 percent to higher education. Educational expenditure per student differs significantly by level in Brazil: \$304 per student for primary education, \$705 for secondary education and \$ 7,806 per student for higher education.[CLE97]

The Brazilian government supports some projects for developing Virtual Reality learning environments. One of those projects is the MOO project. MOO stands for multi-user, object-oriented environment. Brazilian students can communicate with other international to be able to share knowledge all over the world.

### 3.4.8 Diversity of religions

Brazil is one of the largest Roman Catholic countries in the world. In 1996 about 76 percent of the population, or about 122 million people, declared Roman Catholicism as their religion, as compared with 89 percent in 1980. The main reason for the strong Catholicism is the Portuguese colonization of Brazil. [ZEN03] In the late nineteenth century, the original Roman Catholic populace of Portuguese origin was reinforced by a large number of Italian Catholics who immigrated to Brazil, as well as some Polish and German Catholic immigrants. [FRD03] The table below reflects the diversity of religions in Brazil and The Netherlands.

	Percentage in Brazil	Percentage in The Netherlands
<b>Christian (Catholic)</b>	68.00%	31.00%
<b>Christian (Protestant)</b>	21.60%	21.00%
<b>Buddhism</b>	0.20%	-
<b>Muslim</b>	0.10%	4.40%
<b>Jewish</b>	0.06%	-
<b>Spiritism</b>	4.80%	-
<b>Atheism/Other</b>	5.24%	43.60%

Table 3-4: Diversity of religions [ZEN03]<sup>1</sup>

### 3.4.9 Culture

#### Cultural roots

Cultural development in the colonial period (1500-1822) was primarily a transfer of Portuguese traditions to Brazil, particularly under the influence of the Roman Catholic Church. Architecture was the earliest art form to develop a distinctly Brazilian tradition through the blending of European

<sup>1</sup> (Note: the dashes instead of percentages mean that there was no info available, about the share of that religion)

and African influences. During the 18th century, wealth generated by sugar plantations and gold mines went into the building of flamboyant churches and public buildings. [MAP02]

The Brazilian culture is not only shaped by Portuguese influences, but also by the country's native Indians, the considerable African population, and other settlers from Europe, the Middle East and Asia. [LON03] By far the most dominant of these cultures is that of the Portuguese, from whom Brazilians acquired their language, their religion and most of their traditional customs. [MAP02]

African influence on the Brazilian way of life is strongest in the plantation region north along the coast from Rio de Janeiro. Particularly in Bahia, there are traditional dishes of African origin, such as vatapá - made of rice flour, coconut oil, fish and shrimps, red peppers, and many other spices. Evident in northern coastal cities are religious cults of African origin. African influence is also reflected in Brazilian popular music, especially in the rhythmic sambas. [MAP02]

### **Sports**

Soccer is the most popular sport, played in the massive stadiums of the big cities and as recreation. Although there is great rivalry between local teams, there is strong popular support for the national team, which has won the World Cup, soccer's major international competition, four times. Pelé, one of the world's legendary soccer players, led the Brazilian team to three of those victories, in 1958, 1962, and 1970. Motor racing is also very popular, and Brazil has produced a number of championship winners, including Emerson Fittipaldi and Ayrton Senna. Major participant sports include swimming, tennis, sailing, and golf. [JOH00]

### **Carnival**

The festival of Carnival, with its spectacular street parades and vibrant music, has become one of the most potent images of Brazil. Its roots lie in the European Mardi Gras, a lively festival, which precedes the fasting and prayers of the Roman Catholic holy season of Lent. In Brazil it seems to have first occurred in Bahia in the mid-17th century and in Rio de Janeiro in the 1850s, where it was associated with street parades and elegant private balls. Carnival did not take on its present spectacular form in Rio until the 1930s. The dance known as the samba emerged in the favelas (shantytowns) of the city. Samba "schools" based in the favelas compete to create the most spectacular groups of extravagantly costumed dancers and original samba songs. In Rio they now parade through the sambadrome (a street stadium ) before vast crowds of Brazilians and foreign tourists. The more traditional street parties and balls also continue. Carnival is celebrated throughout Brazil, but the most spectacular celebrations outside Rio take place in Salvador, Recife, and Olinda, although the nature of the events varies. [JOH00]

### **3.4.10 Comparison**

In the Table 3-5 **Error! Reference source not found.**, the most remarkable aspects will be compared between Brazil and The Netherlands.

	<b>Brazil</b>	<b>The Netherlands</b>
<b>Population Demographics</b>		
Population	176 million	16 million
Birth Rate (births/1.000 population)	18,08	11,58
Life expectancy at birth	63.55 years	78.58 years
Major ethnic groups	(Port, German, Ita, Spa, Pol) (55%)	Dutch (91%)
<b>Income Distribution</b>		
Gini Coefficient	0.59	0.33
Gross Domestic Product per Capita (GDP)	\$ 7,400	\$ 26,900
<b>Social Mobility</b>		
Former major social group(s)	Slaves	Industrial workers
Today's major social group(s)	Middle Class	Middle Class
Social movement	Slaves	Provo's` (70s, 80s)
<b>Work Attitude</b>		
	'Time is money` does not apply, always looking for a job that pays better and is easier.	High labour output, relatively short working days, number of part-time jobs is increasing.
<b>Doing Business</b>		
	Fast-paced conversation with much emotional expressions. Business appointments are from 10 a.m. to noon and from 3 to 5 p.m.	Value planning and efficient use of time is very important. Arriving even a few minutes late may cause that they doubt your competency or trustworthiness! Decision making in Dutch firms is often based upon consensus. The process can therefore take a good deal of time. [MOR03]
<b>Consumerism</b>		
	Intense consumers, very materialistic. Brazilian people demands high quality and brand name products.	Consumerism took over interests of Dutch community. People will not be boxed in social-religion groups.
<b>Levels of Education</b>		
Levels	Three levels of education (primary, secondary and tertiary)	Three levels of education (primary, secondary and tertiary)
<b>Diversity of Religion</b>		
Christian	92%	52%
Atheism	Low number of non-affiliated people	High number of non-affiliated people
<b>Culture</b>		
	Portuguese, Indian and African influences.	Country's cultural life as a whole achieved an international reputation in the 17th century, which is often called its Golden Age. [MAP02b]
Popular sports	Soccer, motor sports	Soccer, Speed Skating (on ice).
Events	World's famous carnival events (Rio)	Queen's Day.

**Table 3-5: Comparison table between Brazil and The Netherlands**

### **3.4.11 Conclusion**

Considering the six discussed aspects, one can say that Brazil and The Netherlands are very different countries. The Brazilian population is eleven times bigger and their life expectancy is almost fifteen years shorter, the income distribution is significantly more unequal and the Dutch people earn four times more. But the educational system of both countries is comparable. The share of Brazilian Christian people is larger than in The Netherlands, but the number of religious people is declining in both countries. The Brazilian government supports projects for developing Virtual Reality learning environments, which support teachers and students to collaborate in international projects.



**Figure 3-2: The Brazilian soccer team (World Cup 2002)**



**Figure 3-3: Carnaval in Brazil**



## 3.5 Technology

This chapter covers technological aspects of Brazil and The Netherlands, ICT in particular. First the current policies concerning research and development for both countries will be mentioned, after which the IT and electronics markets will be discussed. Finally a brief comparison between the countries will be given, where differences between Brazil and The Netherlands will be depicted.

### 3.5.1 Research and development policies

This paragraph will discuss the policies which are currently active to support and improve research and development (R&D) programs in Brazil and The Netherlands. These programs are often initiated by the national government, or the firm itself in coalition with other firms. Three attributes are important to measure the degree of innovation in a developing country like Brazil:

- presence of an educated R&D sector within the firm whether or not formally structured
- investment in R&D on total turnover
- relationships with universities or research centres
- investment in R&D

The paragraph concerning The Netherlands will discuss (other) subjects, like the policies and institutes which are founded to support R&D-activities. Finally the Dutch struggle to achieve the status of 'Digital Delta' will be mentioned.

#### **Brazil**

The firms in a developing country like Brazil, show the characteristics of an innovative company, are rather small and medium sized firms. The major part of these firms' innovation-related activities is connected with diffusion, adaptation and improvement of existing technologies rather than development of new technology, or significant innovation. The firms are concentrated in two industrial sectors (precision and medical instruments and information technology), predominantly located in the metropolitan region of São Paulo, and present innovation features which are well above those of overall firms from São Paulo state, therefore much well above the overall Brazilian firms. The table presented below is the result of a survey carried out in 1998 by the Federal University of São Carlos, which had been oriented towards industrial 136 representative firms in 5 technological-dense regions in the state of São Paulo, the most industrialized among Brazil [FER98].

	Graduate staff in R&D on total employment		% - Investment in R&D on total turnover		Relationship with Universities & research centres	Formal R&D sector within the firm	Perform R&D activities
	1990	1997	1990	1997			
<b>Non-metallic mineral products</b>	-	-	-	-	100,0	-	-
<b>Metallurgy</b>	-	-	-	-	100,0	-	-
<b>Services to firms</b>	8,9	23,8	5,0	48,3	62,5	25,0	100,0
<b>Information technology</b>	30,0	48,4	18,3	29,3	29,0	16,1	100,0
<b>Chemicals &amp; pharmaceuticals</b>	7,1	13,2	3,0	19,0	66,7	22,2	100,0
<b>Instruments &amp; automation equipment</b>	16,8	20,9	14,8	14,3	46,9	26,5	100,0
<b>Research &amp; development</b>	-	31,3	-	12,0	66,7	-	100,0
<b>Electronics material &amp; telecom</b>	50,7	25,4	6,0	9,9	16,7	33,3	100,0
<b>Electrical machinery</b>	26,3	19,5	1,0	8,7	71,4	14,3	80,0
<b>Office machinery &amp; inf. equipment</b>	47,7	24,8	5,0	6,5	25,0	50,0	100,0
<b>Mechanical machinery</b>	4,0	21,2	2,0	4,0	37,5	12,5	71,4
<b>Metal products</b>	10,0	11,1	1,0	1,0	100,0	-	66,7
<b>General average</b>	<i>21,4</i>	<i>26,7</i>	<i>11,2</i>	<i>17,5</i>	<i>44,9</i>	<i>22,1</i>	<i>100,0</i>
<b>Number of firms</b>	<i>37,0</i>	<i>88,0</i>	<i>31,0</i>	<i>69,0</i>	<i>136,0</i>	<i>136,0</i>	<i>100,0</i>

**Table 3-6: Innovation indicators of firms (numbers above the bold line and 'General average' are percentages)**

A significant growth is seen in the importance of the R&D-department between 1997 and 1990, as well in the number of employees as in investments. 44,9% of the firms has a relationship with universities & research centres, while 22,1% actually has a formal R&D-sector within the firm.

The only sectors whose ratios declined are those which were hit by the commercial liberalization that rose in the 1990s in Brazil (electronics material, electrical machinery and office machinery and information equipment).

### **The Netherlands**

The Netherlands have a long history of administrative labor which has its origin in their 'golden century', which points to a century of intensive commercial activities between The Netherlands and other European countries. A lot of data had to be processed, so procedures were formulated. When the automation-industry arose, The Netherlands were keen to innovate and automate business processes as well as performing research for new technologies and it's markets. Nowadays, the role of universities and research-institutes like TNO is of great importance for commercial activities in The Netherlands. Business-parks are often located near (technical) universities like Delft, Twente and Eindhoven to encourage close cooperation between business and science. An organized support for research is formed by the NWO (Dutch organization for Scientific Research),

researchers are allowed to submit a subject for research, after which it will be examined to determine whether it has the right to be subsidized.

Dutch researchers have the ambition to reach the world-top on ICT-research as 'The Digital Delta', though more investments are needed to achieve this goal. A more effective cooperation between several research departments is an additional requirement to develop a research-program, which is more efficient. Nowadays R&D-departments prefer the US above The Netherlands, due to discouraging policies and national interests. 16% of public research-funds are commercially invested in The Netherlands while this number is 33% in the US.[DOO01][LIE02]

The ICT-sector is responsible for approximately a third of the R&D expenditures of Dutch enterprises. The lion's share of this comes to the account of the ICT-industry. The R&D efforts of the ICT-services sector are far above the level of that of the services sector. As well inside as outside the ICT-sector the R&D efforts by enterprises in The Netherlands on the technology area information technology have increased severely. The share of R&D labour input that is spent on R&D on information technology has increased for enterprises outside the ICT-sector between 1995 and 1999 from 3.5% to a large 10%.

### **3.5.2 IT and electronics**

This paragraph will cover the use of IT and electronics in both Brazil and The Netherlands. Some statistics will be given to clarify the similarities and/or differences between these countries.

#### **Brazil**

Brazil's IT market, which doubled in size between 1991 and 1997, remains a very promising market with significant growth prospects in hardware, software and services. Local companies have a high level of technological and managerial expertise and many are seeking overseas partners with new technologies to develop in Brazil. Most of the leading world players, both in hardware and software, are present in Brazil, and the major service providers are also making progress in this market.

Brazil's IT industry employs around 100,000 people, 50% of whom are employed in manufacturing centres. Many Brazilian IT companies have already set up modern quality management systems and the country is now virtually on a par with the most advanced countries in terms of technology in IT production. According to Brazil's electronics association, ABINEE, the IT market grew by 6% in the first half of 1998. Although Brazil has less than 2% of world production and trade in IT and is not a significant exporter, it has a potentially strong internal market and is attracting investments from global players as a manufacturing base for exports to the rest of Latin America and elsewhere.

A wide range of equipment is manufactured in Brazil, including computers/micro-computers, printers, bank counters, cash dispensers, modems, telephone switches, optical fibres and cables, video monitors, digital radios, faxes, etc. The main production centres for electronic goods

are São Paulo and Amazonas states. The Internet industry in Brazil is increasing significantly, but the service is relatively poor due to the inadequate telephone network, Brazil had 13.98 million active internet-users in the year 2002. [TRA02]

### **The Netherlands**

The development of the domestic ICT-expenditures is reflected in the development of the domestic ICT-sector. The market for ICT-services is predominantly a domestic market. Within this market, the market for computer services is predominantly a business market. The growth of computer service sector develops more or less parallel to the expenditures of businesses and the Government on computer services. This sector was familiar with years of large growth in the period 1996-1998. Hereafter the growth was less each year. In contrast with the market for computer services, the telecommunication market is much more both a business and a consumer market. For the post and telecommunication enterprises up to and including 2000 it was a matter of increasing growth percentages. In 2001, however it is expected that the growth will decrease. Here also goes that for both sectors the growth percentages are still above these of the growth of the national economy. The growth of a market is not only realized by the existing enterprises in that market but also by the inclusion of new enterprises. The number of newly started ICT-enterprises still grows every year. In the period 1995-2001 the number of ICT- and telecommunication-enterprises in The Netherlands has doubled. Although the absolute number of bankruptcies of these enterprises has increased, this is not extreme if you express this as the percentage of all ICT-enterprises [CBS02].

### **3.5.3 Virtual Reality in both countries**

This paragraph covers the use and stimulation of Virtual Reality (VR) in both countries from a MACRO-perspective. Due to minor differences between these countries, they will be combined in one paragraph.

VR is a continuous growing concept in both The Netherlands and Brazil, some studies are performed nowadays and the first VR-firms are initiated. An example of a recent Dutch study is SURFnet's electronic cooperation study which investigates the possibility of Computer Systems for Cooperative Work (CSCW) [SUR03]. Application of VR is rising in the medical sector in both countries, for example students are taught to perform surgeries in an electronic environment, on a virtual patient [NRV03][UTV03]. These skills can be used when the actual surgery will be performed by a machine and the surgeon operates this machine via an alternate interface. In the manufacturing industry, simulations can be performed in order to decrease expensive 'real-life' tests, or to optimize a design without the need of a prototype. Potential customers or engineers can take a walk through a house, or car, after which can be decided whether this is an optimal design. A recent example is a project of Volkswagen performed at a car-exhibition where participants were virtually transformed in a Volkswagen [CYB03]. Other applications are training and simulation, the gaming and erotic industry [UTV03].

### 3.5.4 Comparison

Some statistics will be used in order to compare the use of technology in Brazil with The Netherlands. First some statistics mentioning the amount of technology exports will be discussed. This part of export will be divided in low- medium- and high-technology.

	BRAZIL	THE NETHERLANDS
<b>Low-technology</b>		
1980	-	11
1999	12	12
<b>Medium-technology</b>		
1980	-	22
1999	24	25
<b>High-technology</b>		
1980	-	9
1999	9	26

**Table 3-7: Export of technology as % of total goods exports**

As shown in Table 3-7 **Error! Reference source not found.** Brazil has similar export-amount as The Netherlands looking at low- and medium-technology. The major difference is the amount of export of high-technology, this is 26% in The Netherlands and only 9% in Brazil. This type of technology, like advanced chip-development including its high-precision manufacturing machines and cutting-edge medical instruments, is especially provided by cooperation-treaties between commercial firms (like Philips, DSM and ASML) and universities. In Brazil this kind of technology is starting to become an important export-product, but The Netherlands do have a lead start in this sector.

The Technology Achievement Index (TAI) provides an insight to the level of innovation in countries. This composite index measures achievements, not potential, effort or inputs. It is not a measure of which country is leading in global technology development, but focuses on how well the country as a whole is participating in creating and using technology. The TAI is composed from factors like creation of technology, diffusion of recent and old innovations and human skills [HDR01].

A significant difference between the countries TAI's (See Table 3-8), number of internet-hosts, telephones and electronic consumption indicates a less technology-based society in Brazil, compared with The Netherlands. But the expectations concerning the use of technology in Brazil are a stable increase. The mid-society is increasing and becoming wealthier, increasing the need for luxury and advanced technology.

The Netherlands are facing a challenge to compete with other high-tech countries, the government is focusing on this competition on a medium scale, but awareness is growing that strict policies and cooperation between several institutes should be made in order to achieve the 'Digital Delta'.

In both countries VR is in the stage of study and minor application. These applications can be found in teaching and design activities. In Brazil the virtual teacher project can be a potential program in order to provide good education on remote areas. Teachers from different universities can join

each other, together with students in a virtual environment. Yet, this concept is also in a premature phase.

		BRAZIL	THE NETHERLANDS
<b>Technology Achievement Index</b>			
Value		0,311	0,630
<b>Technology creation</b>			
Patents granted to residents (per million people)	1998	2	189
Receipts of royalties and license fees (US\$ per 1000 people)	1999	0,8	151,2
<b>Diffusion of recent innovations</b>			
Internet-hosts (per 1000 people)	2000	7,2	136,0
High- and medium technology exports (as % of total goods exports)	1999	32,9	50,9
<b>Diffusion of old innovations</b>			
Telephones (mainline and cellular, per 1000 people)	1999	238	1042
Electricity consumption (kilowatt-hours per capita)	1998	179	5908
<b>Human skills</b>			
Mean years of schooling-enrolment	2000	4,9	9,4
Gross tertiary science	1995-97	3,4	9,5

**Table 3-8: Technology Achievement Index**

### 3.5.5 Conclusion

Significant differences between Brazil and The Netherlands can be mentioned, concerning the use of technology and its research and development. The Netherlands are more at a 'mature' stage, while Brazil mostly uses medium-complex technologies. Brazil has to make improvements to close the gap with other Western countries but is on its way. The Netherlands have to fight to prevent a further loss of investments in ICT.

Concerning the 'Digital Delta', The Netherlands nowadays operates as 7<sup>th</sup> internet-country and is still improving its network with projects like SURFnet5, promoted by gigaport [GIG03]. Brazil has similar projects, but due to its immense surface, it's harder to develop and maintain an advanced infrastructure with national coverage. Civilized areas are privileged with a better and more stable connection with the internet. In Brazil this is supported by institutes like the institute of technological research (IPT) [IPT03].

The state of VR in both countries is similar and finds itself in a premature stage, studies are performed and the first applications become operational.

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# 4 National political aspects

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# Chapter contents

<b>4.1</b>	<b>Introduction</b>	<b>65</b>
<b>4.2</b>	<b>Political history until today</b>	<b>66</b>
4.2.1	General political history	66
4.2.2	Political trade policy history	68
<b>4.3</b>	<b>Political stability</b>	<b>70</b>
4.3.1	The Constitution	70
4.3.2	The Legislature	71
4.3.3	The Executive	71
4.3.4	The Judiciary	71
4.3.5	Voting System	72
<b>4.4</b>	<b>Fiscal policy</b>	<b>73</b>
4.4.1	Taxation	73
4.4.2	Government expenditures	74
<b>4.5</b>	<b>Environmental protection</b>	<b>77</b>
<b>4.6</b>	<b>Bureaucracy</b>	<b>79</b>
4.6.1	Real-life examples	79
4.6.2	Bureaucracy and conducting business	79
4.6.3	Government policy	80
<b>4.7</b>	<b>Privatisation</b>	<b>81</b>
4.7.1	Why privatisation	81
4.7.2	Historical overview	81
4.7.3	Results	82
<b>4.8</b>	<b>Employment laws</b>	<b>84</b>
4.8.1	Employment Contract	84
4.8.2	Basic Rights of Employees	85
4.8.3	Termination of Employment Contract	85
<b>4.9</b>	<b>Corruption</b>	<b>88</b>
<b>4.10</b>	<b>Conclusion</b>	<b>90</b>
4.10.1	Political stability	90
4.10.2	Fiscal policy	90
4.10.3	Environment	91
4.10.4	Bureaucracy	92
4.10.5	Privatization	92
4.10.6	Employment laws	92
4.10.7	Corruption	93
<b>4.11</b>	<b>References</b>	<b>95</b>

## **4.1 Introduction**

This part of the report is an assessment about national political aspects in Brazil at a macro level. The following research question is used for this part of the report:

*“Which macro factors in the national political situation will stimulate or inhibit the development and application of Virtual Reality?”*

To try and find an answer to this question, the following sections will be an analysis of several factors in Brazil on the subject of the national politics. These factors will be compared to the Dutch situation and differences and similarities are discussed. Finally all aspects are concluded in respect to the influence on “Virtual Reality”.

## **4.2 Political history until today**

In this section the national political history will be described.

### **4.2.1 General political history**

Dictators have ruled the republic from time to time and most recently from 1964-1985.

Officially Brazil is constituted in a Federative Republic - Federative Republic of Brazil - composed of 26 states and a federal district, where is located the capital of the Republic - Brasília, the government's headquarters and of the executive, legislative and judicial powers [MAC91].

The Brazilian states are contained in five great political-administrative areas: North, Northeast, Southeast, South and Middle-West [MAC91].

Created in 1968, by FIBGE (Brazilian Institute of Geography and Statistics Foundation), that regional division is adopted officially for census researches and for organs of direct administration and of planning institutions and so. This delimitation in only 5 great areas is being examined by a portion of the scientific community's researchers, who question the relationship to its real aspects of representation of regional communities in geographic, human, cultural and economic terms.

Suffrage is voluntary between 16 and 18 years of age and over 70; compulsory over 18 and under 70 years of age [FAC03].

The Legal system is based on Roman codes; it has not accepted compulsory ICJ (International Court of Justice) jurisdiction.

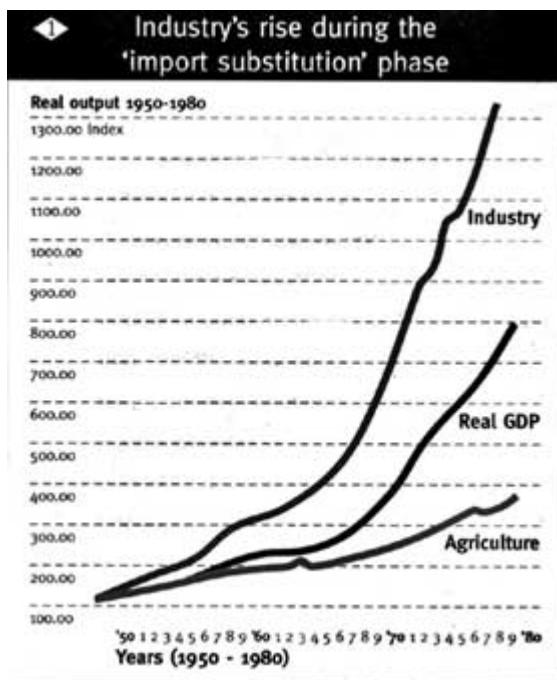
For the timeline of Brazil, see Table 4-1.

<b>Year</b>	<b>Event</b>
<b>1956-61</b>	Juscelino Kubitschek is president, helping Brazil achieve rapid economic growth.
<b>1960</b>	Kubitschek moves capital to Brasilia.
<b>1960</b>	Janio Quadros elected president, but resigns after several months, plunging country into constitutional crisis. He is succeeded by left-wing vice-president Joao Goulart.
<b>1964</b>	Goulart ousted in bloodless coup, flees into exile. Military rule associated with repression but also with rapid economic growth based on state-ownership of key sectors.
<b>1974</b>	General Ernesto Geisel becomes president, introduces reforms which allow limited political activity and elections.
<b>1982</b>	Brazil halts payment of its main foreign debt, which is among the world's biggest.
<b>1985</b>	Tancredo Neves elected first civilian president in 21 years under the electoral college system set up by the military, but falls ill before he can be inaugurated and dies shortly afterwards. His vice president Jose Sarney becomes president at time of economic crisis, with inflation at 300%.
<b>1986</b>	Sarney introduces Cruzado Plan, freezing prices and wages in effort to control inflation. But inflation explodes when freeze is lifted.
<b>1988</b>	New constitution reduces presidential powers.
<b>1989</b>	Fernando Collor de Mello elected president. Introduces radical economic reform including opening up of economy to imports, privatisation and a controversial freeze on savings and bank accounts. His promised economic improvements fail to materialise, and by 1991 inflation reaches 1,500%. Foreign debt payments suspended.
<b>1992</b>	Earth Summit in Rio. Collor resigns after being accused of corruption. He is later cleared. Replaced by vice president Itamar Franco.
<b>1994</b>	Fernando Henrique Cardoso elected president after helping to bring inflation under control. Makes controversial moves on land issue, seizing land for distribution among poor, and allowing indigenous land claims to be challenged.
<b>1996</b>	Police kill 19 Amazon peasants in town of Eldorado dos Carajas.
<b>1997</b>	Constitution changed to allow president to run for re-election.
<b>1998</b>	Cardoso re-elected. IMF provides rescue package after economy hit by collapse of Asian stock markets.
<b>2000</b>	Celebrations to mark Brazil's 500th anniversary marred by protests by indigenous Indians, who say that racial genocide, forced labour and disease have dramatically cut their population from an estimated 5 million before the Portuguese arrived in 1500 to the current 350,000.
<b>2001</b>	Government says it is prepared to make changes to a development programme which critics say would have a catastrophic impact on the Amazon. Under the scheme, the Brazilian government expects to spend \$40bn over seven years on highways, railways, hydroelectric projects and housing in the Amazon basin.
<b>2001 May</b>	President Cardoso abolishes two government development agencies for the Amazon and the north-east of the country. The authorities say the agencies set up bogus projects in order to steal development funds estimated at more than \$1 billion.

Table 4-1: Timeline of Brazil [TIM01]

## 4.2.2 Political trade policy history

After 1945, the Brazilian government tried to reduce the country's dependence on the export of coffee and a few other crops. A series of development plans were put into operation. They encouraged the production of alternative exports (especially comparatively high-tech products such as motor vehicles, steel and petrochemicals). They also encouraged manufacturers to produce products which otherwise would have been imported, this is known as "export substitution". Typical "export substitution" products included electrical equipment. The government protected their newly developed manufacturing industries from foreign competition by introducing all sorts of restrictions and tariffs on overseas imports. It even banned the import of some products.



SOURCE: Banco Central do Brasil.

Figure 4-1: Industry's rise during the 'import substitution' phase

Figure 4-1 shows how growth in agriculture compared with that of industry during the period when the government was encouraging industrial growth. However, one of the major imports during the 1960s and 1970s was oil. The 1970s saw very substantial rises in the price of oil. At the same time, there were large increases in the interest Brazil had to pay to the foreign banks and investors who had lent money to fund the new industries. So once again imports were severely reduced and exports expanded. By the early 1980s, the main exports were: [BRA03]

- Manufactured and semi-manufactured products such as footwear, cotton yarns, machines, electrical goods and transport equipment.
- Agricultural products, especially coffee.



- Processed agricultural products like orange juice and, a new addition, meal made from soybean (and used, for instance, for cattle food).
- By 1990, Brazil's economic achievements had surpassed those of every other less developed country (LDC). Brazil became the tenth large economy in the world. It was time to open up the country. Another important development for Brazil's trade was the formation of a trading block called MERCOSUL in 1994. It is a sort of South American Common Market. The members are Brazil, Argentina, Paraguay and Uruguay.

By 1994, Brazil had lifted many of the restrictions that formed a barrier to world trade. The imports and exports are shown in the table below. The sort of policies which, for example, reserved Brazilian electronics only for the Brazilian market gradually disappeared. However, Brazil still has some way to go in "openness" to world markets. Currently its degree of openness is similar to other markets such as Japan.

## **4.3 Political stability**

October last year, Brazilians elected a new president, as well as senators and congressmen, state governors and legislators. Luiz Inácio Lula da Silva, the leader of the Workers' Party, was voted president with a big majority of the votes. Main points on the agenda of Da Silva were for example: solving the economic imbalances and the extreme poverty. [BRA02]

After a long period of right-wing politics, the election of da Silva shows that democracy is well-established in Brazil, an achievement not only of those who are active in politics but also - and above all - of the Brazilian people. The turning point of the re-democratization of Brazil occurred in the 1980's, a period when values that had been repressed for quite a few years were reaffirmed and once again became part of the country's national political life. If the 1980s were distinguished by the achievement of attaining democracy and political stability, the 1990s were the years of Brazilian economic stability and reforms. [BAR02]

The current system of government is a Federative Republic with a multi-party political system. Brazil has democratic elections for president, senators, representatives, state governors and legislators, mayors and municipal counsels. Brazil is the world leader in electronic online voting (100 million voters.)

### **4.3.1 The Constitution**

After the monarchy was abolished, Brazil's first Constitution under the Republic (1891) established a presidential system and three independent powers: Executive, Legislative, and Judiciary. This structure was retained in Brazil's six subsequent republican constitutions, including the present Constitution, drafted by a specially empowered National Congress elected in 1984, and formally promulgated on October 5, 1988. The 1988 Constitution incorporates a great many new concepts ranging from environmental protection to increased powers for the legislature in its relationship with the Executive. Since 1992 important amendments have been adopted mostly pertaining to economic issues. [INS02]

Brazil is a federative republic composed of 26 States and one Federal District where Brasília, the capital of the country, is situated. Each State has its own government, with a structure that mirrors the federal level, enjoying all the powers (defined in its own Constitution) which are not specifically reserved for the federal government or assigned to the Municipal Councils. The head of the state executive is the Governor, elected by direct popular vote under the Federal Constitution. The one-chamber state legislature is a State Assembly. The state judiciary follows the federal pattern and has its jurisdiction defined so as to avoid any conflict or superimposition with the federal courts.

At the municipal level there are over 4,400 Municipal Councils that are autonomous in strictly local affairs. The Municipal Councils operate under the provisions of the Basic Law of Municipalities.

### **4.3.2 The Legislature**

The national legislature is the National Congress (Congresso Nacional), composed of two houses, the Chamber of Deputies (Câmara dos Deputados) and the Federal Senate (Senado Federal). [INS02]

The number of members in the Chamber of Deputies from each State and the Federal District is proportional to its population. Deputies are elected for four-year terms by direct secret ballot under the system (adopted for all elections for public office) of universal franchise.

The Senate is composed of three Senators from each state and the Federal District, elected for a term of eight years. Senatorial elections are staggered (one-third and then two-thirds) every four years, in elections held concomitantly with those for the Chamber of Deputies. A Deputy and a Senator can stand for re-election without restriction. In 1994 there were 81 Senators and 503 members of the Chamber of Deputies.

### **4.3.3 The Executive**

The Executive, with its powers clearly defined in the Constitution, is headed by the President of the Republic. The President and the Vice President are elected for a four-year term. An amendment to the Constitution in 1997 permits the President and the Vice President to serve a second consecutive term. [INS02]

In 2003 President Luiz Ignacio Lula DA SILVA is The President of the Brazilian country (since 1 January 2003); Vice President Jose ALENCAR (since 1 January 2003); note - the president is both the chief of state and head of government.

The President appoints the Cabinet Ministers who are directly responsible to him and whom he may dismiss at any time. A Minister may be summoned to appear before the Chamber of Deputies, the Senate, or any of its committees.

### **4.3.4 The Judiciary**

Judicial powers are vested in the Federal Supreme Court (Supremo Tribunal Federal), in the Superior Court of Justice (Superior Tribunal de Justiça), regional courts, and in specific courts for electoral, labor, military, and other matters. The justices and judges of all the courts, at both the federal and the state levels, are appointed for life. [INS02]

The Federal Supreme Court is at the apex of the judicial system. It has its seat in the national capital, Brasília, but holds jurisdiction throughout the country. It is composed of eleven Justices, of proven legal and constitutional training and experience, appointed by the President of the Republic, with the prior approval of the Senate.

### **4.3.5 Voting System**

Voting is universal and compulsory for all literate citizens from 18 to 70 years of age. Voting is optional for citizens aged 16 and 17, for senior citizens above 70, and for illiterates of any age. [INS02]

Candidates must belong to a political party. The registration of a political party is effected by the Higher Electoral Tribunal, following the fulfillment of certain minimum requirements established by legislation. In a presidential or a gubernatorial election a candidate must receive an absolute majority to win the election. If no candidate receives this mandate the two top vote-getters compete in a run-off election (second turn) held 20 days after the first election.

## 4.4 Fiscal policy

In the late nineties and early twenties like many other South-American countries, Brazil also had to cope with a major increase in the inflation of their currency. In 1993 the minister of finance launched the anti-inflationary policy called the 'Real Plan'. The Real Plan included balancing the fiscal budget through reducing federal expenditures, and replacing the old currency Cruzeiro with the new currency, the Real, which was pegged to the US dollar (\$1 = R\$1). The primary objective of the Real Plan was to eliminate the chronically high inflation. The Plan was enacted on July 1, 1994 with foreign reserves of about \$40 billion. By 1998, the Plan's primary objective was achieved; it had reduced the annual inflation rate down to about 1.5% from over 2500% in 1993 [BRA99]. The Real, however, is still not a very strong currency, as the current (May 16<sup>th</sup> 2003) value of 1 Real is € 0.41.

According to [INV83] Fiscal Policy can be defined as a sequence of decisions made by the President and Congress, usually relating to taxation and government spending, with the goals of full employment, price stability, and economic growth.

### 4.4.1 Taxation

By changing tax laws, the Brazilian government can effectively modify the amount of disposable income available to its taxpayers. For example, if taxes were to increase, consumers would have less disposable income and in turn would have less money to spend on goods and services. This difference in disposable income would go to the government instead of going to consumers, who would pass the money onto companies. Or, the government could choose to increase government spending by directly purchasing goods and services from private companies. This would increase the flow of money through the economy and would eventually increase the disposable income available to consumers. Unfortunately, this process takes time, as the money needs to wind its way through the economy, creating a significant lag between the implementation of fiscal policy and its effect on the economy.

There are three classical bases for taxation: income, property, and consumption. All else are variations of those classical bases, with the obvious exception of taxes of a regulatory nature, incident upon foreign trade and financial operations [PAR95].

There have already been relevant changes in Brazil with the equivalence of a tax reform, although limited as to the number of taxes covered, inclusive in their content, and mild in their implementation. In 1995 a major tax reform took place. This reform was necessary because of the obsolete and complex nature of the previous one. In order to make the system more clear, the new system should be simplified compared to the old one.

Brazilian tax system encompasses the following tax categories [EMB03] and [PAR95]:

- Federal taxes
- State taxes
- Municipal taxes

Brazilian Federal Constitution establishes tax competence of each federative entity (municipalities, states and federation). It also establishes tax principles. Within its competence, each entity may create its own taxes. However, the Constitution imposes that general rules of taxation - including definition of all taxes and relevant taxable events, tax basis and taxpayers - must be established by a federal law.

	Before 1995	After 1995
<b>Federal Taxes</b>		
Corporate income tax	25% to 43%	15% (additional 10% when income exceeds R\$ 240.000,00)
Personal income tax(on monthly basis)	15%;26.6 and 35%	R\$ 0,00 - R\$ 900,00 tax rate 0% R\$ 900,00 - R\$ 1800,00 tax rate 15% in excess of R\$ 1800,00 tax rate 25%
Social contribution	12 %	12 %
<b>State Taxes</b>		
ICMS (STATE VAT) <sup>2</sup>	?	7-25%
<b>Municipal Taxes</b>		
<p>The tax on transmission of property inter vivos (ITBI) is levied on the onerous transmission of real estate. Rates are progressive and vary from municipality to municipality according to the value of the real estate that is being transmitted.</p> <p>The tax on property of urban real estate (IPTU) is levied on the possession of urban real estate. It is levied annually on the value of the urban real estate. Rates vary from municipality to municipality.</p> <p>The municipal tax on services (ISS) is levied on the rendition of services, at rates ranging from 0,5% to 10%, depending on the kind of service, and varying from municipality to municipality.</p>		

**Table 4-2: Brazilian tax rates**

## 4.4.2 Government expenditures

The Asian crisis of mid 1997 and the Russian crisis of August 1998 caused investors to be highly risk averse in the emerging economies, which resulted in high interest rates in worldwide. In order to support the Real and prevent a devaluation of the Brazilian's currency the IMF approved a three-year financial rescue package of \$41.5 billion to Brazil, which was designed to stop global financial turmoil from spreading to Latin America [BRA99].

In spite of these efforts and the government's strong commitment not to allow the Real to devalue more than 7.5 % a year, Brazil devalued the Real in 1999. The devaluation of the Real was shortly followed by an increase of the interest rate in order to prevent a sudden inflation. A second reason for the Brazilian government to raise the interest rate was to keep the inflow of foreign money steady. To discourage the outflow of dollars, which the

<sup>2</sup> ICMS is levied by the States on circulation of merchandise and on rendition of interstate and inter-municipal transportation and communication services, as well as on import of such goods and services. Rates may vary from 7% to 25%. As a VAT, the ICMS is recoverable to the extent that tax paid upon import or acquisition of products can be offset against tax due upon subsequent transactions.

central bank would have to supply to maintain the pegged exchange rate, Brazil raised interest rates—a step intended to entice investors to hold their money in Brazil to earn high interest rates [GRU99]. In less than 6 months the interest rate was doubled to 44%. For companies, especially companies operating in the technology sector, this high an interest rate restricts the possibilities to invest in new technology rigidly.

Since the currency crisis in Asia and Russia 1997-98, Brazil has undertaken major adjustments in its fiscal policy, which basically have included three main components: [EMB03]

- immediate tightening of financial policies, through the control of current expenditures, including budget cuts, and increases in revenue, via for instance the introduction financial taxes
- a multi-year fiscal adjustment program (1999-2001), which served as the basis for an agreement with the IMF; and
- the continuation of the institutional and structural reforms aiming at greater fiscal discipline and stability in public finance.

The year 1999 marked a major turnaround in Brazil's fiscal performance. The targets established in the program with the IMF were achieved, in the context of very positive fiscal results: (a) the primary surplus of the consolidated public sector was 3,1% of GDP; and (b) the nominal public sector deficit reached a level of 9.5% of GDP. In 2000, similar progress has been achieved, and Brazil has regularly met all the targets set with the IMF.

However according to the Financial Times the Brazilian economy remains vulnerable. The ratio of public-sector debt to gross domestic product rose from 34 per cent in 1997 to 49 per cent in 1999 but has now increased to 55 per cent when it was projected to be on a declining trend. Less than 20 per cent of public sector debt is held abroad but a similar proportion is linked to the dollar. Brazil's total external debt, which is less than 50 per cent of GDP, is primarily private-sector debt. However, the total is more than 310 per cent of exports of goods and services. These ratios put Brazil in the danger zone of debt sustainability.

The country's real growth rate, which was 4.4 per cent in 2000, declined to 1.5 per cent in 2001 as a consequence of the global slowdown; prospects are dim for a pick-up this year. Brazil's current account deficit has averaged 4.4 per cent of GDP for four years and the economy is still relatively closed: exports of goods and services are 13 per cent of GDP. Last, it is located in a bad neighborhood. Foreign and domestic investors are concerned—not unreasonably—that Brazil will follow Argentina into external and internal default and economic and financial chaos. These facts are not reassuring.

The next Brazilian administration needs to act quickly. A successful program requires a primary fiscal surplus at least one percentage point higher than the 3.75 per cent of GDP to which the current administration is now committed; this will involve additional reforms of the pension system and a comprehensive overhaul of the tax system. Tighter fiscal policy should contribute to lower real interest rates and an increase in

investment. At the same time, the central bank must also be allowed to maintain a policy anchored in the current inflation-targeting framework.

Finally, the Brazilian authorities will also have to deal with the lack of internal and external competitiveness of the Brazilian economy.



## 4.5 Environmental protection

Brazil is the biggest country of South America, with an area of 8,547,404 km<sup>2</sup>. Most of its surface is covered by rain forest. Already since the beginning of the twentieth century the rain forest has played a significant role in the Brazilian industry. Brazil's main product of export was coffee. In the fifties 90% of the Brazilian Export quota consisted of coffee. Because of the high demanding environmental circumstances that were needed for Coffee plants to flourish – high fertile soil and much space – the rain forest had to make place for many acres of coffee plants. The soil's fertility lessening every year caused the deforestation at a quicker pace, since farmers took the next still fertile rain forest to move their coffee plantation instead. This process resulted in an increasing deforestation during this time.

Other issues are [CIA03]:

- the deforestation destroys the habitat and endangers a multitude of plant and animal species indigenous to the area
- there is a lucrative illegal wildlife trade
- air and water pollution in Rio de Janeiro, Sao Paulo, and several other large cities
- land degradation and water pollution caused by improper mining activities
- wetland degradation
- severe oil spills

Global efforts from international organizations as well as an increased realization of the importance of environmental protection taking place at governmental level resulted in an increased care for the environment. As part of its recognition of the necessity of conservation and the prudent use of natural resources, the Ministry of the Environment in Brazil has implemented a wide-ranging program of environmental investment.

The history of Environmental Law in Brazil is similar to other countries, especially the countries of Latin American. In the beginning there were laws protecting the water and forests, but only with economic objectives. For example, since 1940 the Criminal Code has been punishing, in its article 271, the pollution of the potable water and the polluter can be sent to prison for 5 years. However, after the historic Congress of Stockholm, in 1972, Brazil addicted important laws protecting the environment [VLA03].

Brazil has a National Environmental Fund, created in 1989 to finance projects related to the sustainable use of natural resources and the management and improvement of environmental quality; government agencies and environmental NGOs can request funds for activities that meet environmental policy aims [GEO00].

Brazil's National Environment Program, with 70 per cent financing from the World Bank, was set up to strengthen environmental bodies, implement the

National System of Conservation Units, protect endangered ecosystems and help reconcile economic interests with environmental protection [GEO00].

Some facts about the environment are summed up in Table 4-3.

<b>Area:</b>	total: 8,511,965 sq km land: 8,456,510 sq km water: 55,455 sq km
<b>Climate:</b>	mostly tropical, but temperate in south
<b>Coastline:</b>	7,491 km
<b>Terrain:</b>	mostly flat to rolling lowlands in north; some plains, hills, mountains, and narrow coastal belt
<b>Natural resources:</b>	bauxite, gold, iron ore, manganese, nickel, phosphates, platinum, tin, uranium, petroleum, hydropower, timber
<b>Land use:</b>	arable land: 6.3% permanent crops: 1.42% other: 92.28%
<b>Irrigated land:</b>	26,560 sq km

**Table 4-3: Facts about the Brazilian Environment [CIA03]**

## **4.6 Bureaucracy**

Bureaucracy is the amount in which everything is regulated by the complete apparatus of civil servants according to the rules. For the inhabitants of Brazil this means a lot of patience to overcome a huge pile of paperwork, formalities and long waiting lines. The following examples are presented to give an impression.

### **4.6.1 Real-life examples**

Studying at a public school requires less paperwork and effort than most other activities involving bureaucracy. In Rio de Janeiro, all the parents have to do is to go to the school which closest to their home, bringing proof of residence (a water or electricity bill will do), a birth certificate, and a 1.2" x 1.6" photo of the child.

To get an Identity Card (Carteira de Identidade), an indispensable official document, the problem is not the price, but the work involved. First, a form must be bought in any stationery shop, and two 1.2" x 1.6" photos taken by any photographer. The applicant must also bring a certified copy or an original Birth Certificate or Marriage License. There is no fee to get the document, but this apparent simplicity can be deceiving. The most formidable barrier is the line to deliver the papers at the Department of Public Security (Secretaria de Segurança Pública). And the document is sent home by mail no sooner than one month after the application is received.

To get a job, the applicant needs lung X-rays, a battery of police certificates that prove his honesty, and a Professional Card (Carteira Profissional) from the federal Work Department (Departamento do Trabalho). To get this latter document, applicants, including minors, must present an ID, proof of residence, and a 1.2" x 1.6" photo. Those who worked previously without registering the job on their work card must go to a branch of the Federal Savings Bank (Caixa Econômica Federal) to fill out a questionnaire about their former employer before being allowed to file for a Carteira de Trabalho.

This official working permit is a booklet in which the employer writes the employee's date of admission, vacations, contributions paid, and even salary raises. All workers when they start paying their dues to the INSS (Instituto Nacional de Seguridade Social -- Social Security National Institute) are rewarded with a new document: the PIS (Programa de Integração Social -- Social Integration Program).

### **4.6.2 Bureaucracy and conducting business**

If Brazilians have so many hurdles to clear to exercise their citizenry, those trying to conduct business must have a special mettle, especially if they want to start their own company. Many opportunities of generating new jobs were lost due to the discouragement of heroic entrepreneurs who gave up due to the unnecessary documents. To start a sole ownership company, for example, the individual has to present a \$35 Business Declaration

Record (Registro de Declaração de Firma) obtained at the Board of Trade (Junta Comercial), a Fire Department Approval Certificate (\$37), and a \$208 Localization License (Alvará de Localização) issued by City Hall. For a business corporation, these documents must be accompanied by a certificate showing that the specific business name is not in use, as well as a Certificate of Incorporation Registration (Registro do Contrato Social).

Foreign companies can operate in the country only after making a special request to the Ministry of Industry and Commerce and securing permission by presidential decree. Several sectors still need clearance from different departments. Oil products, for example, are controlled by the National Fuel Department (Departamento Nacional de Combustíveis -- DNC); for wheat there is the CRTM, the Department of Wheat. Arms and ammunition are linked directly to the Ministry of the Army. [NAS96]

### **4.6.3 Government policy**

Brazil is so aware of its bureaucracy addiction that General-President João Baptista de Oliveira Figueiredo, who governed from 1979 to 1985, created a much-ridiculed Ministry of Debureaucratization to try to solve the problem. Eleven years after the demise of the National Program on Debureaucratization, Brazil is more awash than ever in red tape. [NAS96]

This seems remarkable, because on the one hand Brazil is extremely efficient in terms like financial sophistication and electronic banking. But on the other hand, the cumbersome nature of the Brazilian bureaucracy, regulatory controls and fluctuating tax requirements stifle its entrepreneurial business character. While the banking system is striving for greater efficiency, the government is imposing new taxes that are increasing the cost of some common treasury transactions. [GRI99] Some sources state, that this is the result of “trust no one” policy of the Brazilian government. [BAR00]

## 4.7 Privatisation

Privatisation programs constitute one of the most significant on-going reforms in Brazil. For years, the Brazilian government owned large companies in the petrochemical-, telecommunication- and financial sector. This has come to an end with the introduction of the National Privatisation Program in 1990.

### 4.7.1 Why privatisation

Privatisation encompasses the transfer of concessions to the private sector and the sale of industries and public service companies that are owned by federal, state and municipal governments. For Brazil there were three major reasons to privatise state-owned companies:

- To redefine the state's role by changing from supplier of goods and services to regulator.
- To create a competitive environment by granting public service concessions to private sector in order to reduce the cost of producing and delivering goods.
- To further direct federal government efforts and resources towards: health, education, housing, public security, and high-tech research and development. [BND03]

In short, the aim of the extensive Brazilian privatisation program is to increase productivity and efficiency. [EVD03]

### 4.7.2 Historical overview

In the eighties, the Brazilian government began with the "re-privatisation" of small-sized companies that had been absorbed by the government, in most cases due to financial difficulties. At this time however, the government did not have plans to implement a large-scale privatisation program

The early nineties were characterized by the creation of the National Privatisation Program (PND) in 1990. With the introduction of the PND, privatisation became an integral part of the economic reforms initiated by the government. The first stage of this program included companies in the industrial sector in steel, petrochemicals, fertilizers and mining, mainly at federal level. At the end of 1994, the privatisation of state-sector companies in the productive sector was practically concluded.

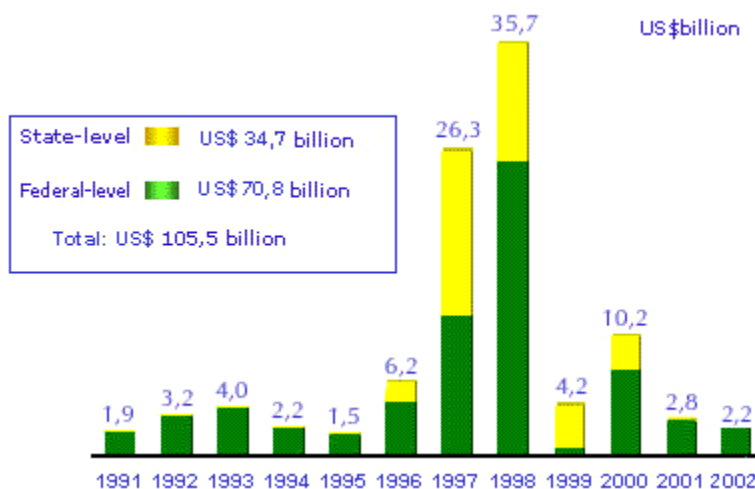
The period from 1995 to 1998 introduced the next stage of privatisation program. The National Privatisation Council (CND) was created to substitute the Privatisation Commission and a new phase of the PND was initiated in which public service companies began to be transferred to the public sector at federal and state level. The agenda included companies in the electricity sector and in the transportation and telecommunications sectors. It added a new objective to the PND: the improvement of the quality of services provided to society as a whole through increases in the

investments made by the controlling stockholders of the newly privatised companies. In 1998 the privatisation of the São Paulo Railroad Network ended an important phase in the transfer of public service companies to the private sector.

Since 1999 privatisation of the telecommunication sector, power and gas, the financial sector, ports, sanitation, roads and airports has started and is still in progress. [BND03]

### 4.7.3 Results

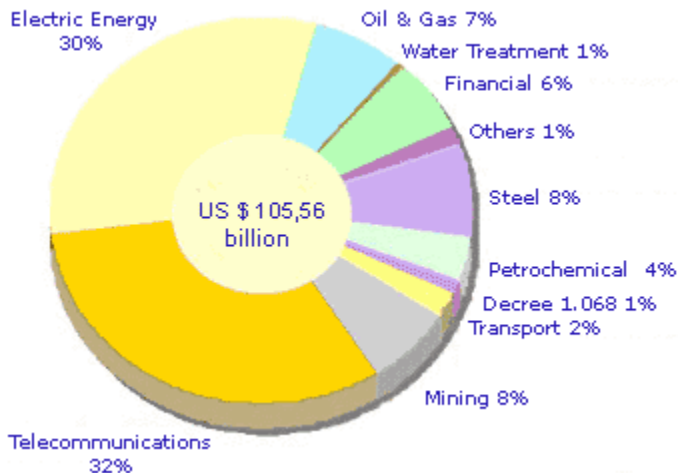
The results of the privatisation program are promising. At the end of 2002, 12 years after the introduction of the PND, a total amount of 105.5 billion US\$ is attained. Figure 4-2 shows the results of this period. [BND02]



**Figure 4-2: Privatization results per year**

With the initiation of the second stage in 1995 and privatization at federal and state level, the privatisation program received a huge impulse. Devaluation of the Real in 1999 and 2001 caused the progress of the program to stagnate.

Figure 4-3 shows the results for each sector. The most progress is made in the energy- and the telecommunication sectors.



**Figure 4-3. Privatization results per sector**

The privatisation program in Brazil offers many interesting opportunities for foreign investors. It is expected that share of the financial sector will grow, as well as the share of distribution of water and electricity, since large-scale privatisation in these sectors has only recently started. [EVD03]

These expectations are supported by the fact that the participation of foreign capital in privatisations has increased over the last years. Currently, foreign investors make 48% of the investments in the Brazilian privatisation program. Main foreign investors in privatisation are the United States (34%), Spain (33%) and Portugal (12%) in 2002. [BND02]

## **4.8 Employment laws**

The Brazilian regulation on employment applies to workers that render services and receive compensation for that. It is important that the employee is subordinated to the employer. An autonomous worker renders services on an independent basis, both as to terms and performance. He/she acts for him/herself, determining his/her own activities, developing his/her own business, as his/her own master, since there is no subordination relationship, and he/she is not subject to the authority of any third party.

According to Brazilian law, an employer is a company, private or public, that takes the risk for its economic activity, hires, pays salaries, and sets out the guidelines for the services provided by the employee.

The rights and duties of employers and employees are set out in the Consolidated Labor Laws - CLT and in collective bargaining and collective agreements. Certain classes of employees, such as civil servants and employees of autonomous government entities, however, are excluded from the scope of the Consolidated Labor Laws, as they are subject to special regulations. [CTT03]

### **4.8.1 Employment Contract**

A formal written agreement is not necessarily required under Brazilian law for employment of an employee. Oral employment is fully valid, provided that the respective annotations are made in the employee's work card. The law sets forth various rights that are inherent to an employment relationship without the need for these rights to be repeated or specified in a written contract.

As a general rule, an employee is contracted for an undetermined period of time, and contracts for a determined period of time constitute an exception to this rule. The latter contract will be valid when:

- the nature of the services justifies establishment of a predetermined period of time
- the nature of the company's activity is temporary
- it is a probation contract (probation contracts cannot exceed 90 days)

No indemnity is payable to an employee on termination of his/her employment after expiration of a fixed-term contract. However, if during the contract the employee is dismissed without good cause by the employer, he/she will be entitled to an indemnity of half of the salary due him/her during the unexpired portion of the contract. If it is the employee who terminates the contract, he/she must indemnify the employer for any loss resulting from this breach of contract. [CTT03]



## **4.8.2 Basic Rights of Employees**

### **Salary and Remuneration**

Under Brazilian labor law salary can be paid monthly, fortnightly, weekly or per task. In addition to cash, the term salary also includes food, housing, clothing and any other benefits the company provides to the employee. For each professional category minimum wages are established in collective bargaining's. As these benefits are considered part of the employee's employment contract for all legal purposes, they cannot be abolished. Under Brazilian law any change in employment contracts which adversely affects the employee, even if with his/her consent, is deemed to be legally null and void.

### **Weekly Remunerated Rest Period (D.S.R)**

All employees have a right to a one day's remunerated rest period, which should preferably fall on a Sunday. In the case of employees who receive their salary monthly, payment of the weekly remunerated rest period will already be included in the monthly salary.

### **Vacations**

When an employee has completed one year of service with the same company, he/she receives 30 calendar days of vacation. In order to receive this vacation, the employee should not have been absent for more than five unjustified times. The salary for this vacation period should be paid in advance, two days before the break starts. The salary that is received by employees before the vacation is augmented with a one-third bonus since the 1988 Federal Constitution.

### **13th Salary**

At the end of each year the employer has to pay a bonus to the worker, known as the Christmas bonus. This bonus amounts to the highest paid monthly salary to the employee during the year. It is possible for the employee to request a proportional advance on this bonus during the year.

### **Health Hazard Allowance and Risk Premium**

The regulation on this subject differs for the various professional categories. In general employment in activities considered by law to be hazardous will be rewarded by an additional monthly allowance for the hazardous conditions. Such allowance will be equivalent to 10%, 20% or 40% of the minimum wage, depending on the hazard degree.

In the case of dangerous activities, such as those involving contact with explosives or flammable materials, an additional payment in compensation for the risks involved will be paid by the employer at 30% of the employee's salary. [CTT03]

## **4.8.3 Termination of Employment Contract**

The termination of an employment contract may occur, as a general rule, either by decision of the employer (dismissal of the employee) or by decision

of the employee (resignation). In the case of dismissal of an employee, it may be either for good cause or by unfair dismissal.

If an employer terminates an employment contract without just cause, it must give the employee 30 days' advance notice, and during such period reduce the working day by two hours or seven consecutive days, without prejudice to payment of the employee's full salary. Lack of advance notice by the employer entitles the employee to a wage corresponding to the advance notice period.

### **Dismissal for Good Cause**

The dismissal of an employee for just cause may only occur where the dismissal results from one of the following acts of the employee: [CTT03]

- dishonesty
- improper conduct or lack of self-restraint
- regularly doing business on his/her own account or for the account of a third party without the employer's permission, or when the activity is in competition with the employer's business or adversely affects the quality of the employee's work
- criminal sentencing of the employee, in final judgment, provided that execution of the penalty has not been suspended
- sloth in the execution of his/her duties
- intoxication during working hours
- violation of trade secrets
- any act of indiscipline or insubordination
- abandonment of employment
- any act of violence or any act injurious to the honor or reputation of any person, except in legitimate cases of self-defense, or defense of the interests of a third party
- any act of violence or any act disparaging to the honor or reputation of the employer or superiors, except in legitimate cases of self-defense, or in defense of the interests of a third party
- constant gambling

## SMSstunter.nl

Communicatie krijgt een steeds belangrijker rol in onze samenleving. De ultieme vorm van communicatie is mobiele communicatie. Steeds meer mensen hebben een mobiele telefoon, op dit moment zijn er in Nederland al bijna 14 miljoen mobiele bellers. Ongeveer 87 % van deze groep zit in de leeftijdscategorie van 16 tot 55 jaar.

Wilt u communiceren met mensen die in deze groep vallen, dan is het wellicht ook voor u aantrekkelijk om via SMS met uw relaties te communiceren. Wij informeren u graag en geheel vrijblijvend over de voordelen in uw specifieke situatie. Om een algemene indruk te krijgen van de voordelen van het benaderen van uw relaties per SMS ten opzichte van de traditionele manieren kunt u kijken op onze website: [www.smsstunter.nl](http://www.smsstunter.nl).

## SMSstunter: goedkoop en betrouwbaar

SMSstunter heeft een verbinding met alle mobiele netwerken in Nederland, België en ver hierbuiten, zodat, in tegenstelling tot sommige andere SMSproviders, alle Nederlandse providers worden ondersteund! SMSstunter koopt deze berichten groot in en dit inkoopvoordeel berekenen wij door aan onze klanten, zodat wij onze diensten altijd scherp kunnen prijzen.

## Diensten

SMSstunter kan u verschillende diensten bieden op het gebied van telecommunicatie. Hierbij kunt u denken aan o.a. SMS, reversed-billed diensten, IVR systemen en MMS. Deze diensten zijn op maat aan te passen, zodat wij ook u de optimale oplossing kunnen aanbieden.

## Groepen SMSen

Via onze gebruiksvriendelijke interface kunt u groepen aanmaken, in deze groepen kunt u een onbepert aantal mobiele nummers zetten. Vervolgens kunt u per groep aangeven of een tekstbericht ontvangen moet worden. Zo kunt u relaties selectief (bijvoorbeeld alleen relaties met een bepaalde leeftijd of interesse) benaderen.

## Voorbeeld

Stel u heeft een discotheek met op vrijdags nederlandstalige muziek en op zaterdag dance party's. U kunt in uw interface twee groepen instellen, een groep voor de liefhebbers van de nederlandstalige muziek en een groep voor de liefhebbers van de dance party's. Zo kunt u wanneer u net die ene bijzondere nederlandstalige artiest geboekt hebt snel, gemakkelijk en goedkoop uw doelgroep hierover informeren.

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## 4.9 Corruption

The practice of political corruption in Brazil has a long history since the colonial period, along two dimensions:

- The manipulation of political decisions to favor private economic gains (decision makers receive some material or financial benefit themselves in return)
- The illegal appropriation of public funds by politicians (i.e. funding 'philanthropic' foundations linked to the decision makers) [FLE97]

A recent example is President Fernando Collor de Mello, who has been accused of corruption in 1992. Although he was acquitted from these accusations because of insufficient evidence, it remains questionable: Paulo César Farias, the treasurer during Collor's government and proven to be corrupt, was found shot to death with his girl friend in a beach house sometime before he was scheduled to testify in court about corruption during the Collor administration. [ZLT03]

Besides political corruption there is also the corruption on a lower level; for example: paying bribes in order to get a shipment out of the Brazilian Customs, or paying a police officer in order to get out of a speed-trap. [BLA03]

These examples illustrate that corruption is still alive in Brazil. However, today's politicians are putting their best effort into reducing corruption. This is done by taking measures that raise the risk factors for would-be delinquents. The public, even if it is not fully aware of these control mechanisms, knows they are in place. Political scientists, philosophers, and jurists identify several advances that have contributed to an increased general "moralization." Many point to the progress made in the institutional arena—strengthening the Public Ministry, the Federal Taxation Authority, and the principle of a free press.

The congress has approved various anti-corruption laws. The Fiscal Responsibility Law, for instance, provides jail sentences for any civil servant who siphons public funds. There have also been technological advances. Bank and telephone accounts are now easily traceable. These days, when a suspect appears who merits investigation, it is not difficult, technically speaking, to uncover what he has been up to. [WPO03]

There have been a lot of reports of corruption in Brazil these days, but the presence of these reports also indicates that people are fighting against it. Successful corruption is, almost by definition, not detected. During the military days people could even endanger their lives when trying to report about it.

Noticeable effects of corruption nowadays are for example all the scandals that the Brazilian media is reporting about. The Brazilian media is really trained to expose these scandals as they still happen quite often. [CVI00] This is probably the most noticeable effect for foreign people visiting Brazil.

Ofcourse there is a lot more, such as paying officials to look the other way or paying bribes in order to get something done, such as rezoning a residential area to a commercial area so that one can build his office there. [EBE01]

Corruption indexes, like the ones that are used in reports from Transparency International, use the perception of the public instead of objective measurements. The perception of corruption is subjective. And it is only this subjective perception that can be measured. Because corruption in Brazil also takes place at much lower levels than in other countries, the public perceives more corruption. Besides, the public opinion on this subject is also heavily influenced by the media and by history; people look to corruption in Brazil as if it were a tradition. This is another reason why a perception index is not objective. [BLA03]

The presence of corruption in Brazil is obvious, but remains hard to measure. An indication of the amount of corruption is the Corruption Perception Index (CPI), measured by Transparency International. These numbers show that the measures that have been taken in order to decrease corruption had effect; the Corruption Perception Index indeed did decline a bit. However, there remains more work to be done as the level of perceived corruption stopped decreasing since 1998. [TRA03]

## 4.10 Conclusion

In this section a conclusion is made for the different aspects described in the paragraphs before.

### 4.10.1 Political stability

	Brazil	The Netherlands
<b>Independent since</b>	1822	1648
<b>Former colony</b>	Yes	No
<b>Stateform</b>	Federative republic	Monarchy
<b>Suffrage</b>	16 and above	18 and above
<b>Elections</b>	Every 4 years	Every 4 years

**Table 4-4: Political history, Brazil vs The Netherlands**

The major differences of Brazil's political situation compared to the Netherlands are the differences that come with a republic system versus a monarchy. In Brazil the President is elected for four years after which he appoints his ministers. Elections will take place until one political party receives the majority of the votes. In the Netherlands the election takes place only once every four years. If the outcome of the election doesn't pinpoint one political party that has the majority of the votes, parties have to form a coalition in order to carry out the tasks of national government.

It is hard to say whether the political stability in Brazil is lower than the situation in the Netherlands. One can argue that in the Brazilian case, the President and its self-chosen ministers receive much power, without any other party having the chance to interfere. In despite of the Country being constituted as a Federation, the existent political centralization is big, and the autonomy of each unit of the Federation is small. Once chosen for four years by the people of Brazil, the President has a mandate to decide in many affairs as he thinks is best. The question that remains is, whether he decides in favor of the people of Brazil or in favor of himself and his political party.

### 4.10.2 Fiscal policy

Both Brazil and the Netherlands have implemented a progressive tax rate system. However, the amount of the tax rates between the two countries show quit a difference. The tax rates in Brazil are fairly low; a corporate income tax of 15 percent on the first R\$ 240.000,00 (is approximately US\$ 134.000,00) and an additional 10 percent when this amount has been exceeded. In the Netherlands the corporate income tax amounts to 40% of the total revenue. The differences get even bigger when viewing the personal income tax rates. In Brazil these are based on a monthly salary but equal the tax rates of the corporate incomes, only the brackets differ. In the Netherlands 4 dishes of personal income tax rates have been extinguished. The rates are respectively; till € 15.883 32,9%, from € 15.884 till € 8.850 38,4%, from € 28.851 till € 49.464 42%, and finally the last dish when income exceeds € 49.465 52% tax should be paid. The tax rates on consumption of good don't differ so much between the Netherlands and



Brazil. Brazil has rates up to 25% and the Netherlands has rates up to 19%. Both countries have a different tax rate classification of the type of goods.

Regarding the government spending, both Brazil and the Netherlands set targets to which the government spending has to comply with in the years to follow. In the Netherlands these targets have been set by the European Union, in order to keep hold on a strong European Currency. The spending limits of the Brazilian country have been set by the IMF, from whom the Brazilian country has lent a lot of money. Besides the IMF, also foreign investors insist on a proper spending policy, both nationally and on the federal level in order to keep their trust in the Brazilian Economy and assuring their inflow of money in the Brazilian companies.

Of course the Netherlands never had to cope with an interest rate of over 44% and a devaluation of the national currency of more than 2500%. Considering these numbers it doesn't make sense to compare them with each other. It is sufficient to note that in the nineties Brazil had to cope with major fiscal and monetary problems, and they succeeded to recover from the problematic situation. However, Brazil will react much stronger on a world wide recession than the Dutch Economy. Therefore, as stated before, the Brazilian government needs to take everything from the uppermost shelf in order to maintain a healthy and sound fiscal and monetary situation.

	Brazil	The Netherlands
<b>Tax rates</b>		
Corporate income tax rates	€ 0,00 - € 96.000,00 tax rate 15% up to € 96.000,00 tax rate 25 %	Fixed, 40%
Personal income tax rates	€ 0,00 - € 4680,00 tax rate 0% € 4680,00 - € 9360,00 tax rate 15% in excess of € 9360,00 tax rate 25%	€ 0,00 - € 15.883 tax rate 32,9% € 15.884 - € 28.850 tax rate 38,4% € 28.851 - € 49.464 tax rate 42% € 49.464 and higher tax rate 52%
State VAT	7% - 25%	6% and 19%
<b>Government expenditures</b>		
Revenues (2000)	\$ 100,6 billion	\$ 134 billion
Expenditures(2000)	\$ 91,6 billion	\$ 134 billion

**Table 4-5: Comparison of the Fiscal Policy between Brazil and The Netherlands (in Euros, using rate R\$/EUR 100/40)**

### 4.10.3 Environment

In the Netherlands agricultural activities are being ruled by governmental and federal legislation to protect the natural environment. In Brazil a good start has been made to implement rules and legislation for the protection of the natural environment, especially the rain forests and coastal line. Nevertheless it will take some years for the Brazilian people to accept the legislative turn in favor of the natural environment.

Facts about the environment of both countries are summarized in the table below.

	<b>Brazil</b>	<b>The Netherlands</b>
<b>Area</b>	total: 8,511,965 sq km land: 8,456,510 sq km water: 55,455 sq km	total: 41,526 sq km water: 7,643 sq km land: 33,883 sq km
<b>Climate:</b>	mostly tropical, but temperate in south	temperate; marine; cool summers and mild winters
<b>Coastline:</b>	7,491 km	451 km
<b>Terrain:</b>	mostly flat to rolling lowlands in north; some plains, hills, mountains, and narrow coastal belt	mostly coastal lowland and reclaimed land (polders); some hills in southeast
<b>Natural resources:</b>	bauxite, gold, iron ore, manganese, nickel, phosphates, platinum, tin, uranium, petroleum, hydropower, timber	natural gas, petroleum, arable land
<b>Land use:</b>	arable land: 6.3% permanent crops: 1.42% other: 92.28%	arable land: 26.53% permanent crops: 1.03% other: 72.44%
<b>Irrigated land:</b>	26,560 sq km (0,31 % of total area)	5,650 sq km (13,61% of total area)

**Table 4-6 – The Dutch and Brazilian Environmental facts compared [CIA03]**

#### **4.10.4 Bureaucracy**

Objective figures to measure bureaucracy are not available, but when the examples are compared with the situation in the Netherlands, one can say that bureaucracy in the Netherlands is not as high as in Brazil.

#### **4.10.5 Privatization**

Privatization can be measured relatively easy and objective. In comparison with the Dutch figures, the Brazilian privatization results are very positive over the period 1990-1998.

	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
<b>Brazil</b>	3,2	4,0	2,2	1,5	6,2	26,3	35,7
<b>Netherlands</b>	-	0,8	3,8	4,0	1,2	0,8	0,3

**Table 4-7: Privatization results in Brazil and the Netherlands**

A reason is that the Dutch government already started privatizing state-owned companies in the early eighties, whereas the Brazilian initiative started a decade later. Figures of this earlier period were not available. Extensive privatization projects in the Netherlands were implemented in the telecommunications sector (PTT/KPN), public transportation (NS) and in other public services like the energy and financial market. When Brazil started its privatization projects, the Dutch projects were almost completed.

#### **4.10.6 Employment laws**

As illustrated in the table below, the employment is well regulated in Brazil. There are a lot of differences between Brazil and The Netherlands; however, the result of most laws is comparable. One subject that both countries differ quite substantial is in regulation regarding health hazards. While the strict regulation in The Netherlands regarding employment environments



prohibits working in health hazardous areas, employers in Brazil receive an allowance.

	Brazil	The Netherlands
<b>Written agreement is necessary</b>	-	+
<b>Weekly Remunerated Rest Period<sup>1</sup></b>	+	-
<b>Paid vacations</b>	+	+
<b>13th salary</b>	+	not obligatory
<b>Health Hazard Allowance<sup>2</sup></b>	+	-
<b>Risk premium</b>	+	+
<b>Advance notice of termination of employment contract</b>	+	+
<b>Vacation bonus</b>	1/3 of monthly salary (approx. 3% of annual salary)	4% of annual salary

**Table 4-8: Employment laws in Brazil compared to The Netherlands**

- There is no weekly remunerated rest period in The Netherlands. However, as there is a maximum of hours per week that can be worked on, there is always a (weekly) rest period.
- In The Netherlands it is forbidden to work in very hazardous environments. Employers have to take precautions in order to make the environment less hazardous. In Brazil employees receive an additional allowance.

#### 4.10.7 Corruption

	Brazil	The Netherlands
<b>Corruption Perception Index 2002</b>	4.0	9.0
<b>Corruption Perception Index 2001</b>	4.0	8.8
<b>Corruption Perception Index 2000</b>	3.9	8.9
<b>Corruption Perception Index 1999</b>	4.1	9.0
<b>Corruption Perception Index 1998</b>	4.0	9.0
<b>Corruption Perception Index 1997</b>	3.6	9.0
<b>Corruption Perception Index 1996</b>	3.0	8.7
<b>Corruption Perception Index 1995</b>	2.7	8.7

**Table 4-9: Corruption Perception Index in Brazil and The Netherlands [TRA03]**

In this chapter an assessment has been made of the national political situation in Brazil. In Brazil, the government has a lot of power and the President has a mandate to decide in many affairs, but it is hard to tell whether or not political stability is guaranteed. In its fiscal policy, the Brazilians had to cope with major fiscal and monetary problems and the country is very sensitive for fluctuations of the world economy. Also the pegging of the Brazilian currency, The Real, to the United States' Dollar imposed rigorous actions from the President in order to maintain a certain level of dollars. In order to encourage foreign companies and individuals to invest their money or keep their money invested in the Brazilian Economy the President had to raise the interest rate and compromise their own spending. However a higher interest rate has its side effects on new investments being made by national companies. If money is expensive to loan, new investments will be postponed and only necessary investments

will be made in order to keep the company running. A new technology which requires investment like Virtual Reality is likely to get less attention when the interest rate is high. Another factor is bureaucracy, which is bad in Brazil; one has to be very patient to cope with the long waiting lines to deal with any formal activity. Besides the bureaucracy there is also the corruption, which certainly still is present in Brazil although it is hard to measure how corruption is actually spread in the Brazilian government.

The government in Brazil is trying hard to overcome these problems: privatization of state-owned companies is in full progress since the government enacted a staged plan for privatization in the early nineties. And because of all the recent changes in the employment regulation, these laws are in practice comparable to Dutch laws on most subjects. Recently Brazil implemented rules and legislations to protect the natural environmental, especially against the cutting down of the rain forests.

The answer to the question is not easy to give. The situation in Brazil was very bad. Fiscal and monetary problems, bureaucracy and corruption made life very hard. There are however indications that the Brazilian government is trying hard to overcome these problems. Privatization, environmental and employment laws show goodwill of the Brazilians. With Brazil being by far the biggest economy in South America this fact makes it more attractive for foreign companies to invest in Brazil. These companies could bring advanced technologies like Virtual Reality with them. However, there still is more improvement to be made to the situation described above for a perfect economical and political environment suitable for technologies like Virtual Reality.

While the situation is fair at the moment, Brazil is not especially promoting these technologies through political measures. The national political situation in Brazil does not have a specific effect on the development of technologies like virtual reality. There are no special restraints found on used technologies so businesses and persons are likely free to use these.

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# 5 International political aspects

Herbert Beltman  
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## Chapter contents

<b>5.1</b>	<b>Introduction</b>	<b>101</b>
<b>5.2</b>	<b>History</b>	<b>102</b>
5.2.1	Military governments	102
5.2.2	Democratic periods	105
<b>5.3</b>	<b>Current situation</b>	<b>106</b>
5.3.1	General policy	106
5.3.2	Regional cooperation	110
5.3.3	Global cooperation: bilateral	112
5.3.4	Global cooperation: United Nations	116
5.3.5	Hostilities	118
5.3.6	Views on political issues not directly involving Brazil	119
<b>5.4</b>	<b>Conclusion</b>	<b>120</b>
5.4.1	Comparison table	122
<b>5.5</b>	<b>References</b>	<b>123</b>



## 5.1 Introduction

This part focuses on the current international political situation in Brazil. The following question has to be answered:

*What international political aspects of Brazil will stimulate or inhibit the development and application of Virtual Reality?*

International politics and Virtual Reality are not completely independent, of course. When a country is at war with western developed countries that deliver important technology needed for the implementation of Virtual Reality, it is not difficult to see that this will influence the development of Virtual Reality in that country. But these effects are indirect. Most of the developments that are discussed in this chapter have only a very indirect influence on Virtual Reality. This is strengthened by the fact that there is not elaborated on international policies that are based on economic relations. These are discussed in another part. National politics aren't discussed either, so changes of regimes, which can have major influences on the development of Virtual Reality, are not the topic of this part, unless they result in major changes in the political relations with other countries.

Nevertheless, there are ways to link the two subjects. Two major aspects of international policy are distinct: which relations had Brazil with other countries in history, and how is the current situation.

## **5.2 History**

In this section the history of the Brazilian international politics is described.

### **5.2.1 Military governments**

This period may be subdivided into two phases: the first lasted from 1964 until 1974 and the second until 1985, when the country returned to the democratic path. This period is known as the military period. Foreign diplomacy changed. The relations with the socialists became cooler and on the other hand the relations with the West were revitalized.

#### **1964-1974**

In the first years of the military government Brazilian foreign policy changed compared to previous periods. The Cold War also had its influences on Brazilian tenets towards international politics.

During this period the foreign policy concentrated on alignment with the United States. It is because this affiliation with the West that gave Brazilian diplomacy a transparent ideological profile. From the American side the new Brazilian government was also supported, new projects in Brazil were started. The statement “what was good for the United States would also be good for Brazil” was symbol for the new foreign policy. This was seen in, for example, breaking of relations with Cuba and military involvement in the invasion of the Dominican Republic. Also the possibilities to send troops to Vietnam were examined. Another result of this policy was that closer ties with African countries were overlooked, friendship with Portugal was re-established and the distance compared to Socialist countries increased. The relations that Brazil had with the Socialist countries became cooler; initiatives aimed at strengthening ties with Portuguese Africa were deactivated while friendly Portuguese-Brazilian connections were revitalized. The most dictatorial phase of the Brazilian political life was in the Gibson Barboza period. During his mandate at External Relations Brazilian diplomacy would face the ideological embarrassments of the military regime and, at the same time, launch initiatives to broaden the political and economic spectrum of the nation’s foreign relations. [MRE03]

From 1967 onwards, economic themes would gain renewed importance for Brazilian diplomacy. The mandate known as that of ‘prosperity diplomacy’, gave new status to the field of commercial diplomatic relations. This tendency was intensified as Brazilian economic policies returned to the national-development course. At this time, the position adopted by Brazil, contrary to the world powers’ condominium system for international security affairs, was noteworthy. Later on the Brazilian diplomatic agenda suffered the influence of the political regime’s mounting authoritarianism. Military presence in government also led to the hardening of Brazil’s stands in negotiation settlements with its neighbours over the use of resources.

Simultaneously, Brazil tried to strengthen its position with nuclear cooperation negotiated settlements with countries such as: Israel, (1966),

France (1967), India (1968) and the United States (1972). Also more attention to less developed countries was devoted. Technical cooperation programs were initiated in Latin America and in Africa. In some cases this were State company investment projects, like energy- or communication projects. To support these projects visits to Senegal, Togo, Ghan, Dahomey, Gabon, Zaire, Nigeria, Cameroon and Ivory Coast were made by the foreign minister.

When looking at the Middle East, there was a more positive attitude towards the Arab Nations. Brazil began to support the demands of the Arab League in the Arab-Israel conflict. In Latin-America Brazil became involved in various international organisms, like the UNCTAD and ECLA (economic commission for Latin America). During conference of these organisms Brazil stated for non-discriminatory and preferential treatment of underdeveloped countries' goods. It also pointed at its support for a Latin American Union project. [MRE03]

### **1974-1985**

The Brazilian domestic and foreign policies started a new phase during the Geisel period. In the domestic sphere, distension measures opened a phase of gradual liberalization of political life. On the foreign level, Brazilian diplomacy inaugurated the cycle known as "responsible pragmatism". It is in this period that Brazil's international performance suffered a profound transformation. This was based on three essential tenets: the end of alignment with the United States, freedom from the ideological dictates of the Cold War and identification with the Third World. Foreign economic policy was motivated by the impact caused by the oil crisis and by novel Brazilian industrial needs. This new policy meant a lot of changes. Relations with China were established and there was a new African policy, military relations with the United States were redefined, the negotiation of the nuclear agreement with Germany and the expansion of exports of nationally produced war equipment. More diplomatic representation in Eastern Europe and strengthening of commercial relations with the Soviet Union are also examples of this new policy. The relation with the United States was more and more marked by distance and divergence. Brazil condemned the Soviet invasion of Afghanistan, but it refused to support the idea of the United States to start actions against the Soviet Union.

Brazilian policy towards the Middle East changed. The 1973 oil crisis resulted in closer ties with the Arab world. The remaining of Israeli in the occupied territories was condemned. This change led to the Brazilian support of the UN resolution stating OLP as the real representative of the Palestinian people. One year later Brazil voted in favor of the UN resolution, which qualified Zionism as a form of racism and racial discrimination.

With the new policy towards the colonial theme Brazil became the first country to officially recognize the independence of Angola. The same year the independence of Mozambique was recognized. Another result of the closer ties with Africa was the opening of six new embassies. These were settled in High Vola, Angola, Equatorial Guinea, Lesotho, Mozambique, São Tomé and Príncipe.



**Figure 5-1: João Batista Figueiredo**



**Figure 5-2: Fernando Henrique Cardoso**

Political relations with the industrialized countries changed. The new interest in credit, investments and technology cleared the path for new foreign relations. The Brazilian president visited France, England, Germany and Japan. This visits resulted in important economic negotiations and technological a cultural cooperation agreements. The most important agreement was the one with Germany, concerning the earlier mentioned nuclear cooperation. In 1975 this agreement was concluded, despite strong protest from the United States. Eight plants were installed with which the program for enrichment of uranium and reprocessing fuel was started. This agreement represented a transaction of about US\$ 4 billion. [FAS03]

During the period of the Figueiredo (1979-1985) government, there was continuity to foregoing foreign and domestic political guidelines. The nation's institutional political life proceeded to march towards gradual normalization. The basic tenets of their foreign policy were also maintained: relations with Latin American countries, the need for development and the importance of North-South dialogue.

The impact of the climbing price of oil, in 1979, caused an economic imbalance that would have its effects on the foreign relations. Simultaneously, escalating confrontation between the superpowers limited Brazil's area of activity. The reactivation of the cold War and the hardening of US trade policy caused political and economic indifferences. All these events led to a less active foreign diplomacy. [MRE03]

### **5.2.2 Democratic periods**

The democratic period is the start of a new period in the Brazilian political history. During the first 5 years, the foreign policy followed the same guidelines that were adopted in the mid 70's. The phase in 1990 however led to transformations of the foreign policy project activated since 1974. This unfolding resulted from national and international causes.

It was due to the proliferation of interests and pressures in the democratic context, the re-ordering produced by the end of the Cold War and accelerated by economic globalization that the internal political crisis would come to strengthen Brazilian democracy. At this point the Brazilian diplomacy was more focused to adapt to international circumstances, without leaving aside the development and autonomy. Therefore, priority was given to multilateral diplomacy and to the strengthening of Brazilian presence in the South American sphere.

The Fernando Henrique Cardoso (1995) administration was inaugurated under extremely favorable domestic political conditions, thanks to economic stabilization. The positive results of the Real Plan (this was a new currency plan), launched the previous year, raised renewed expectations of international credibility and prestige for Brazil. At the same time, the influence exerted by the Brazilian president on the conduction of international affairs would grant special relevance to presidential diplomacy [MRE03].

## **5.3 Current situation**

Brazil had not been in war for several decades. Despite its relatively unstable internal political situation, the Brazilian presence on the international scene has grown considerably, both in purely physical terms and in terms of policy.

Brazil has 102 foreign diplomatic missions. It has consulates in 137 cities, attending to the needs of 1.5 million Brazilians who live abroad and more than 3 million who travel every year. In addition there are hundreds of Brazilian companies with offices outside Brazil and around 5000 overseas students. [BRA03]

Several of the contacts with foreign countries are meant to stimulate trade, but this chapter will concentrate on non-economic policies regarding Brazil's activities in foreign countries today.

First the topics Brazil likes to emphasize most in international politics are discussed. Then the cooperation of Brazil with other countries in Latin America will be elaborated on, followed by a closer look on the cooperation with other countries in the world. Brazil does play a significant role in the United Nations; the next subsection deals with the role of Brazil in this organisation. This chapter will be concluded with a discussion whether Brazil has any enemies or hostile nations, and the views of Brazil on some issues that do not affect Brazil directly.

### **5.3.1 General policy**

#### **Disarmament and non-proliferation**

The Federal Constitution of Brazil definitely prohibits the utilization of nuclear energy for purposes other than the exclusively peaceful ones. In conformity with its constitution, Brazil has assumed a series of international commitments that legally bind it not to produce or acquire nuclear weapons. In 1991 Brazil and Argentina signed the Agreement for the Use of Nuclear Energy Exclusively for peaceful purposes. Both countries also signed an agreement with the International Atomic Energy Agency (IAEA) for the application of safeguards, which entered into force in 1994. In 1998 Brazil adhered to the Treaty for the Non-Proliferation of Nuclear Weapons (NPT), the centerpiece of the international non-proliferation regime and presently the most universally accepted international treaty, as 186 countries are members (including Brazil). Brazil actively participates in the discussions that may lead to irreversible general and complete nuclear disarmament.

Brazil is also one of the original members of the Organization for the Prohibition of Chemical Weapons (OPCW), created in 1997. This organization stipulates the elimination of all types of these weapons in a universal, comprehensive, non-discriminatory and effectively verifiable manner.

Regarding the Convention of the Prohibition of Biological Weapons, Brazil has actively participated in the discussions on its strengthening. This effort is concentrated in creating a verification system for that treaty. Brazil has been a member since 1973. The Brazilian commitments in the area of non-proliferation of weapons of mass destruction were extended, in 1995, to the field of launching vehicles of those weapons (long-range missiles), with its adherence to the Missile Technology Control Regime (MTCR). [DIS03]

### **Development**

Brazil belongs to the industrialized and the developing worlds and has played a leading role in international discussion on the wide-ranging influence of development, in point of hosting the first major international forum held after the end of the Cold War: The UN Conference on Development and the Environment. The debate led to the remaking of multilateral relationships, changed because of the growing number of developing countries, including Brazil, which have come to have a voice in multilateral economic diplomacy.

It is interesting to see that Brazil does not always agree with the solutions proposed by developed countries since rich nations have tended to focus their attention on a selective agenda of issues on which they wanted to take immediate action and on those claiming the full support, just as immediately, of the so called Third World. Brazil would much rather like to see a multilateral view of priorities, the transfer of financial resources to enable the industrialization of the Third World and establishment of better conditions in relation to the international trade in raw materials and agricultural products. However, the Brazilian government continues to believe that development is an essential part of world security. [DEV03]

### **Women's rights**

In 1995, the fourth World Conference on Women: Equality, Development and Peace was held in Beijing under the auspices of the UN. The Beijing Conference established new parameters for action by governments and civil society regarding the promotion of gender equality. Brazil's participation in this conference was based on the Report on Women in the Brazilian Society, in which the progress and difficulties on the situation of women in Brazil was described. Brazil is working hard for the equality of man and women in Brazil. In 1996 the Brazilian government launched the National Program for the Prevention and Combating of Domestic and Sexual Violence, stating that sexual crimes were no longer classed as crimes against custom, but against the individual. In 1996 it was also regulated by law that political parties should comprise a minimum of 20 % women, in order to promote the political involvement by women. In 1998 a minimum of 30 % was established. Women cover about 51 % of all school registrations in all levels and they manage to stay longer in school than men do. Although women have conquered their own space in the labor market, they are still underpaid. [WOM03]

### **Children's rights**

In Brazil, about seven to eight million children live on the streets. This is about 1/8 of the total children population. About 42 % of all children in Brazil live below the poverty line. The poverty amongst Brazilian families is

a great cause for the problems of Brazilian children. First of all is the health of Brazilian children due to malnutrition, diarrhea and respiratory disease. Another problem is the great number of children addicted to drugs like glue, marijuana, cocaine, tobacco and alcohol. [CIB03]

Although the Brazilian law states that no child under the age of 18 is allowed to do work at night or in any dangerous or unhealthy job and that children under the age of 16 cannot be allowed to work at all, except as apprentices (from the age of 14), Brazil is one of the few nations that does not enforce these child labour laws. [BEC03] Due to this fact, the child labour industry thrives amongst the impoverished children. It is estimated that 3.5 million children are involved in the work force in Brazil. One cause is that schooling is usually too expensive for the poorer families. Children often have to work in order to help support their families.

Lots of children work in the children prostitution industry. It is estimated that there are between 500.000 and 2 million child prostitutes in Brazil, most of them are girls. Prostitution preys on impoverished children and rides preliminary on the idea of debts (mostly consisting of housing, medical and food bills). [CIB03]

Children and young people living in poverty are subject to the risk of violence not only on the street but also at home and in the family, where they may be subject to domestic and sexual violence. They are a group that is particularly vulnerable to abuse of power by the police and "extermination groups" (also called "Death Squads"). Many young people who steal on a small scale, or who perform services or are employed by organized drug trafficking groups, are often killed by extermination groups, contracted by people who feel threatened and use hired killers to "clean up" the neighborhood. [HRI03]

Several international organizations (The United Nations, Unicef, Human Rights Watch) have issued these problems in Brazil, and this eventually resulted in the signing of the Convention on the Rights of the Child (in 1990). Brazil is therefore obligated to follow the convention, and in this case specifically articles 35, which refers to the sale, trafficking and abduction of children for any purpose, and article 36, which specifies that all States Parties must protect the child against all other forms of exploitation. When put in an international perspective, Europe is also becoming more and more directly affected by the problem of child sexual exploitation and all members of the international community have some responsibility to take in a problem which is already taking global proportions. [PHB03]

### **Human rights**

Brazil is playing an active role in all the main international forums on human rights, including the UN Commission of Human Rights, the UN High Commission for Human Rights and the UN High Commission for Refugees. One of the most important steps into improving human rights was the launching of the National Human Rights Program, launched in May 1996 by President Henrique Cardoso. This program was prepared in strict collaboration with society and sets out a list of short, medium and long



term measures for expanding the promotion and protection of human rights in Brazil. [HUM03] [PHR03]

Brazil today has the most detailed and wide ranging charter of human rights in its entire history. Since the transition to democracy in 1985 the federal government has promoted changes in legislation and has backed policies to protect and promote human rights, especially the rights of the most vulnerable groups. [HRI03]

### **The environment**

Brazil's commitment to the environment began in 1972 when Brazil took part in the United Nations Conference on the Human Environment. At the UN Conference on Development and the Environment, held in Rio in 1992 new paths were opened for multilateral dialogue, giving prime consideration to global interests. Two conventions were adopted from this Conference: one on Climate Change and the other on Biodiversity. Also documents on more wide-ranging objectives and of a more political nature (The Rio Declaration and Agenda 21) were approved. These documents underlined the need for ecological awareness in economic and material progress. In addition, by introducing the global objectives of peace and lasting social development, Rio-92 was a late response to the management of the Southern Cone countries since the Stockholm conference. Agenda 21 is a program of action meant to enable the adoption of sustainable and environmentally rational development in all countries. The agenda document is a guide for the implementation of a new model of development that is sustainable in relation to the management of natural resources and the conservation of biodiversity. In 1997 Agenda 21 was evaluated in order to identify major difficulties and to define the priorities for action to be undertaken in the years to come. The final document incorporated a "Commitment Declaration" in which the delegation heads formally reiterated the commitment of their countries to the principles and programs contained in the Declaration of Rio and in Agenda 21, as well as their attention to follow through with their implementation. [ENV03]

Recognizing the importance of cooperative efforts to promote environmental protection and sustainable development for the benefit of this and future generations of humankind, the United States and Brazil agreed to pursue a common agenda for the environment. This agenda intended to serve as a mechanism for consultations and cooperation between the United States and Brazil on these critical issues. [BEW03]

The next example illustrates a result of the efforts put into the protection of the environment and Brazil's commitment to the environment: In Brazil, no project or step which could have a significant environmental effect can be commenced or carried on in Brazil without a previous environmental impact study. Without such a study, followed by public hearings, the required environmental license will not be granted. [ENV03]

### **Drugs trafficking**

Brazil has adopted a consistent policy to combat drug consumption, narcotic drug traffic and related crimes. Priority has been given to curbing the abuse and demand inside the country's borders and to follow a policy of

close cooperation with other countries to check narcotic drug trafficking. Brazil has participated actively in the work of the United Nations Commission on Narcotic drugs and pays special attention to the activities of the Inter-American Commission on the Control of Drug Abuse of the Organization of America States (OAS). Brazil is also a signatory of several cooperation agreements to prevent abusive use and to exchange information on national legislation and jurisprudence regarding narcotics amongst others, especially with its neighboring countries. Brazil has also developed a series of bilateral programs aimed at fighting drug trafficking along borders and to improve and update its legislation in order to reduce the demand for narcotics. The National Anti-Drug Secretariat (SENAD) is in charge of planning, coordinating, supervising and controlling the activities to prevent illegal traffic, improper use and the unauthorized production of narcotics, as well as the activities to rehabilitate drug users. [DRU03]

### **Scientific and technological cooperation**

Currently international scientific and technological cooperation is one of the most relevant themes on the world scene. Brazil has been developing a considerable technological sector, which has also benefited from scientific and technological cooperation. In the current phase of science and technology in Brazil, the emphasis of Brazilian foreign policy in this area has been focused on:

- The high tech areas (computers, biotechnology, new materials, precision engineering)
- Improving those technologies that have direct social impact (education, public health, civil safety, nutrition, energy, etc.)

The development in the last sector is not sought only in order to improve the social conditions of the country, but as a prerequisite for the development of high-tech sectors. For example, the lack of a basic education has been singled out as one of the most serious restrictions to the general development of firms with technologically advanced foundations, which obliges them to spend more on the training of personnel. These considerations are also reflected in the multilateral initiatives on the continent. Therefore Mercosur makes it also possible for all partners to reach a uniform level of development through cooperation and the transfer of technology. The aerospace and aeronautics industries, for example, have meant significant progress in the transfer of technology. [SCI03]

### **5.3.2 Regional cooperation**

The relations of Brazil with its neighbors have always been a priority for Brazil. South America is an area where Brazil has a strong regional presence and where Brazilian business finds an outlet for expansion. With the other countries of South America, Brazil has fostered a climate of peace, understanding and shared values, reinforces by democracy and integration. The formation of a South American bloc is favored by geographical considerations and by the potential for expansion in the South Atlantic, Central America and the Caribbean. This explains the priority in

political, economic and commercial terms for a policy that is aware of the need of coordination in more and more areas. [BPW03]

### **Southern Cone**

Since the formation of Mercosur, a Customs Union between Brazil, Argentina, Uruguay and Paraguay, Brazil's relationship with these countries has become closer and more diverse. At present, relationships with those countries are also expanding on the political and structural planes that characterize the group as a major player on the world scene. A similar process is unfolding in relation to Chile and Bolivia since they acquired the status of countries associated with Mercosur in respectively 1996 and 1997.

The main purpose of Brazil's relations with the Southern Cone is that of integration. Due to the needs created by the commercial interchange, priority has been given to efforts directed at improving the physical bases of integration like the construction of bridges, road improvement, power networks and air and waterway transport agreements. [SOC03] The cooperation of the countries of the Southern Cone has also led to collaboration between the Alliance for Health policy and Systems Research and the Network for Health Systems and Services Research in the Southern Cone of Latin America. This Collaboration focuses on the contribution to improved health by encouraging relevant, valid and sustainable research and its application to the health policy and management process. Several contributions of this collaboration are the supporting of research projects through the Alliance Small Grants Research Program and coordinating technical support for the projects of this program. [COO03]

### **Latin American Integration**

Within the context of increasing Latin American integration, Brazil has sought to expand and improve cooperation links with the Amazon countries. These are Bolivia, Columbia, Ecuador, Guyana, Peru, Surinam and Venezuela. Like the integration between the countries of the Southern Cone, the integration between the Amazon countries is also mainly focused on road and power integration. These initiatives are essential for the stimulation of the respective economics and encourage the coming together of two societies. Two examples of this integration are the Manaus-Boa Vista-Caracas highway (completed November 1998) and the 3150 km long Brazil-Bolivia gas pipeline (built in 1999). These eight Amazon countries signed the Amazon Cooperation Treaty (ACT) in 1978. The ACT is a relevant multi-lateral agreement for the promotion of cooperation between the Amazon countries. In order to reinforce this agreement, the foreign ministers of the involved counties created a Permanent Secretariat for the Amazon Cooperation Treaty to be based in Brasilia, restating the importance of the Amazon as an essential source of raw materials for the food, chemicals and pharmaceuticals industries. [LAI03][BVH03][BBG03]

### **The Community of Portuguese-Speaking Countries (CPLP)**

The CPLP was created (from an initiative of the Brazilian government) in Lisbon in July 1996 in order to convoke the seven Portuguese-speaking countries around the three general objectives as defined in the Community bylaws:

- Political and diplomatic coordination among its members
- Economic, cultural, legal, technical and scientific cooperation
- Promotion and diffusion of the Portuguese language

These countries are Brazil, Angola, CaboVerde, Guiné Bissau, Mozambique, Portugal and São Tomé e Príncipe. Brazil ascribes particular importance to the area of cooperation. The Brazilian government is involved in several cooperation projects with African countries whose official language is Portuguese, especially in the area of training human resources and in health. [CPL03]

### **5.3.3 Global cooperation: bilateral**

Apart from regional cooperation, Brazil has of course lots of other cooperation with countries around the world. This section focuses on this cooperation. The main source is the Ministry of Foreign Relations [MIN03], which states the official Brazilian view on the diplomatic relations. This view is often rather optimistic and does not always reflect the real situation completely.

#### **The United States**

A close partner of Brazil is the United States of America. Relations between Brazil and the United States are considerably close and cover a wide range of areas. Unlike the past, currently there has been a remarkable convergence of principles and basic objectives that furnish promising opportunities for cooperation. Both governments share similar views on important themes on the international agenda, such as democracy, human rights, the environment, non-proliferation of weapons of mass destruction and economic liberalization and integration. [UNI03]

The US government has begun to regard the role of Brazil on the international scene as the main country on the South-American continent. Trade deals with Brazil often lead to similar deals with other countries on the continent.

Unfortunately, the relationship with the United States has cooled down the last years. The Bush administration has done little to signal any interest in forging closer ties with Brazil. Diplomatic circles were astonished to find out that no senior U.S. cabinet member attended Mr. Lula da Silva's inauguration for president. [WAS03] While not openly anti-American, many Brazilians have traditionally been suspicious of U.S. goals in the region. Some believe that Washington intends to impose its own policies, without much regard for domestic views; others worry about the implications of U.S. protectionism. Most Brazilian political leaders have feared that voters could interpret overtures towards Washington as a sign of weakness and of catering to American interests. As a result, Brazil's diplomatic relations with the United States have been cold, awkward and distant.

This distant approach has led to a series of disputes, of which the drug patent dispute is a remarkable example. Brazil has strong interests in developing anti-AIDS drugs, known as antiretrovirals. In 2000, it was

estimated that 580.000 Brazilians were HIV-positive or had AIDS. Thanks to an expensive anti-AIDS campaign the number of AIDS-related deaths has begun to fall. Part of the campaign was the stimulation of Brazilian drug manufacturers, which already led to seven anti-AIDS drugs. In 2000, a law was passed that stated that foreign manufacturers of drugs lost the patent to ingredients if the manufacturers failed to produce the ingredients inside Brazil within three years. It is widely assumed that this was meant to force the United States to lower their prices of ingredients. The United States argued that this measure is designed to force international companies to make products in Brazil and thus violates WTO rules. The dispute led to months of negotiations and finally the instalment of a WTO panel with the duty to solve the dispute. The ethical aspects of the problem forced both sides to be extremely careful and diplomatic in their statements: Brazil claimed that the law was necessary to prevent more AIDS deaths in their country, so that the US had to find a balance between quietly protecting their own industry and openly supporting the Brazilian aim to reduce AIDS. [PAT03]

Some efforts have been made to reinforce the band between Brazil and the United States. For instance, in May 2003 the Brazilian Congress have discussed a project which would have permitted the US military to use the Alcântara missile launching base located in the Amazon. The US requested the use of this base in favour of their war against terrorism. Unfortunately, the president of Brazil already has said that he will veto the proposal whether the Congress agrees or not. He claims that Brazilians would lose sovereignty over their territory and get very little in return. [BZZ03]

It must be made clear that these issues are relatively minor. Like most countries in the world, Brazil was, and still is, a fierce supporter of the so-called 'war against terrorism'. Among the casualties in the 11-september attack were several Brazilian citizens. Within a month after the attacks, Brazil took the initiative to convoke TIAR, in response to the conviction that it was necessary to complement, on the regional level, the intense international mobilization that came in the wake of the attacks. TIAR was signed in 1947 in Rio de Janeiro and is an instrument for collective security of the countries in the region. It states that in times of great threats the participating countries are obliged to cooperate in their military powers. [TER03]

Some experts believe the United States can very well benefit from closer diplomatic contacts with Brazil. Support of Brazil can be of great help of typical American desires for increasing political instability in Venezuela and implementation of an effective anti-narcotics policy for the region. It would also be easier to tackle the increasing use by Islamic terrorists of the triple frontier of Argentina, Brazil and Paraguay as a financial centre.

### **Canada**

Canada is another country with strong diplomatic links to Brazil. Although mainly concentrated on trade negotiations, there has been a significant increase in high-level visits in recent years, in which agreements have been made about 'convergence of common values as the defence of democracy, the regard for human rights and protection of the environment'. [CAN03]

Underneath this surface of good intentions some problems and a lack of trust can be seen. There have been several disputes between Brazil and Canada in the last couple of years.

The most important dispute is the aircraft dispute. In 1998 Canada questioned a Brazilian program called PROEX that reduces interest rates for their local aircraft industry. Canada has argued that PROEX is an illegal export subsidy damaging Canada's aircraft industry and asked the World Trade Organisation (WTO) to examine the case. As a reaction, Brazil has challenged a range of Canadian programs, saying that they are similar to the PROEX program. The dispute evolved quickly in a complex conflict, with several cases, appeals and rulings of the WTO, causing new restrictions for both sides. [AIR03]

The aircraft dispute was interrupted by a dispute about the import of Brazilian meat by Canada. In February 2001 the chief veterinarian decided to ban Brazilian meat in Canada, because of its failure to provide sufficient documentation to prove that cattle it had imported from the European Union had been properly accounted for and removed. At that moment, Europe was in the midst of a mad cow disease outbreak, causing a warning from the United Nations to all countries to do more to prevent spreading of the disease. Shortly after the ban, Brazilian politicians and even some Canadian experts believed that the ban was not really decided based purely on health protection arguments, but that it should also be seen as a statement in the aircraft dispute. The Canadian government has always denied this, of course. [BOA03]

### **Europe and Asia**

The very first diplomatic partners of Brazil were of course several countries in Western Europe, especially those who were involved in the colonization of Brazil (Portugal, Spain, and the Netherlands). Important results grew out of the diplomatic action of Brazil towards the Western European countries throughout the 1990s contributing in a significant way to the international insertion of the country. Diverse initiatives of a political, economic and cultural nature were implemented at the bilateral level with each country in the region and also at the multilateral level with the European Union. [WES03] In the beginning of 2003 the new elected president of Brazil made a tour through several European countries to establish close political contacts. [OFF03]

The end of the Communist regimes in Central and Eastern Europe, marked by the falling of the Berlin Wall in 1989 and accompanied by the break-up of the Soviet Union, the federations of Yugoslavia and Czechoslovakia, led to the emergence of new players on the international scene. In the beginning and in a comprehensible manner, these players gave priority to the industrialized nations, particularly the European Union, the United States and Japan being sources of capital, technology and political recognition. With the passing of time, they also turned towards countries in other regions of the world, like Brazil.

Brazil has also been seeking to revive its relations with the traditional countries in the region with whom it has had diplomatic relations for the longest time. Efforts are being made not only to recover the highest volumes of trade recorded before their transition to a market economy system and to expand the range of products, but also to increase the political dialogue and diversify the areas of bilateral cooperation. Brazil follows with interest the process of adhesion of most of these countries to Euro-Atlantic associations- the European Union and the North Atlantic Treaty Organization (NATO) - which can provide new opportunities for intensifying relations with countries in other geographical areas. [CEN03]

Because of the existing bilateral relations between European countries and Latin America, the European Union has established and built up links with Latin America since the 1960's. Nowadays, the European Union is an important economic and political partner for Latin America. It is the leading donor in the region, premier foreign investor and second most important trade partner. In order to facilitate the discussion of topics of common interest, the countries of Latin America created for political consultation is called The Rio Group. The EU -Rio Group is a key forum for political dialogue and one of the main platforms through which EU-Latin American relations are enhanced. In 1999 the first Summit between the Heads of State and Government of Latin America, the Caribbean and the European Union was held. The objective of this Summit was to foster political, economic and cultural understanding between the two regions in order to develop a strategic partnership, focusing on the strengthening of representative and participatory democracy and individual freedom, the rule of law, international peace and security and political stability and building confidence among nations. Among the decisions taken at the Summit, the following decisions in the political field are particularly noteworthy for the cooperation: reinforce institutional dialogue between the two regions, preserve democracy and protect human rights and fundamental freedom and work together to address the threats to international peace and security. The cooperation between the European Union and Latin America also focuses on economic cooperation (amongst others the support to Mercosur) and humanitarian aid (for example in case of natural disaster and displacement of people). [EUL03]

### **The Netherlands**

Not surprisingly, there is a direct bilateral relationship between Brazil and the Netherlands. In Brazil the Dutch government is represented by an embassy in Brasília, a consulate-general in São Paulo and Rio de Janeiro, and consulates in ten smaller cities in Brazil [AMB03]. Brazil is represented in the Netherlands by an embassy in The Hague. [EMB03]

A recent result of the relationship is the signing of an agreement between the both countries on March 7<sup>th</sup>, 2002 in Brasília, regarding social security. This agreement contains guidelines for pension payments. Ratification by both parliaments has yet to be done, but until then both countries will apply the agreement on a provisional base. [AMB03]

More agreements have been made in history. It should be noted that most of these agreements are restricted to internal problems of Brazil, as part of

the policy of developing aid from the Netherlands. However, the mentioning of some of these initiatives in this subsection is justified, because they do not only affect Brazil; more countries play a role. Therefore the agreements could be regarded as political with international aspects.

In 1994 and 1998 the Netherlands supported a pilot program for the conservation of Tropical Forests in Brazil by donating \$5 million twice. The Netherlands have helped implementing technical solutions to solid wastes since 2000 and donated money for several smaller initiatives regarding the environment. This is all part of the implementation of the international environment treaties, to which both Brazil and The Netherlands are party, like the Convention on Biological Diversity, the Framework Convention on Climate Change and the Convention to Combat Desertification. Within these activities, special attention is given to poverty reduction. [AMB03]

Some parties of the Dutch parliament pay special attention to the internal situation in Brazil. An example is the (written) interrogation of the Minister of Foreign Affairs by GroenLinks in 2000, regarding the position of the Indians in Brazil. [KAM03]

### **The Middle East**

There are few countries that have no diplomatic views on the situation in the Middle East at all. Brazil is not one of them. Traditionally, Brazilian foreign policy in relation to the Middle East has been guided according to some important premises. First it should be noted that, although the main religion is catholic, Brazil has both Arab and Jewish communities. Hence Brazil does not choose one or another side. The view of Brazil on the Arab-Israeli peace process is predictable: peace in the region is very important, so the peace process should be resumed. The desire for peace in the region is also driven by the presence of oil in the Middle East, however this is less important nowadays than a couple of decades ago. Brazil has concentrated on South American suppliers, because of both the instability in the Middle East and the strengthening of continental relations. Recently Iraq has been liberated of its dictator Saddam Hussein; it is not clear yet what consequences that will have on political relations with the Middle East. [NEA03]

### **The rest of the world**

Bilateral relations with the rest of the world concentrate mostly on economic cooperation. In particular the countries Australia and Japan tend to show great interest in developing bilateral trade with Brazil. It is quite difficult to extract political aspects from these relationships without their connections to economic interests. Moreover, the political agreements that are made with these countries are often agreements between several countries at once, making these agreements more multilateral than bilateral. Therefore this aspect will not be elaborated here.

## **5.3.4 Global cooperation: United Nations**

The United Nations (UN), an intergovernmental and political organization founded in 1945 at the end of the Second World War, has as its main objectives the maintenance of peace, the defence of human rights and



fundamental liberty and the promotion of development in countries worldwide. The UN operates chiefly via its General Assembly, Security Council, Economic and Social Council and the International Court of Justice based in The Hague. The United Nations system also includes specialized agencies, which are autonomous bodies, linked by special agreements and set up at different times as a response to the various needs of the international community.

Brazil tries to play an active role in the United Nations since the foundation. It has been one of the 51 founders and is participant in most major committees. Some important committees are [BUN03]:

- International Labour Organization (ILO), founded in 1919 and concerned with labour issues, becoming the first specialist agency to be associated with the United Nations in 1946; Brazil is a founding member and one of the ten permanent members of the Administration Council, as well as being the country with the tenth largest budget contribution in the Organization - the highest of the developing countries;
- International Telecommunication Union (ITU), which was set up in 1947 following the reformulation of the 1934 organization of the same name;
- United Nations Food and Agriculture Organization (FAO), based in Rome and set up in 1945;
- International Monetary Fund (IMF) and International Bank for Reconstruction and Development (IBRD) - World Bank, both based in Washington and founded in 1945;
- United Nations Educational, Scientific and Cultural Organization (UNESCO), based in Paris and created in 1946;
- International Civil Aviation Organization (ICAO), based in Montreal and founded in 1947;
- World Health Organization (WHO), having its headquarters in Geneva and created in 1948, and its regional body, the Pan-American Health Organization;
- International Maritime Organization (IMO), with its headquarters in London and founded in 1958;
- World Trade Organization (WTO) based in Geneva and set up in 1995.

During the crisis in Iraq, the Security Council played an important role. Despite being one of the biggest countries in the world, both in population as in size, Brazil is not a permanent member of the Security Council. Brazil is a temporary member of the Council every couple of years. The last time was in 1998-1999. [BSC03]

The Brazilian Government believes that the laws for membership of the Security Council should be reformed. The main objection is the imbalance in the membership of the Council. Three of the five members of the Security Council are western developed countries (United Kingdom, France and the United States), belonging to the first world, while the other two (Russia and China) are communist or former communist countries, hence belonging to the former 'second world'. Brazil feels that the share of third world parties

that used to be colonies of European countries (Latin-America, Africa and part of Asia) is not adequately represented in these five permanent members. This imbalance is also present at the total Security Council, because the delegation of non-permanent members always contains some western countries. Brazil pleads for a 'real' third world country as a permanent member of the Security Council. Although not explicitly stated, it is obvious that Brazil is an important candidate if this proposal is ever executed. [REF03]

### **5.3.5 Hostilities**

Brazil does not have any direct enemies; most likely this is due to the trading cooperation Brazil entertains with the European Union, The United States and much of Latin America. Brazil also aspires to achieve a strong trading relationship with many Asian countries such as Japan and China. Any foreign actions jeopardizing these relations will be avoided at all costs. Brazil is currently attempting to bring itself into line with the Western world and in doing so, will often support the efforts of these nations. As stated before, Brazil also supports all disarmament efforts, including nuclear, chemical, and biological weapons treaties, landmine prohibitions and even restrictions on nuclear-carrying devices. [BRE03]

Recently the relation between Brazil and the United States of America has been done some damage. The election of Luiz Inácio Lula da Silva as Brazil's president has given the United States a unique opportunity to engage seriously with Brazil. Improved relations with Brazil (including genuine progress towards a free trade agreement) would dramatically change the political and diplomatic landscape of Latin America.

Unfortunately the United States have done little to signal any interest in forging closer with Brazil. The United States failed to let a senior U.S. cabinet member attend Mr. Lula da Silva's inauguration and have nominated Roger Noriega (the little-known ambassador to the ineffective Organization of American States) as the senior state department official responsible for Latin America. Brazil now feels that it is not being treated seriously and want the United States to withdraw Mr. Noriega's nomination and should nominate a truly senior figure with deep knowledge and understanding of the region and in particular of Brazil. This attitude of Brazil can be explained by the fact that many Latin Americans (and in particular many Brazilians) have traditionally been suspicious of U.S. goals in the region. This suspicion also fed the fore mentioned dispute between the United States and Brazil about Brazil's anti-AIDS campaign. [WAS03]

Other small hostilities include the trade disputes with Canada, already mentioned in former subsections.

It should be mentioned that Brazil has a small boundary dispute with Uruguay. The conflict deals about two short sections: the Arroio Invernada (Arroyo de la Invernada) area of the Rio Quarai (Rio Cuareim) and the islands at the confluence of the Rio Quarai and the Uruguay River. [MCK03]

### **5.3.6 Views on political issues not directly involving Brazil**

A country like Brazil is of course not blind for the situation in the world. Brazil has strong opinions about certain issues in the world. Instead of giving a list of situations and opinions of Brazil, one subject: the war against Iraq will be elaborated on.

In general, Brazil has more than once expressed their disapproval of the policy of the United States and the United Kingdom regarding Iraq in the first months of 2003. It is not a surprise that Brazil was highly critical about the fact that the war had actually begun. Brazil concentrated on making sure that humanitarian efforts were made in Iraq. Brazil was one of the main countries that supported the reestablishment of the Oil-for-food program. [SIT03]

It should also be noted that Brazil is, unlike the United States, a supporter of the institution of an International Criminal Court. In summer 2002 the Rome Statute was ratified by the country. The ambassador stated in the ratification speech that the ratification "reaffirmed Brazil's commitment to the establishment of a permanent tribunal to promote the rule of law and ensure the gravest international crimes do not go unpunished." In winter 2003 the first 18 judges were elected. One of the judges is Brazilian. [GPF03][WFA03]

## 5.4 Conclusion

In the previous paragraphs the history and the present state of Brazil have been described. The following chapter will give a short summary and a comparison with the Netherlands.

Looking at the early forties Brazil relied heavily on the supports of the western world. The economic support that Brazil received was invested in encouraging the economic situation. Later on this attitude changed. The military period started and Brazil started to follow a different strategy. The relations with the countries around Brazil became more important, and the relations considering the Western World cooled down. After the military period the government started to transform the international policy, due to changed circumstances. Multilateral diplomacy was given priority; the Brazilian presence in South America was strengthened. The relation with western countries was improved.

The history of international politics of Brazil and the Netherlands have a few similarities. In all the conflicts mentioned Brazil would stay as neutral as possible. This phenomenon could also be found in the Dutch foreign policy. The Dutch government just like the Brazilian government tried not to mingle with the international conflicts. For the development of Virtual Reality, this policy is both a stimulating and discouraging development. It is stimulating, because in times of peace there are relatively more resources available for developing technology, and peace is needed for good working circumstances. On the other hand, military involvement in wars can lead to a technology pull of high tech applications. Virtual Reality can most certainly have military purposes, and it is seen, for instance, that in the United States many resources are allocated to these forms of technology development whenever military involvement of the US in some war is expected. However, this is also the case in the Netherlands, while this country is often not directly involved in wars in which Virtual Reality may come very helpful. The stimulation in the Netherlands is therefore mainly based on the strong economic relations with the United States and other western countries that are involved or expect to be involved in wars. This may also apply to Brazil but that is not the focus of this section.

Regarding the current situation, Brazil has shown to be become a more evolved nation. With regard to disarmament and non-proliferation of (mass) weapons, Brazil and the Netherlands stay on the same line, both according to agreements with the International Atomic Energy Agency. With regard to women's rights, Brazil works to retrieve equality between men and women, but it hasn't proceeded as far as in the Netherlands. Lots of women are still being underpaid. Brazil and the Netherlands are both industrialized countries. The difference is that the Netherlands is more developed and can be categorized as a rich country. Another difference is that Brazil puts lots of effort in prohibiting drug trafficking and use, where the Netherlands follow a policy of legalization of soft drugs. Since Brazil is an upcoming developing country they put lots of effort in the stimulating of scientific and technological development. This can also be concluded from the broad

cooperation Brazil has signed with countries in Southern America and countries in the rest of the world. These co-operations have to stimulate the development of the industry and technology and the international trading. Unfortunately, sometimes Brazil has conflicts with other countries, for instance the aircraft dispute with Canada and the patent dispute with the United States. In these cases, Brazil focuses so strongly on its own development that other countries feel that they are unjustified disadvantaged by Brazil's strategy. Brazil is often not the only country responsible for the dispute, but it is clear that Brazil's enthusiasm may work in the wrong direction sometimes. The Netherlands is not involved in big conflicts with other countries the last years, good relationships are very important for the Dutch government. An example of this is the view of the Dutch government on the crisis in Iraq, where some believe that the official view of the Netherlands is primarily given by keeping up the good relationship with the United States.

Brazil also pays a lot of attention to its role in the United Nations. Being one of the founders, the country takes part in most important committees, including some that are directly aiming at stimulation and regulation of technology. Brazil supports cooperation in the UN highly and objects to unilateral actions like the war in Iraq. This is of course caused by the dependency of Brazil of other countries. Brazil has the tendency to present itself as the most important developing country in the UN. To continue the comparison, the Netherlands has a slightly different role in the United Nations. Like Brazil, they stimulate cooperation and are present in several committees, but of course the Netherlands do not present itself as an important developing country. Instead, it claims to be one of the major 'smaller' western countries and thus the 'conscience' of the Western World. Despite these differences, both Brazil and the Netherlands think global cooperation is very important. This is mainly stimulating for the development and use of Virtual Reality. Cooperation on UN level is a beginning for the instalment of global standards in technology. This, and the bilateral co-operations mentioned before, support exchange of technology and knowledge between countries and hence the use and development of technology in Brazil.

### 5.4.1 Comparison table

Aspect	Brazil	Netherlands
<b>Regional cooperation</b>	Southern Cone (Mercosur). Community of Portuguese speaking countries (CPLP).	European Union. NATO. Benelux (informal).
<b>Bilateral disputes</b>	Anti-AIDS drug dispute with US. Aircraft dispute with Canada. Meat import dispute with Canada.	None important.
<b>Relation with US</b>	Biggest trade partner of Brazil. Traditional suspicious view of the people on US intentions.	Not the biggest trade partner. In general people have doubts about the US sometimes, but are not very suspicious.
<b>Arab-Israeli peace process</b>	Peace process should be resumed. Supported the UN resolutions stating the OLP as real representative of Palestinian people and qualifying Zionism as racism and racial.	Pace process should be resumed. History shows slight preference for the Israeli side compared to other countries.
<b>United Nations</b>	Founder. Has a seat in several committees. Non-permanent member Security Council in 1998-1999.	Founder. Has a seat in several committees. Non-permanent member Security Council in 1999-2000.
<b>Hostilities</b>	No direct enemies. Some disputes with US and Canada.	No direct enemies.
<b>Crisis in Iraq</b>	Strongly opposed to the war.	Political, but not military ally of the US and the UK.
<b>Disarmament and Non-Proliferation</b>	Supports the disarmament and non-proliferation of nuclear, biological and chemical weapons of mass destruction. Member of Organization of Chemical Weapons (OPCW) Agreement with IAEA.	Supporter of disarmament and non-proliferation of weapons of mass destruction. Agreement with International Atomic Energy Agency (IAEA). Member of (OPCW).
<b>Women's rights</b>	Women in Brazil are not being equally to men, they are underpaid. Brazil is fighting this inequality.	Women in The Netherlands are being treated equally to men.
<b>Children's rights</b>	Big Child labor industry. Child prostitution industry. Lots of street children (and violence against hem). Brazil signed the Convention on the Rights of the Child.	Children are protected very well in The Netherlands. The Netherlands also signed the Convention on the Rights of the Child.
<b>Human Rights</b>	Brazil plays an active role in all main international forums on human rights (UN Commission of Human Rights).	The Netherlands also play a very active role in the international struggle for Human Rights.
<b>Drug Policy</b>	Brazil prohibits all drug trafficking. And is strongly opposed to the use of drugs.	The Netherlands tolerates the use of soft drugs.
<b>Nuclear relations</b>	During the military governments period Brazil strengthened its relations with 'nuclear' countries. An important agreement with Germany was concluded. Nowadays the nuclear program is falling, most because of financial constraints.	Never had a big nuclear program. Lots of resistance against nuclear weapons and energy.

**Table 5-1: Comparison table**

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# 6 National economical aspects

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## Chapter contents

<b>6.1</b>	<b>Introduction</b>	<b>129</b>
<b>6.2</b>	<b>Brazil</b>	<b>130</b>
6.2.1	General economic situation	130
6.2.2	Gross Domestic Product Trends and income	135
6.2.3	Interest rates	136
6.2.4	Inflation and recession	138
6.2.5	Labour and unemployment	140
6.2.6	Energy availability	143
6.2.7	Conclusion Brazil	145
<b>6.3</b>	<b>The Netherlands</b>	<b>147</b>
6.3.1	General economic situation	147
6.3.2	Gross Domestic Product Trends and income	148
6.3.3	Interest rates	149
6.3.4	Inflation and recession	149
6.3.5	Labour and unemployment	151
6.3.6	Energy availability	152
6.3.7	Conclusion the Netherlands	152
<b>6.4</b>	<b>Conclusion</b>	<b>154</b>
<b>6.5</b>	<b>References</b>	<b>156</b>

## 6.1 Introduction

Today Brazil is in the top ten of the world's largest economies. However, there are a lot of problems that can hardly be solved within the current economic situation. For example high inflation and high unemployment are repeating problems every several years.

As a part of the preparation for Study Tour Samba an investigation of the macro aspects of Brazil is performed. In this chapter the macro-economic aspects will be covered.

A macro-economic review describes the economic level and situation of a country at its present state. Major indicators are used in this type of reviews to be able to compare figures with figures of other countries and figures of previous years.

To look at all of the subjects that are covered in this chapter in perspective, the situation in the Netherlands will be covered as well. Facts and figures about Brazil and the Netherlands will be compared to give an answer to the general question that should be answered in this chapter:

*What does the Brazilian economic situation look like and how does this compare to and stand in perspective to the Dutch economic situation?*

## **6.2 Brazil**

In this chapter the Brazilian macro-economic situation will be covered. First of all, an insight in the general economic situation of Brazil's history till present day will be given. Section 3 discusses the financial structure of Brazil, which will include some information about Brazil's role in the world market. Section 4 to 8 discuss respectively the Gross Domestic Product, interest rates, inflation and recession, labour and unemployment, disposable income and energy availability and costs. In section 9 the conclusions are given, tackled in the same order as the previous sections.

### **6.2.1 General economic situation**

#### **History**

From 1968 till a big improvement in the economic situation of Brazil can be seen. In this period there was an economic growth of 10% every year. Both agriculture and industry were the cause of that, also due to foreign investments. But after 1974 it went downwards very quickly and in 1981 Brazil was in the middle of a big economic recession with inflation of more than 100% and its debts was growing bigger and bigger. In the eighties the GNP raised, dropped and stagnated constantly.

Finally the GNP rose with an annual percentage of 1.5% between 1981 and 1988. In 1987 and 1988 the inflation rose to big heights and the debts were around 115 billion dollars. The money from export was spent for more than one third to the payment of interest of the debts.

On the first of July 1994 the "Plano Real" was introduced, a reordering plan which would reduce the inflation. This operation turned out to be successful, because the inflation was reduced to 35% in 1995. This trend went on in the next years and also the unemployment was reduced.

Although this progression was good for Brazil, it did not count for all states within Brazil. Most of the southern states did make more profit than northern, north-eastern and the central-western states, which had the cause that many people went to the cities in the south-eastern part of Brazil.

In the informal sector there are many hundreds of thousands of street vendors, little shopkeepers, housekeepers, construction workers and waiters who aren't registered anywhere, but who together earn almost as much as the total official sectors. Also children from ten till fourteen years old (while labour is permitted from fourteen years old) work in this black market.

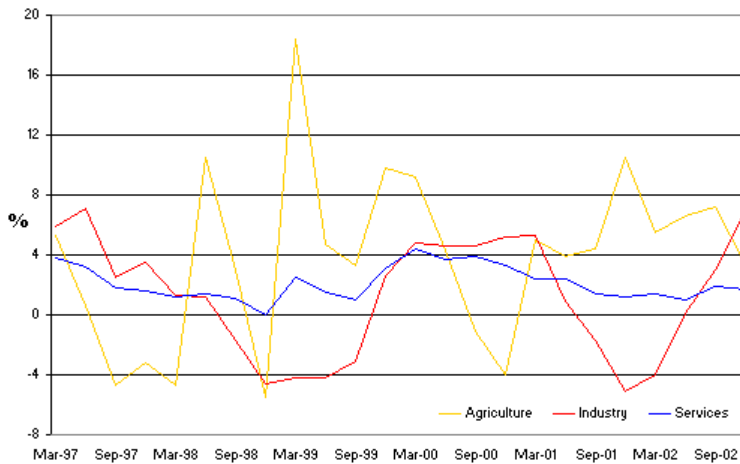
Since 1995 Brazil is profiting from the Mercosur, a customs union and free trade agreement of the countries Argentina, Uruguay, Paraguay and Brazil with a common rate for outer countries. Chilli is an associated member. The Mercosur was a reaction on the NAFTA-agreement between the US, Mexico and Canada, which has the same goal as the Mercosur. One of the

measures is that about 90% of the mutual trade is free of import laws. Slowly these countries become main trading partners of each other and there are already a lot of investments going on. Foreign investors that import from Brazil are mainly from the US, Germany, Japan, Switzerland and Great Britain. [LAN03]

## Sectors

The Brazilian economy is divided into the following sectors: agriculture and cattle breeding, forestry and fishing industry, mining and energy, industry, trading, traffic and tourism. The common distribution of the economy is divided into three sectors. In Figure 6-1 you can see the share of the primary (agriculture), secondary (industry) and the tertiary sector (services) in the GDP. [LAT03]

Major industries of Brazil are: Textiles, shoes, chemicals, lumber, iron ore, tin, steel, motor vehicles and parts, arms, soybeans, orange juice, chicken, coffee, sugar.



**Figure 6-1: Share of sectors in the GDP**

### *Agriculture and cattle breeding*

Most of the agricultural land is owned by the rich people and due to that the food production is decreased. Plans for land reformation came across political issues and that's why the distribution of the agricultural land is still unequal.

Around 9% of the Brazilian land is used for agricultural activities. Due to the technical development, more areas are now suitable for agriculture, especially in the north-north-eastern part. 45% of the export earnings are from the agriculture, and that is 23% of the working population. The Brazilian need for food is almost totally covered by the Brazilian agriculture. Thanks to the very fertile ground, it is possible to cultivate almost everything, and that is a very important fact for the export of Brazil.

Farming is mainly done in the southern states. Coffee is economically still the most important product. Around one third of the world's production of coffee is originating from Brazil. But the export value of coffee decreased a

lot over the past 40 years, due to the diversification policies of the Brazilian government. Cacao, sugar and also soybeans have also become very important export products.

The biggest part of the agricultural land consists of meadows and the cattle farmers contribute for about 25% of the value of the agrarian production. Although the export of beef is increasing, still, most of the production is used for Brazil itself. Also pigs, sheep, goats and horses are being kept.

The bigger farms are located in the Amazon, which causes the unequal land distribution and it further affects the vulnerable Amazon. [LAN03]

#### *Forestry and fishing industry*

Brazil has 60% of its land covered with forests of which 45% is tropical rain forest. Hard wood (Amazon) but also soft wood (Rio Grande do Sul and Paraná) are important products, but since the sixties this exploitation is restricted to the forest management.

The fishing industry does not mean that much. It is also restricted due to decrease of fish population in waters mainly in the Amazon. [LAN03]

#### *Mining and energy*

The mineral resources in Brazil are very big and varied, but in comparison there is little exploitation. Every now and then there are found new places within the Amazon. From 1936 the new registered mineral storages are owned by the state and exploration is only allowed by Brazilians.

Iron ore is the most important export product of the Brazilian mining industry and Brazil is the biggest exporter of iron ore in the world. The most important mining areas for iron ore are in the northern part of the Amazon.

The winning of gold is also important for Brazil (second export land in the world), as well as industry diamond, jaspis, agate, sardis, sapphire, diamond and emerald. Ca. 90% of the total world production of aquamarine, topaz and tourmaline is originated from Brazil. Brazil is one the biggest producers of tin, manganese, mica and beryllium.

Mineral oil production provides Brazil with the half of the total need for mineral oil. The import of oil does cost Brazil over billions of dollars every year.

In the sixties and seventies high priority was given to alternative resources of energy like hydro-electric power, nuclear energy and methanol. 90% of the energy needed in Brazil is originated from the hydro-electric power. There is plenty enough of hydro-electric power in Brazil. The development of nuclear power has lead to a big fiasco due to bad management and constructing errors. [LAN03]

#### *Industry*

Brazil is the main industrialised country within Latin-America. The share of the industry in the GDP was 29% in 2001. 23% of the working population



work in the industrial sector. The most industrial areas are in the south-eastern part of Brazil.

The extension of the heavy industry within the management of development was of great interest, mainly in the car and steel industry. Especially the car-industry has grown very big, with brands like Ford, General Motors and Volkswagen. Thanks to this, Brazil has become one of the main markets and producers within the car industry.

The share of industrial products in the export is 60%. Brazil has a modern industrial park thanks to foreign investments by among other things the US, Japan, The Netherlands and Germany. [LAN03]

### *Trading*

Nowadays the trade balance is at 16 billion dollars, but in the past there were also periods where the difference was smaller and negative.

In 2000 the most important import partners were the US, Argentina, Germany, Japan and Italy. The most important import products were machines, machine parts, electronics, mineral oil, chemical products and food products.

In 2000 the most important export partners were the US, Argentina, Germany, the Netherlands and Japan. The most important export products were iron and steel products, coffee, oil products, machines, cars and car parts, soy and fruit juice. [LAN03]

### *Traffic and tourism*

Due to the huge dimensions of Brazil, the domestic air traffic is very important. The domestic air traffic of Brazil is the densest one in the world with as much as 1500 airports and airfields. Intercontinental flights fly through Rio de Janeiro, São Paulo, Recife and Porto Alegre.

The train tracks only have a total length of 30.000 km, of which the exploitation was privatized in 1996. Most of the Brazilians travel by bus, which is well organized within the more dense populated areas.

The roads have a total length of 1,5 million km, of which only 71.000 km is surfaced! There is a big 5000km long road through the inland of Brazil from the Atlantic Ocean to the Peruvian border.

The inland shipping has 50.000km of available rivers. The shipping industry is concentrated in Rio de Janeiro, Santos, Rio Grande and Paranagua. Smaller harbours are Belém, Recife, Salvador, Florianópolis and Porto Alegre.

Every year Brazil is visited by ca. 2 million tourists. Mainly the carnival in Rio and the beautiful nature are the attractions. But lately also a lot of tourist come for the preservation of the Amazon. The income from that is spent on the protection enactments and the not-harmful development within the Amazon. [LAN03]

### **The distribution of wealth**

The distribution of wealth is Brazil's big disgrace. Nowhere in the world is the social and economical inequality this big, which makes it one of the distinguishing marks of Brazilian society [MRE03]. Black people and Indians are at the bottom of society, large landowners at the top. The distinction between landowners and their slaves is still visible. Slave labour lasted until almost the end of the nineteenth century. The richest 10% earns 51.1% of the national income and the poorest 50% earn 11.6%. There is no real social security structure and lots of kids are on the streets.

This problem is of a structural nature. Since the 1950s the purchasing power of the minimum wage has fallen continuously. These low wages are paid for unskilled labour. For these unskilled workers their wages have not increased, while skilled workers managed to link their wages to their increase in productivity. Thus, there has been a continual worsening of the income distribution.

Furthermore, a working system of autonomous labour unions does not really exist, thus employees cannot negotiate higher wages in cooperation [MRE03]. In addition, a problem of an even more structural nature is the serious defect in the educational system. The school age is from 7 to 14 and even decreasing a little and the education is not of very high quality. This does not only place the workers in a difficult position, but also the country as a whole, because the industry does not have the right conditions to compete on the world market.

### **Conclusion**

For countries like Brazil, which at the outset have a high level of structural unemployment, a concentrated income distribution combined with a low level of school attendance and a low average income, the expectation of repeating the pattern of low inflation and high unemployment, represents a serious threat. More than that, it is a non-viable alternative, both economically and politically.

This is the real challenge facing Brazil - and it gets worse when remember that the country will be, as it has to be, firmly inserted in the international financial markets. There are no alternative policies available apart from major investment in the social area and public investment in infrastructure and technology.

The marked financial imbalance found in the public sector in Brazil, resulting from the policy strategy of a fixed exchange rate and high interest rates, is preventing these investments from being made in the volume and time necessary to create a promising outlook for the long-term situation. On the other hand, unlike other countries, the new life and political organisation in Brazil, with widespread freedom of expression and political representation, cancel out the risk of the existence of pockets of dissatisfaction or revolt that the nation's difficult social position might suggest.

Perhaps this is Brazil's most positive and promising feature. A nation with an Iberian heritage and an authoritarian culture, with a highly unstable

political past, that holds prosperity and liberty as its most important aspirations. These features lead to the conclusion that Brazilian society as well as its economy are going through a period of great transformation that is both promising and yet difficult to achieve.

## 6.2.2 Gross Domestic Product Trends and income

### Gross Domestic Product Trends

The Gross Domestic Product (GDP) of a country gives an insight in the value of all final goods and services produced within that nation in a given year. In comparison to the Gross National Product (GNP), another economic standard, only labour and property that is physically located within the confines of a country are taken into account. The GDP does not include (foreign) influences such as citizens working overseas. [ECO03]

The GDP estimates used are derived from purchasing power parity (PPP) calculations, which should provide a better basis for comparison. [FAC03]

<b>GDP:</b>	purchasing power parity - \$1.34 trillion (2001 est.)
<b>GDP - real growth rate:</b>	1.9% (2001 est.)
<b>GDP - per capita:</b>	purchasing power parity - \$7,400 (2000 est.)
<b>GDP - composition by sector:</b>	<i>agriculture: 9%</i> <i>industry: 32%</i> <i>services: 59% (2000 est.)</i>

**Table 6-1: GDP figures for Brazil [FAC03]**

The figures stated above make Brazil's economy the largest of Latin America and one of the top ten economies of the world.

Brazil is a developing country, though its population is more and more urbanized (Brazil's urbanisation index is 75%, rising to 93% in some regions [ANO03]). Since a majority of Brazil's inhabitants live in cities, services sector takes account for the greatest part of the GDP. Services sector provides 50% of the employment, especially providing jobs in financial and government services [MBZ03].

Being the most industrialized country of Latin America, industry has another large share in the Brazil's GDP. Industrial centres can be found especially in the south eastern parts of Brazil, like the states São Paulo, Minas Gerais and Rio de Janeiro.

From the 1950's to the 1970's the industrialisation process in Brazil had improved important sectors of the economy. Examples are the expansion of automobile, petrochemical and steel industry and large infrastructure projects. This led to Gross Product growth rates among the world's highest. In the early 1970's, when huge capital inflows from international banks were directed to infrastructure and state enterprises in the areas less attractive for private investment, the growth rate even exceeded 10%. [BRA03]

Period	GDP growth (%)
1960-1969	6,07
1970-1979	8,75
1980-1989	2,93
1990-1999	1,79

**Table 6-2: GDP historical growth rates for Brazil [BRA03]**

Due to the international interest increments in the 1980's, Brazil experienced some years of crisis. This depression led to strict measures that started to pay off around 1994, after the introduction of the Real Plan. The cycle of positive growth rates sustained until the currency crises in Asia and Russia in 1998. After help of the International Monetary Fund, the Brazilian economy responded above expectation and remained quite stable. [BRA03]

Because of the crisis in Argentina, an internal energy crisis and a decrease of foreign investments, growth slowed down again in 2001. Economic growth estimates of 2002 are only 1%. The EIU estimates a growth of 2,45% for the years 2003-2005.

Expectations are quite stable, because of the strict economic measures Brazilian government still has to take. However, the short-term recovery measures should be translated into long-term growth.

### **Disposable income**

The GDP per capita of Brazil is purchasing power parity - \$7,400 (2000 est.) and is growing the last years as shown earlier. The richest 10% of Brazil's population receive 47% of the total income and the poorest 10% have a share of only 1% of the total income (1997). According the standard of Brazil 22% of the people there lives below poverty line (1998 est.) [FAC03].

### **Conclusion**

Brazil is one of the top ten countries with the highest GDP. The GDP is growing but recent growth rates show decrease. Brazil had a major up, because of the measures their government took to change the economic situation. The recent moderate growth is caused by the negative aspects of the worldwide economic (and political) situation.

## **6.2.3 Interest rates**

Interest Rates show the relation between the supply and the demand of money. These rates are often used to give a forecast of a country's economy. When interest rates grow, this often projects a growing inflation.

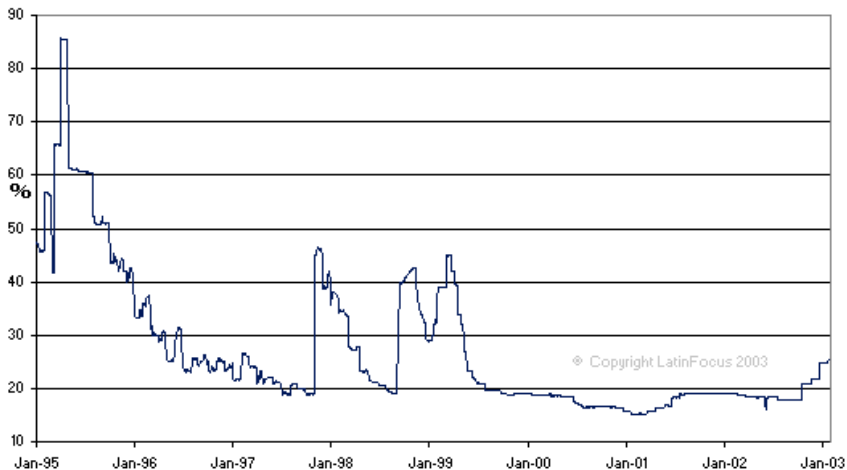
Monetary policy aims to influence the overall level of monetary demand in the economy so that it grows broadly in line with the economy's ability to produce goods and services. Interest rates are increased to moderate demand and inflation and they are reduced to stimulate demand. If rates are set too low, this may encourage the build-up of inflationary pressure; if

they are set too high, demand will be lower than necessary to control inflation.

Changes in the official rate affect the whole range of interest rates set by commercial banks, building societies and other financial institutions for their own savers and borrowers. These changes in financial markets affect consumer and business demand and in turn output. Changes in demand and output then impact on the labour market - employment levels and wage costs - which in turn influence producer and consumer prices.

A change in the official interest rate will take time to influence consumers' and firms' behaviour and decisions. Overall, a change in interest rates today will tend to have its full effect on output over a period of about one year, and on inflation over a period of about two years. [BOE03]

Because of the above, you can see a correlation between the interest rates and the inflation rates. When comparing the figure below with the inflation information in the sections before, the results are roughly the same ups and downs. However, only since 1999 the interest rate was used to influence inflation in Brazil as explained in the section before.



**Figure 6-2: Brazil, Interest Rate, 1995-2002 [LAT03]**

“The rate is defined by the Brazilian Central Bank and incorporates the anticipated inflation over the following 12 (twelve) months and the real international interest rate plus the medium to long term assessment of the country risk. The rate is defined by the Brazilian Central Bank and incorporates the anticipated inflation over the following 12 (twelve) months and the real international interest rate plus the medium to long term assessment of the country risk.” [BND03]

In the interest figures above some interesting trends and peaks are found. The two peaks in 1997 to 1999 reflect the crises in Asia and Russia, discussed earlier. International investors started to withdraw money not only from projects in Asia and Russia, but also in Brazil. To encourage

investors to keep their money in Brazil and discourage an outflow of dollars, interest rates were increased. [GLO03]

It is quite remarkable that the figures in graph, and other figures, show a decrease of interest rates since the economic measures in the early 1990's and a rather stable rate afterwards. This interest decrease was used to obtain a surge in national demand. [BMO03]

The interest rate of Brazil (in 2001) was the highest in Latin America [LAT03]. This high interest rate reflects the tries of Brazilian government to attract investments and money. The debts to investors kept on growing, until one of the states of Brazil had to recognize to its government that it could not pay its debts. Next to the huge government debts, this started an outflow of capital from Brazil. Even after the loosening of the Real from the Dollar, capital seems to be less attracted to Brazil and in contrary to what the Brazilian government hoped for, the interest rates does not really seem to decrease.

### **Conclusion**

The Brazilian interest rate figure is around 20%. This high Brazilian interest rate is a measure to keep investors in Brazil and attract new ones.

## **6.2.4 Inflation and recession**

### **From protectionism to liberalism**

Brazil's economic growth is characterised by periods of growth and recession after the Second World War. First, the economic development was based on import substituting industrialisation (ISI) [ECO03]. After a slow start from 1955 to 1964 with less stability and growth, the ISI economy took off facilitated by a large domestic market. From 1968 to 1974 was Brazil's "wonder"-period [LAN03], with economic growth of 10% a year. A large and diverse industrial sector was developed and agriculture flourished. However, after 1974 the economy declined, because of the protectionist policies (ISI) created an inward-looking and inefficient (because of no competitors) county. The deteriorating external position led to a collapse in investments and inflation. [ECO03] This resulted in a serious recession around 1981 with hyperinflation over 100% and a large external debt [ECO03]. At the end of the 80s this debt was enormous (114.6 billion dollars, while in 1979 50 billion dollars) and one third of export revenues were used to pay off interest. Only in 1990 trade liberalisation began. This reinforced Brazil's numerous competitive advantages (agriculture, natural resources). However, even today, Brazil is a relatively closed country for external trade.

After a few failed economic reforms, *Plano Real* was commenced in 1994, which had as a goal to lower the huge inflation rates to reasonable levels. This plan proved very successful resulting in a significantly lower inflation the last decade. The new currency, reorganisation of government finance, privatisation of royal companies and opening the market from *Plano Real* resulted in a growth in the economy of 4.1% on average, which continues

until today, although at a lower rate (2% average from 1999 to 2002). Inflation lowered to an average of 6.5% over 1999 to 2002 [MBZ03].

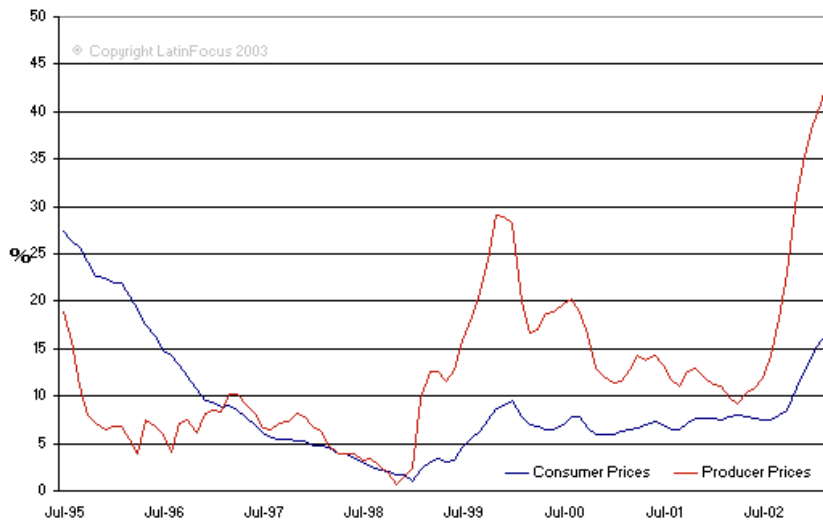
In 1999 the frozen exchange rate of the Real was released. Brazil had established an inflation-targeting regime by freezing the exchange rate. It then replaced the external anchor by a domestic one: the control of the inflation rate by means interest rate setting. Therefore monetary policy was more clearly structured on the basis of one objective (inflation target) and one instrument (interest rate). [BEL03]. At first there was a devaluation of the Real over 40%, however, the currency recovered and external investments increased. The Brazilian economy proved quite flexible and the feared high inflation rates didn't return. The *index of inflation* that is used for the purpose of setting interest rates is the Consumer Price Index (See below). Its targets were established a few months after the crisis: 8% in the year 1999; 6% in 2000; and 4% in 2001. Variations around the target are allowed up to 2 percentage points; that is, for instance, the inflation in 2000 should be kept between 4% and 8%. As said, the system has been working successfully and, as expected, it has enhanced transparency and data dissemination in Brazil's economic policies. [BEL03]

In 2001 growth again was lessened because of a crisis in Argentina, an internal energy crisis and less foreign investments. However, the forecast for economic growth of the Economist Intelligence Unit [EIU03] over 2003-2005 is 2.45% [MBZ03]. Inflation has increased a little the last few years, because of the weak dollar, but it is still relatively stable.

Necessary reforms of the public and social system are only partly completed, however the privatisation program was successful and provided some income. This extra income was not enough to lessen the foreign debt, which is still extremely high (\$157 billion in 1995 to \$ 220 billion in September 2002) [MBZ03]. This continues to put a strain on the trust in the Brazilian currency and with that the inflation rate. Coupled with political troubles this debt did lead to devaluation of the Brazilian Real again in the end of 2002.

### **Index of inflation**

The rate of inflation is strongly coupled to the economic growth or recession. As seen in the previous part, the rate of inflation increases during a recession, sometimes to enormous values. Economic growth is possible with these high inflation rates; however there are many disadvantages, such as prices being continuously updated and declining foreign investments.



**Figure 6-3: PPI and CPI over 1995-2002 [LAT03]**

Two economic indicators are used to indicate inflation: the Producer Price Index (PPI) and the Consumer Price Index (CPI). The PPI measures prices at the wholesale level only. The CPI is based on the price of a standard “basket” of consumer goods. Normally the latter is used for indicating the inflation of a country, especially in Brazil as it is the basis to set the interest rate to control inflation. Below both indicators over the period of 1995-2002 are shown. Clearly visible is the sharp decrease in inflation because of Plano Real, the sharp increase because of the crisis in 1999 and the recovery. Furthermore, as said, a sharp increase is visible at the end of 2002.

### Conclusion

Brazil’s economy has known prosperous and troubling times. After the big recession of the 80’s with enormous inflation rates, *Plano Real* in 1994 has brought the country more stability. Since 1994 the economy has grown and the inflation rate has been relatively low and stable. Inflation rate are very dependant on economic prosperity. Lately the difficult economic climate in the world also affects Brazil and inflation rates have shown a sharp increase.

### 6.2.5 Labour and unemployment

Regardless of the criteria, the Brazilian economy has consistently been placed among the 10 biggest economies in the world [BEL03]. With its many natural resources Brazil has competitive advantages in many areas, including agricultural products (coffee, soybeans, sugar, oranges, tobacco and cocoa); livestock products (meat, poultry and leather footwear); wood products (pulp, paper, veneer and plywood); and mineral and metal products (iron, steel and aluminium). Thus, Brazil has an enormous potential. Also, the rapid trade liberalisation reduced the cost of imports such as machinery. This reinforced Brazil’s competitive advantage in agriculture and livestock, in addition to stimulating expansion of the domestic durable-goods sector and services such as telecommunications,



commerce, transport and public utilities. Furthermore, external competition led to a sharp rise in labour productivity. [ECO03]

### **Agriculture and livestock**

During the course of the twentieth century, agriculture has ceased to be the main productive activity in practically the entire world. The rural way of life has been substituted by industry, by trade and by other essentially urban occupations.

While in 1940 70% of Brazilians earned their living in the country, by the beginning of the 1990s this proportion had fallen to around 20%. In the interval of half a century, the population of Brazil more than tripled, going from 41 to nearly 147 million inhabitants, but the population of the cities increased by nearly 100 million, while that of the country by a mere 7 million. [MRE03]

The agricultural sector provides for 13% of the GDP and 27% of the workforce. This difference indicates that there is still a low productivity in this sector, mostly because of old equipment. There is also a lot of hidden unemployment in this sector and low wages and poverty. Half of the land is owned by 1% of the population, who make all the money.

The relative large size of this sector indicates the comparative advantage. Agricultural products provide a quarter of the export and Brazil is in the top three of producers of coffee, sugar, cacao, corn, beans, meat and soybeans. [MEZ96]

### **Industry**

By 1980, Brazilian industry was manufacturing practically every kind of product. It had established strong links with agriculture. While in the mid 1960s about 80% of Brazilian exports were of primary goods, by 1980 manufactured products made up almost half of total exports.

Productivity increased significantly in all sectors of the economy, especially during the 1970s, but this did not prevent an accelerated growth of employment in industry and in other urban activities, especially those which were functionally linked to industry. [MRE03]

Industry provides for 26% of the GDP and 19% of the workforce. A little over 5% points of this is from state companies and about 10% points from companies working with Brazils mineral and metal products.

Many activities in industry relate directly to agriculture or mining. Still, the industrial sector is relatively small and has a low productivity, because of the protectionism of the past [MEZ96]. Comparative advantages in the industry lie with mining in the form of gold, gems, iron and bauxite. Because of the many natural resources, many investments have been done in this sector. Lately, also the automotive industry is becoming a major player.

## Services

The services sector is also in Brazil by far the largest, providing for 53% of the GDP and 55% of the labour force. The government is with 10% the largest sector followed by financial services and trade. Services have grown enormously the last 40 years, also because of the enormous urbanisation and modernisation.

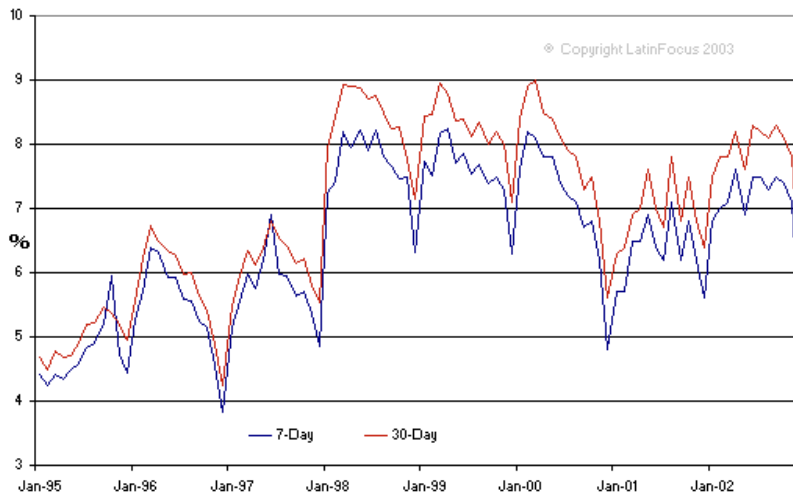
## Informal sector

The informal sector or parallel economy is huge in Brazil being as large as one third of the official economy. To the informal circuit belong the many street merchants, but also personal services, such as maids, handy men, waiters and others, such as small independents and construction workers. Many depend on these jobs to survive and also many children under the age of 14 are working (which is illegal in Brazil).

## Unemployment rates

Figures of total unemployment do not reach levels as high as in Europe, because the unemployment insurance scheme of Brazil does not allow people to wait very long to find a new job. This also lessens their bargaining power and forces them to accept under-qualified work at low wages. All these people do not show up in unemployment figures. When the country is in recession, this translates into lower wages instead of increased unemployment, making the Brazilian labour market very “flexible”.

This is what happened during the 80’s and the beginning of the 90’s. Unemployment was also the biggest fear in society for the Brazilian people. However, since *Plano Real* the purchasing power of employees has increased and employment has increased. But, especially since the fixed exchange rate was dropped, the increased transparency of the market revealed more realistic and thus higher unemployment rates. [MRE03] All of this is shown in the figure below.



**Figure 6-4: Unemployment rates over a 7 or 30 day average**

## Conclusion

Brazil has a relatively large agricultural sector, because of its many natural resources. Industry is relatively slow and closely related to the agricultural sector and Brazil's natural resources. Both sectors also have a low productivity. The services sector is the largest, but smaller than in most developed countries. Finally, there is a very large informal sector, which many people need just to survive.

Unemployment is normally also dependent on economic prosperity, however not in Brazil. The Brazilian unemployment rate is always around the 6%. This is because, Brazilians can not afford to be unemployed, thus instead, in economically difficult times wages increase instead.

## 6.2.6 Energy availability

In this section the energy availability in Brazil will be discussed. First of all there is a section about electricity and then there will be a section about the different kinds of energy sources that Brazil owns.

### Electricity

Brazil has an electricity production of 342.3 billion kWh (2000). By far the most electricity is produced in a hydro way (89%). Fossil fuel and nuclear power delivers 6% respectively 1% of the total electricity production. 4% comes from other sources. [FAC03]

Brazil's energy production isn't enough to fulfil its electricity consumption of 360.64 billion kWh (2000). Therefore Brazil imports 42.3 billion kWh from Paraguay. Brazil does not export electricity [FAC03].

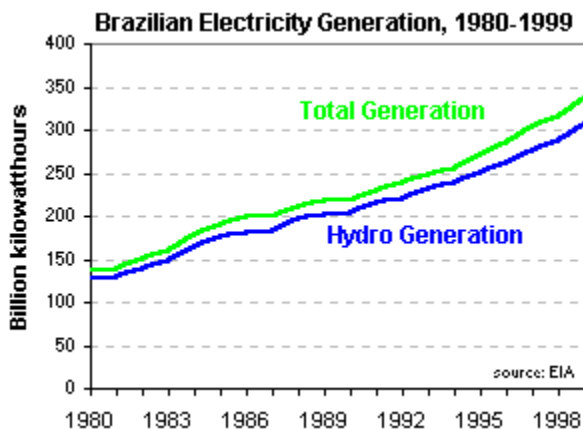


Figure 6-5: Brazilian Electricity Generation, 1980-1999 [LAN03]

### Different kinds of energy sources

Hydropower, the most important energy source, is one of the natural resources of the country besides bauxite, gold, iron ore, manganese, nickel, phosphates, platinum, tin, uranium, petroleum and timber [BRA03].

The table below gives the statistics of energy production in Brazil in 1999 by Fuel Type (Estimated) [ANE03]. Note that these numbers correspond to the total energy production, which includes gasoline, heating etc., compared to only the electricity production in the last section. This means that the numbers don't match.

Interesting is the great part of renewable sources. Industry consumes the most electricity (44.2%). The main oil consumer is the transport sector (49.7%) [ENE03]. Some other interesting facts about energy will be discussed below.

Fuel Type	Energy Produced (Quads)	Percent of Total
Hydroelectric	3.18	52.05
Oil	2.44	39.93
Dry Natural Gas	0.23	3.76
Geothermal/Solar/Wind	0.10	1.64
Coal	0.07	1.15
Natural Gas Liquids	0.05	0.82
Nuclear	0.04	0.65
<i>Total</i>	<i>6.11</i>	<i>100.00</i>

**Table 6-3: Energy production statistics 1999**

### *Hydropower*

Brazil relies heavily on hydroelectric power. Because a shortage of rainfall (and so energy) Brazil government started in 2001 an energy-rationing program in an attempt to reduce the energy usage. The total energy consumption is expected to increase with 3.3% a year, though.

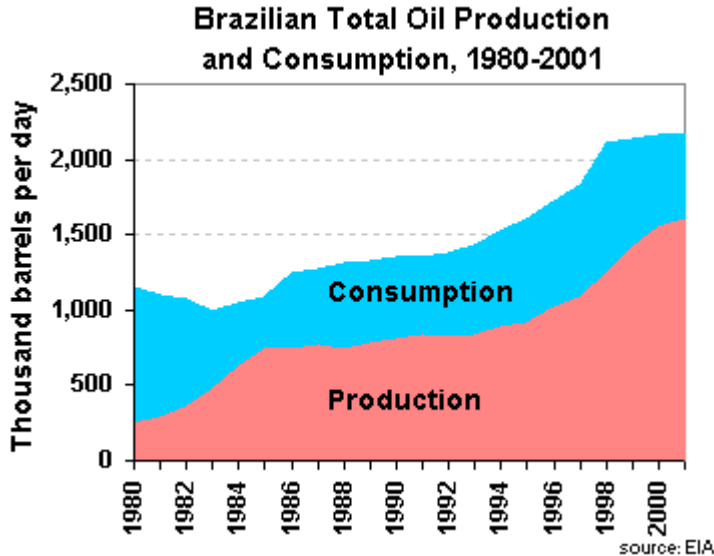
More than 60 hydroelectric facilities in Brazil supply at least a capacity of 100 MWe.

Brazil has unexploited hydroelectric potential: rivers in the Amazon have a potential energy supply of three times the current capacity [ANE03].

### *Oil*

Oil is after Hydro energy the most important energy source. Brazil has the second largest oil reserves in South America: estimated at 8.4 billion barrels. Brazil strives to produce enough for its own, but at this moment it has to import oil. The Oil Production (2001) is 1.6 million barrels per day (bbl/d) estimated and the Oil Consumption (2001) is 2.2 million bbl/d estimated.

The most import oil is from Venezuela and Argentina. The production raised the last decennia to almost 1.6 million barrels per day in 2001[BCA03]. Petrobas, the oil company of Brazil is privatised because it had not enough money to do the needed investments [LAN03].



**Figure 6-6: Brazilian Total Oil Production and Consumption, 1980-2001**

### *Nuclear*

The development of nuclear power has become a fiasco. Mismanagement and construction errors were the reasons for that [LAN03].

Brazil has two working nuclear plants, Angra-1 and Angra-2. Angra-1 was bought from America and Angra-2 (operational in 2000) costing \$10 billion and 23 year to construct. Angra-3, under construction, is said to be imminent. Equipment is mothballed now, but if the decision to go on with the built the nuclear installations is taken, these will be operational in 5 years [BCA03].

### **Conclusion**

Brazil relies on its renewable hydropower for energy production. Brazil has huge natural resources; hydropower (electricity) and oil (2nd most important energy supply) and tries to exploit them to fulfill its own consumption. Only a small part needs to be imported.

### **6.2.7 Conclusion Brazil**

The economic situation in Brazil went down quickly after a big improvement from 1968 in 1974. There were inflation rates of over 100% and debts got bigger and bigger. Plano Real, introduced in 1994, was successful in reducing inflation and unemployment. However, not every state in Brazil did profit from this success equally. The last few years a decreasing growth can be seen.

Brazil's economy is the largest of Latin America and one of the top ten economies of the world. The GDP is \$1.34 trillion, which is much more than the \$434 billion (2002 est.) in the Netherlands. However, the Brazilian GDP per capita of \$7,400 (2000 est.) is less than the Dutch \$26,900 (2002 est.).

The richest 10% of Brazil's population receive 47% of the total income and the poorest 10% have a share of only 1% of the total income (1997). According to the standards of Brazil, about 22% of the Brazilians lives below poverty line (1998 est.).

Services sector takes account for the greatest part of the GDP. It is this sector that provides 50% of the employment, with especially jobs in financial and government services. Brazil has a relatively large agricultural sector, because of its many natural resources. Industry is relatively slow and closely related to the agricultural sector and Brazils natural resources. Both sectors have a low productivity. The services sector is the largest, but smaller than in most developed countries.

The informal sector in Brazil is about the same size as the formal sector. For many Brazilian people the informal sector is necessary to survive.

The interest rate of Brazil (in 2001) was the highest in Latin America. This high interest rate reflects the tries of Brazilian government to attract investments and money. Despite of several measures and in contrary to what the Brazilian government hoped for, the interest rates does not really seem to decrease and is now about 20%.

Normally, unemployment is dependent on economic prosperity, amongst other factors, however this does not seem to be the case in Brazil. The Brazilian unemployment rate is always around the 6%.

Brazil's energy production is not enough to fulfil its electricity consumption of 360.64 billion kWh (2000). Therefore Brazil imports 42.3 billion kWh from Paraguay. By far the most electricity is produced in a hydro way (89%). Hydropower, the most important energy source, is one of the natural resources of the country besides bauxite, gold, iron ore, manganese, nickel, phosphates, platinum, tin, uranium, petroleum and timber. Brazil has the second largest oil reserves in South America: estimated at 8.4 billion barrels. Brazil strives to produce enough for its own use.

## 6.3 The Netherlands

The Netherlands had an advanced economy, which combines high incomes per head with a fairly even income distribution. With exports and imports of goods and services together totaling more than 100% of nominal GDP, the life-blood of Dutch prosperity is foreign trade. Rotterdam is Europe's largest port; its industrial and distribution activities alone generate annual added value of some 10% of Dutch GNP. The country's geographical position at a crucial hub of Europe's transport system and the small size of its domestic market have made the Dutch economy one of the most open and outward-looking in the world. Moreover, the scarcity of natural resources and raw materials has turned it into a processing economy. Trade is instrumental to the manufacturing sector, which is dependent on imported materials. The international orientation of manufacturing companies is highlighted by the presence of well-known multinationals such as Royal Dutch/Shell (oil), Unilever (food), Philips (electronics) and Heineken (brewing).

In this chapter the macro-economic aspects of The Netherlands will be discussed in order to look at the Brazilian facts and figures in a better perspective.

Like in the chapter about Brazil at first there will be given an insight in the general economic situation of The Netherlands. This will be followed by sections discussing the financial structure, the Gross Domestic Product, interest rates, inflation and recession, labour and unemployment, disposable income and energy availability and costs. The chapter will be ended with a conclusion.

### 6.3.1 General economic situation

The Dutch manufacturing sector is relatively small, accounting for some 16% of GDP, according to 2000 data. The services sector as a whole is exceptionally large, providing over 70% of GDP in 2000. Public and personal services are the largest component of services, followed by real estate and renting, wholesale and retail trade, and transport and communications. The financial sector has taken an aggressive approach to the integration of international financial markets, especially ABN AMRO and ING Barings. The agricultural sector is also larger than in most OECD countries (2.8% of GDP in 2000). The Netherlands has a leading position in the world market for horticultural products and is a major exporter of meat and dairy products. The country also benefits from significant natural gas resources and is the fourth largest producer in the world after Russia, Canada and the US.

The way in which the Dutch economy is managed and functions resembles to a large extent the German social market model, with extensive social welfare provisions, influential workers' councils at plant or company level, and an important role for the trade unions in national policymaking. However, the financial system tends more towards the "Anglo-Saxon" model, built on the issue of shares as a means of providing company financing, with banks acting as intermediaries rather than as long-term

investors. In addition, the pension system is largely financed by pension funds owning shares and other assets.

The Social Economic Council (Sociaal Economische Raad, SER) is the pivotal body in the network of bargaining boards and interest groups, and a central institution in any discussion in Dutch policymaking. It consists of three groups, each with 11 members, representing employers, the trade unions and the so-called crown members appointed by the central government, but acting independently. The crown members include the governor of the central bank and the director of the Central Planning Bureau.

The SER provides the government with (non-binding) advice on socio-economic issues. It has an important function in collective labor agreements and the provision of social services. Serving both as an instrument of the government's wage policies and as a mouthpiece for employers and employees, it has made possible the persistent wage moderation of the past 15 years. [ECN03]

### **6.3.2 Gross Domestic Product Trends and income**

#### **Gross Domestic Product Trends**

The Netherlands has an advanced, prosperous and open economy. Totals of GDP are much smaller than those of Brazil, but higher per capita, and also more evenly distributed.

Totals of exports and imports of goods and services are more than 100% of nominal GDP; the economy depends heavily on foreign trade [ECO03].

<b>GDP:</b>	purchasing power parity - \$434 billion (2002 est.)
<b>GDP - real growth rate:</b>	0.3% (2002 est.)
<b>GDP - per capita:</b>	purchasing power parity - \$26,900 (2002 est.)
<b>GDP - composition by sector:</b>	agriculture: 3% industry: 26% services: 71% (2001 est.)

**Table 6-4: GDP figures for the Netherlands [FAC03]**

The scarcity of natural resources, apart from the significant gas resources, has turned the Netherlands into a processing economy, dependent on imported materials. This is quite different from the Brazilian economy that is originally more internally focussed.

Especially the services sector is exceptionally large, with a share of 71% of GDP. Industry, with a GDP share of 26% is predominantly in food processing, chemicals, petroleum refining, and electrical machinery.

The agricultural sector provides a share of only 3% of the GDP and about 4% of the labour force but provides large surpluses for the food-processing industry and for exports. The sector is smaller than in Brazil, but still larger than in most OECD countries.



In 2001-02 economic growth of the Netherlands slowed considerably. In the years before that there was an annual growth of nearly 4%, well above the EU average [FAC03]. The Dutch economy is expected to grow moderately. The GDP will probably increase by 0.75% in 2003 and 1.75% in 2004. This outcome is likely to remain below the euro area average caused by a loss of the Dutch export market share due to high labour cost increases in recent years [CPB03].

### **Disposable income**

The disposable income data shows an increasing income in The Netherlands along with the positive growth of the economy. With the forecasts of the less increasing economy you might expect the disposable income will not increase so much like it did the last years (no relevant indicators were found about this).

The GDP per capita of the Netherlands is [FAC03] is purchasing power parity - \$26,900 (2002 est.) The richest 10% of their population receive 25% of the total income and the poorest 10% have a share 3% of the total income (1994). No numbers of people living below the poverty lines of the Netherlands are found [FAC03].

### **6.3.3 Interest rates**

In the Netherlands, interest rates on deposits have been low and stable for quite some time. The base set by the government is only between 2% and 3%. Investment in The Netherlands is rather attractive for international countries.

Lately, interest rates are dropping because of insecurities in the European economy. Not only because of the war in Iraq, but also because of the bad forecasts for Euro-economy in 2003. Growth of the economy will probably be less than expected earlier.

Duisenberg, president of the European Central Bank, called the measures necessary to counterbalance the negative factors in present economy. However he stressed monetary measures will be overshadowed by the political situation worldwide [NRC03].

### **6.3.4 Inflation and recession**

The open, export-oriented, strong and stable economy of the Netherlands does not know the hyperinflation and big changes in economic growth such as in Brazil. But, there have of course been periods of economic growth and recession and inflation is one of the highest in Europe.

### **Current Economic Situation**

During the European recession in the early to mid 1980's, many jobs were lost because of the sharp rise in labour cost and public finances had got out of hand. To counter this recession the *Polder Model* was introduced. This consisted of increasing taxes and levies and decreased wages, pensions and health benefits, which were all necessary to stay internationally competitive. Since these reforms were implemented the Dutch economy has responded quite positively. The average growth rate in

the Netherlands since 1994 has been 3.2%; this growth is equivalent to the phenomenal US growth during this period, while exceeding the EU average of 2.5%. Although the Dutch inflation rate of 2.1 % is slightly higher than the EU average of 1.75 %, the increase is attributed to same recent increase in oil prices experienced in the US. [BCN03]

It is interesting to note that many of the current economic problems resemble the problems during the 80's. However, there are of course also many differences.

### Forecast

The forecast for the Netherlands in the near future is that inflation and wages will fall steadily. In 2002 inflation reached a high, because of high labour costs and import prices and the introduction of the euro. Inflation rates will reduce in 2003 and are projected at only 1% in 2004 [CPB03] and are influenced by the Euro and oil prices. Because of falling inflation and rising unemployment, wages will increase less and purchasing power will decrease because of higher taxes (Much like the mid 80's).

### Inflation rates compared with Brazil

The inflation rates of Brazil and the Netherlands from 1981 to 2002 are shown in the table below. Furthermore, figures of these rates over 1994-2002 are shown. As explained, Brazilian inflation rates are much higher with extremely large changes, while the Dutch inflation rate has been relatively stable, only showing a small peak lately and forecasted to return to "normal".

Year	Brazil	The Netherlands
1981	101,7	
1982		
1983		
1984		
1985	228	
1986		
1987	366	
1988	900	
1989		
1990		2,5
1991	432,8	3,2
1992		3,2
1993		2,6
1994	100,7	2,8
1995	25,9	1,9
1996	16	2
1997	18	2,2
1998	3,2	1,98
1999	4,86	2,21
2000	7,04	2,52
2001	6,84	4,54
2002	8,5	

**Table 6-5: Price-inflation (Consumer price index)**

### 6.3.5 Labour and unemployment

Since many jobs were lost during the recession in the 80's, the Dutch government had placed a high priority on job creation. The Dutch employment growth average of 2.1% since 1994 (vs. the EU average of 0.4%) is also a positive indicator of the Polder Model's success [BCN03]. The unemployment rate in the Netherlands in 2000 decreased to 3%, comparing favourably to the 10% of the EU as a whole [CPB03].

The unemployment in the Netherlands was higher as in Brazil, but then steadily decreases while the Brazilian unemployment increases slightly. Furthermore, there is a lot of hidden unemployment in Brazil, these figures do not account for.

Year	Brazil	The Netherlands
1990		6
1991		5,4
1992	5,76	5,4
1993	5,31	6,6
1994	5,06	7,6
1995	4,64	7,1
1996	5,42	6,6
1997	5,7	5,5
1998	7,6	4,21
1999	7,56	3,2
2000	7,14	2,63
2001	6,23	2,04
2002	6,3	

**Table 6-6: Unemployment rates Brazil and the Netherlands**

#### Sectors

The agricultural sector is larger than in most first world countries (2.8% of GDP in 2000), but much smaller than in Brazil. The Netherlands has a leading position in the world market for horticultural products and is a major exporter of meat and dairy products. The country also benefits from significant natural gas resources and is the fourth largest producer in the world. The Dutch manufacturing sector is relatively small (also compared to Brazil), accounting for some 16% of GDP in 2000.

The services sector as a whole is exceptionally large, providing over 70% of GDP in 2000. Public and personal services are the largest component of services, followed by real estate and renting, wholesale and retail trade, and transport and communications. The financial sector has taken an aggressive approach to the integration of international financial markets.

An informal sector such as seen in Brazil is none-existent in the Netherlands. Most informal jobs are for a little extra money and are not a primary job. Of course, this is due to the very good social security system, which makes sure informal jobs are not needed simply to survive, as in Brazil.

After last years' stagnation in world trade a growth is expected for all sectors [CPB03]. The present strength of the Dutch economy stems to a large extent from developments in the trade and transport sector. Trade,

transport and distribution play an important role in the Dutch economy. Exports account for 60% of the GDP. The Dutch trade sector employs 27% of the population.

Foreign investors increasingly acknowledge the Netherlands as the "Gateway to Europe" due to its unique strategic position. Of the total movement of goods imported in Europe, 48% enters via the Netherlands. The Netherlands leads in logistics, transport, distribution and industry.

The Netherlands has a relatively large number of small businesses, making the Dutch business community highly flexible and diverse. In addition, a number of very large multinationals have set up large research laboratories, lending the Netherlands an important role in the development of emerging technologies. [ETA03]

### **6.3.6 Energy availability**

#### **Electricity**

In the Netherlands there is an electricity consumption 100.71 billion kWh (2000) than production 87.953 billion kWh (2000). The Netherlands export 4.031 billion kWh (2000) against 100.71 billion kWh (2000) import [FAC03].

#### **Different kinds of energy sources**

In the Netherlands the main production source for electricity is fossil fuel: 90%. Nuclear and other sources deliver 4% respectively 5%. There is no significant supply of hydro energy.

The Netherlands have natural gas, petroleum and arable land as natural resources [FAC03].

The Dutch are one of Europe's largest producers and exporters of gas.

Two percent of Dutch energy consumption is supplied by renewable energy sources.

### **6.3.7 Conclusion the Netherlands**

After the European recession in the 80's, the Dutch *Polder Model* proved very successful. The 90's were a period of large economic growth. Only recently, the economy has shown lack of growth, mostly because of the unstable world situation. Forecasts show an increasing growth rate for the next few years.

Inflation has always been relatively stable in the Netherlands, mostly because of the strong Guilder. Although higher than the European average, the Dutch inflation rate with an average of about 3% in the 90's was much lower and much more stable than the Brazilian. The last few years show a relatively high increase in inflation, mostly because of high wages, the introduction of the Euro and because the economy is slowing down. However, the forecasts for the next few years show a relatively low inflation rate.

The Dutch have a relative to Europe, large agricultural sector. However, it is much smaller than Brazil's. The industry sector is quite small, while the

services sector is extremely large. There is only a small informal sector, mostly to avoid taxes, with almost no one depending on it.

Since the introduction of the *Polder Model* the unemployment rate has dropped steadily, to the very low figure of around 2%. Because of the worsened economic climate, the unemployment rate is expected to increase a little.

## 6.4 Conclusion

To answer the research question this section compares Brazil and the Netherlands. When comparing Brazilian GDP figures to the figures of the Netherlands it shows that the GDP of Brazil is about two times that figure of the Netherlands. Brazil is one of the top ten countries, when comparing GDP, though it has to be kept in mind that Brazil is a very large country with a much larger amount of inhabitants than the Netherlands: Watching at the GDP per capita, the Dutch figure is about four times as large as the Brazilian. Also has to be stated that inhabitants of the Netherlands receive a more equal share, whereas only a small part of Brazil's inhabitants seems to profit from the positive figures.

Looking at the composition per sector, Brazil and the Netherlands look very alike. In both countries the major sector is formed by services, followed by industry and the sector with the smallest share is agriculture. A difference is the Brazilian internal focus, whereas the Dutch are more an export nation.

In both countries the GDP is growing, with recent decrease in growth. The Netherlands and Brazil have had their ups and downs, due to different causes. Brazil had a major up, because of the measures their government took to change the economic situation. The recent moderate growth is caused by the negative aspects of the worldwide economic (and political) situation.

The received income in the Netherlands is much more even divided among the people. Both countries have shown a growing economy the last years. The Netherlands rely mostly on fossil fuel for its electricity production and Brazil relies on its renewable hydropower. Brazil has huge resources hydropower (electricity) and oil (2nd most important energy supply) and tries to exploit them too fulfill its own consumption, but has to import these kinds of energy. The Netherlands also imports electricity to fulfill its own consumption needs but exports (as one of Europe's largest producers) gas from its large gas sources.

Overall it can be said that the Dutch economy is quite stable and shows only small and gradual changes. Brazil is trying to change its economy, which is not always successful, and copes with extremely large changes in many indices. However Brazil is developing and is showing an increasingly stable and moderate image.

	Brazil	The Netherlands
<b>Sectors</b>		
<b>Large informal sector</b>	Yes	No
<b>Largest sector</b>	Services	Services
<b>Gross Domestic Product</b>		
<b>GDP</b>	\$1.34 trillion (2001 est.)	\$434 billion (2002 est.)
<b>GDP - real growth rate</b>	1.9% (2001 est.)	0.3% (2002 est.)
<b>GDP - per capita</b>	\$7,400 (2000 est.)	\$26,900 (2002 est.)
<b>GDP - composition by sector</b>	agriculture: 9% industry: 32% services: 59% (2000 est.)	agriculture: 3% industry: 26% services: 71% (2001 est.)
<b>Distribution of Wealth</b>		
<b>The richest 10% population receive</b>	47%	25%
<b>The poorest 10% population receive</b>	1%	3%
<b>Inflation and Interest</b>		
<b>1991</b>	432,8	3,2
<b>1994</b>	100,7	2,8
<b>1995</b>	25,9	1,9
<b>1996</b>	16	2
<b>1997</b>	18	2,2
<b>1998</b>	3,2	1,98
<b>1999</b>	4,86	2,21
<b>2000</b>	7,04	2,52
<b>2001</b>	6,84	4,54
<b>Est. Interest rate 2003</b>	20%	2-3%
<b>Unemployment</b>		
<b>1992</b>	5,76	5,4
<b>1993</b>	5,31	6,6
<b>1994</b>	5,06	7,6
<b>1995</b>	4,64	7,1
<b>1996</b>	5,42	6,6
<b>1997</b>	5,7	5,5
<b>1998</b>	7,6	4,21
<b>1999</b>	7,56	3,2
<b>2000</b>	7,14	2,63
<b>2001</b>	6,23	2,04
<b>Energy</b>		
<b>Electricity consumption</b>	360.64 billion kWh (2000)	100.71 billion kWh (2000)
<b>Electricity production</b>	342.3 billion kWh (2000)	87.953 billion kWh (2000)
<b>Import electricity</b>	42.3 billion kWh	100.71 billion kWh (2000)
<b>Export electricity</b>	0 kWh	4.031 billion kWh (2000)
<b>Large renewable resources</b>	Yes	No
<b>Most important natural resource</b>	Hydro-energy	Gas (One of the largest European exporters)
<b>Electricity Resources</b>		
<b>Fossil fuel</b>	6%	90%
<b>Nuclear</b>	1%	4%
<b>Hydropower</b>	89%	0%
<b>Other</b>	4%	5%

Table 6-7: Comparison table between Brazil and The Netherlands

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# 7 International economical aspects

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## Chapter contents

<b>7.1</b>	<b>Abstract</b>	<b>163</b>
<b>7.2</b>	<b>Introduction</b>	<b>164</b>
<b>7.3</b>	<b>International economic relations</b>	<b>165</b>
7.3.1	International trade history	165
7.3.2	Current situation	166
7.3.3	Trading partners	166
7.3.4	Import and export	171
7.3.5	National currency	172
7.3.6	Tourism	175
7.3.7	Economical statistics	175
7.3.8	Technological stop	179
<b>7.4</b>	<b>Brazil compared to the Netherlands</b>	<b>181</b>
7.4.1	International trade history	181
7.4.2	Current situation	181
7.4.3	Trading partners	181
7.4.4	Import and export	183
7.4.5	National currency	183
7.4.6	Trade barriers	183
7.4.7	Tourism	184
7.4.8	Economic statistics	185
7.4.9	Overview	186
<b>7.5</b>	<b>Conclusion</b>	<b>187</b>
<b>7.6</b>	<b>References</b>	<b>188</b>

## 7.1 Abstract

In this chapter, an attempt is made to relate International Economical aspects of Brazil to the development of Virtual Reality in Brazil. Virtual Reality is defined as a way for humans to visualize, manipulate and interact with computers and extremely complex data. Brazil's economy has a history of depending on the export of one single product. In the 20<sup>th</sup> century, this dependency was ended using import substitution policies. Brazil nowadays has abstained from substitution policies and is a more open economy, although it does still have some trade barriers. Brazil exports more than it imports and participates in many trade organizations, of which the South American Mercosur is the most important. Brazil has a very heterogeneous import and export package. Based on its import and export package Brazil is very industrialized country importing raw materials and exporting airplanes and motor vehicles. Although Brazil has a history of high inflation, the new currency (the Real) has a moderate inflation. The main differences between the Netherlands and Brazil are its international trade history, the composition of its import and export, and the fact that Brazil has a fast growing tourist industry. Main similarities are its relatively new currencies with moderate inflation and its balance between import and export. The impact of specific International Economical aspects on Virtual Reality are difficult to establish since Virtual Reality is a technology that is only used in certain specific sectors. Researching these specific sectors is advised and can be done in a so-called Meso assignment.

## **7.2 Introduction**

This paper was written as a part of the preparation for the S@MBA study trip to Brazil in October 2003. The first phase of this preparation is to find an answer to the following research question:

*Which factors and/or actors of international economical aspects will stimulate or inhibit the development and application of Virtual Reality?*

This paper is part of this phase, the so-called macro-assignment and focuses on the international economical aspects of Brazil compared to those of the Netherlands.

This paper is introduced by a brief description of Virtual Reality and its use. It will be followed by a comprehensive description of several aspects of the international economy of Brazil. Then a comparison between Holland and Brazil will be made on this subject. In the conclusion, an attempt will be made to relate the similarities and differences between the Netherlands and Brazil to its impact on Virtual Reality.



## 7.3 International economic relations

In this section the international economic relations of Brazil will be described. First there will be a introduction about the history and the current situation of the international trade and after the trade partners, import and export will be described. Also the currency, tourismn and all the statistics will pass in this section, as well as the technology stop.

### 7.3.1 International trade history

Until the beginning of the 20<sup>th</sup> century, Brazil's economy relied on the exportation of a single product. In fact it is believed the name Brazil was derived from the Portuguese word for the red colour of type of wood it exported (*brasa*) during its first period as a Portuguese colony. In English this type of timber is now known as brazilwood [ENC03]. During the 16<sup>th</sup> and 17<sup>th</sup> century, sugarcane became Brazil's primary export product. During the 18<sup>th</sup> century, the economy of Brazil relied on the export of gold, silver, diamonds and emeralds. During its entire colonial period most of the export goods were exported to Portugal, but England also had a large influence on the Brazilian economy starting at the beginning of the 17<sup>th</sup> century) [ECO03]. In the beginning of the 19<sup>th</sup> century, the king of Portugal fled to Brazil because of the French invasion of his country and Rio de Janeiro was made capital of the Portuguese Empire. During this period the ports of Brazil were freed of mercantilist restrictions. Fifteen years later when the king returned and left his son as the new king of Brazil Portugal attempted to retighten the colonial restrictions on Brazil, but this stirred large unrest. During the entire 19<sup>th</sup> century, coffee was Brazil's main export product and most imports were completely dependent on England. At the end of the 19<sup>th</sup> century Brazil's export did not rely purely on coffee but also on rubber during a period called the wild-rubber boom. This period ended when rubber plantations were created in Southeast Asia.

In the beginning of the 20<sup>th</sup> century, measures were taken to reverse Brazil's growing dependence on coffee export. These measures started the first surge of the industrialization. During this period, the United States of America became the new primary source for imports at the expense of the English. The great depression (1929) became an important milestone for further industrialization. From that period on Brazil enforced import substitution policies. Import substitution is the process to prohibit the import of certain products and producing these products within one's own county. Import substitution expanded sectors such as the automobile industry, petrochemicals and steel. Import substitution helped expanding the internal production of Brazil and reduced the difference industrial import coefficient (percentage of import in respect to the gross national product). [BBH03].

Shortly after World War II Brazils main trading partner was the United States. During the period from 1964 to 1985 when Brazil was under the rule of various militaristic regimes this started to change. Although the military regime was installed because of a wave of anti-communism, Brazil irritated the United States by asking "Why should the United States trade

with Russia and her satellites but insist that Brazil trade only with the United States?" and proceeding to negotiate with the Soviet Union and other Communist countries to (re)establish diplomatic and commercial relations. During the entire life of the military dictatorship, extending into the 1980s, Brazil and the Soviet bloc engaged in extensive trade and economic cooperation, reaching billions of dollars per year and including the building of several large hydroelectric plants in Brazil. [BLU95]

By the end of the 1980's, the effects of import substitution in respect to the national product of Brazil became relatively unimportant due to the large increase in internal demand. Like any other Latin American country Brazil borrowed large amounts of money from U.S., European and Japanese banks [BBH03]. In the early 1980's, however, a sudden, substantial increase in interest rates in the world economy precipitated Latin America's debt crisis. The 1980's crisis signalled the exhaustion of Brazil's import substitution model and it contributed to the opening up of the country's economy. In the early 1990's Brazil was engaged in a series of far-reaching economic reforms. Besides reforming the economy internally, trade liberalization was an important aspect of these reforms. The following measures were taken: the removal or reduction in the scope of non-tariff barriers, such as market reserves, quotas, prohibition, etc, the decrease of the average import tariff level and the reduction of the degree of dispersion in the tariff structure. The customs duty has remained as the only instrument of protection. This made Brazil one of the most open economies in the world, although some trade barriers still remained.

### **7.3.2 Current situation**

Today, Brazilian industry accounts for 20% of national production, agriculture for another 20% and the services sector, 60%. The majority of the Brazilian population is concentrated within urban areas, particularly in major cities. Brazil's urbanisation index is 75%, rising to 93% in some regions, as in the case of the state of São Paulo.

Currently Brazil is one of the most open economies of the world. In the following sections, the most prominent features of Brazil's international economy will be described. These are its wide variety of trading partners, the make-up of its import and export and its national currency the Real. Also Brazil's trade barriers, the tourist sector and various economical statistics will be discussed.

### **7.3.3 Trading partners**

#### **Introduction**

Brazil has been one of the leading developing countries in international trade, investment and economic affairs. It is one of the founding members of relevant international organizations in these areas. Brazil is also a major player in regional trading groups, like the Latin American Integration Association (LAIA) and Mercosur [MER03].

Brazil has been one of the major players in international trade. Although its share in world trade, varying around 1.5%, is much lower than those of

industrialized countries with comparable GDP (Gross Domestic Product), Brazil's foreign trade, both in exports and imports, is well spread among the different economic and trading areas in the globe.

### Markets

For most of the 19<sup>th</sup> century until 1945 the USA has dominated Brazil's trade, except for a short period in the 1930s when Germany competed for first place. Around 50% or more of Brazil's trade during and just after Second World War (1939-1945) was with the USA. Today, trade with the USA is still important but the overall pattern is different. The imports and export percentages of Brazil's main trading partners are shown in Table 7-1.

<b>Main Export and Import Market 1994 (percentage share - % total)</b>	
<b>Exports to:</b>	
USA	20.5%
Argentina	9.5%
Netherlands	7.1%
Japan	5.9%
Germany	4.7%
Rest of European Union	27.1%
Other	25.2%
<b>Imports from:</b>	
USA	23.6%
Argentina	11.0%
Germany	10.4%
Japan	5.4%
Rest of European Union	25.4%
Other	24.2%

**Table 7-1: Brazil's main export and import in 1994 [SEC03]**

The following can be derived from the table. Almost 40% of Brazilian exports go to European Union (EU) countries such as Holland, Germany, Italy and the UK. South America takes 20%, with almost half going to Brazil's neighbouring country Argentina. The USA is still the largest single overseas market today, taking 20.5% of Brazil's exports.

### Argentina's economical crisis

In 1999 Argentina had already suffered from turmoil caused by Asian and Russian crises when devaluation of the Brazilian currency added to its problems. While the authorities repeatedly assured the investors that currency (*peg*) was here to stay, persistent economic recession and deteriorating access to external financing made look Argentina's economic and financial situation suddenly more worrisome. Large official financial assistance in 2000 and 2001 was supposed to reassure investors about Argentina's solvency while taking care of the immediate liquidity problem and thus safeguarding its currency peg. However, this effort was not successful and after desperate attempts to avoid the unavoidable, the crisis reached a climax by the end of 2001. [JON02] Violent social unrest brought down the government of president de la Rúa and a new government was installed. The new government has announced that Argentina is unable to service its \$142 billion external debt and has declared a moratorium on its external debt payment. A country that few years ago was a darling of

financial markets has in a very short period of time become something akin to international pariah, mired in a deep political, social and economic crisis. [HTA02]

Since Argentina is one of Brazil's most important trading partners one would imagine its recent economic woes would influence the economy of Brazil. There has been a lot of criticism on the policies of the International Monetary Fund in respect to the build-up of Argentina's crises. Recognizing that Brazil might suffer adverse spillover effects from Argentina's crisis, a precautionary IMF program was established in September 2001. Under this program, Brazil progressively accumulated the right to draw up to about \$30 billion of IMF resources, under the condition that it maintains a responsible fiscal policy (with a primary budget surplus of at least 3½ percent of GDP). The objective was to reinforce confidence in Brazil's economic policies both by supplying an important supplement to Brazil's own foreign exchange reserves (of \$30 billion to \$40 billion) and by providing the monitoring of an IMF program to help assure that critical economic policies remained on track [TES02].

Before the recent presidential elections the chances of Brazil pulling through without the need for a debt restructuring and the chaos that would bring depended on two conditions being satisfied: First the acceptance of the conditionality of the IMF program by both the main opposition candidates. Second that the appraisal that Brazilian fundamentals are in relatively good shape carries conviction with the financial markets, so that the current situation is seen as a favourable time to buy into Brazil rather than any recovery being viewed as an opportunity to cut and run. [WIL02]

The most recent developments in the crises have been the strong market rally in Brazil since the election of President Lula and the signs of bottoming-out in Argentina. Buoyed by market-friendly policy statements on the budget and on debt, by the appointment of a moderate/conservative economics team, and by a willingness of the central bank to raise interest rates in the face of higher inflation, the post-election rally has been marked by a decline in Brazil's external interest spread to roughly 1,300 basis points, an appreciation of the real to 3.60, an upturn in the Brazilian stock market, a sharp decline in capital flight, higher rollover rates in recent government bond auctions, and an easing of the external credit crunch on some Brazilian corporations. So far, the IMF's program is on track and \$6 billion of the IMF's \$30 billion commitment has been disbursed. That said, since the Lula government has been in office for only a few months, the rally is based mostly on what they say they are going to do not on what they have done. [GOL02]

### **The Bombardier-Embraer dispute**

The Bombardier-Embraer dispute is about two companies who both produce passenger planes of the 50 to 100 passenger size. Both companies are in direct competition to produce planes for foreign airlines. Canada took Brazil to the World Trade Organization (WTO) on the grounds of an illegal subsidy. The Brazilian government, quite openly, was subsidizing Embraer by the difference in interest rates between Brazil (high rates) and world interest rates, in order for Embraer [EMB03] to offer an improved

competitive bid. Brazil took Canada to the WTO on the grounds that the Canadian government was offering Bombardier [BOM03] illegal export subsidies: concessionary loans to improve Bombardier's competitive bidding.

With respect to new sales of these aircraft, Bombardier was losing market share to Embraer. The WTO ruled that both countries were offering illegal export subsidies. Canada modified its form of concessionary loans to the acceptance of the WTO, but Brazil did not. Therefore, the WTO ruled that Canada could impose economic sanctions upon imports from Brazil of the \$344 million Cdn per year for six years [UTO03]. Canada selected a series of imported products for these potential 100% tariff increases (Note: a 100% tariff increase would mean that imports in most of these goods would become zero, the modified import price would be too high for any importer). Canada attempted to negotiate with Brazil, but with no effect. Then Canada imposed a ban on Brazilian beef, which infuriated the Brazilian government. The argument was that the health hazard (from the mad cow disease) from British beef might have spread to Brazil. Canada withdrew the beef ban. Canada received no benefits from the ban other than making Brazil angry and Brazil again challenged that Canada was unfairly subsidizing Bombardier.

Then the Canadian government granted Bombardier a specific subsidy for the competition with Air Wisconsin, which Bombardier won through the secret Canada Account in the Canadian Export Development Corporation. Brazil took Canada to the WTO, which has just ruled that Canada was in default of fair-trading. Canada did not impose trade sanctions on Brazilian imports into Canada, although it had the right to do so.

Canada made three strategic mistakes. It challenged Brazil, which brought Canada's export support program (for airplanes and many other products) into question. Canada is a trading nation with exports in excess of 30% of GDP. Airplanes constitute a minor item in total trade. Second, Canada banned Brazilian beef – to no gain but to loss of support in Brazil. Third, Canada granted an export subsidy to Bombardier for the Air Wisconsin competition; a situation it knew it would lose and this has brought a Brazilian challenge into Canada's operations of its secret Canada Account in the Export Development Corporation.

The controversy between Bombardier and Embraer had - and still has - as its cause the credits granted by both governments to benefit the builders in their respective countries. Embraer strongly competes with Bombardier over the regional planes market and Canada has requested the WTO to investigate the use made by Brazil of credits for exports. However, Canada also granted its own export credits to clients, which caused Brazil to submit a complaint before the WTO [AIR03].

Canada aimed its guns at Proex, a programme supported by the Brazilian government, which offers credits to Embraer buyers in order to increase the orders made to this company. The Canadian government, for its part, offered subsidised credit to the North American Air Wisconsin to help

Bombardier obtain a contract for 1,500 million dollars in the purchase of planes.

In 2002 Embraer declared victory over rival Bombardier after the WTO gave Brazil the right to impose \$248 million in trade sanctions against Canada. This ended a six-year dispute [YAH02].

The decision by the WTO's dispute settlement body came after it was found the Canadian government's export financing program for Quebec-based Bombardier violated the trade body's rules. Despite the ruling, Brazilian diplomats likely will not impose sanctions. Instead, Brazil hopes to work with Canadian officials on a negotiated settlement that would create a level playing field for financing packages used by each country. The decision of the WTO gives Brazil a strong position at the negotiating table. Embraer has a structural disadvantage relative to Bomardier as Brazilian interest rates are among the highest in the world at 26.5% a year. However, Brazil's cheap currency helps Embraer sales. Brazil's position at the negotiating table also will improve as Canada has had WTO authorization since 2000 to impose \$232 million in sanctions against Brazil. Brazil's export financing program, called Proex, previously violated rules but has since been found to comply with WTO standards.

### Recent figures

The table below shows some recent figures about Brazil's main export and import.

Main trading partners, 2002 - (US\$ fob)					
Order	Country of destination	Exports	Order	Country of origin	Imports
1	U.S.A	15.354.008.322	1	U.S.A	10.285.158.007
2	Netherlands	3.182.298.119	2	Argentina	4.747.098.228
3	Germany	2.536.723.329	3	Germany	4.398.203.453
4	China	2.520.457.098	4	Japan	2.347.430.617
5	Mexico	2.342.347.351	5	Italy	1.761.742.678
6	Argentina	2.341.866.721	6	France	1.747.000.825
7	Japan	2.097.953.829	7	China	1.554.086.366
8	Belgium-Luxembourg	1.892.009.552	8	United Kingdom	1.341.423.551
9	Italy	1.816.747.735	9	Nigeria	1.091.067.022
10	United Kingdom	1.768.904.607	10	South Korea	1.066.587.947
	Total Exports	60.361.785.544		Total Imports	47.231.931.815

**Table 7-2: A recent figure from Brazil's export and import dated 2002 [SEC03]**

Notice from the table that the U.S.A still occupies the first place. The other countries are competing for the second place or below that. Most likely the U.S.A will remain at the first place for quite some time.

### 7.3.4 Import and export

Product	Percent
Capital goods	26.6
Raw material and intermediate goods	49.3
Nondurable consumer goods	6.5
Durable consumer goods	6.3
Fuels and lubricants	11.3

**Table 7-3: Brazil's imports in 2001 [BCD03]**

As Table 7-3 shows, Brazil's main imports are raw materials and intermediate goods within which chemical and pharmaceutical goods were the most important items (29% of the raw materials and intermediate goods in 2001 were pharmaceutical or chemical). The capital goods mainly consist of industrial machinery, which account for 32.8 percent. The category nondurable consumer goods mainly consist of pharmaceutical goods (33.8%) and foodstuffs (32.6%). The durable consumer goods are made out of passenger motor vehicles (39.9%), adornments (20.3%) and household machinery (13.2%).

Product	Percent
Basic goods	26.4
Semi manufactured goods	14.2
Manufactured	56.5
Special transactions	3.0
Basic goods	26.4

**Table 7-4: Brazil's exports in 2001 [BCD03]**

When looking at the exports of Brazil in the table above, one notice that Brazil exports many manufactured goods to other countries. The main manufactured goods Brazil exports are airplanes (8.6 %) and passenger motor vehicles. The most important exported semi manufactured product is cane sugar, covering 17% of the exported semi manufactured goods. Among the basic goods (also known as primary products), one finds iron ore (19.1%), soybeans (18.8%) and chicken meat (8.4%).

Looking at these numbers, one could conclude that Brazil is quite a industrialized nation; it's main imports are raw materials, which are basic compounds for Brazil's main exported product: airplanes and motor vehicles.

Focusing on the trade between Holland and Brazil, Holland's most imported product from Brazil looks to be food and living animals [EVD03]; in 2001 this category accounted for 40% of all the products imported by Holland from Brazil. The second most imported category of goods are non-edible raw materials, they filled 37% of Holland's import from Brazil. Concerning Holland's export to Brazil, the conclusion can be made that this concerns mainly machinery and transport material (39%), chemical products (35%) and electrical devices (16%).

## 7.3.5 National currency

### Monetary unit

The official currency of Brazil is called the 'Real'. It has been the official currency since the introduction in 1994. A Real is 100 'centavos'. Notes come in 100, 50, 10 and 5 Reals. Coins come in 50, 25, 10, 5 and 1 centavos. In Table 7-5, the exchange rates of the Real are given [XRA03] for the largest trading partners.

	1 BRL	in BRL
<b>American Dollar</b>	0,31027	3,223
<b>British Pound</b>	0,197461	5,0643
<b>Canadian Dollar</b>	0,450481	2,21985
<b>Chinese Yuan</b>	2,56817	0,389383
<b>Euro</b>	0,288596	3,46505
<b>Japanese Yen</b>	37,3782	0,0267535

**Table 7-5: Exchange rates for the Brazilian Real**

Besides the Real (see Figure 7-1), US dollars are also accepted as a valid currency.

The Brazilian currency is historically subject to very high inflation rates. A number of plans have been launched, such as the economical reform plan from Cruzado in 1986 and the Collor plans in 1990 and 1991 [EVD03]. On short terms, they were successful in decreasing the inflation rate. Short after, however, inflation rates became higher then ever, reaching almost 2500% in 1993 [EVD03]. In July 1994, the Real plan was launched. This lead to an inflation rate of merely 5% to 97% in 2000 [EVD03]. Brazil has a relatively low interest rate comparing to the rest of South-America.

### Trade barriers

Importing into Brazil can be difficult, since Brazil has quite a lot of trade barriers. There are four different types of trade barriers [WAS03]. These Brazilian trade barriers are:

- Tariffs
  - Revenue tariffs
  - Protective tariffs
- Import Quotas
- Non-tariff Barriers (NTB)
- Voluntary Export Restrictions (VER)

### Tariffs

There are two different types of tariffs, which function as trade barriers: the revenue tariff and the protective tariff. The revenue tariff is a type of trade barrier, which is applied to a product not produced domestically. The purpose of a revenue tariff is to provide the government with revenues. The protective tariff is a trade barrier designed to protect or shield domestic producers from foreign competition [LBC03]. As a member of the Southern Cone Common Market (Mercosur), Brazil maintains relatively low trade barriers with Argentina, Paraguay, and Uruguay but applies a high tariff on



all goods and services coming into Brazil from countries outside Mercosur. According to the Embassy of Uruguay, the average rate for Mercosurs common external tariff was 13 percent in 2001.

### **Import quotas**

Many products imported into Brazil are restricted to import quotas. This is basically a rule which defines the quantity of the specific goods you may import into Brazil. For many kinds of goods there are import quotas. By these means the Brazilian government can control how many goods, of a specific type which can be anything from cars to computers, are imported into Brazil. Currently, Brazil has a bilateral agreement with Argentina that establishes an annual import quota of 85,000 cars for both countries. These kinds of import-quota-agreements are very common in Brazil.

### **Non-tariff barriers**

Non-tariff Barriers are barriers that restrict import and/or export by means of licensing. The real barrier lies in the fact that these licenses are sometimes very hard to obtain. Sometimes almost impossible, this has been done on purpose.

### **Voluntary export restrictions**

Some foreign firms “voluntarily” restrict exports to Brazil. An understanding between trading partners in which the exporting firms, in order to reduce trade friction, agree to limit exports of a particular good. This has basically the same impact as the import quotas.

### **Examples of trade barriers**

As a member of the Southern Cone Common Market (Mercosur), Brazil maintains relatively low trade barriers with Argentina, Paraguay, and Uruguay but applies a high tariff on all goods and services coming into Brazil from countries outside Mercosur. According to the Embassy of Uruguay, the average rate for Mercosurs common external tariff was 13 percent in 2001.

Currently, Brazil has a bilateral agreement with Argentina that establishes an annual import quota of 85,000 cars for both countries. These kinds of import-quota-agreements are very common in Brazil [BRA03].

According to the U.S. Department of State, "importers must comply with onerous registration guidelines, including a minimum capital requirement, to register with SECEX [SEC03]. Complete information on requirements for importing into Brazil is available only through SISCOMEX, and such information is only available to registered importers" [IND03]. This described non-tariff barrier is commonly used in Brazil.

There are some firms who apply a voluntary export restriction; these restrictions can be bi-lateral or even multi-lateral.



Figure 7-1: A part of a bill of 5000 Real



Figure 7-2: Tourismn at one of the beaches in Rio de Janeiro

### **7.3.6 Tourism**

While tourism industries around the world have suffered following the September terrorist attacks in the US, in Brazil tourism is booming. Not only have Brazilians cancelled their trips abroad to take their vacations at home but the flow of foreign tourists is also increasing. Sales of domestic package tours have shot up since September 11 and are expected to rise even further.

The surge will be a welcome reward for efforts in recent years to develop a tourism industry that is considered far too small for the world's ninth largest economy. Investments in the sector have grown 5.5 per cent annually over the past decade and reached USD 5.6 billion last year. Since the mid-1990s, when Brazil attracted only as many tourists as the much tinier Uruguay, the influx of foreign tourists has grown considerably and the sector in 1999 generated total revenue of USD 25.8 billion, according to official sources.

Yet analysts say that is still far below the potential of a country that offers countless pristine beaches along its 7,300 kilometres of coastline, the world's largest rainforest and wetland, as well as a rich colonial heritage, not to mention Carnival and Rio de Janeiro. Mexico, for instance, receives more than three times as many visitors.

The growth trend began before the US attacks as the result of a depreciating currency, which made holidays abroad more expensive for Brazilians. Their travels abroad had already fallen 6 per cent in the first half of 2001, while domestic sales were up 13 per cent. ([FIN03]).

### **7.3.7 Economical statistics**

#### **Export destinations**

Brazil main export destination is the European Union. Together, all the members of the European Union consume 26% of Brazilian products and goods. Half of the exported goods to the European Union consists of basic goods, the other consists of (semi) manufactured goods [BCD03]. Basic goods are for soybeans and soy meal. These two products account for over 30% of Brazil's basic goods export. Other very large importers are the USA and Latin America. The USA imports mostly manufactured goods, as well as the members of Mercosur and Laia. Below, an overview of Brazilian export by aggregate factor and by region is given. All the numbers are million US Dollars.

One of the major factors for the growth of the export of basic products is the cutback of the production of meat products and animal based feeds in the European Union.

Products	2000		2001		
	Value	Value	Change from 2000 (%)	Share (%)	
				Total	Blocs
<b>Total</b>	55086	58223	5.7	100.0	-
Basic	12562	15342	22.1	26.4	-
Semi manufactured	8499	8243	-3.0	14.2	-
Manufactured	32528	32901	1.1	56.5	-
Special transactions	1497	1737	16.0	3.0	-
<b>Laia</b>	12902	12225	-5.2	21.0	100.0
Basic	775	892	15.2	1.5	7.3
Semi manufactured	367	379	3.3	0.7	3.1
Manufactured	11726	10921	-6.9	18.8	89.3
Special	34	33	-4.2	0.1	0.3
<b>Mercosur</b>	77733	6364	-17.7	10.9	100.0
Basic	453	438	-3.1	0.8	6.9
Semi manufactured	193	209	8.3	0.4	3.3
Manufactured	7066	5697	-19.4	9.8	89.5
Special transactions	22	20	-10.6	0.0	0.3
<b>USA</b>	13366	14378	7.6	24.7	100.0
Basic	937	830	-11.4	1.4	5.8
Semi manufactured	2447	2043	-16.5	3.5	14.2
Manufactured	9714	11158	14.9	19.2	77.6
Special transactions	268	347	29.3	0.6	2.4
<b>European Union</b>	14784	14865	0.5	25.5	100.0
Basic	6277	7322	16.6	12.6	49.3
Semi manufactured	2552	2170	-15.0	3.7	14.6
Manufactured	5897	5085	-13.8	8.7	34.2
Special transactions	58	288	396.5	0.5	1.9
<b>Asia</b>	6324	6949	9.9	11.9	100.0
Basic	2681	3459	29.0	5.9	49.8
Semi manufactured	1892	1925	1.7	3.3	27.7
Manufactured	1581	1548	-2.1	2.7	22.3
Special transactions	170	17	-90.0	0.0	0.2
<b>Others</b>	7710	9805	27.2	16.8	100.0
Basic	1892	2838	50.0	4.9	28.9
Semi manufactured	1242	1726	39.1	3.0	17.6
Manufactured	3610	4188	16.0	7.2	42.7
Special transactions	967	1052	8.8	1.8	10.7

Table 7-6: Export by aggregate factor and region [BND02]

### Import sources

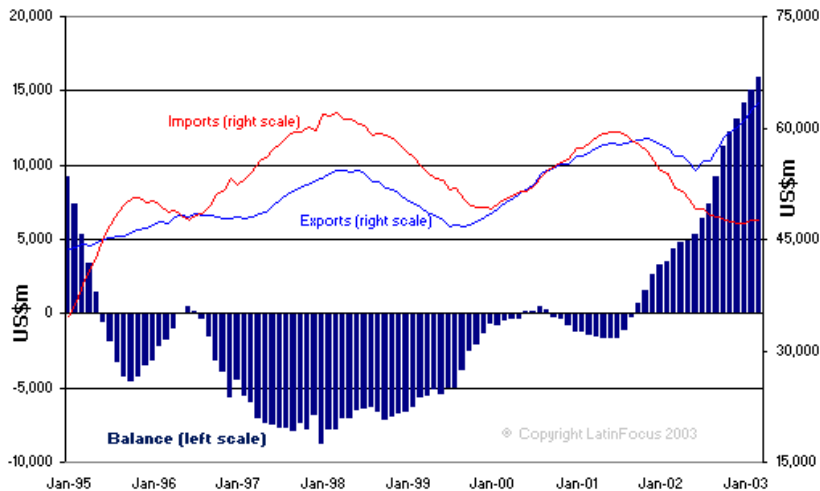
The largest import source is the European Union. Its members produced over 14 billion US Dollars for Brazil in 2001. Mostly, raw material and intermediate goods are imported. They consist mostly of chemical and pharmaceutical goods.

Products	2000		2001		
	Value	Value	Change from 2000 (%)	Share (%)	
				Total	Blocs
<b>Total</b>	55835	55581	-0.5	100.0	-
Capital goods	13602	14802	8.8	26.6	-
Raw material and intermediate goods	28548	27396	-4.0	49.3	-
Nondurable consumer goods	3934	3589	-8.8	6.5	-
Durable consumer goods	3394	3516	3.6	6.3	-
Fuels and lubricants	6357	6276	-1.3	11.3	-
<b>Laia</b>	11659	10019	-14.1	18.0	100.0
Capital goods	962	966	0.5	6.5	9.6
Raw material and intermediate goods	5734	5172	-9.8	18.9	51.6
Nondurable consumer goods	1360	1081	-20.5	30.1	10.8
Durable consumer goods	787	1049	33.3	29.8	10.5
Fuels and lubricants	2817	1750	-37.9	27.9	17.5
<b>Mercosur</b>	7795	7010	-10.1	12.6	100.0
Capital goods	819	811	-1.0	5.5	11.6
Raw material and intermediate goods	3987	3621	-9.2	13.2	51.7
Nondurable consumer goods	1042	776	-25.5	21.6	11.1
Durable consumer goods	716	911	27.2	25.9	13.0
Fuels and lubricants	1231	891	-27.6	14.2	12.7
<b>USA</b>	13032	13037	0.0	23.5	100.0
Capital goods	4310	4565	5.9	30.8	35.0
Raw material and intermediate goods	7247	7073	-2.4	25.8	54.3
Nondurable consumer goods	669	586	-12.4	16.3	4.5
Durable consumer goods	503	476	-5.4	13.5	3.6
Fuels and lubricants	304	338	11.1	5.4	2.6
<b>European Union</b>	14065	14822	5.4	26.7	100.0
Capital goods	4876	5443	11.6	36.8	36.7
Raw material and intermediate goods	7114	7418	4.3	27.1	50.1
Nondurable consumer goods	1068	1074	0.6	29.9	7.2
Durable consumer goods	797	723	-9.2	20.6	4.9
Fuels and lubricants	209	163	-22.2	2.6	1.1
<b>Asia</b>	8600	8925	3.8	16.1	100.0
Capital goods	2604	2761	6.0	18.7	30.9
Raw material and intermediate goods	4220	4125	-2.3	15.1	46.2
Nondurable consumer goods	393	409	4.0	11.4	4.6
Durable consumer goods	1086	1087	0.1	30.9	12.2
Fuels and lubricants	296	543	83.3	8.7	6.1
<b>Others</b>	8480	8778	3.5	15.8	100.0
Capital goods	851	1067	25.5	7.2	12.2
Raw material and intermediate goods	4232	3608	-14.7	13.2	41.1
Nondurable consumer goods	444	439	-1.1	12.2	5.0
Durable consumer goods	222	180	-18.5	5.1	2.1
Fuels and lubricants	2731	3483	27.5	55.5	39.7

Table 7-7: Import by category of use and region [BND02]

As can be depicted from tables 2-6 and 2-7, there is a balance in import sources and export destinations. The largest export destinations are also the largest import sources.

**Trade balance**



**Figure 7-3: Trade balance [LAT03]**

In the last few years, Brazil realized a positive trade balance. According to Latin Focus [LAT03], in 1998 the trade balance was -6606 million US Dollars. The first year for a positive trade balance was 2001 (2651 million US Dollars). Since then, steady growth will lead to a predicted balance of 15875 million US Dollars in 2003. For 2003, Brazil is expected to export for 63517 million dollars and to import for 47642 million dollars. The history of the trade balance is shown in figure 2-1.

**Foreign investments**

Brazil has a lot of foreign investors. There are no legal restrictions on investments in the voting stock of companies, except when there is legislation in the companies sector. The foreign investments have been increasing due to the increasing privatization. For example, the privatization of light was financed for 61% by foreign investment. After the sale of the company Gerasul, it reached 100%.

The largest investor is the USA. Spain and Portugal are the second and third largest investors. In total, 87480 million dollars were invested in Brazil in 2002. An overview is given in Table 7-8.

Country	PND		State privatizations		Telecommunications		Total	
	US\$ million	%	US\$ million	%	US\$ million	%	US\$ million	%
<b>USA</b>	4,318	15.1	6,024	21.6	3,692	12.8	14,034	16.5
<b>Spain</b>	3,606	12.6	4,027	14.4	5,042	17.5	12,675	14.9
<b>Portugal</b>	1	0.0	658	2.4	4,224	14.7	4,882	5.7
<b>Italy</b>	-	-	143	0.6	2,479	8.6	2,621	3.1
<b>Chile</b>	-	-	1,006	3.6	-	-	1,006	1.2
<b>Belgium</b>	880	3.1	-	-	-	-	880	1.0
<b>England</b>	2	0.0	692	2.5	21	0.1	715	0.8
<b>Canada</b>	21	0.1	-	-	671	2.3	692	0.8
<b>Sweden</b>	-	-	-	-	599	2.1	599	0.7
<b>France</b>	479	1.7	196	0.7	10	0.0	686	0.8
<b>Holland</b>	5	0.0	410	1.5	-	-	415	0.5
<b>Japan</b>	8	0.0	-	-	256	0.9	264	0.3
<b>South Korea</b>	-	-	-	-	265	0.9	265	0.3
<b>Argentina</b>	-	-	148	0.5	11	0.0	159	0.2
<b>Germany</b>	75	0.3	-	-	-	-	75	0.1
<b>Uruguay</b>	0	0.0	-	-	-	-	0	0.0
<b>Other</b>	1815	2.6	350	1.3	-	-	1,078	1.3
<b>Foreign participation</b>	11,210	36.7	13,654	48.9	17,270	59.4	42,134	48.2
<b>Total</b>	30,481	100	27,949	100.0	29,050	100.0	87,480	100.0

Table 7-8: Foreign investments in 2002 [BND02]

### Trade organizations (WTO)

The World Trade Organization (WTO) regulates all regional trade agreements (RTA's). There are currently over 170 RTA's active. Below is a list of all the regional trade agreements that Brazil participates in:

Abbreviation	Name	Participating countries
<b>GSTP</b>	General System of Trade Preferences among Developing Countries	Algeria Argentina Bangladesh Benin Bolivia Brazil Cameroon Chile Colombia Cuba Democratic People's Republic of Korea Ecuador Egypt Ghana Guinea Guyana India Indonesia Islamic Republic of Iran Iraq Libya Malaysia Mexico Morocco Mozambique Myanmar Nicaragua Nigeria Pakistan Peru Philippines Republic of Korea Romania Singapore Sri Lanka Sudan Thailand Trinidad and Tobago Tunisia United Republic of Tanzania Venezuela Vietnam Yugoslavia Zimbabwe
<b>LAIA</b>	Latin American Integration Association	Argentina Bolivia Brazil Chile Colombia Cuba Ecuador Mexico Paraguay Peru Uruguay Venezuela
<b>MERCOSUR</b>	Southern Common Market	Argentina Brazil Paraguay Uruguay
<b>PTN</b>	Protocol relating to Trade Negotiations among Developing Countries	Bangladesh Brazil Chile Egypt Israel Mexico Pakistan Paraguay Peru Philippines Republic of Korea Romania Tunisia Turkey Uruguay Yugoslavia

Table 7-9: Regional trade agreements Brazil [WTO03]

### 7.3.8 Technological stop

After 1987, economical problems that had confronted industry earlier in the decade intensified, unfavourable macroeconomic conditions persisted, and political troubles affected expectations negatively. Until the end of the

1980s, industry relied heavily on government protection and favours, but it also faced pervasive regulations and extensive governmental interference. These factors had a lethal effect on industrial investment and on the productivity of several industrial sub sectors, increasingly blunting the competitive edge they had struggled to achieve in the world market. Moreover, as a result of the fiscal crisis, the government was hard-pressed to continue to provide support and subsidies for industry and to maintain and expand the country's infrastructure.

The Collor de Mello administration, inaugurated in 1990, introduced significant changes in Brazil's economic strategy. Regarding industry, the government implemented measures to eliminate regulations, to liberalize trade, and to markedly reduce governmental favours and subsidies. It also announced a series of actions aimed at increasing industry's competitiveness. Despite these efforts, political and macroeconomic difficulties prevented the effective implementation of the new strategy, and the mounting fiscal crisis dampened efforts to rebuild and improve the badly deteriorated infrastructure. Therefore, an important part of the industrial sector failed to recover and to modernize. With stagnation, the domestic market could not give industry a dynamic push. Moreover, the reduction in investment, coupled with the deteriorating infrastructure, led to declines in competitiveness. These developments, together with fewer import barriers, caused industry's balance of trade to decline, from a peak of US\$16.3 billion in 1988 to US\$11.1 billion in 1991. In the early 1990s, despite sectoral weaknesses, the industrial sector became a major contributor to the country's exports and trade surplus. [MEM03]



## 7.4 Brazil compared to the Netherlands

In this section Brazil will be compared with the situation in the Netherlands. The comparison is made on the same points as described in the section before.

### 7.4.1 International trade history

Brazil went through a very different development process than the Netherlands. When Brazil was in its colonial period providing a single product for the homeland Portugal, the Netherlands was a large colonial nation trading various kinds of products from its colonies.

The power of the Dutch trading empire faded parallel to the foundation of the Brazilian empire flourished without any trading restrictions from Portugal. And while Brazil relied heavily on imports from other countries like the U.S.A. and England, the Netherlands was an economy with a very heterogeneous import and export package.

In the first half of the 20<sup>th</sup> century the Netherlands was already an industrialized country and did not have to instruct import substitution policies to help flourish its economy. After the Latin American foreign debt crises Brazil and America became more alike as Brazil became a more open economy which the Netherlands has been throughout the entire 20<sup>th</sup> century.

### 7.4.2 Current situation

Currently Brazil still differs largely from the Netherlands. Each aspect of Brazil's economical situation as identified in the previous chapter will be compared to the Dutch situation.

### 7.4.3 Trading partners

#### Statistics of the Netherlands

The Dutch export dropped in 2002 with three percent to 235.000 million euro. Almost 146.000 million euro went to the five most important trading partners: Germany, Belgium, the United Kingdom, France and the United States. The division of the export between the trading partners in 2001 is shown in Table 7-10.

<b>Germany:</b>	57600 million euro
<b>Belgium:</b>	27900 million euro
<b>UK:</b>	25600 million euro
<b>France:</b>	23500 million euro
<b>United States:</b>	11400 million euro

**Table 7-10: Export to the five most important trading partners [CBS03]**

The Dutch import dropped in 2002 with six percent to an amount of 204000 million euro. Germany, Belgium, UK, France and the United States

altogether contribute to more than half of the total import. The division of the import between the trading partners in 2002 is shown in Table 7-11.

<b>Germany:</b>	39900 million euro
<b>Belgium:</b>	22100 million euro
<b>UK:</b>	16200 million euro
<b>France:</b>	12100 million euro
<b>United States:</b>	17800 million euro

**Table 7-11: Import from the five most important trading partners [CBS03]**

Table 7-12 shows some recent figures about the main export and import of the Netherlands.

<b>Main trading partners, 2001</b>					
<b>Order</b>	<b>Country of destination</b>	<b>Export percentage</b>	<b>Order</b>	<b>Country of origin</b>	<b>Import percentage</b>
1	Germany	25.6	1	Asia	21.1
2	Belgium-Luxembourg	12.2	2	Germany	18.5
3	Other members of the EU	12.2	3	North America	10.2
4	United Kingdom	11.1	4	Belgium-Luxembourg	9.5
5	France	10.3	5	Other members of the EU	9.2
6	Asia	6.5	6	United Kingdom	8.9
7	Italy	6.2	7	France	5.7
8	North America	4.8	8	Eastern Europe	4.0
9	Eastern Europe	3.9	9	Other West European countries	4.0
10	Other West European countries	3.5	10	Central & South America	3.0
11	Africa	1.6	11	Italy	2.8
12	Central & South America	1.3	12	Africa	2.6
13	Other countries	0.8	13	Other countries	0.5
	Total Export Percentage	100		Total Import Percentage	100

**Table 7-12: A recent figure from the export and import of the Netherlands dated 2001 [CBS03]**

### **Argentina's economical crisis**

In the Netherlands an economical crises in an important trading partner, e.g. Germany, would probably also destabilize the economy of the Netherlands. A difference between the Netherlands and Brazil however is that while Brazil is subject to the wishes of the International Monetary Fund but would be more able to adopt its own policies.

### **Trade disputes**

The Netherlands as part of the European Union also has a history of trade disputes with the United States. These trade disputes are somewhat different from the Bombardier-Embraer trade dispute, which concerns with two counties subsidizing its companies to improve a bid. US-EU trade disputes mainly consist of imposing import duties by both countries to reduce the import of each other's goods [EUP02].

## **Brazil compared to the Netherlands**

Comparing Brazil's trading partners to the trading partners of the Netherlands, it shows that the Netherlands are mainly trading within Europe. Both countries trade a lot with their neighbouring countries. Looking at the trading statistics of both countries the conclusion can be made by looking at the figures that the Netherlands' main trading partner is Germany while Brazil trades the most with the U.S.A.

### **7.4.4 Import and export**

Brazil's main imported products are raw materials and intermediate goods, especially for use in the pharmaceutical and chemical industry, where Holland mainly imports chemical products and office machinery (including computers) [CBT03].

Brazil's most important export product would be airplanes and motor vehicles, while the Netherlands mainly export foodstuffs, chemical products and services like (tele)communication, transport and storage [CBT03].

Brazil appears to be an industrial country; it imports raw materials and produces products like airplanes and motor vehicles, while the Netherlands is more of a service providing country by importing office machinery and exporting services.

### **7.4.5 National currency**

#### **Monetary unit**

The national currency in the Netherlands is the Euro (symbol: €). It was introduced in 2002 in the Netherlands, as well as in Belgium, Germany, Finland, France, Greece, Ireland, Italy, Luxembourg, Austria, Portugal and Spain. The euro is a widely accepted monetary unit, the Brazilian Real is not. Although each participating country has its own coins, they are interchangeable.

The Netherlands have had a relatively low inflation rate for decades. The inflation of 2002 was 4.3%. Compared to other European countries this is rather high, since the average of 2001 was 2.2% [EUC03].

### **7.4.6 Trade barriers**

Comparing the trade barriers of Brazil to the ones of the Netherlands there were not very large differences. The Dutch trade is the same as Brazil's concerning the four trade barriers. One thing must be noted: Brazil is much more devoted to stimulating their own productivity. This is easily explained by the simple fact Brazil is having a hard time trying to survive, while the Dutch can rely on an already worked out decent and stable trade based on an open economy. So one notable difference between Brazil and the Netherlands concerning the trade barriers is the fact that Brazil is quite dependent on their often used trade barriers while the Dutch are enjoying an open economy with, compared to Brazil, a few minor trade barriers.

### **Examples of trade barriers in the Netherlands**

In response to two complaints concerning a refusal to permit the marketing of foodstuffs enriched with vitamins and iron freely marketed in other Member States, the Commission has examined Dutch legislation on the production and processing of foodstuffs. That legislation prohibits the addition of vitamins in cases where no technical or nutritional need has been demonstrated. Although the protection of health may provide justification for preventing the marketing of foodstuffs, the requirement of demonstrating a specific nutritional need goes beyond what is necessary for the protection of health. According to the settled case-law of the Court of Justice, only an actual danger to health which has been proved on the basis of scientific knowledge and of the general diet of the population of the Netherlands could justify a prohibition of that nature. The Commission has decided to deliver a reasoned opinion to the Netherlands in these two cases because the Dutch authorities have failed to produce sufficiently detailed proof of the existence of a real danger[EUR03]. This example can be compared to an import quota as well to a non-tariff barrier.

The Dutch pride themselves on their open market economy, non-discriminatory treatment of foreign investment, and a strong tradition of free trade. Foreign investors receive full national treatment, and the Netherlands adheres to the OECD investment codes and the International Convention for the Settlement of Investment Disputes. There are no few Dutch barriers to exports, and relatively few trade complaints are registered by firms. The few trade barriers that do exist usually result from common EU policies. The following trade barrier is an example from the few barriers that exist. Agricultural Trade Barriers: The Common Agricultural Policy (CAP) and EU common external tariffs, severely limit imports of certain U.S. agricultural products, while threatening others. Bilateral import barriers, although usually connected with EU-wide regulations, do arise in customs duties, grading, inspection and quarantine, especially with fresh beef (hormones) and poultry (phytosanitary). EU rules and procedures sometimes hinder commodity and product entry. Current EU-wide regulations, and the lack of timely approval processes for agricultural products, including Genetically Modified Organisms (GMOs), impede U.S. exports. Some of these policies cause major financial and logistical problems to Dutch importers and U.S. exporters for particular products, thus dampening trade prospects and flows.

### **7.4.7 Tourism**

Since 2001, Brazil's tourist industry had grown much, partly because Brazilians preferred their own country as destination of their holidays more and more, and partly because Brazil gained international popularity as a tourist destination.

The Netherlands is a popular holiday destination. In 1997, almost eight million tourists from all over the world visited the country, at least a third of them from Germany. Large numbers of visitors also came from Belgium, the United Kingdom, France, the United States and Canada. The number of tourists from Spain, Italy and Japan rose considerably in the 1990s, while the Netherlands is now starting to attract more visitors from the Czech Republic and other former Eastern Bloc countries.

Compared to Holland, Brazil does not differ very much in being a holiday destination. Tourists from Brazil however, travel rather to their own country, while the Dutch prefer travels to foreign destinations.

## 7.4.8 Economic statistics

### Export destinations

The largest export destinations of the Netherlands are mostly members of the European Union and the USA [PHI00]. Opposed to Brazil, the Netherlands do not export to Latin America. But apart from that, there is a great similarity between the export destinations of the countries.

### Import sources

The countries from which the Netherlands imports the most products and/or goods are members of the European Union. However, the USA is the fourth largest import source. The Dutch import more from the USA than from large European countries like France and Italy. Also Japan is a large import source [PHI00]. The ranking for export destinations differs from the ranking for import sources in the Netherlands. In Brazil, there is a great similarity between the countries. The import/export ratio for each trading partner from Brazil is more in balance than in the Netherlands.

### Trade balance

The Netherlands like Brazil exports more than it imports, the same as Brazil. In 2002 the Netherlands exported for the amount of 205.0 billion Euros and imported for 234.3 billion Euros [CBS03].

### Trade organizations

Brazil is a great distance from the Netherlands. Since trade organizations are mostly geographically grouped, Brazil and the Netherlands are not together in a trade agreement. Below, a list of the trade agreements of the Netherlands is given:

Abbreviation	Name	Participating countries
<b>EC</b>	European Communities	Austria Belgium Denmark Finland France Germany Greece Ireland Italy Luxembourg Netherlands Portugal Spain Sweden United Kingdom
<b>OCT</b>	Overseas Countries and Territories	Greenland New Caledonia French Polynesia French Southern and Antarctic Territories Wallis and Futuna Islands Mayotte Saint Pierre and Miquelon Aruba Netherlands Antilles Anguilla Cayman Islands Falkland Islands South Georgia and South Sandwich Islands Montserrat Pitcairn Saint Helena Ascension Island Tristan da Cunha Turks and Caicos Islands British Antarctic Territory British Indian Ocean Territory British Virgin Islands

**Table 7-13: Regional Trade Agreements the Netherlands [WTO03]**

Not being part of a common trade organization does not mean that the Netherlands and Brazil do not trade. Quite the contrary, the Netherlands are among the top six of foreign investors in Brazil [EVD03].

### Competiveness ranking

The International Institute for Management (IMD) monitors the competitiveness of all countries in the first or second world. Each year, they construct a world competitiveness yearbook [IMD02]. For their most recent yearbook, they used 321 categories to investigate 59 economies. Brazil was 35<sup>th</sup> in this ranking; the Netherlands occupied the 4<sup>th</sup> place. All the criteria used to construct the ranking can be divided into four groups: economic performance, government efficiency, business efficiency and infrastructure. Looking at these groups, it is understandable why the Netherlands occupy a high place in the ranking and the Brazilians do not. The economy of Brazil is not as strong as that of the Netherlands. Also, their government is far less efficient. For example, they have a ministry of bureaucracy.

### 7.4.9 Overview

The important international economical aspects of Brazil, are summarized in the overview of Table 7-14. This overview illustrates Brazil's most important strengths and weaknesses.

Item	Brazil	The Netherlands
<b>Currency</b>		
Monetary unit	Real (\$ 0,31027)	Euro (\$ 1,1498)
Inflation in 2002	5,97%	4,3%
<b>Trade</b>		
Export destinations	USA, Argentina, European Union, Netherlands	Germany, Belgium, United Kingdom, France, USA
Import sources	USA, Argentina, Germany, Japan, European Union	Germany, Belgium, United Kingdom, France, USA
Trade balance 2002 (billion Euros)	12	29
Trade focus	Industrialized products	Services
Organizations	GSTP, LAIA, MERCOSUR, PTN	EC, OCT
Trade issues	Crisis Argentina, Trade war Canada	Trade restrictions from animal diseases, US-EU trade disputes
Competitiveness rank	35	4

**Table 7-14: The Netherlands compared to Brazil - overview**

## 7.5 Conclusion

Brazil has a very different trade history than the Netherlands. Both countries however show more similarities these days because Brazil and the Netherlands both have trade barriers which are basically the same barriers, generally speaking. But, it must be said that Brazil is having a hard time trying to maintain the trade using trade barriers, while the Dutch have some trade restrictions which are not as important compared to Brazil. Both countries have a very open economy. While Brazil's import and export package are composed in a manner of an industrialized country, but Holland's represents that of for a service-providing country. Brazil offers a more balanced trade than a trading nation like the Netherlands and is part of a trading organization called Mercosur. Both Brazil and the Netherlands have a monetary unit that was only recently introduced. In both cases, it was for economical reasons. However, for Brazil it was absolutely necessary in order to put a stop to extreme inflation rates. For the Netherlands (and most other participating countries) it was to enforce their economies by multilateral collaboration.

Since a large part of Brazil's export is from the aeroplane industry this contributes to the development of Virtual Reality. The Bombardier-Embraer trade dispute illustrates the importance the Brazilian government lies on the international competitiveness of this industry. The fact that it imports many of its medical supplies will most likely inhibit the development of Virtual Reality techniques for the medical sector. Since Brazilians prefer to visit their own country instead of going abroad, development of Virtual Reality techniques within the tourist industry will be stimulated. Since Brazil still has a policy of restricting the import of new technologies, most Virtual Reality techniques would be attempted to be created in Brazil. This would stimulate the development of Virtual Reality in Brazil itself but the worldwide development of Virtual Reality would be inhibited.

It is difficult to pinpoint which specific aspects of the international economy of a country contribute to Virtual Reality. In the introduction and this conclusion some specific sectors are named that contribute to the development of Virtual Reality. More investigation of these specific sectors would be useful to determine the state of Virtual Reality in a country. This will be the subject of the next series of papers (the meso-papers) for the study tour.

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# 8 Aircraft

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## Chapter contents

<b>8.1</b>	<b>Introduction</b>	<b>194</b>
<b>8.2</b>	<b>Sector definition</b>	<b>195</b>
<b>8.3</b>	<b>Demand conditions</b>	<b>196</b>
8.3.1	Composition	196
8.3.2	Shape and growth	196
8.3.3	Domestic vs. international demand	198
8.3.4	Market share	199
8.3.5	Trade flows	199
8.3.6	Import & export	199
8.3.7	Price development	199
<b>8.4</b>	<b>Factor conditions</b>	<b>201</b>
8.4.1	Labour	201
8.4.2	Costs	201
8.4.3	Infrastructure	203
<b>8.5</b>	<b>Firm strategy, structure and rivalry</b>	<b>204</b>
8.5.1	Product characteristics	204
8.5.2	Market structure	204
8.5.3	Current economic position	205
8.5.4	Market goals and orientation	205
8.5.5	Organisation and management of individual companies	206
8.5.6	Trends	207
<b>8.6</b>	<b>Related and supporting industries</b>	<b>210</b>
8.6.1	Supporting industries	210
8.6.2	Related industries	212
<b>8.7</b>	<b>Government</b>	<b>213</b>
8.7.1	International relations	213
8.7.2	Collective labour agreements	214
8.7.3	Protectionism of the government	214
8.7.4	Environmental policy, energy policy, etc.	215
<b>8.8</b>	<b>Chance</b>	<b>217</b>
8.8.1	War	217
8.8.2	Political changes (abroad)	217
8.8.3	Climate factors	217
8.8.4	Rate of exchange crisis	217

<b>8.9</b>	<b>Aircraft industry &amp; the Netherlands</b>	<b>218</b>
8.9.1	Demand conditions	218
8.9.2	Factor conditions	218
8.9.3	Firm strategy, structure and rivalry	218
8.9.4	Related and supporting industries	219
<b>8.10</b>	<b>Government</b>	<b>220</b>
8.10.1	Chance	220
<b>8.11</b>	<b>Comparison</b>	<b>221</b>
<b>8.12</b>	<b>Strengths and weaknesses</b>	<b>222</b>
<b>8.13</b>	<b>Virtual Reality</b>	<b>224</b>
8.13.1	CAD/CAM	224
8.13.2	Electronic mock-up	224
8.13.3	Flight Simulator	224
8.13.4	Virtual Reality Centre	224
8.13.5	VR in respect to the aspects of the Brazilian aircraft industry	225
<b>8.14</b>	<b>Conclusion</b>	<b>227</b>
<b>8.15</b>	<b>References</b>	<b>228</b>

## 8.1 Introduction

In this chapter the aircraft sector in Brazil is described and the findings are compared to the situation in the Netherlands. The following research question will be answered:

*'What are strong and weak aspects of the Aircraft sector and what could Virtual Reality contribute to the development of this sector?'*

In order to be able to answer that question, one of the sector analysis models developed by Michael E. Porter will be applied. The so-called Porter's Diamond model contains four basic determinants and two additional variables. The four determinants are:

- Demand conditions
- Factor conditions
- Firm strategy, structure and rivalry
- Related and supporting industries

And the two related variables are:

- Government: Government's influence on the competitive forces within an industry
- Chance: Accidental circumstances that strongly influences the competitiveness of an industry

For both the Brazilian (in a more extensive way) and the Dutch aircraft sector the four determinants and two variables are used. Before the sector analysis, the sector will be defined more precisely. After analysis of the sector's strong and weak aspects, a determination will follow of how Virtual Reality contributes and could contribute to those aspects.

## 8.2 Sector definition

It is important to define the sector of analysis precisely, to be able to do research more focused and to make clearer conclusions. The definition is based on the Standard Industry Classification System (SIC-87). SIC-87 specifically defines sectors and sub-sectors.

- 37 Transportation equipment
  - 372 Aircraft, and parts
    - 3721 Aircraft
    - 3724 Aircraft engines and engine parts
    - 3728 Aircraft equipment [SIC95]

As you can see, besides the aircraft itself, the aircraft parts industry and aircraft equipment industry also belong to the research area. Aircrafts could be commercial, corporate and military jets and also helicopters. Spacecrafts and military (ballistic) missiles are excluded from the used scope.

## **8.3 Demand conditions**

This chapter covers the demand conditions in world's aircraft market, especially focused on the Brazilian aircraft industry. The demand conditions are the first aspect of the four basic determinants of Porter's Diamond. The demand conditions are described through investigation of the following seven aspects: Composition, shape and growth of demand, the degree to which the domestic demand is representative for the international market, market share, trade flows, import/export numbers and price development.

### **8.3.1 Composition**

There are about 500 companies in the Brazilian aviation industry employing approximately 50,000 people. [MAC00] The aircraft sector itself consists of 10 different aircraft manufactures and 25 aircraft parts suppliers. Brazil's major aircraft manufacturer is Embraer. That company is also world's fourth largest commercial aircraft manufacturer. Despite the significant domestic development achieved in the last 4 years, Brazil is still very dependant on the international market. Most major international companies, like Boeing, McDonnell Douglas, Airbus, Bombardier, have representatives in the country. [ALM99]

That was the supply side, now the demand side. Furthermore several separate markets can be distinguished: Commercial aviation market, Corporate aviation market and the Defense market. Major buyers on the commercial aircraft market are the domestic air transport companies. Because of the size of the country, the requirement for air travel is extensive. Brazil has got many airliners, like Varig, Transbrasil, Vasp and TAM. The Brazilian aircraft sector has also customers among the international airline companies, like the United States, China, Japan, France, Italy, Switzerland, Sweden, South Africa and many others. The U.S. is the most important buyer.[ALM99][EMBO1]

A Brazilian aircraft company like Embraer also develops and builds business jets. For example, multinationals belong to the corporate aviation market. Most of those companies are from American origin. Embraer builds also military aircrafts. Buyers are the Brazilian Air Force (BAF) and the Mexican government for example.

The (international) airliners and governments are not the only buyers on the aircraft market. The aircraft manufacturers themselves are also very important customers. Embraer for example, is a major buyer of equipment and parts for its own production line. [MAC00]

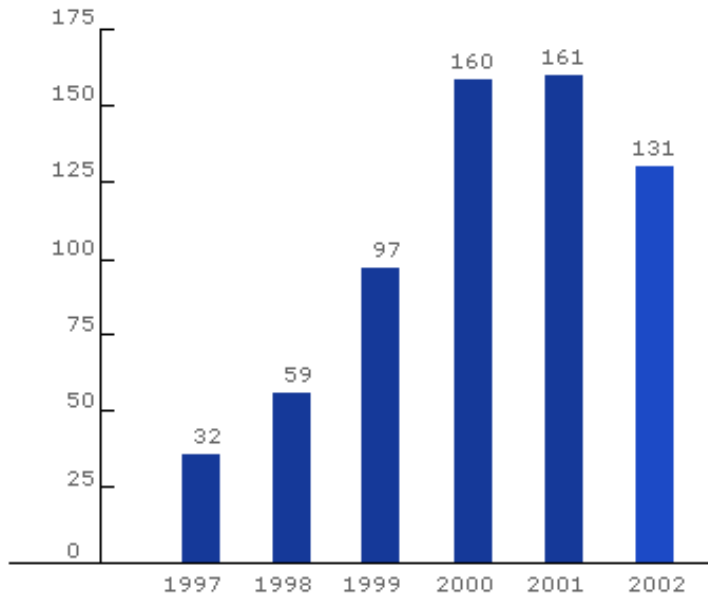
### **8.3.2 Shape and growth**

The Brazilian market for aircraft and parts has been estimated at (USD) \$2.7 billions for 1999. [ALM99] The terrorist attacks on the United States, September 11<sup>th</sup> 2001, had and still have an enormous impact on world's airline and aircraft industry. The deceleration of the world economy causes



also a decreasing demand for aircrafts. Despite of that, companies like Embraer deliver still a high number of aircrafts. Especially the medium-sized commercial aircrafts and regional jets are more interesting for airliner companies, because the number of passengers per flight dropped. But Embraer could not avoid the decreasing demand for aircrafts. Figure 1 shows the increasing (till 2001) and dropping number of delivered jets in 2002. [EMB01][MAC00]

**Amount of delivered**



**Figure 8-1: Jet delivery Embraer [EMB01]**

Market segment (number of seats)	Forecasted commercial jets delivery		
	2003-2012	2012-2022	2003-2022
30 - 60	1,745	1,765	3,510
61 - 90	1,175	1,415	2,590
91 - 120	1,090	1,420	2,510
<b>Total</b>	<b>4,010</b>	<b>4,600</b>	<b>8,610</b>

**Table 8-1: World jet deliveries by segment [EMB03]**

Table 8-1 gives an overview of the world jet deliveries, forecasted by Embraer. The 8,610 jets are estimated at a value of (USD) \$180 billion. Embraer expects 132 aircraft deliveries for 2003, and 136 for 2004. It intend to change its sales strategy. 83 percent of their current sales consist of commercial jets. The intention is to decrease that to 70% and sell more corporate and defence aircrafts. Now they invest more on new technologies for non-commercial aircrafts. [EMB03] Because of the fact that Embraer is a major player in the Brazilian and world aircraft market, these expectations characterize the Brazilian aircraft market. Other aircraft (parts) manufacturers in Brazil are dependant on Embraer.

### 8.3.3 Domestic vs. international demand

Despite the significant domestic development achieved in the last couple of years, Brazil is still very dependent on the international market. Most major international companies have representatives in Brazil.

Brazil is still one of the most important world aviation and space markets. It has the fifth largest civil aviation fleet and the seventh largest helicopter fleet, besides having the largest regional aircraft industry in the world. [ALM99]

The Brazilian Civil Aviation Department keeps track of all Brazilian aircrafts. Their numbers show a steady grow in Brazilian aircrafts:

Year	Total of Registered Aircraft	Aircraft Canceled	Active Aircraft
1990	12023	4529	7494
1991	12761	4580	8181
1992	13178	4698	8480
1993	13524	4767	8757
1994	13816	4840	8976
1995	14173	4898	9275
1996	14476	4973	9503
1997	14885	5099	9786
1998	15250	5193	10057
1999	15624	5342	10282
2000	15811	5440	10371
2001	16033	5501	10532
2002	16230	5585	10645
2003	16290	5614	10676

**Table 8-2: Numbers of registered, cancelled and active aircrafts over the years [DAC03]**

After the reduction of government intervention in the sector, the largest air transport companies-VARIG, VASP, TAM and Transbrasil-increased their sales profit by 63 percent in 1998. These results are expected to continue over the next three years. Also, the regional air sector represents 19 percent of Brazil's domestic flights and generates almost (USD) \$3.2 billion per year. In 1998, the demand for aircraft-related equipment and parts increased 72 percent from the previous year. [MAC00]

Nowadays, only 6 percent of the sold aircrafts are meant for the Latin American market. The United States and Canada are the most important customers. This image will be strengthened in the future. Table 2 represents the forecasted international demand in 2003 and in the future.

Region/ Capacity share %	North America	Europe	Asia/Paci fic	Latin America	Africa & Middle East	China
<b>2003</b>	38	24	20	6	6	6
<b>After 2003</b>	56	21	6	7	3	7

**Table 8-3: Today and expected capacity share (%) by region by Embraer [EMB03]**

Leasing aircrafts is a popular practice in Brazil. Aircraft are generally leased to air sector companies and are eventually either returned to the lease company or sold in Brazil within three to five years and absorbed into the country's general fleet. [SEC03]

### **8.3.4 Market share**

The United States are by far the greatest aircraft manufacturer of the world. Boeing is the market leader (55% estimated). The second greatest market player is a French company, namely Airbus. The first non-American aircraft manufacturer, Bombardier, is Canadian. Embraer is the fourth largest aircraft manufacturer in the world. [CHR00] Embraer has gained a much larger share of the market than they would have achieved without Proex. More about Proex later on in paragraph 'Price development'.

### **8.3.5 Trade flows**

The U.S. is the most important country related to the Brazilian aircraft (parts) market. Aircraft and aircraft parts represent Brazil's largest category of imports from the U.S. Market receptivity for U.S. aircraft and related products remains strong with very modest third-country competition. U.S. suppliers of aircraft and aircraft parts lead the market.

The United States is not the only parts supplier for the Brazilian aircraft industry. The domestic aircraft part industry is also very important. Companies like Aeroeletronica, Aeromot, Avibras and Celma are major suppliers for companies like Embraer. [ALM99] More information on the trade flows in next paragraph.

### **8.3.6 Import & export**

The total imports in 1998 were (USD) \$1.7 billions, and (USD) \$1.3 billions in 1997. In 1998, the United States had 60,56% percent of the total import market, followed by France with 16,97% percent.

The government of Brazil announced a program to help the commercial aviation sector in Brazil increase service offerings more rationally, while deregulating airfares. The government project aimed to speed up the import of parts and equipment that are vital for increasing activity. The Government of Brazil also opened credit lines for new aircraft purchases associated with international routes. [ALM99]

Brazil imported 38 Airbus from France, establishing France as the second largest supplier for aircraft and aircraft parts with 17 percent of the import market. In 1997/1998 TAM, the fourth-largest Airline Company imported 38 A-319 and A-320 aircraft from Airbus. The main third country competitors are France, Spain, Italy and Canada. American companies, such as Collins and Alcoa, supply the majority of aircraft parts. [ALM99] Remarkable is that Embraer was Brazil's largest exporter in 1999, 2000 and 2001. [EMB03]

### **8.3.7 Price development**

The Brazilian aircraft industry badly wants a bigger share of the regional aircraft market. Embraer made a name for itself building high-quality

commercial, corporate and military aircrafts. The problem was, they were so expensive nobody wanted to buy them. That has changed. Embraer's family of regional jets, launched in 1995, was an instant hit. Price is one big factor: Embraer's popular ERJ 145, a 50-seat jet, sells for around \$17 million, compared with \$21 million for a competing aircraft made by Bombardier.

Since 1996, the two rivals Embraer and Bombardier have a disagreement about export subsidies. Those export subsidies were part of the government program: 'Programa de Financiamento às Exportações' also known as Proex. [WHE01][CHR00] Embraer gained much market share, because of the lower export prices.

This situation escalated all the way to the World Trade Organization, which ruled that the subsidies Brazil and Canada grant their respective aircraft manufacturers are unfair. Both countries have modified their subsidy programs, but the WTO says Brazil must go further. So the WTO authorized Canadian trade sanctions on (USD) \$1.4 billion worth of Brazilian imports over six years. For further details, see the chapter about government aspects. [WHE01]

Embraer itself has nothing to lose from sanctions, since Canada doesn't import any of its jets. More important, analysts expect it will survive the phaseout of the Proex program: Operating costs have fallen vis-a-vis Bombardier's, thanks to the 1999 devaluation of the Brazilian real. [WHE01]

## **8.4 Factor conditions**

This chapter will concentrate on the availability of resources that might affect the development of the aircraft industry in Brazil, focus will be on the five most important factors where this industry might benefit from. First an assessment is made of the availability of highly qualified labour and research institutes. Then costs of ground, labour and energy, availability of materials, modern infrastructure and the geographic conditions will be considered.

### **8.4.1 Labour**

#### **Research institutes**

In 1993 the Brazilian Aerospace Industries Association was established to represent the interests of those Brazilian companies working in aerospace (and space) engineering. Although Empresa Brasileira de Aeronautica – usually known as EMBRAER dominates the Brazilian aircraft industry, other companies have established expertise in key areas and these include AVIBRBS (sounding rockets and missiles); Aeroeletrifica (avionics and other electronics); CENIC (composite materials); Elebra / NORCAL Group (Electronics); TECNASA (electronics for air navigation support, radar countermeasures); Mectron (defense systems); Digicon (transducers, precision mechanics); and AKROS (structural analysis and CAD). [BNS00]

#### **Highly qualified labour**

Foreign specialized technicians and highly qualified professionals may work under a temporary contract with legal entities, whether of national or foreign capital, established in Brazil. The pertinent contract must be approved by the Ministry of Labour. Approval of contracts of specialized technicians and highly qualified professionals takes into account the compatibility of their qualifications with the area of business in which the company is engaged. The company must justify the need to contract such professionals and technicians in relation to similar professionals and technicians available in Brazil. [GAT00]

### **8.4.2 Costs**

#### **Labour**

In Latin America, unit labour cost levels relative to the United States declined during the 1980s, with the exception of Brazil. This suggests that the divergence in labour productivity levels was accompanied by a decline in the dollar-corrected labour compensation levels in the other Latin American economies for which there are estimates. Table 8-4 shows the labour productivity growth rates for Brazil between 1980-1999.

Country	Value added per person employed, 1980-2000 growth rate	Value added per hour worked, 1980-99 growth rate	Labour compensation per unit of output, 1980-99 growth rate
Brazil	-0.2	0.2	5.0
Netherlands	0.3	1.2	1.0

**Table 8-4: Labour productivity growth rates between 1980-1999 [ILO01]**

### Energy

Brazil accounts for about 50 percent of South America's landmass, population and regional economy. It also boasts the continent's dominant business aircraft fleet. Brazil has 300 bizjets, 650 turboprops and 900 helicopters (of which 400 are turbine-powered) burning jet fuel. On top of this there are almost 6,000 piston-engine aircraft using Avgas.

Jerry Scott, president of Baseops, the aviation handling division of international fuel marketer World Fuel Services, said Latin America has generally not followed the U.S. FBO industry's practice of bundling fuel prices in with ground handling costs for business aircraft. It is more like the rest of the world in that fuel and services are largely unbundled. In many cases, fuel is provided through national oil companies in Latin America.

Air BP, Petrobras aviation distributor BR Aviation and Shell are the three main competitors for the Brazilian aviation fuel market, according to Air BP South America integration and planning manager Lina Miranda. ExxonMobil has a smaller position at São Paulo, Rio de Janeiro and Recife. Air BP is a relatively recent market entrant and expects to expand its Brazilian presence within the next three years. It currently operates at 11 general aviation airports and has plans to grow extensively in the future, including into the main regional and international airports.

In a bid to further boost volumes, Shell Aviation is planning to introduce fuel and other services in at least two new countries by the end of this year. Under a continuing growth policy, it has established operators at more than 10 different Latin American airports in the past three years.

Baseops/World Fuel Services provides fuel and services throughout Latin America and also plans expansion. All three companies viewed the inaugural LABACE event in São Paulo as an opportunity to promote their various fuels and lubricants, and related services such as fuel cards.[AIF03]

### Interest rate & inflation

In January, Brazil's planning and budget minister Guido Mantega said falling inflation should allow interest rates to drop from around 25 percent to the upper teens by yearend. However, on February 19, Brazil's central bank was forced to increase its prime lending rate by 1 percent to 26.5 percent in a bid to head off inflationary pressures. Industry leaders complained immediately that this move will choke fresh investment while failing to stop prices from rising.

Nonetheless, in the weeks following the January 1 presidential inauguration, Brazilian companies were able to go back to the international capital markets and raise more than \$1 billion in a fortnight. Assuming this optimism can be sustained, it represents a marked turnaround from last year when Brazil had to have \$30 billion in debt deferred by the IMF.

So maybe it is not such a bad time to be coming to Brazil's main business city, São Paulo, to market executive aircraft at the Latin American Business Aviation Conference and Exhibition (LABACE). Certainly the prospects for aircraft sales to companies would appear to be better than those of the U.S. and European defense firms who were recently told that the da Silva administration has shelved a \$720 million order for new fighters to free up more of this year's budget for antipoverty initiatives—perhaps serving as a reminder that the new Leftist government is not exclusively concerned with keeping capitalists happy. [AII03]

### **Rate of exchange**

This particular exchange rate is highly significant to Brazil's economy and particularly to aviation. In 1996 the dollar and real were nearly equal, which fueled an airplane- and helicopter-buying spree that lasted some four years. In 2002 the Real dropped and this caused bad forecasts immediately. [AIH02]

Brazil has seemed much more optimistic lately, with the business community trying to prolong its honeymoon with newly elected Workers Party president Luiz Ignacio Lula da Silva. Inflation is slowing and the Brazilian real has lately recovered to around 3.69 to the U.S. dollar, compared with a recent low of R4.03 to the dollar, prior to the October 2002 election. [AII03]

## **8.4.3 Infrastructure**

### **Airports**

Brazil has the world's second-largest airport network, with São Paulo being the busiest: three main airports, three dedicated heliports, and more than 200 helipads [AIN03]. In other Latin American countries excluding Mexico, the activity is concentrated at two or three major airports in each country. [AIE03]

### **Airways**

Several international programs have succeeded in providing substantial and tangible support in every region of Latin America. The programs do currently focus on configuring the airport and airspace regions for both São Paulo, Brazil and Buenos Aires, Argentina. Although the volume of air traffic is small relative to other regions of the world, these large metropolitan areas in Latin America have a substantial delay problem due to their airport and airspace configuration. MITRE is not only helping Brazil and Argentina identify and solve these specific problems, but is also teaching customers and local resources in the area about the use of modeling tools and the process of analysis so that they develop the ability to solve future problems themselves. [MIT01]

## **8.5 Firm strategy, structure and rivalry**

In this chapter the Brazilian aircraft sector and the ways in which the Brazilian aircraft companies are organised and structured will be discussed. Companies that are optimally organised in respect to the resources of Brazil, have competitive advantages. Competitiveness within the aircraft sector is important because it is closely related to the level of innovation and development.

### **8.5.1 Product characteristics**

The aircraft industry consists of enterprises engaged in the manufacture, assembly or modification of aircrafts. It includes the manufacture of specific parts as well as the complete aircraft. This industry also includes repairs and maintenance of aircraft and includes repair / maintenance of machine components, navigation equipment, etc. and aircraft equipment.

The aircraft industry is a versatile and high tech industry, relying on many different techniques. Aircraft companies thus need other companies to supply important aircraft parts. For example: engines, landing gear, raw material, mechanical hardware, avionics instruments, environment control systems, auxiliary power units, wires, etcetera are often delivered by companies which specialize in these parts.

Importing and exporting aircraft parts forms an important characteristic of the aircraft industry. Another characteristic is the high-tech nature of the aircraft industry. A lot of research and development surrounds this industry and its companies. [SEC03]

### **8.5.2 Market structure**

Brazil's aerospace sector consists of civil and military aviation and space sub-sectors.

- The civil aircraft producers and designers are manufacturing a range of medium-body aircrafts from 8 to 120 seats. Other local firms are mainly servicing metal processing, engineering projects and software engineering. [MAR03]

Aircraft, such as the ERJ 145 50-seater jet and the ERJ 135 37-seater jet, are manufactured at Embraer. Embraer also builds a number of components, has particular strength in constructing undercarriages, and is a subcontractor for various overseas manufacturers of fixed/rotary wing aircraft. Brazil does not build civilian aircraft jet engines, and companies such as Rolls Royce and General Electric have established local subsidiaries to fulfil this role. Brazil has a full range of servicing facilities for most locally used aeroplanes.

- As regards military aviation, Embraer manufactures the AMX fighter in conjunction with the Italians. Financing for military



aircraft is arranged through government grants. The Brazilian forces also operate various foreign planes, including A4, F5, Mirage and Xavante. The Navy operates Lynx helicopters, whilst the army helicopter fleet is based on Aérospatiale and American equipment. In line with government policy, local companies are key players in military programmes.

- Brazil has a complete space programme: it constructs rockets (at the Aeronautical Technical Centre) and satellites (at the National Institute for Space Research or INPE) and has a launch site (CLA). There has been some British commercial involvement with INPE, considerable French activity with INPE, and a joint project with China. Brazil is also familiar with Earth Observation (e.g. mapping of the Amazon area by INPE as part of environmental policy projection), and is part of the International Space Station (ISS) project. [AER03]

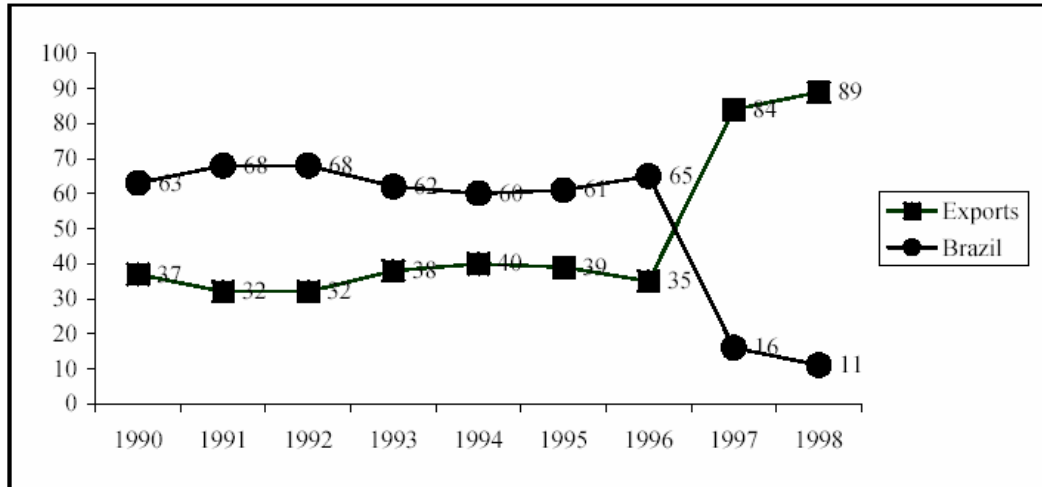
### **8.5.3 Current economic position**

Because of the large distances, various terrains, the traffic congestion between the major economic centres of Sao Paulo and Rio de Janeiro, and because of a developing but still underdeveloped highway system, the requirement for air travel in Brazil is extensive. Brazil is one of the largest economies in the world, and the number of registered aircrafts is growing steadily. [SEC03]

The economic growth of the Brazilian civil aircraft industry is accompanied by an increase in imports of systems and structural parts and development of local services suppliers of metal processing, engineering projects and software engineering. Local services suppliers have re-entered the civil market after the economic recession of beginning 1990s and particularly due to the aircraft producer forty-five jetliner increasing sales after 1994. [MAR03]

### **8.5.4 Market goals and orientation**

The major part of the market of the Brazilian civil aircraft industry is foreign, which accounted for approximately 72,5% of the turnover in the year 2000. The United States were responsible for approximately 60% of the industry exports in the year 1999. Graph 1 shows that the market orientation of Embraer shifted in 1996 from national to international.



**Figure 8-2: Exports and Brazilian market participation of the aircraft producer's turnover (%) [MAR03]**

### **8.5.5 Organisation and management of individual companies**

In this paragraph the organisation and management of Brazilian aircraft companies will be discussed.

#### **Embraer**

The starting-up phase began in 1969 when the Brazilian Ministry of Defence, Aeronautic Command, founded the aircraft producer. The aircraft producer was created as a spin off of the Technological Centre of Aeronautics (CTA), with the objective of supplying the Aeronautic Command with parts, components, and training and attack aircrafts. The main civil aircraft produced during the 1970s was a 19-seat light twin-engine turbo propeller.

The Ministry of Defence was the main buyer and also gave strong tax incentives and subsidies to the aircraft producer for developing production and technological capabilities to manufacture the nineteen-seat aircraft. These incentives were oriented for financing (through subsidies and tax exemption), marketing (through procurement and protectionism) and developing technologically (through the creation of special decrees for technology transfer and supporting research). In this first ten years of existence, the main market was national.

The recession in the international civil aircraft market and the Brazilian government decreasing procurement and subsidies had been the main factors affecting the financial crisis of the aircraft producer in the beginning of the 1990s. The company was thus privatised in 1994. Between 1990-1994 many small and medium size local suppliers exited the market due to the economic recession. [MAR03]

Embraer's activities entail the design, development, production and marketing of a range of turboprop and jet aircraft for regional airline and military use, turboprop aircraft for general aviation, corporate and

agricultural utilization, and aviation-related mechanical and hydraulic systems. Embraer is a major buyer of equipment and parts for its own production line, as well as a major international supplier for the aviation market. The majority of its aircraft systems, structural parts, components and sub-systems are imported, illustrating that Brazil has lacked local supply chain capabilities. The United States are its largest customer, and largest supplier of parts. U.S. has a percentage of 65% on Embraer purchases. According to the company's administrators, Embraer profitability is expected to continue to grow in the next four years. [SEC03]

### **Other Successful Aircraft and Parts Companies**

Aeroeletronica, a subsidiary of Aeromot Aeronaves e Motores S.A., designs, certifies and manufactures electronic systems and units mainly for civil and military aircraft. Aeroeletronica has also been heavily engaged in the design and production of avionics systems and parts for the Brazilian-Italian combat airplane, the AM-X. Today, Aeromot is the only Brazilian company, besides Embraer, to have units of its design or manufacture flying in the national and international market. Besides those two major programs, Aeromot develops and manufactures several other products, including an ELT (Emergency Locator Transmitter), an Auto Pilot System for drones and units for Brazilian satellites.

Avibras Industria Aeroespacial S.A is a pioneer company in the aerospace field and is also a private engineering enterprise with more than 30 years of experience in the aerospace sector. Avibras offers a large array of high-tech products for the civilian and military markets.

In 1972, Motortec Industria Aeronautica S.A. started with the merger of three companies in the aeronautical sector: Motortec, Avitec, e Comtec. Today, Motortec is a 100 percent Brazilian enterprise that has been developing projects for the overhaul sales of aircraft and their components. Motortec is the best-known aircraft maintenance company in Brazil. The company's activities within the country are increasing along with the Brazilian aeronautical sector growth. [SEC03]

### **8.5.6 Trends**

Air transport today represents a business involving billions of dollars throughout the world. As an example, the world's largest airport - Atlanta, USA - alone handles more than 80 million embarkations and disembarkations per year. Approximately 75 million passengers embarked or disembarked in Brazil in 2001. It is estimated that from 10 to 12 million people in the country utilize air transport. That number is small for a nation of 170 million inhabitants. From these numbers can be concluded that a lot of growth in the Brazilian aircraft industry is possible. [ATRO3]

The Brazilian airspace will gradually be more opened for foreign companies. These companies will then be allowed to extent their activities on the aircraft market, which will increase the competitiveness. Furthermore, the national airports will be modernised in the next few years allowing for more flights. [EVD03]

Air transport is currently very much on the rise. The aeronautical industry is ever more concerned in investing in larger, more sophisticated aircraft, and is particularly committed to environmental preservation. On the ground, airports are also undergoing a permanent technological and logistical evolution, the better to allow takeoff and landing of the newest planes in all kinds of weather conditions. Ways are being found to respond to the ever-growing demand for air transport.

The prospects for the coming years are excellent. Aviation is the fastest-growing sector in the world and in Brazil, not only due to the country's attraction to foreign visitors, but also to the vast potential for growth in domestic tourism. [ATR03]



**Figure 8-3: The Embraer ERJ 140 (Commercial aviation)**



**Figure 8-4: The Embraer Super Tucano ALX (Military aviation)**

## **8.6 Related and supporting industries**

This factor handles the value chain and the presence of related industries. The presence of this kind of industries with a competitive position and a strong value chain, will guarantee an attractive industry. These different kinds of industries are interconnected in so called clusters. Industries within a strong cluster can take advantage of synergy effects developed within the cluster. Several aspects to describe a good overview are bundled in this chapter. [BOE02] Due to the fact the study-tour focuses on the aircraft industry, the spacecraft industry will be considered as 'related industry' and not as 'aircraft industry'.

### **8.6.1 Supporting industries**

Embraer made some agreements with competitors in order to assemble kits, included with this agreement, organizational know-how in serial production was provided. Within the *Grupo Permanente de Mobilização Industrial*, which associated since 1965 the Armed Forces and the Federation of São Paulo Industries, Embraer also developed a close collaboration with Brazilian private firms, which supplied an increasing share of final components. Half of the directors were also private sector executives. Although equity links were relatively tenuous, aeronautics could thus be seen as a good example of the "triple alliance" between multinational corporations, local private entrepreneurs, and state-owned enterprises that underlined Brazil's rapid accumulation of capital until the early 1980s [GOL01].

Brazil does have a well-developed local aircraft parts industry. Brazil has 10 different aircraft manufactures and 25 aircraft parts suppliers. Despite the significant domestic development achieved in the last 4 years, Brazil is still very dependent on the international market. Most major international companies have representatives in the country.

Furthermore this paragraph is divided in two sections, the suppliers and the service organization respectively.

#### **Suppliers**

The production of an aircraft can be divided in three stages [GOL01] :

- Fabrication of primary parts (metals sheets and plates, parts produced using computerized machines and prefabricated parts)
- Assembly of major components
- Final installation of the aircrafts various operating systems (such as wiring an electronics)

These stages require different types of materials, which become increasingly complex when the aircraft approaches the delivery dates. To acquire materials like metal sheets or aluminium, reliable suppliers are needed. This makes a stable supply-chain essential for tight-scheduled production cycles.

Suppliers of Brazil origin as well as suppliers of foreign origin are concerned in the Brazil aircraft industry. To indicate the division between these national and foreign suppliers, some statistical data is depicted in Table 8-5.

	Annual Estimated Average (The numbers are in million US dollar)			Growth Estimated (%)
	1997	1998	1999	
<b>Import Market</b>	1,352,0	1,713,0	1,980,0	15%
<b>Local Production</b>	1,660,0	2,000,0	2,163,0	
<b>Exports</b>	971,0	1,567,9	2,088,6	
<b>Total Market</b>	2,041,0	2,145,1	2,054,4	15%
<b>Imports from US</b>	1,036,0	1,037,0	1,039,0	10%
<b>Exchange Rates (R\$/US\$)</b>	0,25	0,85	1,93	

**Table 8-5: Statistical data concerning import, local production and export [STR01]:**

Notify the stronger growth of the export compared with the import. Also the total import market grew, while the imports from the US remained reasonably stable. This brings us to the distribution of market shares from foreign countries represent, which are depicted in Table 8-6.

Country	Percentage
US	60,56
France	16,97
Spain	8,71
Italy	4,09
Canada	3,37
Germany	1,92
Others	17,18

**Table 8-6: Distribution of market shares of foreign suppliers for air sector related equipment [STR01]:**

Suppliers for the Brazilian market for aircraft parts is broken down roughly as follows [STR01]:

Product	Mainly supplied by
Engines	Canadian companies
Gear landing	Monsier Douwty Co.France
Raw materials	Alcoa - USA
Mechanical hardware	USA
Avionics instruments	Collins - USA
Environment control systems	USA
Auxiliary power unit	USA
Wires	USA

**Table 8-7: Aircraft parts and their suppliers**

### Service organization

Nowadays, Embraer has over 170 different suppliers and clients in Europe alone. To manage the logistic chain between Brazil and Europa, an agreement between Danzas, DHL en Embraer was initiated. This agreement encloses the logistical process, divided in three services:

- Routine
- Critical
- Aircraft on Ground (AOG)

This process is supported by a strong IT-infrastructure operating an internet-based order management and tracking tool. [DAN02]

A trading network that allows Embraer to interact with its customers and suppliers for after-sales purposes named AEROChain has been implemented. The following functionality is offered by this system [BEA02]:

- Build and strengthen customer relationships by working seamlessly with customer systems
- Offer ease of transaction to suppliers
- Decrease costs for both Embraer and suppliers by automating work processes and integrating suppliers into an extended, collaborative trading community
- Create new revenue opportunities for Embraer's replacement parts and aftermarket services

### **8.6.2 Related industries**

The civilian space program of Brazil is praised by its embassy for the transparent structure. There is accession to the Missile Technology Control Regime in 1995 (MTCR), the NASA Space Grant Consortium (NSG), the Non-Proliferation Treaty (NPT) and the Comprehensive Test Ban Treaty (CTBT).

The March 1994 signing of the Protocol to Amend and Extend the Brazil-US Agreement Relating to Cooperation in Science and Technology marked the beginning of a new phase in the relationship between the countries in S&T. From August through October of 1994, INPE and NASA performed a joint operation called Guar 94 with the launching of 33 American-manufactured sounding rockets from the Alcntara Launch Center. The transfer to Brazil of these rockets, some of which are included in the Category I of the MTCR, represented the concrete recognition by the American Government of the evolution of Brazilian policy to control the export of sensitive goods.

The Guar 94 operation strengthened bilateral space cooperation and strongly contributed to NASA's 1996 invitation for Brazil to participate in the International Space Station. The agreement between NASA and the Brazilian Space Agency was signed in 1996 during President Clinton's visit to Brazil is a symbol of bilateral S&T cooperation between government entities. [EMB03]



## 8.7 Government

All of Brazil's airlines are owned by private investors. No government agency has any equity interest in any of the airlines. Currently, the airlines are all 100% Brazilian-owned, though Gol may be admitting AIG as an investor during the first half of this year. Under applicable law, non-Brazilian investors can own up to 20% of the voting shares of a Brazilian airline. This restriction probably hindered Varig's search during 2002 for a foreign investor. The failure to find such an investor was a contributing factor to the Varig-TAM merger announcement.

On top of the provision exempting all weapon-producing companies from duties on the import of inputs, Embraer did not pay trade (ICM) and production (IPI) taxes. Also, all Brazilian companies could obtain a 1 per cent rebate on their corporate-income tax if they bought non-voting shares in Embraer. Federal agencies were also required to buy Brazilian aircraft provided their price was no more than 15 per cent more expensive than competing imported goods. Finally, aircraft imports were subject to a 50 per cent duty if a competing Brazilian (i.e. Embraer) product was available. [GOL01]

In the next five years Brazil will invest 1.4 billion US dollar in expansion and modernisation of 18 airports. Up and till the year 2005 the Brazilian government will also invest in airport infrastructure improvements. These investments are signs of an expected expanding aircraft industry. [EVD03]

### 8.7.1 International relations

Over the past decade, Brazil's Embraer has come from nowhere to challenge Canada's Bombardier for third place in the world aviation manufacturers' rankings behind Boeing Corp. and Airbus Industrie. Canada accused Brazil of giving Embraer unfair state aid with its Programa de Financiamento às Exportações (PROEX), which will be discussed earlier. In the late '90s an investigation by the WTO resulted in Canada getting the green light to impose trade sanctions against Brazil of up to \$233.5 million a year (or \$1.4 billion over the next six years) - the largest compensation package the WTO has so far authorized in a trade dispute. Brazil argued that this was a unique case, while it reflects the problems a developing country faces when it tries to compete with high-tech competitors in Western countries.

Nevertheless a WTO investigation panel ruled January 2000 that Canadian government support that helped Bombardier clinch three contracts with U.S. and Spanish airlines worth about \$4 billion was illegal and urged Ottawa to "withdraw the subsidies without delay." [NAP02]

The WTO has given Brazil permission to slap \$248 million US in annual sanctions against Canada in the long-running trade dispute over subsidies in the aircraft industry. The WTO decision means Brazil will be able to apply 100 per cent duties on some goods imported from Canada. Brazil originally asked the WTO for permission to impose \$3.3 billion in trade

sanctions on a variety of Canadian products from radioactive isotopes to waffles. [CBC03]

Furthermore, Brazil has a traditional friendly relation with the United States to achieve more autonomous integration into the world economy, alternative relationships (e.g. Europe or Japan) should be formed. [OXF00] This urge presents itself in the main strategic objective of Brazil, which is to fully integrate into the global system and to participate in international organizations in order to ensure its sustainable development. Respect for democratic principles, the rule of law and good governance constitutes the cornerstone of the relations between the EU, Brazil and the countries of Mercosul.

### **8.7.2 Collective labour agreements**

Brazil knows a number of collective agreements in Brazil which are presented below: [ILO02]

- Prohibit pregnancy testing prior to employment.
- Require pay equality for work of identical function where length of service is identical.
- Entitle pregnant employees to a change of job where the current post involves a risk to the health of the mother or foetus.
- Provide for paid pre- and postnatal leave for medical examinations.

Concerning trainings, Brazil does not stipulate concrete mechanisms for training, but does encourage that the employees be given an "education payment" to reimburse them for the costs of their own first grade education and that of their children, in fee-paying establishments, and on the understanding that this is not in the nature of a salary payment. It also regulates the granting of special leave for reasons of study, on the basis that these release days be considered as effective work time.

### **8.7.3 Protectionism of the government**

The government of Brazil recently announced a program to help the commercial aviation sector in Brazil increase service offerings more rationally, while deregulating airfares. The government project aims to speed up the import of parts and equipment that are vital for increasing activity. The Government of Brazil will also open credit lines for new aircraft purchases associated with international routes. The deregulation of market share in the domestic market is also being proposed. The maximum allowable market share is currently 35% between main airports. The legislation for the project was presented to the Brazilian Congress on October 14th, 1999 by the Secretariat of Economic and Planning (SAE) in partnership with the Brazilian Department of Civil Aviation (DAC). The project has not been approved yet and is currently working its way through the congressional process. Some safeguards were also added to the proposed legislation. For example, discounts must be passed on to the flying public.

Brazil's civil air sector is regulated by the Department of Civil Aviation (DAC). This department is linked to the Ministry of Aeronautics and is located in Rio de Janeiro. DAC is responsible for setting up the rules for carriers, including national and international routes. Aircraft and parts for military use are under the responsibility of the Ministry of Aeronautics.

Each aircraft that operates in the regional market produces 40 direct and indirect jobs. The government provides a subsidy to regional companies with the intention of maintaining their operations and motivating their continuing existence. There is also a "supplementary tariff" which is paid by large domestic companies and allows the regional companies to charge reasonable prices. [UCS03]

There is an insurance controversy concerning war risk cover in Brazil. Since 11 September 2001, the Brazilian government has provided an automatic insurance scheme designed to assist the airlines by alleviating the need to purchase war risk cover. Probably this coverage has already ended. [BAS03]

### **8.7.4 Environmental policy, energy policy, etc.**

This paragraph covers the government of Brazil's opinion concerning the environment. Also the water and energy-policies will be discussed.

#### **Environment**

Brazil is becoming more and more aware of environmental issues as a result of the increasing dissemination of information from several sources, especially since the 1992 "Rio Summit". The last decades new laws and programs have been approved in order to regulate the use and decrease the abuse of the Brazilian environment.

This has led, in several cases, to the initial definition of an agenda for environmental action and protection and to the formulation of several important official programs at all governmental levels, including a few promising experiences of Local Agenda 21. It can be said that there has been a gradual incorporation of an environmental dimension into the processes of planning, decision-making and management of urban areas.

However, the available data confirms the argument that there has been little actual improvement to the country's environmental realities, not only because of the scale and nature of the several existing problems, but also due to the fact that there are long standing obstacles preventing efficient environmental action.

#### **Water**

Although Brazil holds about 8% of the earth's fresh water reserves, the reserves are not evenly distributed within the country. About 80% of Brazil's fresh water reserves are in the Amazon basin where only 5% of Brazil's population live. The water availability in the northeast of Brazil is only 1,500 cubic meters /inhabitant/year, which according to United Nations parameters is at a critical level.

According to the water resources policy coordinator of the National Water Agency (ANA), about 70% of the river basins in Brazil located from the northeastern state of Sergipe to the southern state of Rio Grande do Sul are highly polluted. Major causes of water pollution in Brazil are non-treated residential sewage, inappropriate soil use and disposal of industrial waste, use of pesticides and fertilizers, deforestation and mining.

The latest available official statistics state that only 33.5% of the residences in Brazil are served with sewage systems. Sewage coverage varies significantly among Brazil's different geographical regions. Untreated sewage is often disposed directly in water bodies, affecting the quality of water for consumption, recreation and irrigation.

### **Energy**

By 2009, Brazil's thermal power installed capacity is expected to jump from 5,9 GW (1999) to about 27 GW, representing 25% of the total energy generated in country. During the next decade, hydropower will still prevail in Brazil, but its predominance is expected to decrease to about 75% or 80.1 GW. In view of the large amount of hydropower plants in Brazil, the local equipment industry has developed an expertise for hydro-related equipment and is able to supply practically 100% of Brazil's needs. However, for thermal power, the local industry may supply equipment up to 65% for coal-fired plants and about 60% for natural gas plants, leaving significant business opportunities for U.S. suppliers of thermal power technology and equipment.

The lack of sufficient private sector investment in new thermal power generation has made the Brazilian government rely on Petrobras, Brazil's Federal Oil and Gas Producer, to take the lead on natural gas power projects and attract investors. By 2003, new natural gas power projects with Petrobras's participation (alone or joint ventures with private investors) are expected to generate 5,000 MW.

The power rationing in place in selected Brazilian regions as of early June 2001 has been forcing the Brazilian Government to seek solutions for a series of obstacles that have restrained new private power sector investment (e.g. regulatory, tariff/price caps, and environmental license issues.). To this end, a U.S. company with investments in Brazil commented with CS Rio: "The government of Brazil has been listening more to investors now that power rationing is a reality." Another foreign industry representative alluded to the "ghost of inflation" as a crucial point behind the government's resistance to adjust electrical tariffs, one of the major issues for the establishment of new purchase power agreements and project finance.

## **8.8 Chance**

Brazil has been influenced, just like the rest of the (western) world, by the terrorist attacks of the 11<sup>th</sup> of September 2001. Some extra safety-measures have been taken. For the aircraft-industry this results in more dense patrol-activities around urban land.

### **8.8.1 War**

Brazil did not cooperate in the actual campaign against Iraq, but stated that a peaceful disarmament is the only right way to handle the situation. Actually Brazil took a great role in the opposition against Iraq. President Lula interpreted the actions of the US like the following statement [NMW03]:

*“In my opinion, it disrespects the United Nations”, said Lula, “it doesn't take into account what the rest of the world thinks. And I think this is serous.”*

### **8.8.2 Political changes (abroad)**

President Lula da Silva just started in Brazil and despite bad expectations he's achieving quite well. His government has a great task of leading Brazil into the 21<sup>st</sup> century. In the near future no drastic changes are expected. Western investors were shivery about Lula, because they thought he would interfere in Brazils economical structure in a negative way, most of the companies are partial owned by the state (not in the aircraft industry). This feeling seems groundless after all. [ROB03]

### **8.8.3 Climate factors**

On the ground, airports are also undergoing a permanent technological and logistical evolution, the better to allow takeoff and landing of the newest planes in all kinds of weather conditions.

### **8.8.4 Rate of exchange crisis**

Brazil's current low currency boosts the export-volumes to high levels, taking the economical growth to along. While most of the world suffers from the economical crisis, Brazil seems to benefit from this. The long-term interest decreased from 26% to something below the 17%.

## **8.9 Aircraft industry & the Netherlands**

This chapter contains a description of the Dutch aircraft industry. Like the Brazilian aircraft sector analysis Porter's Diamond sector analysis model is applied on the Dutch aircraft industry, but less detailed.

### **8.9.1 Demand conditions**

After the bankruptcy of the Dutch aircraft manufacturer Fokker in 1996, the sales decreased from 1.3 billion Euro in 1995 to 0,4 billion Euro in 1996. Because of a more stimulating policy of the Dutch government, the sales increased to 0.6 billion Euro in 1998. The Dutch aircraft market transformed from an aircraft manufacturing position to a more supplying function for aircraft parts, through the disappearance of Fokker Aircraft. The Dutch aircraft industry develops and supplies parts particularly for aircraft integrators like Boeing and Airbus and some minor regional jet and military aircraft manufacturers. [NIV00]

### **8.9.2 Factor conditions**

Characteristic for the Dutch aircraft sector is the amount of high-skilled employees. Companies invest much money in Research & Development. A weakness is the high labour costs. That is a reason why the Netherlands has no major aircraft integrators. It is more interesting to set up research and development companies for high-tech engine parts, construction materials, subsystems etcetera. Another reason why the Netherlands is an interesting country for the international aircraft sector, is the transport and distribution function which the country originally fulfills. [NIV00]

### **8.9.3 Firm strategy, structure and rivalry**

Like said before, the Dutch aircraft sector is not an integrating industry, but more an aircraft parts supplier for the international aircraft market. The following categories are important products of the Dutch aircraft sector:

- Construction materials
- Structural components
- Systems and subsystems
- Aircraft interior parts
- Engine parts

Recently, the Netherlands has got a new beginning integrator for aircrafts that are used for educational purposes. That company is called Euro Enaer. That is the one and only Dutch aircraft manufacturer since the bankruptcy of Fokker. The Netherlands has got a leading role in developing lightweight aircraft constructions. They gained that position with developing products like lightweight construction material Glare, thermoplastic materials, assembly methods and metallic glue. [NIV00]

### **8.9.4 Related and supporting industries**

An example of the relation between a Dutch and a Brazilian aircraft (service) company is the cooperation between Fokker Services and Embraer. Embraer has officially authorized Fokker Services (FS) as Authorized Service Center for the Embraer ERJ class aircrafts. Fokker Services has authorization for execution of all warranty maintenance, manufacturing or repairing parts if spares are not available, building modifications. FS has access to all maintenance documentation and all relevant tooling and equipment.

Most of the Dutch technical oriented universities are related to the Dutch aircraft industry. The University of Delft developed new construction materials. An example of cooperation between University of Twente and the Dutch aircraft companies is the development of laser-drilled holes in jet-engines (in order to cool them).

## **8.10 Government**

After the bankruptcy of Fokker Aircraft, the Dutch aircraft sector has reached a new phase. New (international) projects were initiated, where the Netherlands is or could be involved with. Example of those projects is the Joint Strike Fighter (JSF) project. A Dutch company like Stork is involved with the development of some aircraft parts for the new JSP aircraft.

Through studies and projects of the Ministry of Economic Affairs, the Dutch aircraft sector gained financial support for research and development. The government invested 145 million Euro in commercial aircraft development. That investment was very important for the future of the Dutch aircraft sector. A couple of Dutch companies joined the Airbus A3XX project (new jumbo jet).

### **8.10.1 Chance**

The Netherlands is a quite stable country. The threat of war is negligible. Instead of this threat the need for peacekeeping missions for the UN increases and therefore new risks and possibilities are presented.

Last few years the Dutch government knew some great changes. Some new political party were founded and the first proposal of this party was not to join the JSF-project. After the murder of the party chairman, his replacement (he had a liking for planes) altered this proposal and consented to the JSF-project. Nowadays The Netherlands are getting into a regression so with new projects like the JSF will not be participated for a while.

The Dutch climate is quite stable every year. No earthquakes or El Ninos afflict the country. Nevertheless due its relatively low placement, The Netherlands are quite vulnerable for floodings and the rising sea-level. The location of Netherlands main airport Schiphol is quite close to the sea, but this does not imply big problems (yet). When Schiphol expands in the future, maybe the demand for new aircrafts and parts will increase.



## 8.11 Comparison

This chapter covers a brief comparison between the Brazilian and Dutch aircraft industry. This survey will contain the aspects covered by this chapter.

<b>Aspect</b>	<b>Brazil</b>	<b>The Netherlands</b>
<b>Size</b>	National flights are a big share of the total amount of flights. Several international airports.  Great infrastructure of interconnected firms.	National airlines do exist, but are relatively small compared with the international position of Schiphol.  Little suppliers which have aircraft-related activities as core-business. Stork Fokker functions as market-leader in the Dutch aircraft maintenance sector
<b>Function (manufacture/supply/maintenance)</b>	Brazil performs as a world-player in manufacturing, supplying and maintaining aircrafts.	The Netherlands have had an aircraft manufacturer (Fokker) but after a few restarts, it has been taken over by Stork and functions as supplier and maintenance company. The Netherlands closely cooperate with other countries from the EU, for example Belgium, Germany and France.
<b>Research &amp; Development</b>	Caused by its dense aircraft industry and its role a world player in this sector, Brazil has to innovate constantly. This can be recognized in its research programme. New aircrafts have been developed in Brazil for a long time, as well on civilian as military terrain. Virtual reality is starting to become operational in the R&D-sector	The research-sector has had a great acceleration caused by the JSF-project, this research is mainly done by research-institutes like universities laboratories. Research-activities in The Netherlands are at all imaginable levels, from fundamental to practice-driven research. Virtual Reality has been applied in the R&D-sector with success.
<b>Government</b>	The Brazilian government has supported and protected their industries for a while. This resulted in a sanction by the WTO.	The Dutch government have invested vast amounts of time and money in aircraft related research. These efforts now pay off. New products and techniques have been developed and attracted the world's attention. Most famous example is the use of Glare in the Airbus 380
<b>Currency</b>	The low value of the Brazilian currency causes an attractive position in the global market. Exports have risen since this low value.	The Euro have reached a high value in the global markets, which causes the Dutch export-products to be expensive for foreign countries. This is a disadvantage.

**Table 8-8: Comparison Brazilian vs. Dutch aircraft sector**

## 8.12 Strengths and weaknesses

After detailed analysis of the Brazilian aircraft sector strong and weak aspects can be determined. In the table below, the strengths and the weaknesses are given, categorized by Porter's determinants and variables.

Aspect	Weakness	Strength
<b>Demand conditions</b>		
<b>Composition</b>	Aircraft (parts) manufacturers in Brazil are very dependant on Embraer.	Aircraft industry is a major employer for Brazil. Many companies are related to aircraft sector.
<b>Shape and growth</b>		Brazil is strong in manufacturing regional jets. Through deceleration of world economy and 9-11, regional jets are more and more popular.
<b>Domestic vs. Int. market</b>	Brazil's aircraft sector is very dependant on U.S. market. Through the terrorist attacks, international demand dropped significantly.	Brazil can develop and produce half of the national demanded aircraft parts.
<b>Market share</b>	Brazil is strong in developing and manufacturing commercial and corporate jets, but lags behind in military aircrafts.	Embraer is fourth largest commercial aircraft manufacturer of the world.
<b>Trade flows</b>	Very/too dependant on U.S. aircraft market	Relatively great internal aircraft parts trade flows.
<b>Import/export numbers</b>		Embraer was the largest exporter in 1999, 2000 and 2001. Aircraft industry is a strong exporter for Brazil. Great import flows of aircraft parts from U.S.
<b>Price development</b>	Aircraft subsidies Program (Proex) causes unfair competition. WTO decided to sanction the Brazilian aircraft sector.	Brazil can develop and manufacture aircrafts cheaper than many competitors.
<b>Factor conditions</b>		
<b>Labour</b>		A lot of research is done in aviation, so Brazil can be self supporting regarding to its workforce, this is why companies that want to attract foreign highly qualified personnel will have to look in Brazil first.
<b>Interest rate / exchange rate</b>	The selling of airplanes is highly influenced by the exchange rate of the Real.	Lula da Silva stabilized the exchange rate of the Real and this had positive effect on the selling of airplanes and helicopters so far.
<b>Oil supplies</b>		Brazil is selfsupporting in its oil supply so the oil prices can be kept fairly low and they are not to dependent of the foreign oil supplies.
<b>Infrastructure</b>	Because of the large amount of airways it can be quite hard to maintain the infrastructures' quality, some foreign institutions like MITRES started projects to improve the state of infrastruture.	Overall the infrastructure is fairly good, but there are some pitfalls.

<b>Firm strategy, structure and rivalry</b>		
<b>Research and development</b>	The high-tech nature of the aircraft industry forces aircraft companies to spend large amounts of money on research and development	Extensive research and development makes use of many other techniques and thus stimulates other industries.
<b>Servicing facilities</b>		Brazil has a all servicing facilities for the locally used airplanes. Their dependence on foreign companies is very small.
<b>Market orientation</b>	Mainly foreign countries (US); little market in Brazil itself	Dependant on many foreign economies, which are not likely to all collapse.
<b>Aircraft Leasing</b>	Leasing stimulates longer use of older airplanes. This causes less demand for new aircrafts.	Lease companies flourish.
<b>Market Trends</b>	Currently a relative low number of Brazilians use airtravel	There is a lot of space for growth.
<b>Related and supporting industries</b>		
<b>Supporting industries</b>		Lots of suppliers in the same country, ease of negotiations and appointments. Due to the great distances, logistics can temper this advantage
<b>Government</b>		
<b>International relations</b>	Struggle for developing country to compete with high-tech competitors form western countries (Canada, France, US), little government support allowed by the WTO	Currency is low at the time → quite cheap export
<b>Collective Labour agreements</b>		Relatively Low-wages
<b>Protectionism</b>		The political structure was a barrier in the past, to much interference can influence firms in both positive and negative ways. Finally Brazilian politics seem to become stable.
<b>Chance</b>		
<b>War</b>	Crash of flight-industry after 11-9-01	More need for surveying planes
<b>Political changes</b>	In the past Brazilian government was quite instable	President Lula is expected to do good for Brazil

**Table 8-9: Strengths and weaknesses concerning the Brazilian aircraft sector**

## **8.13 Virtual Reality**

In this chapter the use of virtual reality techniques in the Brazilian aircraft sector is discussed. Embraer forms a nice example of this technique, since they have their own Virtual Reality Center. First some older techniques are discussed that led to the introduction of this Virtual Reality Center.

### **8.13.1 CAD/CAM**

Embraer started using *Concurrent Engineering* techniques in the ERJ-145 project in order to eliminate the need of modifications, originating from production and maintenance problems. Applying concurrent engineering with real time connection via CAD/CAM (Computer Aided Design/Computer-Aided Manufacturing) during the entire development process involved several project teams and manufacturing and technical assistance from Embraer and its main suppliers. The design of each component and part, approximately 19,518 different items, was facilitated by the use of a new technology with roots in CAD already used in the development of the Brasilia.

### **8.13.2 Electronic mock-up**

Called electronic mock-up, this resource not only made possible for the ERJ-145 to be totally designed by computer, but also practically eliminated one of the most traditional stages of an aircraft development. By generating three-dimensional images of each part and component of the ERJ-145 in real time and integrating them in a single database, the electronic mock-up allows a meticulous analysis of each part of the aircraft and its relation with the other components connected to it<sup>7</sup>. The use of the electronic mock-up eliminated the traditional mock-up work (a full-scale study model manufactured in wood). This resulted in a reduction of 50% of the allocated personnel (from 75 to 38 engineers) for the accomplishment of this task, saving approximately about 93,000 man-hours and US\$ 3 million.

### **8.13.3 Flight Simulator**

Another fundamental strategy was the flight simulator of the EMB-120, in which a database containing the aerodynamic characteristics of ERJ-145 was introduced. Through this artifice the pilots "flew" the ERJ-145 before it even existed, collecting information and correcting flight imperfections. The simulation of the airflow around the airplane, made possible by CFD (Computerised Fluid Dynamics) technology, was fundamental in the development of a new "cleaner" wing, with supercritical profile developed by Embraer. The complete development of the jet absorbed two million work hours or approximately four years.

### **8.13.4 Virtual Reality Centre**

The progress in the technological area caused the transition to the Virtual Reality Centre - CRV. Embraer built the VRC in partnership with SGI Silicon Graphics Inc., representing the biggest investment in IT of the

company, an operation at a cost of US\$ 2.6 million. The Centre began operation on February 7, 2000.

With the use of CRV for the development of the new family of ERJ-170 and ERJ-190 regional jets, the decision-making process became more effective, with early identification of problems and mistakes, design flaws, etc. There was a reduction of 50% of the time for the activity cycle (from finishing up the design of the aircraft to certification) and the time-to-market. The ERJ-170/190 is being developed in a timeframe of 38 months as compared to 60 months of the ERJ-145 program, representing a cost and time saving for manufacturing between 5% and 10%.

One of the main advantages for the company to assemble the Virtual Reality Centre was to expedite the development process of aircraft with the same technology as the biggest aerospace industries of the world. Thus, it will no longer be required that teams involved in projects would have to build replicas of each model developed, in real size or in scale, for tests – a significant saving of project time and cost reduction. This system allows the designer to accomplish a "virtual tour" in each section of the aircraft, perform tests, model structures, etc. The CRV technology can be applied in several areas such as in the design and manufacture, human model simulation, marketing (some sales were confirmed after the buyers made the virtual tour within the airplane), design review, manufacture (hangar), kinematics, ergonomics, corporate presentation etcetera. This system also allows the certification authorities to better evaluate the aircraft as it is being built.

One specific problem for which Embraer uses virtual reality is to analyze the cooling of a landing gear's brakes. It is very hard to interpret both the trends of the CFD (Computerised Fluid Dynamics) and the experimental results. Using virtual reality to visualize the phenomena helps to understand what is happening. [CAS02][CEI03]

### **8.13.5 VR in respect to the aspects of the Brazilian aircraft industry**

The Brazilian aircraft market has a large focus on foreign countries. To keep this export and maybe increase it, virtual reality can be used. Foreign customers could inspect or modify an aircraft remotely by using virtual reality. This saves a lot of traveling costs and prevents some potential expensive mistakes caused by unclarity between the aircraft company and customer.

Research and development is an important aspect of the aircraft sector. Using virtual reality can increase research speed as shown in the example above. Development of new aircrafts can be enhanced because virtual reality improves the process of working concurrently and visualizes errors in the design.

On the other hand virtual reality has some consequences for people in the area of physical model making. By using virtual reality the demand for

physical models decreases. Also the amount of needed salesmen could decrease, since customers can remotely inspect aircrafts by using virtual reality.

## **8.14 Conclusion**

After an elaborate research the following conclusions about the Brazilian aircraft industry can be drawn. Focusing on strong and weak aspects one sees that after the occurrences of 11<sup>th</sup> of September the production of regional jets has boosted, this compensates the decline in interest for the intercontinental airplanes. Because of the fact that Embraer is strong in developing regional jets the demand is expected to increase, Embraer might benefit from this.

An implicating weakness of the Brazilian Aircraft industry is the dependency on the U.S. aircraft market and industry. If a market mainly depends on one country, it can collapse if this country is coping with economic problems.

Brazil does have good prospects for the future, especially President Lula da Silva provided new economic stability after a period of low exchange rates for the Real and high interest rates. Today, more money is spent on development and research, which is good for the aviation industry.

The research and development on aviation reached a fairly high level, because the government supports this sector to cope with the great demand. The application of Virtual Reality might speed up research and development processes, especially during the implementation of new technologies in current products. This can be cost reducing and attract customers. Another benefit of using Virtual Reality is that customers can get better insight into the products they would like to buy. They might even be able to customize desired products.

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# 9 Architecture

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# Chapter contents

<b>9.1</b>	<b>Summary</b>	<b>235</b>
<b>9.2</b>	<b>General introduction</b>	<b>237</b>
9.2.1	Research question	237
9.2.2	Scope	237
9.2.3	Architecture in Brazil	238
<b>9.3</b>	<b>Porter applied to Brazil</b>	<b>242</b>
9.3.1	Demand conditions	242
9.3.2	Factor conditions	246
9.3.3	Firm strategy, structure and rivalry	249
9.3.4	Related and supporting industries	251
9.3.5	Conclusion	255
<b>9.4</b>	<b>Porter applied to the Netherlands</b>	<b>257</b>
9.4.1	Demand conditions	257
9.4.2	Factor conditions	258
9.4.3	Firm strategy, structure and rivalry	259
9.4.4	Related and supporting industries	261
9.4.5	Conclusion	262
<b>9.5</b>	<b>Similarities and differences</b>	<b>264</b>
<b>9.6</b>	<b>Virtual reality in Brazil</b>	<b>266</b>
9.6.1	Current state of virtual reality	266
9.6.2	Chances for virtual reality in Brazil	267
<b>9.7</b>	<b>Conclusion</b>	<b>269</b>
<b>9.8</b>	<b>References</b>	<b>270</b>

## 9.1 Summary

The Dutch and Brazilian architectural sector is described using Porter's Diamond. The determinants of Porter are demand conditions, factor conditions, firm strategy, structure and rivalry and related and supporting industries. The government and the element of chance will also be taken into account where applicable.

Both Brazil as the Netherlands have recently privatised the sector, which resulted in a growth of the market and demand. While Brazil has many smaller domestically operating companies, the Netherlands have a complex and fragmented market with larger internationally operating firms. Dutch companies are hi-tech with high standards, while Brazilian companies are more brick and concrete with cheap labour.

There is a large difference in the amount of international operations. Brazilian companies generate less than 1% of their turnover in foreign countries, while the Dutch top 5 in size generate 33% to 89% of their turnover in foreign countries.

In Brazil there are a lot more of materials to use in construction. The Dutch have to import. In Brazil, the climate and geographical conditions vary throughout the country. The Netherlands in much smaller, so architects have to cope with much more equal conditions. The most important geographical condition in the Netherlands is water.

In both of the countries different architectural studies are supplied in different forms of higher education. The better conditions of the Dutch educational system could be the cause of better conditions in the area of Human Resources in the Netherlands.

Both of the countries deal with urbanization. The Dutch, however do not have cities with millions of people. This huge urbanization in Brazil, asks for special skills in architecture. In Holland the lack of space, the high density of population and finding the balance between urbanized and rural areas are the main challenges.

In both countries the government plays the most important role in this sector. Almost everything that has to do with architecture has to deal with governmental issues.

Virtual reality enables faster design and greater flexibility because altering a virtual design is much faster. Reports of successful experiences of using VR in product development processes abroad begin to appear. Virtual reality can be used to be more competitive in (inter) national context where the role of commercial/industrial computer graphics is growing. Also for Brazil these developments are important. The interactive experience can make it easier to test a design under different circumstances and change immediately when needed. This is especially useful for Brazil. The greatest advantages for Brazil can be expected with the development of groupware

and virtual reality combination systems. With this system it will be possible for architects and constructors to work together even if they are not in the same room. For Brazil this is especially an advantage because of the great distances, but it can also be a need in the globalizing world to be competitive.

Problems to be recognized are that companies will have to make the huge initial investment in a virtual reality system. It is necessary to acquire or lease proper equipment, as well as modelling and virtual environment integration and development software, and there is also the cost of training staff and hiring expert labour.



## 9.2 General introduction

As a part of the preparation for Study Tour Samba an investigation of the meso aspects of Brazil is performed. In this chapter the meso aspects of the architecture sector will be covered. This section contains a general introduction to the sector and a brief history. The history of Brazilian architecture will be discussed and a very well known example of modern Brazilian architecture, the capital, Brasilia.

The rest of this chapter will be used to take a better look at the architectural sector in Brazil. To look at all of the subjects that are covered in this section in perspective, the situation in the Netherlands will be covered as well.

The Dutch and Brazilian architectural sector will be described using Porter's Diamond. A description of the Brazilian and the Dutch sector, using the determinants of Porter, will be given and will be used to compare the sectors. Concluding the strong and weak aspects of the sectors and an answer to the following research question will be given.

### 9.2.1 Research question

The research question that will be answered in this section:

*“What are strong and weak aspects of the selected sectors and what could Virtual Reality contribute to the development of these sectors in Brazil”*

As stated earlier, strong and weak aspects of the architectural sector will be described, using Porter's Diamond as a model and a tool to find these aspects. An attempt will be made to conclude how Virtual Reality is (or could be) used in order to meet these strong and weak aspects.

### 9.2.2 Scope

Under the ISIC classification sector 74 contains the business activities, where sector 742 more specifically contains architectural, engineering and other technical activities. This sector is divided in two parts:

- Sector 7421 - Architectural and engineering activities and related technical consultancy;
- Sector 7422 – Technical testing and analysis.

The scope of this chapter is sector 7421. While from this division it shows that testing and analysis is not a part of the sector this classification remains very broad and vague. Therefore, first will be given an overview of what is a part of this sector. [UNA03]

It is hard at first to grasp what this sector contains as it is not directly used like this as an industry. The main industry relating to this sector is the

construction industry and you can basically see the sector as a part of this industry. While the main focus is on architecture, it also contains all the related activities that come into play. However, while the industry focuses on the actual building, this sector focuses on the design, therefore encompassing the field of consultancy.

### **Architecture**

Brazilian architecture has earned worldwide recognition since the forties. The architect was then a solo player, his name and personal reputation an easily identifiable asset of paramount importance in the market place. This situation lasted for the next two decades but started to change in response to the boom of public works and industrial development projects that marked the seventies of Brazil. In order to cope with the new challenges, the individual offices gradually became the well-structured firms of today, focusing on a multidisciplinary approach. This enabled them to take on larger projects with more demanding technological requirements. [SIN03]

### **Consulting Engineering**

Consulting Engineering companies switched their business concentration when Brazil began to invest in infrastructure in 1960. Before that time, the company has concentrated on civil engineering work which was provided through builders and sub-contractors of public works projects. Consulting Engineering responded to the increase in demand for services to solve the countries investment and industrial infrastructure needs. The services offered by Consulting Engineering today include:

- Research and development of technology
- Technical and economical feasibility studies
- Basic and final engineering plans
- Procurement, technical supervision and follow-up
- Software systems
- Building and assembly supervision
- Implementation management
- Consultancy on privatization and concession of public works
- Consultancy on specific projects
- Setting up of quality programs[SIN03]

Architectural firms thus nowadays have much in common with their consulting engineering counterparts - in fact working in close cooperation with them or being the same. The sector comprises of these companies, but since so many fields come into play (as for example shown by the services provided) many industries relate.

## **9.2.3 Architecture in Brazil**

Brazilian colonial architecture is mainly derived from Portugal. Examples of this style can be found in churches and monasteries in older cities of Brazil, like Ouro Preto.

From the second half of the 19<sup>th</sup> century, there was a large French influence in Brazilian architecture.

After this, Brazilian architecture has evolved to its own style and has gained worldwide attention as one of the country's most characteristic art forms. "The volume and pace of urban expansion during the last 30 years have provided exceptional opportunities for combining social and functional needs with artistic expression. The result has been not only the burgeoning of many fine buildings, but also the birth of entire suburbs and completely new cities."

Good examples of modern Brazilian architecture in the 1940's are:

- the passenger terminal at Santos Dumont Airport (Rio de Janeiro)
- the Ministry of Education (Rio de Janeiro)
- the low-cost apartment buildings at Pedregulho (Rio de Janeiro)
- the Museum of Modern Art (São Paulo)
- the wave-shaped Church of Pampulha (Belo Horizonte)

More recent examples of modern architecture are:

- Reidy's Museum of Modern Art in Rio de Janeiro
- Vilanova Artigas' Faculty of Architecture (São Paulo)
- Lina Bo Bardi's Pompéia Cultural Center (São Paulo)
- Luis Filgueiras Lima's Sarah Kubitschek Hospital in Salvador (Bahia)
- and of course Brasilia [MRE03] [BRA03]

### **Brasilia**

The best known example of modern Brazilian architecture is the new capital city, Brasilia. It has a population of over 1 million people and is located in the Central-West of Brazil. Imagination and creativity were wisely used in the urban planning (mainly by *Lúcio Costa*, chosen on the basis of *national contest*) and the design of the main public buildings (mainly by *Oscar Niemeyer*) [MSI03].

The construction of Brasília was determined by the President of the Republic, Juscelino Kubitschek in 1956 and is now registered by UNESCO as a world heritage site [MRE03] [BRA03]. It was created *ex nihilo* in the centre of the country in 1956, and has become a landmark in the history of town planning.

"Urban planner Lucio Costa and architect Oscar Niemeyer intended that every element – from the layout of the residential and administrative districts (often compared to the shape of a bird in flight) to the symmetry of the buildings themselves – should be in harmony with the city's overall design. The official buildings, in particular, are innovative and imaginative." [WHC03]

The idea behind the city was to fill the great void in the deserted Central-West Region and to attract settlers in an effort to integrate this region with the coastal areas.



**Figure 9-1: Oscar Niemeyer**



**Figure 9-2: The famous cathedral in Brasilia**

## Architects

Major architects who worked in Brazil are Juscelino Kubitschek, Lucio Costa, Oscar Niemeyer and Israel Pinheiro.

Good examples of modern Brazilian architecture from its early period in the 1940's are: the passenger terminal at Santos Dumont Airport by the Roberto brothers and the Ministry of Education, both in Rio de Janeiro; the low-cost apartment buildings at Pedregulho outside Rio by Affonso Reidy; the Museum of Modern Art in São Paulo; and the wave-shaped Church of Pampulha in Belo Horizonte designed by Oscar Niemeyer. Later examples of modern Brazilian architecture are much more numerous; some of the most distinguished are: Reidy's Museum of Modern Art in Rio de Janeiro, completed in the 1950's; Vilanova Artigas' Faculty of Architecture in São Paulo (1960's); Olavo Redig de Campos' Brazilian Embassy in Washington, D.C. (1970's); Lina Bo Bardi's Pompéia Cultural Center, São Paulo (1980's); and Luis Filgueiras Lima's Sarah Kubitschek Hospital in Salvador, Bahia (1990's).

Of course, the best-known example of modern Brazilian architecture is the new capital city of Brasília, where imagination was given full flight. The urban plan conceived by Lucio Costa and the design of the main public buildings by architect Oscar Niemeyer have become landmarks in the realm of architecture on a massive scale. Especially noteworthy are Niemeyer's Palácio Itamaraty (home of Brazil's Ministry of External Relations) with its soaring concrete arches and water garden, and Brasília's Cathedral (considered by many to be Niemeyer's finest achievement) with its clasped fingers of concrete reaching prayerfully to the sky. (Niemeyer was also a participant in the group of architects who designed the United Nations building in New York City and the headquarters building of the Communist Party in Paris).

New buildings alone cannot create beautiful and harmonious urban environments. Alongside the bold new architectural concepts, a school of landscape designers headed by Roberto Burle Marx has arisen in Brazil to balance the images of concrete and glass structures with the welcoming greenery of gardens and parks. As a result of his work in many Brazilian cities, Burle Marx has acquired an international reputation. Examples of his work are now to be found in public and private gardens and parks in the Americas and in Europe.

## **9.3 Porter applied to Brazil**

Porter's diamond has four basic determinants and two additional variables. In this section, Porter's diamond will be used to describe the Brazilian architectural sector. Four basic determinants and two additional variables will be described to do so, being respectively:

- Demand conditions
- Factor conditions
- Firm strategy, structure and rivalry
- Related and supported industries
- Government
- Chance

The two variables government and chance will be covered within the parts of the four basic determinants.

### **9.3.1 Demand conditions**

First there will be an overview of the composition of the demand in this sector. The composition of the sector shows us where the demand is coming from. With this information the shape and growth of the market can be estimated. Furthermore, an idea will be given about how the international demand compares to the domestic.

#### **Composition**

Demand in this sector can be divided into three groups. The government used to be the primary contractor or architecture, engineering and construction services until recently. Many government companies have then been privatized, while the third group consist of companies that always have been private.

Before dealt with these three groups and the extent of their demand, the composition of firms in this industry will be roughly explained first.

The Brazilian legislation for government tenders does not allow engineering design and construction to be performed by the same firm. Thus most Brazilian firms have focused in either engineering/design or construction.

Brazilian architectural firms are fairly small, and their roles are usually limited to pure design work. They do not specialize and have a portfolio with all types of projects. Fees for full architectural services range from 1.5 to 2% of the project value, much lower than the average fees in other countries. Under existing Brazilian laws, price bidding is required in all government projects.

In most projects, services are hired separately for the design, engineering, procurement and construction. The lump sum approach is new, but one that major companies see as an increasing trend, especially in large projects.

Most private companies select architectural, construction and engineering services based upon price competitiveness, but service quality, company background and reputation are also taken into consideration.

Brazilian construction is predominantly brick and concrete and labour is still considered inexpensive. Firms that offer alternative construction methods may have good opportunities, but must be prepared to invest time to develop their market presence and establish their clientele.

[STR03]

#### *Government*

The government used to be the main provider of construction projects, once responsible for 98% of the contracts. However, tight budgets and commitments with the International Monetary Fund to balance its budget deficit led the Brazilian government to drastically cut expenditures in construction projects. Also, with the privatization of most infrastructure services, government project tenders dropped to 73% in 1998 and drop by another 10% in 1999.

Projects with partial government participation are transportation projects, such as highways, railways, waterways and ports. Furthermore, there are energy projects, such as pipelines, natural gas development, hydroelectric plants, transmission lines and powerhouses and a few general infrastructure projects, such as telecommunication expansions. This participation consists of stimulation programmes. Most of the companies that are responsible for these sectors were recently privatised.

[STR03]

#### *Privatised government sectors*

With the privatization of most public services, large contractors such as Camargo Correa, Norberto Odebrecht, and Andrade Gutierrez, which had a dominant public sector portfolio, are gradually shifting toward private sector projects. Investments in the following recently privatized sectors will lead to increased engineering and construction activities:

- Roads: Although trucks are responsible for 60% of cargo transport in the country, Brazil has only 161,000 km of paved roads, compared to 5 million km in the United States, 790,000 km in Japan, and 750,000 km in France. The new concessionaires have commitments to invest approximately US\$ 12 billion to repair, widen, maintain and build new sections.
- Railroads: The Brazilian rail network of 22,000 km is very small, compared to 200,000 km in the United States, 40,000 km in England and 23,000 km in Japan. Railroads are responsible for 23% of cargo transport in Brazil. Privatization of the entire network initiated in 1996 was completed in 1998. Lack of government investment for a couple of decades left the existing network in very poor condition and the new concessionaires have contractual commitments to invest approximately US\$ 3.3 billion during the 30-year concession period to upgrade, build and maintain the network.

- **Energy:** The power sector is expected to grow substantially over the short-to-medium-term. In order to meet an expected energy consumption increase of 4.7% a year, Brazil needs to increase its power generation by over 4,000 MW each year through 2008. According to preliminary statistics released by Eletrobras, Brazil needs to expand its installed power capacity from 61,300 MW to 104,600 MW in ten year's time. Under the government privatization program, sixteen power distribution companies and one bulk energy supplier had been privatized as of May 1999. Another sixteen power companies are expected to be privatized by the year 2000.
- **Telecommunication:** The government estimates approximately US\$ 75 billion in needed investment by the year 2003, and a significant share of that figure refers to construction activities. All telephone (cellular and fixed line) systems throughout the country were privatized in 1997 and 1998, with new Brazilian and international owners investing significantly to expand and modernize these infrastructures.
- **Sanitation:** The Federal Government is still discussing with Congress a new regulatory framework to speed up sanitation privatization and concessions. Brazil needs to invest about US\$ 33 billion by the year 2010 to adequately upgrade water and solid waste services to the Brazilian population. [STR03]

#### *Private sector*

Besides the large number of projects with government involvement, there are also many projects from private companies. These are a few of the more important sectors:

- **Industrial Construction:** Segments that have been investing in new construction include auto part manufacturers, chemical industries, transportation and logistics services. Industrial construction has been growing at an average rate of 20% per year in the last few years. The concept of "Business or Industrial Parks" is still new in Brazil, but one that has demonstrated potential growth. This is one of the sectors that has been least affected by the recent currency devaluation.
- **Shopping Centres:** There are currently 447 shopping centres in operation in Brazil; another 131 are under construction and 54 are in the design phase. The current economic recession has slowed down or cancelled many projects; however, experienced shopping centre developers and investors such as Multiplan and Previ are still optimistic and believe in a quick recovery of the sector.
- **Hotels:** International firms such as Choice, Melia and others are conducting aggressive expansion plans in the Brazilian business hotel market. Investment plans released to local press by some of them follow: Accor (US\$ 800 million), Previ (US\$ 300 million), Sol Melia (US\$ 300 million), Choice Atlantica (US\$ 100 million), and Marriott (US\$ 320 million). Currently, only 15,000 rooms are ranked at four to five stars in the State of Sao Paulo, the most



important centre of business in Brazil. New projects should increase this availability by 50% in the next three years.

- Resorts: Embratur, the Government authority responsible for tourism, has received project proposals totaling approximately US\$ 5 billion. Many projects are not only supported by the private initiative, but also by the Interamerican Development Bank. With the objective to create jobs and promote tourism, the Brazilian Development Bank (BNDES) will be offering special credit lines for hotel developments in Brazil. The sector has expanded at an average rate of 7% per year in the last 10 years. [STR03]

### **Shape and growth**

The Brazilian construction industry in 1998 was estimated at US\$ 75 billion, corresponding to approximately 9.8% of the GDP. Brazil's currency devaluation of 50% in January 1999 slowed down construction activities, but mid-to-long-term forecasts are conservatively optimistic. Due to the large privatization of public services implemented by the Brazilian government, the infrastructure segment should recover more quickly, followed by the industrial and commercial construction. Residential construction is suffering from lack of financing, high interest rates and an increasing unemployment rate. [STR03]

These sectors will be dealt in more detail.

#### *Infrastructure*

In 1996, the Brazilian government launched a program called "Brazil-in-Action", which consists of infrastructure and social projects strategically chosen to promote sustainable development in coming years. The program included the construction, upgrading and modernization of highways, railroads, ports and waterways that had suffered almost two decades of insufficient investments.

The newly privatised companies treated in the last section are committed to make heavy investments in upgrading, expanding and maintaining the existing infrastructure.

Investments in those projects totalled US\$ 55 billion in the first two years. The federal government participated with about 15% of the investments and the remainder of resources came from the private sector. At the end of 1998, the Brazilian Association of Infrastructure and Basic Industries (ABDIB) had identified 1,442 projects that called for investments of US\$ 229.2 billion through the year 2003. Many of the projects are to be implemented by the privatized companies. [STR03]

#### *Industrial Construction*

Brazil's economic stabilization begun in 1994 resulted in a strong inflow of foreign capital into industry segments such as automotive, food-processing, beverages, and others. The economic crisis did not discourage many investors, who believed in a fairly quick recovery. Considerable investments are being made not only by those new companies, but also by the Brazilian industries that needed to upgrade and modernize their plants in order to face new competitors. Many of them slowed down industrial production to

adjust to the immediate market situation, but maintained their plant expansion and construction plans. For foreign investors, the currency devaluation led to lower U.S. dollar costs for such projects and some expedited their expansion plans. [STR03]

#### *Commercial Construction*

Business class hotel construction is also booming in Brazil. Investments of approximately US\$ 2.4 billion have been made to build more than 70 hotels to be built by the end of year 2000. International hotel chains have plans to open several hotels in the next couple of years to meet the repressed demand for business hotels in major and secondary Brazilian cities. [STR03]

#### *Residential Construction*

Residential construction is stagnant due to high interest rates and a lack of financing. Sales volume of new homes in the Sao Paulo Metropolitan Area, the largest and the most important city in Brazil, was 28,600 units in 1998, a 55% drop compared to 1997 and no significant growth in this segment in 1999. In order to stay competitive in the market, leading contractors are looking for new products and technologies to reduce the construction costs, especially for the lower-income family housing. [STR03]

### **The degree to which the domestic demand is representative for the international market**

There are no official statistics concerning the volume of architectural, construction and engineering (ACE) services obtained from foreign countries. The volume of services performed by foreign firms is quite small, probably less than 1%.

Larger architectural, engineering and construction firms in Brazil do offer internationally recognized competitiveness. In a globalized market, several multinationals have chosen to open new plants or to expand their industrial activities in Brazil. To attend these more demanding clients, small-to-medium-sized Brazilian firms must acquire more modern and efficient construction technologies. [STR03]

Basically, since architecture and construction is traditionally a local or national activity, with the exception of specific special projects or buildings, the international demand is much less and not on the same scale as the domestic demand.

### **9.3.2 Factor conditions**

In this section another determinant of Porter's Diamond will be described: The factor conditions of the Architectural and engineering sector, as described in the General introduction, will be discussed. Specialized conditions for only this sector will be discussed as well as more generalized factors that describe conditions that affect more than one sector.

In this section mainly the supply side of the sector will be addressed and to what extent a good climate for the supply of architecture and engineering is

shaped. This is quite difficult, because the supply side of a sector like this is mainly formed by the demand.

Conditions that will be discussed are available materials, climate, geographic position, human resources and urbanization.

### Materials

60% of Brazil is covered with forests of which 45% is tropical rain forest. The hard wood in the Amazon is an important Brazilian product, but economically even more important is the exploitation of softwood in the states of Rio Grande do Sul and Paraná.

One of the most important products of Brazilian mining is iron ore. Brazil is world's largest exporter of iron ore [LAN03]. Brazil is also one of the world's largest steel producers. Next to car-industry this is an industry that has been able to flourish partially thanks to measures of the Brazilian government concerning the development of heavy industries [EVD03]

All of these products are important materials for the architectural sector. Not in the first place for the sector itself, but the availability of materials that have to be used when making buildings, creating cities, etcetera, creates a better climate for the architecture sector. The availability of materials to make the building sector flourish can be an important indicator of good conditions for the sector of architecture.

### Climate

However 90% of Brazil is within the tropics, more than 60% of the Brazilian lives in areas where altitude, sea winds or polar fronts moderate the temperature. There are five climatic regions in Brazil: equatorial, tropical, semi-arid, highland tropical and subtropical.

In this table some facts about the climate of different parts of Brazil can be found:

Cities	Climate
São Paulo, Brasília, Belo Horizonte (Plateau cities)	19°C; milder climate
Rio de Janeiro, Recife, Natal, Salvador (At the coast)	26°C; warmer, balanced by trade winds
Porto Alegre, Curitiba (South of Brazil)	Subtropical, frost in winter, hot summers
Region	Climate
Amazon	22-26°C; rarely above 32°C
Northeast	23-27°C; hottest
Inland	18-21°C; lower
South of Rio	17-19°C; seasons more noticeable

**Table 9-1: The Brazilian Climate [BRA03]**

The climate varies quite a lot in Brazil, which is obvious when you take a look at the size and the geographical position of the country. This must have some consequences for business in Brazil, also for the architecture sector. A consequence that can be thought of is the broad spectrum of weather influences to take into account when designing [BRA03].

Another aspect of the climate in Brazil is rainfall and drought. For example around the mouth of the Amazon, near the city of Belém, the upper regions of the Amazon (more than 2000mm/year) and the state of São Paulo heavy rainfall is quite common. On the other hand, in the Northeast, the driest part of the country, rainfall is undependable and the evaporation rate is very high. The rest of Brazil, however, had moderate rainfall (1000 to 1500mm/year) [WIZ03].

When looking at the history it can be seen that the climate of Brazil has had some influence on the architecture. Different sources tell that the architecture during the colonial period was derived from Portugal, with some adaptations demanded by the tropical climate [BRN03].

### **Geographic position**

Brazil covers an area of 8,511,965 Km<sup>2</sup> and is the fifth largest country in the world [TPU03]. It is based on relatively stable continental crust, mostly below 500 meters, with little or no volcanic or seismic activity. This rather stable conditions of the ground that has to be build on, does not appraise any special conditions for architecture [WIZ03]. This is different in many other regions of the world, where creativity in architecture is boosted by the necessity of coping with the hazard of earthquakes etcetera.

The three key elements to the geography of Brazil are the Amazon basin and the Pantanal wetlands in the North and Northwest, the central plateau on which the capital Brasilia is situated and the hills and mountains in the South and along the Atlantic coast [WIZ03]. So like already was made clear in the section concerning the Brazilian climate, Brazil is quite diverse, and architects have to keep that in mind.

### **Human Resources**

Human Resources is one of the most important aspects needed to create a good climate for almost every sector. Brazilian education is not of high quality, but there is a recent trend towards better education. However, higher education in Brazil is of better quality, with for example highly proficient faculties, on a par with similar institutions in the more advanced countries [SEB03].

Mainly, higher educated personnel are needed for the architecture sector. At about all of the universities in the larger cities, subjects like for example arts, design and industrial drawing are educated.

### **Urbanisation**

Brazil has a population of over 170 million people (2002). However, like already was stated, the area that is covered by Brazil is huge, about 80% of the population lives in the cities. Fourteen cities in Brazil have a population of over 1 million and the largest cities of Brazil are in the top of world's largest cities. São Paulo and Rio de Janeiro are two of the world's largest cities with populations of more than 20 million and 12 million respectively [WIZ03].

Two-thirds of Brazilians live in nine major urban centres: Sao Paulo, Rio de Janeiro, Belo Horizonte, Porto Alegre, Salvador, Recife, Fortaleza, Brasilia and Belem [BRN03].

Brazil's average population density is low compared to other countries. People live along the Atlantic coastal areas of the southeastern and northeastern states. Industrial activity is concentrated in the southeastern region, with 50 percent of the industrial production located in the state of São Paulo. Migration from the northeast to the southeast, as well as from rural to urban areas has been heavy since 1970. More recently, the population flow has turned towards the less inhabited central-western and northern regions [BRA03].

Town	State	Population of State
São Paulo	São Paulo	34.0m
Belo Horizonte	Minas Gerais	16.5m
Rio de Janeiro	Rio de Janeiro	13.3m
Salvador	Bahia	12.4m
Porto Alegre	Rio Grande do Sul	9.5m
Curitiba	Paraná	8.7m
Recife	Pernambuco	7.4m
Fortaleza	Ceará	6.6m

**Table 9-2: Division of population among the states of Brazil [TPU03]**

The urbanization of Brazil and its large cities create great opportunities for architecture and town planning. With a population of this size, mainly living in the enormous cities, a necessity of good and creative architecture and town planning is created. A good example of this necessity is the creation of Brasilia. Like already was addressed in an earlier section of this chapter “the urban plan and the design of the main public buildings have become landmarks in the realm of architecture on a massive scale” [MIS03]. Another fact that leads to the innovation of the rich Brazilian architecture and town planning heritage is the recent modernization of a great number of towns [MRE03].

### **9.3.3 Firm strategy, structure and rivalry**

In the section is about the firm strategy of the model of Porter will be discussed. This determinant will be related to the architecture in Brazil and deals with the way companies are created, organised and structured. The level of competitiveness is linked up with the level of innovation and development within a sector. The aspects that will be discussed are the (general) economic position, market structure, umbrella organisations, competitiveness and well-know firms.

#### **Economic position at this moment**

Brazil is the eighth largest economy in the world, and the largest one in Latin America. The GDP of Brazil is \$1.34 trillion. Because of the crisis in Argentina, an internal energy crisis and a decrease of foreign investments, the growth of the last years slowed down in 2001. Economic growth estimates of 2002 are only 1%. The EIU estimates a growth of 2,45% for the years 2003-2005 [EIU03].

Over the years, the construction market has closely followed overall GDP fluctuations in Brazil. The architecture and engineering market being part of the construction industry also follows. This market was in 1998 estimated at US\$ 75 billion, corresponding to almost 9.8% of Brazil's GDP. Brazil's currency devaluation slowed down construction activities. The long-term forecasts either are conservatively optimistic in view of investments in the recently privatized transportation, telecommunications and energy sectors.

The privatisation of public services in Brazil is considered to be the world's largest. The new private concessionaires are committed to make heavy investments in upgrading, expanding and maintaining the existing infrastructure.

### **Market structure**

There are about 150,000 companies in Brazil registered as architectural, engineering and/or construction firms. A concentration can be found in the State of Sao Paulo where 35,000 firms are registered. The market is an open market for foreign companies under certain restrictions.

The Brazilian legislation for government tenders does not allow engineering design and construction to be performed by the same firm. Most Brazilian firms have focused in either engineering/design or construction, since the government used to be the primary contractor of engineering and construction services until recently.

### **Umbrella organisations**

Brazil has several umbrella organisations. There are associations and unions which defend the interests of different parties.

All architectural, engineering and construction firms in Brazil must be registered with the Regional Council of Engineering and Architecture (CREA) in the state where their activities will take place. Institute of Architects of Brazil

### **National competitiveness and possibilities for foreign companies**

Larger architectural, engineering and construction firms in Brazil offer internationally recognized competitiveness. For foreign companies there are opportunities to become a partner with small to medium-sized Brazilian firms. In the globalized market, several multinationals have to expand their industrial activities chosen or to open new plants in Brazil. With the entering of these multinationals small-to-medium-sized Brazilian firms must acquire more modern and efficient construction technologies. No restrictions are made against foreign firms offering consulting services in Brazil. For architectural, engineering or construction activities this is however different. Foreign firms that want to be active in this sector must be either established in Brazil, or have a Brazilian partner [STR03].

### **Individual companies**

In 1998, gross revenues of the top 20 construction companies totalled US\$ 7 billion, almost 10% of the market estimated at US\$ 75 billion.

Below are the top 10 construction companies, according to oO Empreiteiroo magazine [OEM98] published in 1998.

1. Norberto Odebrecht
2. Andrade Gutierrez
3. CBPO
4. Camargo Correa
5. OAS
6. C.R. Almeida
7. Queiroz Galvao
8. Constran
9. Enterpa
10. Gafisa

The top 10 engineering firms, according to the same source were:

1. Promon
2. Jaakko Poyry
3. Engevix
4. Iesa
5. CTM
6. Concremat
7. Logos
8. Multiservice
9. Cobrapi
10. Ductor

Brazilian architectural firms are fairly small. Their roles are usually limited to pure design work. The portfolio of these companies is ranging from residential to institutional, industrial, commercial, and all other types of projects, so they are not specializing in a part of the sector. Fees for full architectural services range from 1.5 to 2% of the project value.

Some well-known architectural firms in Brazil include: Aflalo & Gasperini, Botti Rubin, Carlos Bratke, Edison Musa, Julio Neves, Ricardo Juliao, Ruy Ohtake, Sergio Teperman, etc.

### **9.3.4 Related and supporting industries**

When it comes to architecture in Brazil, almost everything has to be built from scratch. This gives a value chain that goes from zero to the full hundred percent. Therefore this sector is very attractive for a lot of companies. Many industries participate in this process, like the suppliers of the building materials, the designers of the construction and the people who put it all together. Besides, there are often other industries which come into play and make life easier or just more difficult. You can think of companies who care about aspects like environment preservation and social, functional, cultural, economic, historical and artistic needs. Moreover the government is the organization who will probably have biggest share in the whole process, e.g. the construction of new buildings in a city, new roads throughout the country, improvement of tourist attractions in

the middle of the Amazon and even the building of a complete new city like Brasilia.

This part will discuss the supporting and the related industries of the sector.

### **Supporting industries**

A lot of the work is done by independent companies who are deployed by the government (consulting industries, construction industries, etc.). Those companies themselves can deploy other companies, to deliver building materials for example. Taking one interesting aspect when it comes to architecture, this one is discussed in the next part.

#### *Road mapping*

Until the first half of the twentieth century Brazilian roads generally accounted for small occasional investment. There was no system covering the whole of the national territory. Most of these roads were dirt tracks. The constitution of a national road system, creating the inter-regional links necessary for the integration process, arose from the determination to equip the territory to meet, among other demands, the development of industry in São Paulo. A landmark in this phase was the 1952 National Road Plan, in which roads appear as the main means of transport.

Since the 50s and in particular since the 1970s, the Brazilian road network has grown accompanied by the paving and the duplication of roads, which have become modern and fast motorways. This growth is worthy of note in the northern (2,013.3%) and Central-Western (1,533.9%) regions, areas where the population was sparse and which at this time have become areas of progress in the process of interiorisation.

<b>Brazil and regions</b>	<b>Proportion of total paved roads in the country (%)</b>	<b>Density</b>
North	5.83	2.17
North East	28.19	26.03
South East	35.82	55.69
South	18.47	46.13
Central West	11.69	10.46
Brazil	100.0	16.88

**Table 9-3: Properties of Total Paved Roads in the Country, by Regions**

At present in the southeastern, northeastern and southern regions the highest number of surfaced roads and the greatest densities in the system (length in kilometres of the road system per thousand km<sup>2</sup> of area) were found. [MRE03]

### **Related industries**

Related industries can be corporations that come into play when it comes to environmental problems. Also you can think of relations when talking about the new capital city Brasilia, which wasn't the first planned city.

Here several organizations are discussed which can be seen as related industries.



### *UNESCO*

UNESCO stands for United Nations Educational, Scientific and Cultural Organization. Its constitution was adopted by the London Conference in November 1945, and entered into effect on the 4th of November 1946 when 20 states had deposited instruments of acceptance. It currently has 189 Member States.

The main objective of UNESCO is to contribute to peace and security in the world by promoting collaboration among nations through education, science, culture and communication in order to further universal respect for justice, for the rule of law and for the human rights and fundamental freedoms which are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations. [UNE03]

Although UNESCO doesn't play a very important role in this sector, it has its influences on the preservation of certain aspects in architectural and engineering activities and related technical consultancy.

The Brazilian city Ouro Preto is on the UNESCO's World Heritage List and has to be restored and protected. This gives additional value for companies who have to restore buildings, landscape architects, etc. Thus UNESCO is a related industry, although it is a worldwide organization. In the section 3 you can find what The Netherlands have on the world heritage list.

### *CONAMA*

The development of environmental policies in Brazil is not only a prerogative of the government anymore. Society, concerned with the future, has been continuously manifesting itself, creating associations for the protection of nature and promoting popular manifestations of environmental defence. Besides, this is always a main point in the media.

These policies, expressed in legislation and institutional organisation, define the State's intervention instruments in the administration of resources and the quality of the environment. In the sphere of industrial pollution control, the Second National Development Plan (1975- 79), in its chapter on urban development, pollution control and preservation of the environment, defined the priority for the control of industrial pollution, through the adoption of anti-pollution norms and an industry location policy in densely urbanised regions. The legislation authorises the creation of licensing systems in states and municipalities for the installation and functioning of potentially polluting activities.

The establishment of the Environmental National Policy (Law 6938, from 31/8/81) inaugurated a new phase for the environmental question in the country. The current strategies and institutional arrangements in force are consolidated in this law and its decrees. Among the instruments adopted in the application of the law, the zoning and environmental risk control, and the evaluation of environmental impacts distinguish themselves for their innovative character.

Another important initiative for the preservation of the environment was the introduction of criminal responsibility for environmental degradations, with procedures defined and regulated by law 7347, from 03/6/85. This law creates the public civil action of responsibility for damages to the environment, the consumer and to artistic, aesthetic, historic and tourist goods.

Since the implementation of law 6938, the federal government has announced several Resolutions of the National Environmental Council (Conama) to discipline and set out the environmental problems of the country. The analysis of the law's 15 years of existence show that the environmental question is recognised in Brazil, although few states have managed to implement effective actions and acquire the instruments to face an agenda aimed at the preservation of ecosystems, be they natural or man made.

The National Environmental Council (Conama) is the consultative and deliberative organ of the National System of the Environment (Sisema), both instituted by law 6938/81. As a deliberative organ, the Conama has approved a number of disciplinary resolutions regarding the Brazilian environmental question. Among them stand out the following, as illustrated by the table:

<b>Resolution Conama</b>	<b>Subject</b>
04/85	Defines Brazilian ecological reserves
20/86	Classifies the waters of the national territory
07/87	Norms for the use of asbestos
09/87	Talks about Public Audiences
06/88	Inventory of industrial residues
05/89	Institutes the National Program of Air Quality Control
02/90	Institutes the silence program for noise control
03/90	Establishes the air quality standards
08/90	Establishes emission standards for fixed sources of combustion
06/91	Talks about the destruction of residues of health establishments, ports and airports
07/94	Talks about the importation of any kind of residue

**Table 9-4: Resolution Conama**

These resolutions have become viable through the actions of the states' environmental organs or by the Brazilian Institute of the Environment and Natural Renewable Resources (Ibama) via their specialist departments [MRE03].

#### *CETESB*

CETESB stands for Company of Environmental Sanitation Technology. Cetesb is the organ linked to the government of São Paulo State responsible for the evaluation, prevention and control of environmental pollution, as well as the execution of scientific and technological services direct or indirectly related to its field of action. Linked to the State's Secretary of the Environment, it constitutes a mixed economy partnership divided in 31 units located in the State's main cities.

Due to the fact that urban pollution is more significant in São Paulo, despite existing in other Brazilian cities, Cetesb's is the most representative data and its environmental control actions serve as reference to other States in Brazil. The main activities of this environmental agency are the monitor ship and control of environmental pollution; the research, development and transfer of technologies regarding the environment; and the technical assistance to municipalities in sanitation matters. The Company also acts as technical organ of the State's Environmental System (Sisema) and of the National Environmental Council (Conama).

Since its creation in 1968 Cetesb has put together a relevant portfolio of success stories in the control of environmental pollution characterising itself as an entity of excellence in Latin America and recognised by international organisations such as the Pan-American Health Organisation and the United Nations Program for the Environment. In order to maintain a scientific exchange with other countries and promote its actions, Cetesb has a home page on the Internet.

Among the activities developed by Cetesb, for the improvement of environmental conditions in the State of São Paulo, are a 24-hour service to the community which covers the whole state and aims at identifying causes and adopting protective measures for the community and the environment against possible damaging effects; the licensing system of pollution sources; the control of urban pollution through plans of action to prevent and remedy problems related to the quality of air, water or soil, caused by stationary sources (industries), mobile sources (vehicles), non conventional sources (rubbish incineration, building sites, public services, etc) and specific sources of inconvenience (noises, vibrations, smells). Urban sewers and waste are special concerns of Cetesb.

Cetesb has been trying to change the way of seeing and understanding the environment, both by the governing authorities and the communities, via programs of assistance to municipalities, and programs of support and environmental education. The idea is to find agreed solutions for urban sanitation problems. Cetesb also maintains programs of inspection and control which directly influence around 5 thousand priority industries, and has a register of 80 thousand companies, which are potential water, air and/or soil polluters. [MRE03]

### **9.3.5 Conclusion**

Until recently most of the demand for this sector was generated by the government. Most government infrastructure services were privatised and because of a lack of government investments in the last years, there are many improvements to be made. This means the privatised companies will generate a lot of demand. At the private sector side there good chances in the hotel and resort sector.

The currency crisis of 1999 slowed down development in the whole construction industry. Due to the large privatization of public services implemented by the Brazilian government, the infrastructure segment should recover more quickly, followed by the industrial and commercial

construction. Residential construction is suffering from lack of financing, high interest rates and an increasing unemployment rate.

Larger architectural, engineering and construction firms in Brazil do offer internationally recognized competitiveness. However, at the moment a negligible amount of demand is generated by or for the international market.

Considering the factor conditions of Brazil it can be said that quite a good climate is shaped for the architecture sector. The natural wealth in Brazil provides a lot of materials that can be used in related industries and this is likely to boost the demand for architectural labour. The Brazilian climate and geographic position do not pose very special conditions on the architectural sector. These factors only state once again that Brazil is a country full of differences. Brazilian architects have to cope with a lot of different geographical and climate-related conditions.

The greatest boost to the architectural sector is given by urbanization and modernization of Brazilian towns. More and more people live in the enormous city, which demands creative and innovative architecture and towns planning.

No real obstructions can be found in education. Architectural labour is mainly done by higher educated personnel and quite a lot of programmes on this matter can be found.

Over the years, the construction, architecture and engineering market has closely followed overall GDP fluctuations in Brazil. Economic growth estimates of 2002 are only 1%. The estimated growth the economy in Brazil is 2,45% for the years 2003-2005. The construction market was in 1998 was estimated at US\$ 75 billion, corresponding to almost 9.8% of Brazil's GDP. The long-term forecasts either are conservatively optimistic in view of investments in the recently privatized transportation, telecommunications and energy sectors. The privatisation of public services in Brazil is considered to be the world's largest.

There are about 150,000 companies in Brazil registered as architectural, engineering and/or construction firms. In the State of Sao Paulo are 35,000 firms concentrated. Brazilian architectural firms are fairly small. All architectural, engineering and construction firms in Brazil must be registered with the Regional Council of Engineering and Architecture (CREA).

Looking at the related and supporting industries one can say that the industry in this sector remains constant. That means that, since Brazil is such a big country, there will always be maintenance to old structures and plans for new ones. But some projects can be of good value for this industry for still a long time. For example, the roads are still in bad shape nowadays, and need to be surfaced or improved in a lot of areas within the country. This (and also other projects) makes this sector a very attractive one for the industry.

## 9.4 Porter applied to the Netherlands

To come with good conclusions the description of the architectural sector of Brazil will be compared to the architectural sector of the Netherlands. The same determinants and additional variables as used to describe the Brazilian situation will be used in this section.

### 9.4.1 Demand conditions

First there will be an overview of the composition of the demand in this sector. The composition of the sector shows us where the demand is coming from. With this information the shape and growth of the market can be estimated. Furthermore, an idea will be given about how the international demand compares to the domestic.

#### Composition

The market has grown considerably in recent years due to both definitional changes in what constitutes the public market and increasing out-sourcing by the public sector.

The market is both complex and fragmented. It comprises of central government, regional and local government, state-owned enterprises and privately and publicly-owned enterprises which are granted a monopoly or concession to provide a public service. [TPP03]

The privatisation of government companies only started recently with the transportation, energy and telecommunication market. Most projects still have a lot of government involvement and participation in the infrastructure sector and they are still the prime contractor.

The hi-tech services oriented atmosphere of the Netherlands provides a good base for several larger internationally operating companies that work in the architecture, engineering and consultancy sector. The Dutch are known for their experience with waterworks and often consulted in this matter.

The residential construction sector is heavily regulated by the government. However, this does not make the market transparent. In the residential construction sector there has been a large shortage of supply, which cannot keep up with demand and drives prices up. This is basically for bureaucratic reasons and is not expected to improve in the near future. [EYN03]

#### Shape and growth

The total market consists of 64.5 billion euro, 7.0% of the GDP [KAM02]. The forecast for the construction sector are following the absence of economic recovery. After an increase of 2.5% in 2001, there was a slight decrease in 2002, which is expected to be larger for 2003. From 2004 to 2008 the sector as well as the economy is expected to recover. The recovery could be unevenly distributed among the sector. [WKZ03]

The infrastructure sector account for 15,6% of the total sector and shows a yearly growth of around 6% for the last few years. This is because of the private sector (mega projects) because government expenditures have been steady. In 2003 and after that this steady growth is expected to decline. In a few years the government investments are expected to increase.

The industrial and commercial construction sector (24.9%) show slightly lower results stable in the last years with the declining economy. It has had a strong increase the last few years and is expected to recover quite fast in 2004.

Residential construction (31,5%) will continue its decline of the last few years. The number of building permits is also expected to decline until 2004, while demand is still high. Because of the structural problem in this market, this will not change in the near future. However, this market will follow the recovery trend after 2004 of the rest of the sector.

[WKZ03]

### **The degree to which the domestic demand is representative for the international market**

The Netherlands have quite a few large internationally operating firms in the architectural, engineering and consultancy sector. Being an internationally, services and business oriented country these companies have a lot of international projects, ranging from 33 to 89% of their turnover in the top 5 [DHV03]. This means the international market is quite important for Dutch companies in this sector.

Dutch companies are competitive in the international market because of the high standards and thus high quality results and involvement in many highly regarded projects including the waterworks. The Netherlands follows the international economic trends for the large part and thus is the domestic demand quite representative for the international.

## **9.4.2 Factor conditions**

### **Materials**

The Netherlands has a leading position in the world market for horticultural products and is a major exporter of meat and dairy products. The country also benefits from significant natural gas resources and is the fourth largest producer in the world. There are hardly any materials needed for construction that can be found in The Netherlands apart from sand and maybe other products needed for cement etcetera.

### **Climate**

With a mild maritime climate the summers are generally warm with changeable periods, but excessively hot weather is rare. Winters can be fairly cold with the possibility of some snow. Rainfall is prevalent all year [TPN03]. These conditions do not pose any special demands on the architectural sector. They have to be coped with, but nothing rare can be found here.

## Geography

The Netherlands covers an area of 41,532 Km<sup>2</sup>. It is bordered by the North Sea, Belgium and Germany. Large areas have been reclaimed from the sea and consequently one-fifth of the country lies below sea level. The country is flat and level and many rivers and canals can be found [TPN03]. These facts have to be taken into account in the architectural sector. The Dutch have to cope with the forces of nature's water. Not only with bridges and tunnels to create an infrastructure in between of all the rivers and canals, but also with for example dikes to keep the lower parts of the country dry. The Dutch are known all over the world for the necessity to cope with water. "The history of the country has been determined by the struggle against water." [MVW03]

## Human Resources

With a broad supply of programmes on architecture on mainly higher education level, a good climate for new architects is created. Higher education, which is of quite high quality, offers education on, among others, architecture, landscape architecture, city planning and history of architecture. These programmes can be found at universities and schools trough whole the country [ARW03] [ARN03].

Year	1993	1994	1995	1996	1997
Number	12700	20595	20560	22435	25635

**Table 9-5: Total number of employees in the architecture sector [PLO99]**

## Urbanisation

About 16 million people live in the Netherlands. This makes it one of the most densely populated countries in the world. The population density is 472 inhabitants per km<sup>2</sup> [TPN03]. It is obvious that this requires special attention while designing buildings, cities, infrastructure, etcetera.

Town	Population
Amsterdam	734,316
Rotterdam	598,568
The Hague	450,635
Utrecht	260,345
Eindhoven	204,596
Arnhem	141,062

**Table 9-6. Principal commercial centres and towns, 2002 [TPN03]**

Next to the urbanized areas there still are rural areas. Together with the density of the population this forms a problem. One of the most important goals of the Dutch government in this area is coming up with ideas to combine and transform these rural and urbanized parts of the country.

## 9.4.3 Firm strategy, structure and rivalry

### Economic position at this moment

After the Dutch recession in the 80's, the 90's were a period of large economic growth. Only recently, the economy has shown lack of growth,

mostly because of the unstable world situation. The GDP will probably increase by 0.75% in 2003 and 1.75% in 2004 [CPB03]..

Because of the slowed down economic grow in 2002 and 2003 the construction sector is faced by a going down production level. In 2001 the total production grew with 2.5% percent. The expected growing rate for the years 2002 was -1.7 percent [KAM02].

The need for architectures engineering activities depends of course on the demand in construction activities, which are influenced by the general economic situation.

Looking at the tables below, which contain some numbers of the architecture sector, you may conclude that the growth of the architecture sector is indeed linked up with the growth on the economic situation. The recent less positive rates of the economy in the Netherlands will certainly influence the demand for construction activities in a negative way.

Year	1993	1994	1995	1996	1997
Number	3965	6185	6050	6485	7160

**Table 9-7: Total number of architecture companies [PLO99]**

Year	1993	1994	1995	1996	1997
Number	2322	3591	3594	3823	4454

**Table 9-8: Total overview of the turnover in the architecture industry (in million guilders) [PLO99]**

### Market structure

There are about 7160 companies (1997) in the architecture industry and 78 000 companies (1999) in the construction sector.

### Umbrella organisations

In the Netherlands there are several umbrella organisations. Some of these organisations are government organisations or started as government's initiatives.

Some important organisations are listed below:

- Architectuur Lokaal – goal is to improve the quality of architecture and share knowledge
- Ministerie van OC & W – decides about culture(architecture) policy and sponsors projects via sub organisations
- Raad van Cultuur - Council for Culture. The statutory advisory body to the Dutch government on issues of cultural policy
- Rijksbouwmeester – concerned with the quality about architecture and landscape planning

The government in the Netherlands actively governs with town, city and landscape architecture via different local and national departments. Some important national departments are:



- Ministerie van Verkeer en Waterstaat – infrastructure;
- Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer – landscape architecture;
- Rijksplanologische Dienst – landscape architecture.  
<http://classic.archined.nl/sites/overheden.html>

Some of these will be described further in the next section: Related and supporting industries

Private organisations are mostly sector specific related, like WeBNA, BNO and BNI

#### **9.4.4 Related and supporting industries**

Architecture in The Netherlands gives us a slightly different picture than that of Brazil. Just look at the difference in size. Because The Netherlands is densely populated, the assignment of new areas for these purposes is not that easy. People live closer together, population is growing, the need for a larger airport, increasing traffic jams, etc.. These factors don't make it easy to get to a good solution.

##### **Supporting industries**

Supporting industries for the architecture sector in The Netherlands would be all supplier and service organizations involved in the process.

When looking at the present situation of the architecture sector in The Netherlands, one can say not that much is going on. The roads are in pretty good shape and most of the work done here is maintenance. The same is true for the railways and the waterways. The cities are expanding, but most new buildings are flats. New cities are simply not built because of the lack of space. Only a few new suburbs are being built at the moment. E.g. the expansion of Schiphol airport also ran into a lot of governmental and environmental problems and that doesn't help that much for an attractive industry.

However, these “problems” with space as well as with water require a lot of innovative and creative designs. Thus, many ground-breaking projects have been executed, which provided a lot of expertise knowledge.

As in section 2, some organizations will be discussed which can be seen as related industries. Some of them are already mentioned in the previous section of umbrella organizations.

##### *UNESCO*

Also The Netherlands has some sites on the world heritage list. These include Schokland and its surroundings, Defence Line of Amsterdam, Mill Network at Kinderdijk-Elshout, Historic Area of Willemstad, Inner City, and Harbour, Curaçao, Ir. D.F. Woudagemaal, Droogmakerij de Beemster (Beemster polder) and Rietveld Schroder House.

Thanks to being on this list, there is a larger amount of money available to preserve these sites, and so it influences the architectural sector in a positive way.

#### *VROM*

Like CONAMA and CETESB in Brazil in The Netherlands there is the VROM, which stands for spatial arrangement, public housing, conservation and public accommodation. Since The Netherlands is a small country the VROM will very often be an intervening party. [VRO03]

VROM works with other state authorities, companies, social organizations and institutions, interest groups and all inhabitants of The Netherlands.

#### *Ministry of transport, public works and water management*

This ministry takes care for traffic via roads, waterways and by air and for clean water in rivers, lakes and the sea. Since The Netherlands has many roads and many waterways, this gives the sector a lot of work, and so is of great value for the industry. You can think of great projects for controlling the water level within the country like the dikes.

### **9.4.5 Conclusion**

The Dutch architectural sector is both complex and fragmented. It comprises of central government, regional and local government, state-owned enterprises and privately and publicly-owned enterprises which are granted a monopoly or concession to provide a public service. Privatisation only started recently and resulted in significant growth in the sector. The market is high-tech and internationally orientated.

The architecture and constructing sector seems to follow the general economic situation. In The Netherlands the expected growing rate of the construction sector for the years 2002 was -1.7 percent. In 1997 7160 companies in the architecture industry were count. This sector had a total income of 4454 million in 1997. The architecture sector in The Netherlands is in a quiet phase. Most of the work is maintenance, because a lot of big projects have passed already. While this sector is an important one with a good value chain, it is not a very attractive industry in the country. Most work is related with the government, which means a lot of different interests of other parties.

Forecasts for the sector follow the recent economic trend, with no growth at the moment and recovery from 2004-2008. The infrastructure sector and the industrial and commercial construction sector are expected to grow, while the residential construction sector is expected to decline further.

Many Dutch architectural companies are operating internationally. Dutch companies are competitive because of the high standards and thus high quality results and involvement in many highly regarded projects including the waterworks. The Netherlands follows the international economic trends for the large part and thus is the domestic demand quite representative for the international.

There are hardly any materials needed for construction, that can be found in The Netherlands apart from sand and maybe other products needed for cement etcetera. The climate conditions do not pose any special demands on the architectural sector.

With a broad supply of programmes on architecture on mainly higher education level, a good climate for new architects is created. Higher education, which is of quite high quality, can be found in the whole country.

## **9.5 Similarities and differences**

Both Brazil as the Netherlands have recently privatised the sector, which resulted in a growth of the market and demand. Most demand is still generated by the government and it still has much influence. While Brazil has many smaller domestically operating companies, the Netherlands have a complex and fragmented market with larger internationally operating firms. Dutch companies are hi-tech with high standards, while Brazilian companies are more brick and concrete with cheap labour.

The size of the sector is slightly higher in Brazil in terms of the value as well as the percentage of GDP. The forecasts for Brazil are good, with positive growth, while the Netherlands are forecasted to have a decreasing growth.

The big difference is the amount of international operations. While both countries are recognised for their architecture (Brazil because of well known architecture and the Netherlands because of the waterworks), there is a large difference in the amount of international operations. Brazilian companies generate less than 1% of their turnover in foreign countries, while the Dutch top 5 in size generate 33% to 89% of their turnover in foreign countries.

In Brazil there are a lot more of materials to use in construction. However, the Dutch seem to be perfectly able to import most of the materials they need.

Other differences are formed by the climate. In Brazil, the climate and geographical conditions vary throughout the country. The Netherlands in much smaller, so architects have to cope with much more equal conditions. The most important geographical condition in the Netherlands is water.

In both of the countries different architectural studies are supplied in different forms of higher education. The better conditions of the Dutch educational system could be the cause of better conditions in the area of Human Resources in the Netherlands.

Both of the countries deal with urbanization. The Dutch, however do not have cities with millions of people. This huge urbanization in Brazil, asks for special skills in architecture. In Holland the lack of space, the high density of population and finding the balance between urbanized and rural areas are the main challenges.

Both have to deal with a lot of governmental issues. In both countries the government plays the most important role in this sector. Almost everything that has to do with architecture has to deal with governmental issues. You can think of conservation, sanitary and pollution control, town and city planning and landscape architecture. Because the size of The Netherlands is so small these issues are even more correlated than in Brazil. For example, when building an airport site; the problem with noise inconvenience will be more likely in The Netherlands than in Brazil.

Furthermore in The Netherlands a lot of the work is already done, which still has to be done in Brazil. Think of road building, waterworks projects, etc.. Therefore this sector is more attractive in Brazil than it is in The Netherlands. Knowledge out of these projects in The Netherlands can be used to service projects in other countries like Brazil. For example the new planned city Brasilia did get a lot of help from the knowledge of the planned city Canberra (Australia).

In the table below facts about Brazil and the Netherlands are set out to each other.

	<b>Brazil</b>	<b>The Netherlands</b>
<b>Demand conditions</b>		
Composition	Simple Domestic Brick and concrete	Complex, fragmented International Hi-tech
Main demand	Government	Government
Size	\$75 billion 9.8% of GDP	€ 64,5 billion 7.0% of GDP
Growth	Forecasted as good	? 2,5% 2001, ? in 2002/3
Infrastructure	?	?
Industry and commercial	?	?
Residential	-	?
International operations	1% of turnover	33 to 85% of turnover
International competitiveness	Recognized Well known architecture	Good, high standards Waterworks
<b>Factor conditions</b>		
Construction materials especially from	Brazil	Import
Architectural studies	Yes, higher education	Yes, higher education
Circumstances	Climate differences, very big cities	densely populated country
<b>Firm strategy, structure and rivalry</b>		
Number of architecture companies	N.A.	7160 (1997)
Number of architectural, engineering and/or construction	150,000	N.A.
Turn over architecture companies	N.A.	4454 mil. (1997)
<b>Related and supporting industries</b>		
Government intervention	Yes, but less than in The Netherlands	Yes
Attractive industry sector	Yes, lot of work to be done in this sector	No, most work done for maintenance of old projects
Value chain in sector	Massive value chain	Not a big value chain anymore
Knowledge in sector	Not that much	A lot, e.g. in waterworks

**Table 9-9: Comparison Porter's diamond**

## **9.6 Virtual reality in Brazil**

Because there are many interpretations of virtual reality, a short introduction to virtual reality is given in this section to define what VR is and how it can be used in the architecture sector. Virtual Reality is the simulation of a real or imagined environment that can be experienced visually in the three dimensions of width, height, and depth. Virtual Reality systems additionally provide an interactive experience, visually in full real-time motion with sound and possibly with tactile and other forms of feedback. In the case of architecture this means that designs are made virtual or those existing constructions are made virtual to redesign them. In the VR systems the virtual design can be altered with the goal to construct the final design in the real world. With the help of virtual reality design time can be reduced a lot. VR is the intuitively correct man machine interface for all product design process stages. That technology is a fast method to recognize design errors instantly. With VR is possible to have an error reduction, time-gains and cost-reduction.

In combination with groupware systems designs can be made in teams. These teams also can be virtual teams, which means that the group members are geographical 'distributed'. These systems are under development, but for the future there is a great chance for these systems [BLO03].

### **9.6.1 Current state of virtual reality**

Because of the lack of appropriate information and because of the difficulty of expressing it is hard how far virtual reality is developed in Brazil. By searching in Internet resources, it was found that virtual reality is a serious subject for many parties and that support architecture business with Virtual Reality is a part of that. Often there is cooperation with foreign companies / institutions. The list below shows examples of visible Brazilian virtual reality that supports constructing activities:

- Virtual Reality Laboratory of the university of Santa Catarina, "Master and develop Virtual Environments, through research and applications close to the society and the industry."
- Laboratory of Integrated Systems of Cidade Universitária, "To develop virtual reality applications required by industry and society. " (This laboratory has international cooperation with Media Research Lab of the New York University).

## 9.6.2 Chances for virtual reality in Brazil

Virtual reality enables faster design because altering a virtual design is much faster. In international context the role of Virtual reality grows. To be more competitive in (inter) national context it is important to invest in virtual reality.

Application	Year 2000 (3D Portion) U\$ Billion	Year 2005 (3D Portion) U\$ Billion	CAG	3D CAG
Virtual reality	U\$1.4 (U\$1.4)	U\$3.6 (U\$3.6)	21%	21%
CAD/CAM	U\$18.5 (U\$7.6)	U\$25.9 (U\$15.9)	7%	16%
Art/Animation	U\$7.2 (U\$5.2)	U\$15.1 (U\$11.0)	16%	16%
Multimedia	U\$27.5 (U\$7.5)	U\$48.5 (U\$16.7)	12%	19%
Real-time Simulation	U\$1.2 (U\$1.2)	U\$2.2 (U\$2.2)	12%	12%
Scientific Visualization	U\$6.2 (U\$1.5)	U\$13.0 (U\$3.9)	16%	22%
Graphic Arts	U\$10.3 (U\$4.3)	U\$25.8 (U\$12.6)	20%	25%
Other	U\$9.4 (U\$2.6)	U\$15.1 (U\$5.4)	11%	16%
<b>Total</b>	U\$81.7 (U\$31.3)	U\$149.2 (U\$71.3)	13%	18%

**Table 9-10: Worldwide forecast for commercial/industrial CG applications (CAG = compound annual growth)**

As said earlier Brazil has different climate circumstances that influence the constructions. The interactive experience can make it easier to test a design under different circumstances and change immediately when needed. The greatest advantage in Brazil can be expected with the development of groupware and virtual reality combination systems. With this system possibilities will be created for working architects and constructors together even if they are not in the same room. For Brazil this is especially an advantage because of the great distances, but it can also be a need in the globalizing world to be competitive.

Virtual reality will not provide equal advantages for all companies. Some companies will choose to only operate local for example. Problems to be recognized are that companies first have to make investments in a virtual reality system but do not have enough money for this. More successful companies can more easily afford this and will be more competitive. Thus, this will be more difficult for smaller and less competitive companies, making the market less diverse. It is necessary to acquire or lease proper equipment, as well as modelling and virtual environment integration and development software, and there is also the cost of training staff and hiring expert labour. Greater industrial investment in this area is also discouraged by a lack of useful literature. There are few published reports of practical experience, and no objective comparisons of VR performance results against traditional approaches in terms of time and cost savings in product development processes. This picture is changing somewhat over the last years due to greater investments and to the emergence of successful cases. Advances in VR research provides increasingly powerful hardware and software tools, and more sophisticated immersion and

interaction feelings, thus attracting greater interest from several industrial segments and an increasing number of users and applications. Additionally, reports of successful experiences of using VR in product development processes abroad begin to appear.

Obviously, acceptance of these new processes and methodologies by engineers and technicians is not immediate, and there is a natural and understandable resistance to change. Therefore, a great effort is necessary in information, publicity, and usage justification for this new technology. The use of virtual systems in a larger scale depends heavily on the evolution of equipment and software technology to increase the number of approaches that can be effectively and precisely simulated, as the credibility of the technique is crucial for the decision of introducing a procedural change.



## 9.7 Conclusion

To answer the research question,

*“What are strong and weak aspects of the selected sectors and what could Virtual Reality contribute to the development of these sectors in Brazil.”*

The architecture (related) industries of the Netherlands and Brazil are examined. There are no remarkable extreme shortages or advancements in the industry sector in Brazil (in comparison with the Netherlands), but there are important differences. There is a large difference in the amount of international operations. Brazilian companies generate less than 1% of their turnover in foreign countries, while the Dutch top 5 in size generate 33% to 89% of their turnover in foreign countries. Dutch companies are more familiar with hi-tech and high standards.

By researching the virtual reality aspects the following conclusion can be drawn:

Virtual reality enables faster design because altering a virtual design is much faster. Reports of successful experiences of using Virtual Reality in product development processes abroad begin to appear. Virtual reality can be a way to be more competitive in (inter) national context where the expected use of commercial/industrial computer graphics grows. Also for Brazil these developments are important if they want to become more internationally orientated. The interactive experience can make it easier to test a design under different (climate) circumstances and change immediately when needed. This is especially useful for Brazil. The greatest advantage in Brazil can be expected with the development of groupware and virtual reality combination systems. With this system possibilities will be created for working architects and constructors together even if they are not in the same room. For Brazil this is especially an advantage because of the great distances, but it can also be a need in the globalizing world to be competitive.

Problems to be recognized are that companies will have to make the huge initial investment in a virtual reality system. This will be more difficult for smaller and less competitive companies, making the market less diverse.

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# 10 Human health activities

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## Chapter contents

<b>10.1</b>	<b>Abstract</b>	<b>275</b>
<hr/>		
<b>10.2</b>	<b>Introduction</b>	<b>276</b>
10.2.1	Hospital activities	276
10.2.2	Other human health activities	277
10.2.3	Virtual reality and the medical sector	277
10.2.4	Porters diamond	279
<hr/>		
<b>10.3</b>	<b>Brazil</b>	<b>280</b>
10.3.1	Government	280
10.3.2	Hospital activities	282
10.3.3	Other human health activities	289
<hr/>		
<b>10.4</b>	<b>The Netherlands</b>	<b>294</b>
10.4.1	Government	295
10.4.2	Hospital activities	296
10.4.3	Other human health activities	299
<hr/>		
<b>10.5</b>	<b>Comparison</b>	<b>303</b>
10.5.1	Government	303
10.5.2	Hospital activities	303
10.5.3	Other human health activities	306
<hr/>		
<b>10.6</b>	<b>Conclusion</b>	<b>308</b>
10.6.1	Hospital activities	308
10.6.2	Other human health activities	308
10.6.3	Virtual Reality in Brazilian human health activities	308
<hr/>		
<b>10.7</b>	<b>References</b>	<b>311</b>

## 10.1 Abstract

This document describes the *hospital activities* and *other human health activities* sector in Brazil, and tries to relate this to the development of Virtual Reality (VR) techniques. Hospital activities incorporate both the hospital activities in the public and private sector. Other human health activities include activities in health clinics, blood and organ banks, and emergency medical systems. The sectors were investigated using the four determinants of Porters diamond model: Demand conditions, firm strategy and rivalry, relating and supporting industries, factor conditions. Influences by the government were described for both sectors combined. The same analysis was done for the sectors in the Netherlands, and several important distinctions were noted. One of the most important observations the fact that the Brazilian system creates a large health facilities gap between the rich and poor. The high-tech hospitals for the rich will however have a large demand for VR-techniques. The lack of qualified personal in Brazil is also an important stimulus for VR-techniques. The VR-technique telemedicine has a lot of potential in Brazil because of the way health facilities are spread across the country.

## **10.2 Introduction**

This paper was written as a part of the preparation for the S@MBA study trip to Brazil in October 2003. The second phase of this preparation is to find an answer to the following research question

*What are strong and weak aspects of the hospital activities and other human health activities sector and what could Virtual Reality contribute to the development of these sectors?*

This paper is part of this phase, the so-called meso-assignment. It focuses on Brazil and compares it to the Netherlands. A porter's diamond model will be used to make an analysis of both sectors.

The exact interpretation of '8511-hospital activities' and '8519-other human health activities' [BOE03] for this chapter will be given in this introduction. Application of Virtual Reality techniques in the sector will also be discussed. The introduction will conclude with a description of porter's diamond model.

For both Brazil and the Netherlands an introduction on the health organization and a description of the influences of the government on both sectors will be given. A detailed analysis of the sectors strong and weak points following the four determinants of the sectors will be given for both sectors. In a separate chapter the countries will be compared and in another chapter conclusions from this comparison will be derived.

### **10.2.1 Hospital activities**

The Hospital activities sector 8511 can be divided into three parts: 8511/1 Public sector hospitals, 8511/2 private sector hospitals and 8511/3 nursing home activities. In this chapter the nursing home activities subclass (8511/3) will not be discussed.

8511/1 Public sector hospital activities, includes the activities of hospitals with or without NHS Trust status. Hospital activities such as medical and surgical; technical care activities such as diagnosis, treatment, operations, analyses, emergency activities, etc. Accommodation activities such as boarding, meals, etc. could also be discussed This includes short or long term hospital activities of general and specialised hospitals, sanatoria, preventoria, asylums, mental hospital institutions, rehabilitation centres, leprosaria and other health institutions which have accommodation facilities, including military and prison hospitals. The activities are chiefly directed to in-patients and carried out under the direct supervision of medical doctors.

8511/2 Private sector hospital activities include and exclude the same activities and conditions of the public sector hospital activities. These activities are however not performed in public but private hospitals.



This class excludes health activities for military personnel in the field, private consultants' services to in-patients, dental activities without accommodation, ambulance and rescue activities. The emphasis will lie on the public hospitals in the various countries [SIC03].

### **10.2.2 Other human health activities**

The other human health activities sector 8519 (sometimes coded 8514, but always the last of the 851 human health activities sector) includes activities for human health not performed by hospitals or by medical doctors but by paramedical practitioners legally recognized to treat patients.

This class may include activities of nurses, midwives, physiotherapists or others in the field of optometry, hydrotherapy, medical massage, occupational therapy, speech therapy, chiropody, homeopathy, chiropractics, acupuncture, etc. These activities may be carried out in health clinics such as those attached to firms, schools, homes for the aged, labour organisations and fraternal organisations, in residential health facilities other than hospitals, as well as in own consulting rooms, patients' homes or elsewhere.

This class also includes the activities of dental para-medical personnel such as dental therapists, school dental nurses and dental hygienists, the activities of medical laboratories the activities of blood banks, sperm banks, transplant organ banks and the ambulance transport of patients

This class excludes the production of artificial teeth, denture and prostatic appliances by dental technicians who do not fit them and the testing activities in the field of food hygiene [SIC03].

In this document the following subdivision will be made.

- Health clinics (this also includes home care)
- Blood and organ banks (this also includes sperm and organ transplant banks)
- Medical laboratories
- Emergency medical systems (this emphasizes on ambulance services)

### **10.2.3 Virtual reality and the medical sector**

The medical industry utilizes virtual reality (VR) a great deal. Doctors are using it to treat diseases more effectively. They can study images of a cancer patient's body structure to plan an effective radiation therapy technique. Doctors also commonly use surgical modelling to learn how an organ responds to a given surgical instrument. This allows doctors to master surgical procedures without having to endanger anyone by learning "on-the-job". Some doctors even use virtual reality to cure patients of certain phobias.

Doctors are using virtual environments to treat cancer more safely and effectively. Doctors study 3D images of a patient's body structure to plan

radiation therapy so it damages a minimum of healthy tissue as it destroys the cancer.

### **Examples of VR in the medical sector**

People with acrophobia (the fear of heights) are often treated with virtual reality. The patient is subjected to a virtual world that exercises their fear. In the acrophobia example, they could be looking over the side of a cliff in their simulation. The patients are usually able to overcome their fears due to the fact that they know the situation is only computer simulated and can not actually harm them [MIT96].

In Georgia, engineers are developing a sophisticated data glove so that one-day cancer specialists in Atlanta will "feel" tumours in patients 130 miles away, sensing its size, texture, and pressure [WVR03]. There are many more applications where doctors use virtual environments to better visualize their patients conditions. Another example is augmented reality where a patient's echo data is blended with a view of the real world through VR eyeglasses [VRM03].

Currently research is done for the use of virtual reality as an analgesic. Patients are in a virtual environment e.g. flying in an ice cave or tagging along as a gorilla with other monkeys while surgery is being done. The brain is too distracted by the virtual activities to process the pain stimulant so no pain is being perceived. The VR-analgesic could be an excellent replacement for traditional analgesics like morphine because it has no known substantial side effects. The VR-analgesic could also be used for patients with fear of needles or for patients in such extreme pain that no additional morphine can be administered. [ADV03].

An application field on the rim of what is known as Virtual Reality is telemedicine. Telemedicine is the use of telecommunications for medical diagnosis and patient care. It involves the use of telecommunications technology as a medium for the provision of medical services to sites that are at a distance from the provider. The concept encompasses everything from the use of standard telephone service through high speed, wide bandwidth transmission of digitized signals in conjunction with computers, fibre optics, satellites, and other sophisticated peripheral equipment and software. Telemedicine can be divided into three areas: aids to decision-making, remote sensing, and collaborative arrangements for the real-time management of patients at a distance. As an aid to decision-making, telemedicine includes areas such as remote expert systems that contribute to patient diagnosis or the use of online databases in the actual practice of medicine. This aspect of telemedicine is the oldest in concept. Remote sensing consists of the transmittal of patient information, such as electrocardiographic signals, x-rays, or patient records, from a remote site to a collaborator in a distant site. Collaborative arrangements consist of using technology to actually allow one practitioner to observe and discuss symptoms with another practitioner whose patients are far away. [TEL03]

### **10.2.4 Porters diamond**

Porter's diamond is a model, which can be used to analyze the competitiveness of a sector in a country. The diamond defines four attributes of a nation: Factor conditions, firm strategy and rivalry, related and supported industries and demand conditions. These attributes will be described separately for each sector and country. Two additional variables (government and chance) are modelled too, so that the following represents the model. To formulate accurate conclusions, a comparison needs to be made with a similar analysis of another country.

#### *Factor conditions*

This attribute deals with the production factors available for the sector. Among the examined factors one could find human resources, interest rate and infrastructure.

#### *Firm strategy, structure and rivalry*

This determinant deals with the organization of the companies in this sector, and the rivalry between local companies.

#### *Related and supported industries*

This attribute examines the presence of related industries, and the value of it for the particular sector. Local rivalry forces firms to move beyond basic advantages that the home country may enjoy, such as low factor costs.

#### *Demand conditions*

This determinant examines how the market in the particular sector demands a certain production. A more demanding local market leads to national advantage, whereas a strong, trend-setting local market helps local firms anticipate global trends.

#### *Government*

According to porter the government strongly influences the competitive forces within an industry. The government's policy will be described simultaneously for both sectors.

#### *Chance*

Although circumstances can strongly influence the competitiveness of an industry, there are no applicable aspects for the two sectors in Brazil and the Netherlands.

## 10.3 Brazil

Considering the fact that Brazil has over 170 million citizens, the medical sector is seriously under developed. Comparing to similar countries, Brazil has a much lower level of development. The government tries to improve the health sector by giving it a higher priority and by giving more attention to quality instead of quantity [EVD03].

The government decided that all Brazilian subjects are entitled to at least a minimum level of healthcare. They set up the basic drug program to ensure this. Other large healthcare projects include the reform project by the Worldbank (REFORSUS). The main objective of this project was to improve the delivery of care under the Unified Health System (SUS) and to assist the government in introducing policy forms in order to improve the financial sustainability and efficiency of the SUS [WOR01].

### 10.3.1 Government

The Ministry of Health is also the national coordinator of the Unified Health System (SUS). The federal government, through the Ministry of Health and the National Health Council, in coordination with other federal agencies, regulates the working of the health system operations and the setting of technical standards for health care. Moreover, the Ministry of Health is also part of the National Rural Development Council and Community Unity Council, both of which engage in multi-sectoral activities. Some statistics on the government expenditure on health are given in Table 10-1.

Total expenditure on Health, Share in GDP (%)	8,3
General Government expenditure on Health Share, in Total expenditure on Health (%)	40,8
Private expenditure on Health, Share in Total expenditure on Health (%)	59,2
General Government expenditure on Health Share, in Total Government expenditure (%)	8,4
Out-of-Pocket Expenditure, Share in Total Expenditure on Health (%)	38,5
Social Security spending on Health, Share in General Government Expenditure on health (%)	0
Prepaid plans, Share in Private Expenditure on Health (%)	35,1
Per capita Total expenditure on Health, at average exchange rate (US\$)	267
Per capita Total expenditure on Health, at International Dollar rate (\$)	631
Per capita Government expenditure on Health, at average exchange rate (US\$)	109
Per capita Government expenditure on Health, at International Dollar rate (\$)	257

**Table 10-1: Government expenditure on health statistics for Brazil in 2002 [WHO03]**

All three levels of government carry out intersectoral actions and programs, formalizing healthcare activities through contracts and agreements. At the federal level, the Ministry of Health's Internal Control Secretariat (CISSET) is responsible for supervising and auditing health expenditures. The CISSET, however, is also connected to the Ministry of the Treasury's Federal Secretariat for Control, and the Federal Court of Accounts—a legislative agency responsible for external audits. The Office of the Attorney General, whose functions include ensuring “effective respect by the Government Branches and by services of public relevance for the rights ensured under

this Constitution,” monitors, inspects, and investigates complaints about the compatibility of actions and services with constitutional and legal provisions, as well as the legality of health system expenditures once the Federal Constitution of 1988 has characterized such health actions and services as an area of “public relevance.” The National Auditing System is ultimately responsible for supervising, evaluating, and monitoring activities in the health sector, with direct functions determined by the levels of government with which they are associated.

At each level of government the health councils and conferences act as social control authorities, with the former regularly monitoring the activities carried out and the expenditures incurred. There is a law (law 9656/98) on private health insurance plans, which is the primary instrument for regulating the activities of public corporations that offer private health care/insurance plans and is the exclusive province of the federal government.

The Ministry of Health coordinates the National Health Information Network (RNIS), which is available on the Internet, to encourage access to and the exchange of health information for use in management, planning, and research applications by SUS administrators, agents and users, and additionally, promote professional training in health sector information and technologies.

The Human Resources Policy Coordination Office (CGPRH), under the Ministry of Health’s Health Policy Secretariat, is the agency in charge of subsidizing the formulation and implementation of national human resources policy in health. It also coordinates the Equitable Health Services Program, established to deal with one of the sector’s most serious problems: the distribution of health professionals. Accordingly, it works to ensure more equitable distribution of health professionals throughout the country. Some persistent human resources problems include inequalities in the salaries received by health care professionals and in hiring and job performance, as well as work practices that are not in keeping with health system objectives.

In June 1998 a new legislation concerning the private health assistance market was enacted. The main consequences of this new Law were: the market was opened to foreign companies, all companies will have to be inspected and regulated by Brazilian insurance authorities (in the past only health insurance companies were formally audited and inspected by the Government) and all companies will have to comply with minimum capital requirements and also offer a minimum package of services. The legislation is still going through adjustments, as a result of pressures from the companies and customers [HEA03].

For the past two years, the Ministry of Health, through public consultation, has been regulating clinical protocols and issuing therapy guidelines for a variety of pathologies that require the prescription of special drugs, establishing criteria for their diagnosis and treatment, as well as prescribing safe, rational, and efficient medications. At the primary care level, public health institutions have standardized treatment protocols in

place for a variety of pathologies. Programs for hypertension, diabetes, AIDS, and tuberculosis have well-established treatment protocols. Some hospitals, especially university hospitals, apply protocols that have not yet been disseminated to SUS hospitals [PAN03].

Enacted on 21 March 2001, Law 10.205 establishes Brazil's national blood policy. In addition to prohibiting remunerated donations of blood and blood products, other objectives of this law include guaranteeing self-sufficiency in terms of hemocomponent production, qualitative integration of the blood bank network, and establishing a national blood system. The Ministry of Health has set up a blood quality control program within the Brazilian Program for Quality and Productivity (PBQP). The objective of this program is to improve the quality of blood used in transfusions and set up a national policy on blood and blood products, to guarantee the availability, safety, and quality of blood [PAN03].

The Ministry of Health coordinates the National Transplant System, in charge of overseeing the processes of locating and distributing human tissue, organs, and other body parts harvested for medical purposes. The National Organ Clearinghouse (Central Nacional de Notificação, Captação e Distribuição de Órgãos) maintains a list of potential recipients, operates the national transplant notification system, and coordinates organ distribution between the states, as well as the work of transplant centres throughout the country. State centres coordinate transplant activities within their jurisdictions. In 2000, 6.552 transplants were performed, which was 17% more than in the previous year and 60% more than in 1995.

### **10.3.2 Hospital activities**

#### **Demand conditions**

With over 170 million people Brazil has the sixth largest population in the world after that of China, India, the United States, Indonesia and the Russian federation. The Brazilian population is predominantly young with 62% under 29 years of age. Considering the high rate of population growth during the early and mid 20th century, Brazil has undergone a dramatic demographic transformation since 1970. This trend is largely due to a massive urbanisation process and economic modernisation. In 1980, 67% of the population was urban. In 2000, over 81% lived in cities. The fertility rate fell from 6,3 children per woman in the early 1960s to 4,4 in the 1980s, resulting in a decrease of the annual rate of population growth from 2.9% in the 1960s, to less than 1,9% in the 1990s [BEL03]. Table 10-2 shows some health care related statistics of Brazil, mostly dated 2001.

<b>Population</b>	174.468.575
<b>Age structure</b>	0-14 years: 28.57% (male 25.390.039; fem 24.449.902) 15-64 years: 65,98% (male 56.603.895; fem 58.507.289) 65 years and over: 5,45% (male 3.857.564; fem 5.659.886)
<b>Population growth rate</b>	0.91% (2001 est.)
<b>Birth rate</b>	18,45 births/1,000 population (2001 est.)
<b>Death rate</b>	9,34 deaths/1,000 population (2001 est.)
<b>Net migration rate</b>	-0.03 migrant(s)/1,000 population (2001 est.)
<b>Sex ratio</b>	at birth: 1.05 m/f under 15 years: 1.04 m/f 15-64 years: 0.97 m/f 65 years and over: 0.68 m/f total population: 0.97 m/f (2001 est.)
<b>Infant mortality rate</b>	36.96 deaths/1,000 live births (2001 est.)
<b>Adult mortality rate</b>	Per 1000 inhabitants: 247 males, 134 females
<b>Life expectancy at birth</b>	total population: 63.24 years male: 58.96 years female: 67.73 years (2001 est.)
<b>Life expectancy at age 60</b>	male : 9.4 years, female : 13,0 years
<b>Total fertility rate</b>	2.09 children born/woman (2001 est.)
<b>HIV/AIDS - adult prevalence rate</b>	0.57% (1999 est.)
<b>HIV/AIDS - people living with HIV/AIDS</b>	540,000 (1999 est)
<b>HIV/AIDS - deaths</b>	18,000 (1999 est.)
<b>Expectation of lost healthy years at birth due to poor health</b>	males : 13,3 years, females : 11,0 years
<b>Percentage of total life expectancy lost due to poor health</b>	males : 20,2%, females : 15,2%

**Table 10-2: Health indicators of Brazil dated 2001 [MOB03]**

The demand for health care is increasing, this is partly explained by the simple fact that the population is still growing. Another explanation could be that the average life expectancy is increasing, resulting into more older people, who require more medical attention. A very important aspect of the demand for health care is the disease known as AIDS. AIDS was first detected in Brazil at the beginning of the 80's. At the time, the disease was confined to the coastal areas of the States of São Paulo and Rio de Janeiro and mainly affected male bisexual and homosexual groups in the medium-to high-income brackets as well as haemophiliacs and people who received contaminated blood and blood derivatives. By the end of the 90's, however, the epidemic had spread geographically and socially: in various locations throughout the country there was an increase of the number of cases of infection among women and low-income social groups. Today, AIDS can be found in all Brazilian States, with the poorer populations being the most affected by the disease and heterosexual transmission being the most common means by which the virus is spread [BRT03].

### **Firm strategy structure and rivalry**

In Brazil the Ministry of Health (MoH) is the Coordinator of the country's overall health policy. "Serviço Único de Saúde" – SUS (Unified Health System) is the national public healthcare system. Brazilians are entitled to

free healthcare through SUS. In addition to the public sector, there is a large and wide private health network in Brazil, which complements the services provided by the Government.

Table 10-3 shows there were 7.346 hospitals in Brazil in January 2003. These Hospitals can be divided into three categories: public hospitals, private hospitals and teaching hospitals. Public hospitals are owned and mostly managed by the Federal, State and local health authorities. In the past few years some States have licensed the management of public hospitals to the private sector. Although public hospitals make up almost thirty percent of the total hospitals in Brazil, due to their low number of beds per hospital their number beds are slightly over a half of this percentage. Private hospitals exist in two types. There are business-run hospitals that are owned by companies or individuals. These individuals are usually doctors. The non-profit or charitable hospitals are owned by individuals, companies, foundations and religious organisations. Some private hospitals also treat public patients through SUS on a reimbursement basis. Non-profit hospitals are entitled to tax exemptions on the purchase of equipment, if more than 60% of their services are provided to public patients. Teaching hospitals are owned by universities that provide health-related courses. They exist both as public or private hospitals. Public federal University hospitals are subordinated to the Ministry or State Secretary of Education. Teaching hospitals receive a 20% higher reimbursement from SUS than the non-teaching hospitals [HMA03].

Category	Hospitals		Beds		Beds per Hospital
	Size	Share	Size	Share	
<b>Public hospitals</b>	2.150	29 %	87.400	16 %	41
<b>Private hospitals</b>	5.040	69 %	409.200	75 %	81
<b>Teaching hospitals</b>	154	2 %	47.600	9 %	309
<b>Hospitals</b>	7.345	100 %	544.200	100 %	75

**Table 10-3: Statistics on the hospital market of Brazil in January 2003 [HMA03]**

Brazil has several state-of-the-art hospital units, which are comparable to the best hospitals in the USA and Europe. However, these are heavily concentrated in the most developed centres, like Rio de Janeiro, São Paulo and Porto Alegre. Brazil also has a considerable number of hospitals that operate in very poor conditions both in the private and public sector, either due to lack of financial resources or to bad administration.

The relationship between the public and private health systems is rather conflictive. In particular, the private sector tends to believe that the public sector is incapable of fulfilling its obligation to provide the whole population with health care. Therefore, it would prefer to see it concentrate its efforts on the basic health needs of the country, such as vaccinations and prevention campaigns, actions against epidemic diseases, sanitation, and providing health care only to that section of the population that is unable to join any private health plan. In other words, the private sector would like to see the public health system reduce its role as direct supplier of health services, while increasing that of regulator and overseer. In particular, most feel that there is a need in the market for clearer regulations to ensure fair competition. On the other hand, the public health system is very attached



to the role it was given by the SUS. Therefore, it is reluctant to accept privatization of the health system and commercial exploitation of health care. From its point of view, the privatization of health care would lead to further exclusion of the rural areas and would be of no benefit to the majority of the Brazilian population who have to rely on the public health system [ZAR03].

Brazilian private hospitals are mostly owned by doctors (or a group of doctors), private health assistance companies (HMO's), and philanthropic organisations. Doctors rather than managers until recently have managed hospitals. However, pressures from the private health assistance companies, an increase in competition, and the reduction of the country's inflation in the past 5 years have highlighted the need for better cost management. Thus, professional managers are now being introduced as hospital owners look for efficiency savings. An indication of this trend is the increasing number of Hospital/Health Management post-graduation courses being offered in the country in the past 3-4 years.

Recent history was characterised by a strong growth in the supply of health services, especially in the area of public establishments. The number of public hospitals in the 1980's grew from 1,217 to 1,966 and that of public establishments without hospital facilities grew from 8,828 to 20,817 between 1980 and 1989. The rates of growth for these two types of establishment were 61.5 % and 135.8 % respectively. In the case of the private sector, the rates, in spite of being significant, were less intense. The number of private hospitals grew from 4,893 to 5,238 (7%) and that of establishments without hospital facilities grew from 3,551 to 6,881 (93.9%). So, from a general point of view, Brazil had around 7.2 thousand hospitals at the end of the 80s, with the predominant presence of the private sector, and 27.7 thousand establishments without hospital facilities, in which the presence of the public sector is predominant [HEA03].

The opening of the market to foreign companies should increase the quality of services and reduce cost to the customer. The need for gains of scale should lead to the increase of mergers and acquisitions within the sector. Already the hospital industry in Brazil is going through a major consolidation process, with the concentration of hospital units in larger groups through acquisitions and/or mergers/associations. Brazilian companies will be under pressure to modernise and improve their services due to increasing competition, which will follow from the operation of foreign companies in Brazil in this sector. Demand for IT, training and management services are likely to grow. Managed Care is one of the tools that the Brazilian private health assistance plans are considering to improve efficiency. In addition, private health assistance companies, like the public health sector, are now investing heavily in preventive programmes aimed at reducing their claim's rate in the short and longer term. At the moment most customers in the private sector are from the upper and middle classes. It is expected that the growth in this area should now come mainly from the lower middle classes.

## Related and supporting industries

Supporting industries are sectors that somehow support the health sector. Since hospitals are buildings, industries such as building companies could be included, as well as the food industry for supplying the necessary food for the patients. It was decided however to focus on medical related industries only. The following industries will be discussed in detail:

- Drugs and other health inputs.
- Equipment and technology

### *Drugs and other health inputs*

Making drugs available for the population remains the most challenging public health problem, with the exception of specific success stories such as Brazil's program for getting medication to those infected with HIV, which has received international recognition. One indication of this is the relative weight of drug expenditures in terms of family budget, especially among the population with the lowest levels of income. For the lowest income decile, the average total per capita monthly health expenditures represent 6.8% of per capita family income. Per capita monthly expenditures on drugs account for 5.06%, almost 75% of which is spent on health. This percentage is always equal to or greater than 60% of expenditures in the fifth decile and below.

This strong showing with respect to drugs appears to be linked to three factors: self-medication, the lack of drugs available for the population using the outpatient services system, and the fact that private health plans do not cover these expenses. Several innovations are being considered with a view to reorganizing SUS drug benefits. The Ministry of Health launched the Basic Drug Program to facilitate access by the population to essential drugs. The aim of the program is to distribute essential drugs used in treating the most common illnesses to municipalities with fewer than 21,000 inhabitants and to rationalize prescription practices by preparing a drug registry and drug therapy protocols. The Basic Drug Program is a standardized stock of some 40 drugs supplied in the necessary quantities to meet the needs of approximately 3,000 individuals over an average period of 3 months.

Decile	Per capita expenditure on regularly used drugs (R\$)	Total per capita expenditure on health (R\$)	% per Capita income spent on regularly used drugs
1	1.1	1.42	5.06
2	2.21	2.94	5.13
3	3.22	4.72	5.02
4	4.07	6.27	4.67
5	5.45	8.96	4.73
6	8.04	13.42	5.47
7	7.78	15.70	3.96
8	10.13	23.10	3.71
9	12.69	36.34	2.97
10	20.48	83.78	1.65

**Table 10-4: Relative weight of drug expenditures per capita expenditure [PAN03]**

In 2000, the Ministry of Health budgeted R\$ 991 million for the purchase of prescription drugs (4.4% of the federal expenditure), 56% of which went to

purchase drugs for the National Program on STD/AIDS [PAN03]. There is no data available on prescription drug expenditures for the other levels of government. Significant steps are being taken toward regulating the drug market in terms of price monitoring and the regulation of generic drugs. This is embedded in Law 9.787.

#### *Equipment and technology*

Providing equal access to highly complex technology resources poses one of the most difficult challenges to the public health system given the Federal Constitution's guaranteed right to comprehensive care. According to the data from the Brazilian Institute of Geography and Statistics (IBGE) in 2000, these resources are concentrated primarily in the South and Southeast. Moreover, the vast majority of such equipment belongs to the private sector.

Of the 14 types of diagnostic imaging equipment available, the IBGE's 1999 Health Care Survey (AMS 1999) found that 68.2% were located in the South and Southeast. Moreover, AMS 1999 found that Brazil's private sector owns more than 80% of 10 types of this equipment, and more than 90% of 6 of these (magnetic resonance imagers, tomography units, ultrasound Doppler, X-ray units for measuring bone density, simple mammography and stereo mammography units). Taking all three X-ray power categories into account (up to 100 mA; 100 to 500 mA; and 500 mA +), there are a total of 15,995 X-ray units in the country, only 25.9% of which are located in public health facilities. Of these, 39% are in the power category of up to 100 mA. Taking all facilities providing services in the public system into account, the total number of X-ray units available in the SUS is 10,582, or 66% of the country's total. With respect to the 2,149 mammography units in the country, 75% are located in facilities in the South and Southeast; 92.6% belong to private facilities; 41.6% are available to the public system (public + private SUS facilities). Thus, only 7.4% of this equipment is located in public facilities. This was also found to be the case for optical equipment: approximately 71% of these units are located in the South and Southeast, where 83% belong to the private system. Although the public system provides health care to 75% of the population, it has only 52% of the country's available imaging equipment (considering SUS public and private networks). With respect to the distribution of haemodialysis units in Brazil, the Southeast Region has the highest concentration, with more than 50%, whereas the corresponding figure in the North and Northeast is approximately 20%. These data point to a disturbing fact: the extraordinary expansion of the public network was not based on a rational policy for incorporating technology that would guarantee regional health care networks access or appropriate care in all cases.

### **Factor conditions**

#### *Human resources*

Hospital activities mainly rely on highly qualified labour, which requires a high level of education. The rate of schooling of children and adolescents in Brazil is still low. While only 75% of the poor children frequent the first grade, almost all (97%) those from families with income higher than 2 minimum salaries per month per capita are at school. The rate of schooling

is 90% in the urban area and 72% in the rural. This results in a relative low amount of available highly qualified labour in the poorer areas.

Brazil has one of the lowest ratios of nurses to doctors in the developing world (0.33 : 1 in 1996) and an average of only 13 doctors per 10.000 residents. Increasing numbers of women are entering the medical profession. In 1996, 31.9 % of all practicing physicians in the country were women. The distribution of health services and health professionals in the country is characterized by a heavy concentration of human resources in the most developed regions and in the state capitals. The health sector accounts for about 8% of all jobs in the formal economy of the country.

According to Ministry of Health data, between 1997 and 1998 there was a slight increase in the number of health professionals (physicians, dentists, nurses, and nursing auxiliaries) per 1.000 residents in the poorest regions (North and northeast). Nevertheless, these ratios are much lower than those observed in the South and Southeast, where health care resources have traditionally been concentrated. In health units of the federal systems, the number of physicians per 1.000 residents can, in some cases, be up to 5 times the number available in other units (i.e., 0,4 per 1.000 residents in Maranhão, 2,8 per 1.000 in the Federal District, and 2,1 per 1.000 in São Paulo). It is important to note that of the 665.000 positions for high-level health professionals in 1999, only 32% were full-time positions.

Because of low salaries (an average of € 1.300 monthly), one out of four Brazilian doctors has three jobs or more. Nursing staff have similar work patterns, increasing the possibility of transferring resistant strains from one hospital to another.

#### *Economical factors*

Since 1995, the Brazil's interest rate has changed from a heavily fluctuating rate with an average of 50% to a steady, almost fixed rate around 19 percent. This has made loaning money more attractive, which results in creating a better investment climate.

Furthermore, the Real Plan (which ended the hyper-inflation in Brazil in de mid-90's) resulted in a much lower inflation rate, which also contributed to a better investment climate. A second effect of the Real Plan is the stabilization of the exchange rate, which encouraged international investments in Brazil.

The public health sector in Brazil has several sources of finance, which include the Brazilian Treasury, which contributes for 11 billion USD per year. Other sources include the States and Municipalities, which add another five billion USD per year. In total, the Brazilian Government provides for 55% of funding for the SUS. Loan agreements are made with many multilateral organizations, such as World Bank and the Inter-American Development Bank, which aim at financing the ministry of health's health reform project named REFORUS, having 700 million USD worth of resources. There are also separate funds from multilateral organizations for sexually transmitted diseases projects.

The private sector has access to long-term funds through BNDES (National Bank for Economic and Social Development), the IFC (International Finance Corporation) and the Brazilian banking network.

#### *Other conditions*

Most hospitals are concentrated in the southeast of Brazil. Since that area is also the most developed and has a high population density, the price of the land is rather high. So there seems to be a positive relation between the land price and the number of hospitals in an area. However, this can be explained by the fact that there is a linear relation between the population density and the number of hospitals. That is the real connection.

### **10.3.3 Other human health activities**

#### **Demand conditions**

##### *Health system*

Demand conditions are different for the public system and the private system in other human health activities. Looking at the demand for public services concerning health clinics the conclusion can be made that it is similar to the demand conditions of the hospital activities as described in chapter 2.3.1. The private services, on the other hand, show many differences between the demand conditions comparing the hospital activities with the other human health activities.

##### *Private system*

Private systems of supplementary medicine are those, which carry out functions of providing health services not remunerated by the public sector. The main forms of this sector are: group medicine, which operates like a pre-payment system, offering health plans for firms and families; medical cooperatives, which also offer health plans in a pre-payment system, although they have their own structures of service provision based on collaborating doctors and in their own and/or contracted hospitals; company's own systems (especially the larger ones), also known as Self-administered Plans, which in general operate by contracting health services in a post-payment system; and health insurance plans, which operate in various ways, according to the type of cover which the client wants, in some cases allowing systems of free choice.

##### *Growth of the private system*

The growth of the autonomous private sub-system has been very fast since the end of the 80s. The autonomous private sector (especially the segments of health insurance, group medicine and medical cooperatives) basically survives from income from prepayment per capita.

Between 1987 and 1994 an expansion of 54% of the clientele and 258% of the turnover of the autonomous private health system can be observed. It should be emphasised however that in this same period the rates of increase of the resources available from the SUS were also high until 1989, whilst a strong retraction in public expenditure occurred in the first half of the 1990s.

*Statistics*

<b>Form</b>	<b>Estimated Turnover (In € Billion)</b>	<b>Population Covered (In millions of people)</b>	<b>First Aid</b>	<b>1987</b>	<b>1994</b>	<b>(%)</b>
<b>Group Medicine</b>	1.00	2.10	110	15.1	16.0	7
<b>Medical Cooperatives</b>	0.35	1.75	400	3.6	8.5	136
<b>Company Self-Management</b>	0.42	2.00	376	5.0	8.0	60
<b>Health-Insurance Plans</b>	0.08	0.78	875	0.7	5.0	614
<b>TOTAL</b>	1.85	6.63	258	24.4	37.5	53.7

**Table 10-5: Distribution of cover and Turnover in the Autonomous Private Health System in Brazil [PSM03]**

Some statistics on the growth of the Brazilian private health care system can be found in Table 10-5 and Table 10-6. The growth in the autonomous private sector was differentiated according to the various sub-systems making up this sector. It can be shown in the tables above that both in terms of clientele and in terms of turnover; the greatest growth was recorded in the health-insurance plans, followed by medical cooperatives and company self-management. The main clientele, however, is still concentrated in the plans of group medicine companies [PMS03].

<b>Form of Health Care</b>	<b>Estimated Turnover</b>		<b>Population Covered</b>	
	1987	1994	1987	1994
<b>Assistencial</b>	1987	1994	1987	1994
<b>Group Medicine</b>	54,1	31,7	61,5	42,7
<b>Medical Cooperatives</b>	18,9	26,4	14,3	22,7
<b>Company Self-Management</b>	22,7	30,2	21,3	21,3
<b>Health-Insurance Plans</b>	4,3	11,7	2,9	13,3
<b>TOTAL</b>	100,0	100,0	100,0	100,0

**Table 10-6: Percentage distribution of cover and turnover of the Autonomous Private Health System [PMS03]**

*Demand growth*

A growing part of the Brazilian population is switching to the private health sector. People who can afford private health are bound to do so. The poorer population is gaining access to private health through companies they work at and other related means. Because of the growing participation in the private health sector, the demand for private health care is growing.

**Firm strategy structure and rivalry***Health clinics*

There are over 8.000 health clinics in Brazil [BIO03]. The most promising types of clinics are dental and home care (so called outpatient clinics).

According to ABIMO (the Brazilian Medical, Dental and Lab Industries Association), dentistry was the sector in the health area that had the most significant growth in the last five years. In spite of this expansion, the market is already saturated in some regions, which has led to an obvious distribution problem. Located on the southeast, the state of São Paulo, for example, has a dentist/inhabitants ratio of 1/738. By contrast, the poorer northern State of Para has a 1/3,300 ratio. Brazil has over 150,000 practising professional dentists (one for every 1,142 inhabitants), and currently 11,500 new dentists graduate from over 200 colleges every year, and still the number of institutions is increasing. According to the São Paulo state dentists' association, the prices for visits to the dentist range from € 12 (consultation) to € 550 (corrective orthodontic treatment), but they may be three times higher in some cases. Today, one of the most popular treatments is teeth cleaning. The price for this can reach € 420 and most clients are smokers [DEN03].

Professionals that are already involved with home care in Brazil say that home care is a highly promising and largely unexplored market. There is no accurate number of companies that give home care service. There are about 50 private companies that are exclusively dedicated to home care services. However, it is important to bear in mind that many insurance companies offer home care services. Although the market looks promising for expansion, companies that are interested in investing in this sector will encounter some difficulties due to the lack of specific regulation and lack of publicly available information about the sector [HCA03].

#### *Blood and organ banks*

Since there is no real rivalry between different blood, sperm and organ transplant banks, only some figures on the market size will be given. The public blood bank network is made up of 3,264 blood centres and, in 1999, supplied blood for a total of 1,931,951 transfusions nationwide. The National Organ Clearinghouse (Central Nacional de Notificação, Captação e Distribuição de Órgãos) maintains a list of potential recipients, operates the national transplant notification system, and coordinates organ distribution between the states, as well as the work of transplant centres throughout the country. State centres coordinate transplant activities within their jurisdictions. In 2000, 6,552 transplants were performed, which was 17% more than in the previous year and 60% more than in 1995 [PEN03].

#### *Medical laboratories*

There is little data available on the market structure of medical laboratories in Brazil. There are 400 laboratories in Brazil. [PHA03]

#### *Emergency medical systems*

The various services that comprise Emergency Medical Systems in Brazil can be grouped into 3 categories: the public service represented by the Serviço de Assistência Médica Urgente (SAMU) and the fire department (bombeiros), privatized highway services, and fully privatized ambulance services.

SAMU is free to all citizens and is supported by SUS, mostly through municipal funds. SAMU was established in 1995 following an agreement between Brazil and France to exchange technical information. A major characteristic of the SAMU system is the evaluation or screening of emergency calls (medical regulation) by a physician at the communication or dispatch centre. Medical regulation may result in medical advice to the caller, basic life support (BLS) ambulance dispatch, or ALS ambulance dispatch. ALS dispatches generally are performed with a physician dispatched to the scene, either in the responding ambulance or in a separate automobile. The public accesses SAMU by calling 192. Fire departments and military police occasionally have had their own ambulance systems and public access numbers. Absorption of these services into SAMU is the trend.

In regions where the highway system is privatized, an ambulance system may exist specifically for auto accidents and other highway emergencies. The guiding philosophy of these services is to transport patients as rapidly as possible to previously selected trauma hospitals. Highway tolls fund this service. Like the SUS-supported SAMU service, patients are not charged directly for these services.

Several private ambulance services operate in Brazil, especially in the south. Patients usually pay a monthly insurance premium for private ambulance service. Uninsured patients also may access private ambulances but, of course, must pay for this service. The physicians who provide care in these ambulances usually are moonlighting residents or other physicians with no training in emergency care.

Paramedics do not exist in Brazil because Brazilian law precludes non-physicians from performing intubations, defibrillation, and other advanced life support (ALS) procedures. Many emergency physicians feel that an inappropriate number of seriously ill medical patients are brought to ED's by taxi or private vehicle. Suggested reasons for this state of affairs are the public's general lack of awareness that SAMU can be accessed for conditions other than trauma and the prohibitive cost of private ambulances for non-insured patients. [EMS03]

### **Related and supporting industries**

All the sectors to be discussed are related; they are all part of the larger health sector. Therefore, they have (mostly) the same related and supporting industries as the hospital sector. Again, the focus is only on medical related and supporting industries. In the previous sector, drugs examined and other health inputs, equipment and technology. For health clinics, blood and organ banks and medical laboratories, these industries support the very existence of them. They provide the necessary equipment.

However, there is an additional supporting industry for emergency medical systems: the highway-toll system. The money raised by these toll boots raises the necessary funds for the financing of some emergency systems, such as ambulance systems.



One additional factor for related and supporting industries is the fact that the National Agency for Sanitary Control or Agência Nacional de Vigilância Sanitária (ANVISA) makes it difficult for companies to import medical equipment. This governmental organ creates long waiting times and raises additional revenues on medical equipment [SCH03].

**Factor conditions**

Other human health activities in Brazil have the same factor conditions as human health activities; the same level of education is required, the same economical conditions have similar influences on this sector. A further, more in-depth analysis is therefore not required; a less in-depth overview suffices.

The availability of human resources with respect to this sector compares in to the availability of human resources in hospital activity, because the same problems were find here; a small amount of trained professionals (1,132 inhabitants per dentist), and a great amount of potential (untrained) labour force, among which an important amount not able to afford the needed education. Studying the influence of the economical factors such as interest rate, exchange rate and inflation, the same conclusion can be made that the economical factors contribute to a more attractive investment climate, which supports the development of this sector.

## 10.4 The Netherlands

The Netherlands has developed a mixed health care system, which combines social and private elements. The system has four layers:

- Collective disease prevention, including immunization, school health care, mother and childcare, and health education.
- Primary health care, including general practitioners, community nurses, physiotherapists, midwives, pharmacists, and social workers.
- Acute hospital care.
- Long-term care, including psychiatric hospitals, convalescent centers, and nursing homes.

<b>Dutch Health Care Costs</b>	<b>€ billions</b>
Cost of Intramural Care	15.3
Hospitals	8.8
Mental hospitals	1.6
Institutions for the mentally ill	1.7
Nursing homes	3.0
Other institutions	0.2
Cost of Extramural Care	12.1
Specialist practices	1.4
General practices	1.1
Dental institutions and practices	1.1
Midwifery and other paramedic practices	0.7
Supply of medicines, dressing, etc	4.0
Public health institutions	3.2
Other institutions	0.6

<b>Other Costs</b>	<b>1.4</b>
Food and water inspection	0.1
Policy, administration and management	1.3
<b>Total cost</b>	<b>28.8</b>

<b>Financed by</b>	
Government	3.0
Health insurance funds	10.9
Exceptional Medical Expenses Act (AWBZ)	8.6
Private sector	5.0
<b>Total income</b>	<b>27.5</b>

<b>Cost per capita</b>	<b>1,854</b>
------------------------	--------------

**Table 10-7: Costs of the Dutch health care**

The Exceptional Medical Expenses Act (AWBZ) which came into force in 1994 is one of the primary sources for funding medical expenses associated with long-term care or high-cost treatment, where the risk is such that it cannot be carried by individuals or adequately covered by private insurance. The AWBZ provides insurance for every Dutch citizen against exceptional medical expenses with regard to long-term diseases (psychiatric care, care for the elderly in homes for the aged and nursing homes, expenses for home nursing services, etc). AWBZ insurance is obligatory and

premiums are income-related, up to a fixed maximum basis of assessment. Premiums are paid by the employer on behalf of employees. Self-employed persons pay the premium themselves, and retired persons are exempt from payment. The original goal of the AWBZ was to finance care for patients with serious and long-term illnesses. The scope of the law has been extended to cover other costs to the extent that the care covered by the AWBZ does not have sufficient financing. The provisions of the AWBZ Act are implemented by health insurance funds as well as public and private insurers.

The Social Health Insurance Act (ZFW) covers expenses with regard to acute diseases, and is obligatory up to a certain income level. Approximately 61 percent of inhabitants are insured with the ZFW. Premiums are income-related and paid by both employers and employees. In addition, employees pay a fixed rate related to household size. Retired persons pay reduced premiums. The provisions of the ZFW are implemented by health insurance funds. Contribution rates for the AWBZ and ZFW are fixed annually by the Government.

### **10.4.1 Government**

The Ministry of Health encourages people to live healthily, exercise more, smoke less, drink moderately, have safe sex, and adopt a healthy diet. People with health problems should be able to consult their GP, a hospital, or other care providers as whenever needed. They have the right to health care. Together with health insurers, care providers, and patients' organizations, the Ministry ensures that enough services are available and people have enough choice [VWS03].

The Health Ministry is responsible for health care policy and budgets. The Ministry overspent its 1997 budget by € 190 million and has permission to overspend by € 383 million in 1998. The Ministry overspent by a total of €800 million per year in 1995 and 1996. About € 30 billion was spent on health care in 1997 (€900 million more than in 1996). The total is made up of €12 billion from a general fund for hard-to-insure risks, € 11 billion from public health insurers, and € 5.5 billion from the private sector. The Government contributed € 1.5 billion in 1997, 50 percent less than in 1996. This cut was achieved chiefly through the introduction in 1997 of a system of patient fees, under which people insured through the ZFW had to pay twenty percent of the cost of care up to maximum of €100 per visit. The difference was made up by the general fund. The Health Ministry is committed to continued reduction in costs and will follow up on its policy of implementing price cuts in pharmaceuticals, with cuts in prices of medical aids. In addition, the Health Ministry plans to rationalize the statutory health care package. A 4-year plan aims to save €300 million between 1998 and 2002. Cost cutting in 1999 should yield €100 million - €50 million from cuts in pharmaceutical prices, and the rest from implementing structural adjustments [NHC03]. The statistics for 2002 are given in Table 10-8.

Total expenditure on Health, Share in GDP (%)	8,1
General Government expenditure on Health Share, in Total expenditure on Health (%)	67,5
Private expenditure on Health, Share in Total expenditure on Health (%)	32,5
General Government expenditure on Health Share, in Total Government expenditure (%)	12,1
Out-of-Pocket Expenditure, Share in Total Expenditure on Health (%)	8,6
Social Security spending on Health, Share in General Government Expenditure on health (%)	94,1
Prepaid plans, Share in Private Expenditure on Health (%)	76,7
Per capita Total expenditure on Health, at average exchange rate (US\$)	1900
Per capita Total expenditure on Health, at International Dollar rate (\$)	2255
Per capita Government expenditure on Health, at average exchange rate (US\$)	1283
Per capita Government expenditure on Health, at International Dollar rate (\$)	1523

**Table 10-8: Government expenditure on health statistics for Netherlands in 2002 [WHO03]**

In the Netherlands, preventive laws exist. There is the Tobacco Act (smoking in public places is prohibited), the licensing and catering act (for distributing and selling alcohol), the Control of Infectious Diseases and Investigation of Causes of Disease Act and the Public Health Act [VWS97]. Recently, the Tobacco Act has been extended to the work ground of people.

## 10.4.2 Hospital activities

### Demand conditions

The Netherlands has a high-quality health care system, but, like its counterparts in other developed nations, it faces tremendous strains. An aging population has put pressure on the budget. The public demands access to modern treatments and will no longer accept impersonal care and long waiting lists. Moreover, many frustrated health care practitioners are leaving the system and recruitment has become rather more difficult, resulting in a lack of doctors and nurses [IMF03].

Public health policy in the Netherlands is aimed at ensuring that the population has access to necessary health care. A resident of the Netherlands has traditionally been insured from the cradle to the grave under the generous, but costly, socialized welfare state. Approximately €30 billion was spent on the provision of health care in 1997. Important trends are emerging to affect the nature of the Dutch health care system: Increasing demand for medical services; growing pressure to contain associated costs; an aging population; shifts from institutional towards out-patient care. The total population of the Netherlands is expected to increase from 15.6 million in 1998, to more than 16 million in 2005. The percentage of people over 65 will increase by more than 20 percent, and the number of elderly (80 years or more) will increase by a third. The Dutch Central Bureau of Statistics [CBS03] forecasts that by 2020, one third of the population will be over 50 years of age. This "graying" of the population will result in an increase in chronic and degenerative diseases and disorders with a corresponding increase in the demand for appropriate health care services [NHC03]. Figure 3-3 shows some health care related statistics of the Netherlands, mostly dated 2000.

<b>Population</b>	15,892,237 (July 2000 est.)
<b>Age structure</b>	0-14 years:18% 15-64 years:68% 65 years and over:14% (male 885,839; female 1,281,071) (2000 est.)
<b>Population growth rate</b>	0.57% (2000 est.)
<b>Birth rate</b>	12.12 births/1,000 population (2000 est.)
<b>Death rate</b>	8.72 deaths/1,000 population (2000 est.)
<b>Net migration rate</b>	2.3 migrant(s)/1,000 population (2000 est.)
<b>Sex ratio</b>	at birth:1.05 m/f under 15 years:1.05 m/f 15-64 years:1.03 m/f 65 years and over:0.69 m/f total population:0.98 m/f (2000 est.)
<b>Infant mortality rate</b>	4.42 deaths/1,000 live births (2000 est.)
<b>Life expectancy at birth</b>	total population:78.28 years male:75.4 years female:81.28 years (2000 est.)
<b>Total fertility rate</b>	1.64 children born/woman (2000 est.)
<b>HIV/AIDS - adult prevalence rate</b>	0.19% (1999 est.)
<b>HIV/AIDS - people living with HIV/AIDS</b>	15,000 (1999 est.)
<b>HIV/AIDS - deaths</b>	100 (1999 est.)

**Table 10-9: Health indicators of the Netherlands dated 2000 [FNPO3]**

### **Firm strategy structure and rivalry**

Public health policy in the Netherlands is aimed at ensuring that the population has access to necessary health care. A resident of the Netherlands has traditionally been insured from the cradle to the grave under the generous, but costly, socialised welfare state. Private health care plays a minimal role in the Dutch system. Private companies, however, play an important role in the health care system, and the state is keen to use market forces to increase efficiency and reduce costs, without compromising the basic tenets of equal access to (affordable) health care for all citizens.

Category	Hospitals		Beds		Beds per Hospital
	Size	Share	Size	Share	
<b>Public hospitals</b>	128	84 %	48.300	85 %	377
<b>Academic hospitals</b>	9	6 %	8.200	15 %	912
<b>Hospitals</b>	137	100 %	56.500	100 %	412

**Table 10-10: Statistics on the hospital market of the Netherlands in January 2000 [NIVOO]**

Since there are no private hospitals in the Netherlands the market is made out of public and academic hospitals. The numbers in Table 10-10 require some explanation. In 1990 the Netherlands had 169 hospitals, but this number decreased due to of mergers of hospitals. When a hospital merges it can create one new integrated hospital or maintain the original hospital locations. Data on different hospital locations is not available.

The Social Health Insurance Act (ZFW) covers expenses with regard to acute diseases, and is obligatory up to a certain income level. Approximately 61 percent of inhabitants are insured with the ZFW.

Premiums are income-related and paid by both employers and employees. In addition, employees pay a fixed rate related to household size. Retired persons pay reduced premiums. The Government and the private insurance funds also contribute to the ZFW. Private insurers contribute to the ZFW to compensate for the disproportionately high number of retired persons in the ZFW. The provisions of the ZFW are implemented by health insurance funds. Contribution rates for the ZFW are fixed annually by the Government. Beginning in January 1997, persons insured with ZFW have been obliged to affect co-payment for certain services such as hospital stays, diagnostic tests and pharmaceuticals, with the exception of general medical and dental services. Persons whose earnings exceed the income level for obligatory insurance with the ZFW may take out a private health insurance policy, though insurance is not obligatory for this income group. Approximately 33 percent of the population is insured through a private health insurance fund. Civil servants (5 percent of the population) are insured via a special fund. These insurance providers determine, together with the government, which medical treatment is reimbursable.

Dutch government policy (now enshrined in legislation) aims at the integration of medical specialists in hospitals and seeks to end their economic and organisational autonomy. The government has attempted to achieve this by including medical specialists in hospital management, with limited success due to their counter strategies. Led by the self-employed, medical specialists have opted in favour of a strategy of collective organisation in hospitals. [BLU03]

There are several important trends in firm strategy and structure of the Dutch health care system. There is a move from curative towards preventive care. Also the ongoing emergence of new technologies allows for new medical possibilities. Although the population of the Netherlands keeps growing the number of hospital beds keeps dropping. This is possible because the duration of a patient's visit is shortened over recent years [SIG03]. This is also possible because hospitals are shifting from institutional towards out-patient care by collaborating with rest homes.

### **Related and supporting industries**

Like Brazil, the following industries will be discussed: blood centres and equipment and technology.

At the end of the eighties, the costs of drugs and other health inputs were already quite high. In order to make drugs cheaper, the government privatized drugs in order to let the market mechanism lower the price of drugs. In the nineties however, it was clear that the price of drugs were still rising, even stronger than the health sector as a whole [BUU96]. A lot of measures were issued in order to contain the cost and volume of the pharmaceutical sector. Despite these measures, the costs rose with an average of 6% in the period 1989-1997 [SCP03]. Because of these costs, an average of € 235 was spent on drugs in 2002 [SFK02]. Comparing to other European countries, the Netherlands spends relatively little money on drugs per capita expenditure, as shown in figure 3-1.

One of the largest manufacturers of medical equipment is the Dutch company Philips Medical Systems. They focus on state-of-the-art technology, such as x-ray, ultrasound machines, nuclear medicine, computed tomography, cardiac and monitoring systems, magnetic resonance imaging (MRI) and radiation therapy [PMS03]. The machines they manufacture are used in hospitals all over the world. The Dutch also have a lot of foundations and governmental institutions to guarantee a certain level of quality, for example TNO Prevention and Health (TNO-PG).

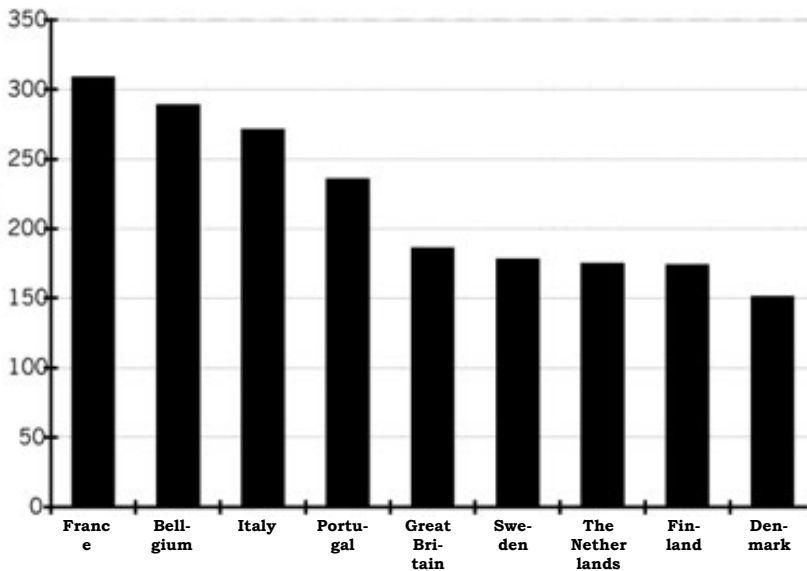


Figure 10-1: Money (in euros) spent on drugs per capita expenditure [SCP99]

### Factor conditions

The availability in the Netherlands of human resources for hospital activities is enough to provide a good service. Dutch healthcare is a rather good one: but the amount of skilled labour is fewer than the demand, as a result of a limited capacity in the medical education. This level of education however is quite comprehensive.

Most of the financial sources for hospitals in the Netherlands are provided by assurance companies, because every inhabitant is obligated to have an assurance. Some things, like some forms of plastic surgery are not covered by all assurance companies, which thus require self-funding. The government provides funds by subsidizing on the assurance premiums.

The interest rate in the Netherlands is between 4,5 and 5,5 percent.

## 10.4.3 Other human health activities

### Demand conditions

Private health care plays a minimal role in the Dutch system. Private companies, however, play an important role in the health care system, and the state is keen to use market forces to increase efficiency and reduce costs, without compromising the basic tenets of equal access to (affordable)

health care for all citizens. The demand for other human health activities is basically the same as for the hospital activities.

### **Firm strategy structure and rivalry**

#### *Health clinics*

As of January 1, 2003, there were 7,623 dentists, spread over 5,500 practices in the Netherlands with approximately 2,200 patients per dentist. Over 93% of practicing dentists are private professionals. There are 283 orthodontists, 203 dental surgeons, and some 10,000 dental nurses. The dentistry market is made up as follows. 71% is solo practice with no dental assistants and 14% solo practice with one or more dental assistants. 10% are partnerships with two or more dentists and no dental assistants 5% partnerships with one or more dental assistants. Total annual operating costs amount to € 724 million. Total payments for dental work amount to € 1 billion. Dentists see on average 141 patients per week. Thirty-eight percent of dentists will not accept new patients, 58 percent will only accept new patients under certain conditions. Two-thirds of dentists complain of a shortage of dentists in their region. There are 1,050 dental labs, employing approximately 4,000 people [DNL03].

Home health care is primarily provided by a national network of regional, private non-profit organizations. Nursing funding is provided through a fixed budget based on the provider's staffing level, and is derived from private insurance (40 percent) and public insurance (60 percent). Home help is funded through an age-adjusted budget from the Health Ministry. A membership fee serves as the home help co-payment, and the home help co-payment is adjusted for household composition and income.

#### *Blood and organ banks*

By the end of nineties the number of blood banks in Holland was decreased to nine large regional blood banks. In 2001 blood bank activities were centralised effectively creating four large centres, each covering a part of the country. Combined these blood banks take blood at about 600 locations spread across the entire country [BNL03]. All the blood centres (there are around 600) in the Netherlands are under the supervision of the Sanquin Foundation. Sanquin originated from a fusion between the Dutch blood banks and the Central Laboratory for blood transfusion of the Dutch Red Cross. They are by law the only organization in the Netherlands who is allowed to provide the blood for transfusions etcetera. In 2001, more than 614000 people donated blood and/or blood plasma. Together, they donated 872000 times [SAN03]. In the Netherlands organ transplantation is coordinated through an organization called Euro-transplant. In total in 1999 200 organ transplants were performed [ONL03].

#### *Medical laboratories*

There are about 400 medical laboratories in The Netherlands. These laboratories are specialized in various fields such as clinical chemical sciences or clinical embryology or can belong to medical institutions such as blood banks or genetic centres [MNL03].



*Emergency medical systems*

In the Netherlands there are private and public ambulances. Both kinds of organizations have the same kind of ambulances, and the same interior. The pre-hospital care used to be a part of the fire brigades, but today, most of the services are separated from the fire-brigade. There are no volunteers involved, all personal is professional. The ambulance services are paid from the same insurances as other hospital costs.

The ambulance has to be in the right place within 15 minutes or 30 minutes depending on the urgency-type of the emergency. On the ambulance there are two people working with a different background of education: a driver and a nurse. The driver is responsible for the transport of the patient, assisting the nurse in the medical treatment and communication with the alarming-centre and hospital. The driver has to follow a special ambulance training of 2 years. The nurse is responsible for the medical treatment of the patient, the administration of the work and assists the driver in the planning of the route. This nurse has followed the education to Registered Nurse followed by a specialization. Because the nurses are quite highly educated in The Netherlands, they are allowed to practice very advanced medications [ENL03].

**Related and supporting industries**

Some of the sectors that are discussed in this chapter are (just as in Brazil) actually the supporting industries for hospitals, or are at least related to them. Especially medical laboratories and emergency medical systems are related or even supporting industries of the Dutch hospitals.

Because of the growing waiting lists in the Netherlands, private clinics are becoming more common. The neighbouring countries, such as Germany, also profit from this need. They are more expensive than the public clinics, not in the least because it is almost never covered by insurance. However, when the need is great enough, people visit these clinics in order to receive the medical assistance they need.

The infrastructure of the Netherlands is very compact; a lot of people live in a small area. Because of that, the roads are most of the time very crowded. Measures had to be taken in order to allow ambulances (as well as police and fire trucks) to reach an accident. Ambulances are by law allowed to travel bus lanes, use the spare road part on highways, etcetera. However, the ambulance system is not privatized as it is in Brazil.

In order to discover new medicines, tests clinics exist in the Netherlands. Volunteers are paid for their cooperation in testing new medicines. To insure their safety, a great variety of laws (both national and European) have been issued.

**Factor conditions**

A slight difference exists in the availability of human resources for other human health activities compared to hospital activities, since qualified labour is available in a greater amount. This is a result of the fact that the education is less limited (except for dentists) than for hospital activities.

Also here the level of education (and thus of the available qualified labour) is somewhat higher than in Brazil.

Most of the financial sources for this sector are provided by assurance companies, some of them however are not covered by assurance companies (for instance some dental surgery).

## 10.5 Comparison

The information of Brazil (Paragraph 10.3) and the Netherlands (Paragraph 10.4) is compared in this section. All the information is described by subject and the numbers and percentages are compared in tables.

### 10.5.1 Government

The Brazilian government as well as the Dutch government have the same goal. Both governments want to provide the best health care possible with the lowest cost. The Dutch have a far better health care system than Brazil has, this is easily explained by the fact that Brazil is still in the development phase of health care. The Dutch have an already proven health care system; they only have some minor problems. The differences and similarities on government expenditure are given in Table 10-11.

	Brazil	The Netherlands
Total expenditure on Health, Share in GDP (%)	8,3	8,1
General Government expenditure on Health Share, in Total expenditure on Health (%)	40,8	67,5
Private expenditure on Health, Share in Total expenditure on Health (%)	59,2	32,5
General Government expenditure on Health Share, in Total Government expenditure (%)	8,4	12,1
Out-of-Pocket Expenditure, Share in Total Expenditure on Health (%)	38,5	8,6
Social Security spending on Health, Share in General Government Expenditure on health (%)	0	94,1
Prepaid plans, Share in Private Expenditure on Health (%)	35,1	76,7
Per capita Total expenditure on Health, at average exchange rate (US\$)	267	1900
Per capita Total expenditure on Health, at International Dollar rate (\$)	631	2255
Per capita Government expenditure on Health, at average exchange rate (US\$)	109	1283
Per capita Government expenditure on Health, at International Dollar rate (\$)	257	1523

**Table 10-11: Government expenditure on health statistics for Brazil and the Netherlands in 2002 [WHO03]**

### 10.5.2 Hospital activities

#### Demand conditions

The Netherlands and Brazil both experience an increase in demand for health care. Table 10-12 compares the population statistics of both Brazil and the Netherlands. Bear in mind that Brazil is a great deal larger than the Netherlands both in size and population.

	<b>Brazil</b>	<b>The Netherlands</b>
<b>Population</b>	174.469.000 people	15.892.000 people
<b>Age structure</b>		
0-14 years	29 %	18 %
15-64 years	66 %	68 %
65 years and over	5 %	14 %
<b>Population growth rate</b>	0,91%	0,57%
<b>Birth rate</b> (per 1.000 people)	18,45 births	12,12 births
<b>Death rate</b> (per 1.000 people)	9,34 deaths	8,72 deaths
<b>Net migration rate</b> (per 1.000 people)	-0.03 migrants	2,3 migrants
<b>Sex ratio</b>		
0-14 years	0,97 male/female	0,98 male/female
15-64 years	1,04 male/female	1.04 male/female
65 years and over	0,97 male/female	1.03 male/female
	0,68 male/female	0,69 male/female
<b>Infant mortality rate</b> (per 1.000 live births)	36,96 deaths	4,42 deaths
<b>Life expectancy at birth</b>		
male	63,24 years	78,28 years
female	58,96 years	75,4 years
	67,73 years	81,28 years
<b>Total fertility rate</b> (per woman)	2,09 children born	1,64 children born
<b>HIV/AIDS</b>		
Adult prevalence rate	0.57%	0.19%
People living with HIV/AIDS (per 1.000 people)	3,10	0,94
Deaths (per 1.000 people)	0,10	0,01

**Table 10-12: Health indicators of Brazil and the Netherlands dated 1999-2002**

While both Brazil and the Netherlands experience an ever aging population, the percentage of people that are 65 years or over in the Netherlands is thrice that of Brazil. So the Netherlands suffers more from graying compared to Brazil. Brazil has a negative migration rate while the Dutch have a relatively high migration rate, due to the large amount of migrants the Dutch are attracting. A noticeable difference between the Netherlands and Brazil is between the infant mortality rate and the life expectancy. The Dutch have a far better medical system, so the difference between these figures isn't strange at all. As can be seen, in Brazil there are more HIV/AIDS cases than in the Netherlands, although the Brazilian government is trying to decrease these numbers, with success, the Dutch government had taken sooner and better action to prevent HIV/AIDS. That's why cases of HIV/AIDS, are (also relatively) less in the Netherlands compared to Brazil.

### Firm strategy and rivalry

Category	Brazil				The Netherlands			
	Nr. per million inh.	Share	Beds per 1000 inh.	Beds per hosp.	Nr. per million inh.	Share	Beds per 1000 inh.	Beds per hosp.
<b>Public hospitals</b>	12,3	29 %	0,50	41	8,0	84 %	3,04	377
<b>Private hospitals</b>	28,9	69 %	2,35	81				
<b>Teaching hospitals</b>	0,9	2 %	0,27	309	0,6	6 %	0,52	912
<b>Hospitals</b>	42,0	100 %	3,12	75	8,6	100 %	3,56	412

**Table 10-13: Firm structure compared in Brazil and the Netherlands for 2003**

Brazil has far more hospitals per inhabitant than the Netherlands. This is because new hospitals are still opening in Brazil, in the Netherlands there is a policy of hospital centralization. The problem with hospitals in Brazil is that although there are enough hospital beds to serve everyone they are not properly distributed. The problem in the Netherlands is that there is not enough capacity so there are waiting lists.

The largest difference in terms of firm structure is the fact that the Netherlands does not have a private health system, unlike Brazil. The Netherlands, unlike Brazil, does not have the effect that rich people are provided with far better health care than lower class citizens. (It must be noted that the Dutch do have a sort of private – public health care system, but certainly not one as described in this chapter).

In terms of hospital management Brazil and the Netherlands are growing towards each other. While the Netherlands emphasizes more on the inclusion of medical personal in the management teams, in Brazil doctors currently in charge of hospitals follow hospital management courses.

### **Related and supporting industries**

Comparing the related and supporting industries of Brazil and the Netherlands, there is almost no difference. This is not very surprising, since the structure of a medical sector will be (at least to some extent) alike for first and third world countries.

There are some regularly used drugs that are covered by HMO in Brazil, but by far not all of them. The government has started the Basic Drug Program in order to improve this.

### **Factor conditions**

Brazil's hospital activities seem to be prohibited by the relative low labour costs, but because of an unevenly divided income balance, the amount of potential (untrained) labour force cannot be used efficiently.

The investment climate also provides more support for the development of this sector in Brazil, compared with the past (before the Real Plan), as a result of the Real Plan, which decreased the inflation and stabilized the exchange rates. The interest rate in the Netherlands is far lower than in Brazil; it's between 4.5 and 5.5 percent, so about 4-5 times lower than in Brazil. This creates a much more attractive investment climate, more attractive than in Brazil.

The availability in the Netherlands of human resources for hospital activities is enough to provide a good service; Dutch healthcare is a rather good one; but the amount of skilled labour is fewer than the demand, as a result of a limited capacity in the medical education.

Most of the financial sources for hospitals in the Netherlands are provided by assurance companies, because every inhabitant is obligated to have an assurance. Some things, like some forms of plastic surgery are not covered by all assurance companies, which thus require self-funding. The government provides funds by subsidizing on the assurance fees.

## Summary

Table 10-14 provides a summary of the comparison of this sector between Brazil and the Netherlands. Strong points are indicated with a plus, and weak points with a minus. When an aspect of the sector cannot be easily be named a strength or weakness there is no plus or minus indication.

Aspect	Brazil	The Netherlands
<b>Government</b>	41% Government expenditure on health (no social security)  39 % Out of the pocket expenditure on health  20% Prepaid plans expenditure on health	68% Government expenditure on health (94% through social security)  9% Out of the pocket expenditure on health  25% Prepaid plans expenditure on health
<b>Demand Conditions</b>	+ Aging Population   3,1 AIDS patients per 1000 inhabitants	+ Aging Population  - Unrest about public health care waiting lists  0,94 AIDS patients per 1000 inhabitants
<b>Firm Strategy</b>	Public and private hospitals  - Bad geographical allocation of hospitals  - Large division between rich and poor  + Management courses for doctors in charge of hospitals  42 hospitals per million inhabitants  3,1 hospital beds per 1000 inhabitants  75 average beds per hospital	Only public hospitals  - Over concentration of hospital facilities  + Smaller division between rich and poor  + Incorporation of medics in the management team  8,6 hospitals per million inhabitants  3,6 hospital beds per 1000 inhabitants  412 average beds per hospital
<b>Related and Supporting industries</b>	+ 3,5 % of income spent on drugs  - No HMO coverage of drugs as yet	- 1,5 % of income spent on drugs  + HMO coverage of drugs
<b>Factor Conditions</b>	- Not enough skilled labour  - Low Level of education  + Positive Government stimulation	- Not enough skilled labour  + High Level of education  + Positive Government stimulation

**Table 10-14: Overview of the Comparison of hospital activities**

### 10.5.3 Other human health activities

An overview displaying a comparison between is given in table 4-5. Differences both applying for hospital activities and other human health activities are not repeated.

<b>Aspect</b>	<b>Brazil</b>	<b>The Netherlands</b>
<b>Demand Conditions</b>	+ Growing demand for private healthcare	
<b>Firm Strategy</b>	<ul style="list-style-type: none"> <li>- Bad geographical allocation of dentists</li> <li>- Local dentist shortage</li> <li>+ Large Potential for home care</li> <li>+ Blood and organ transplant growth</li> <li>- 400 Medical laboratories total</li> <li>- EMS not in public services</li> </ul>	<ul style="list-style-type: none"> <li>- Overall dentist shortage</li> <li>+ Emphasis on outpatient care</li> <li>- Blood and organ shortage</li> <li>+ 400 Medical laboratories total</li> <li>+ EMS paid by public services</li> </ul>
<b>Related and Supporting industries</b>	<ul style="list-style-type: none"> <li>+ Privatized High Ways</li> <li>- Import barriers on medical equipment</li> </ul>	- Crowded Infrastructure

**Table 10-15: Overview of the Comparison of other human health activities**

## **10.6 Conclusion**

In this section a conclusion is made for the hospital activities and for other human health activities. Also for the use of virtual reality in the Brazilian human health activities is made a conclusion.

### **10.6.1 Hospital activities**

The main difference between the Brazilian and Dutch Hospital activities sector is that Brazil has public and private hospital activities, but the Dutch only have public hospital activities (in the scope of this chapter). There is no social security system in Brazil and the relative government expenditure in Brazil is only 60% that of the Netherlands. In addition 40% of the expenditure on health comes *out of the pocket*, and 20% from prepaid plans. These factors create a large difference in quality of health care between the rich and poor in Brazil while this exists in far lesser degree in the Netherlands. Both countries experience an aging population but Holland has a far larger graying of the population and there for a relatively larger demand for hospital facilities. The spread of AIDS in Brazil also contributes to the demand for hospital facilities. Hospitals in Brazil are not divided evenly across the country. In the rich south-east there are a lot of high-tech private hospitals while the rest of Brazil has far less private hospitals. The same goes, be it in a far lesser degree, for the public hospitals. Hospitals in the Netherlands have a capacity almost six times that of Brazil. Both countries experience a shortage in personal, but the problem for Brazil is much larger because of the low level of education in the country.

### **10.6.2 Other human health activities**

Much that was said about the hospital activities sector applies for the other human health activities. In this sector Brazil also has a public and private system. The Netherlands however also has more privatized dentists and incorporates privatized ambulances into its public system. Brazil has no shortage of dentists in the rich south-east region but the wealthy Netherlands does because of a shortage in certified personnel. Brazil and the Netherlands also both have a fast growing home care market.

### **10.6.3 Virtual Reality in Brazilian human health activities**

The Brazilian human health activities sector and Virtual Reality could be a positive influence on each other. The fact that there are a lot of high tech hospitals in the south east of the country means these hospitals will have a large demand for advanced Virtual Reality techniques, to improve patient therapies. VR techniques could help the Brazilian hospital sector compensate for its lack of trained personal, e.g. by using VR in stead of professionals to comfort patients. The poorer public hospitals however will have a small budget for Virtual Reality techniques. The fact that Brazil only has a few medical laboratories will not contribute to the development of Virtual Reality.



Telemedicine has a lot of potential in Brazil, since in most regions hospitals are scattered. Telemedicine is also useful for other human health activities. Ambulance services for example can use this technique to overcome the lack of a paramedic on board the ambulance or telemedicine could be used for the growing outpatient care market. An example of the use of telemedicine in Brazil is the Amazon telehealth Program, currently developed by the EduMed Institute for Education in Medicine and Health, a Brazilian not-for-profit foundation, in collaboration with the Faculty of Health Sciences of the University of Amazonas [AMO03]. The Program will facilitate remote communication among medical students in rural and aboriginal communities in the Amazon jungle and their teachers in Manaus' University Hospital and other supporting hospitals, in order to solve the problems they come face-to-face with, by means of voice and video transmissions over the Internet and satellite. It will help them to improve the public services for health prevention and care in those regions, thus increasing the quality of life of its population.

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# 11 Higher education

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## Chapter contents

<b>11.1</b>	<b>Introduction</b>	<b>318</b>
<b>11.2</b>	<b>Education in Brazil</b>	<b>319</b>
11.2.1	Higher education	320
<b>11.3</b>	<b>Porter Analysis</b>	<b>325</b>
11.3.1	Demand conditions	326
11.3.2	Factor conditions	333
11.3.3	Strategy, structure and rivalry	338
11.3.4	Related and supporting industries	339
11.3.5	Government	341
11.3.6	Chance	342
<b>11.4</b>	<b>The Netherlands</b>	<b>344</b>
11.4.1	Primary education	344
11.4.2	Secondary education	344
11.4.3	Higher education	345
11.4.4	The role of the government.	346
<b>11.5</b>	<b>Comparison</b>	<b>348</b>
<b>11.6</b>	<b>Conclusion</b>	<b>350</b>
<b>11.7</b>	<b>References</b>	<b>352</b>

## 11.1 Introduction

In this chapter the sector analysis performed on the sector higher education in Brazil will be discussed. This sector contains all education that is attended after secondary school, which implies the vocational and technical studies, and education at university level. The research question for this section is:

*What are the strong and weak aspects of the sector higher education and what could Virtual Reality contribute to the development of these sectors.*

In order to answer this question, first the definition about Virtual Reality has to be clear. Since many definitions of Virtual Reality have been described, the one below will be used in this section. This definition of Virtual Reality was elaborated by Aukstakalnis and Blatner [AUK92]:

*Virtual Reality is a way for humans to visualize, manipulate and interact with computers and extremely complex data.*

This Virtual Reality paradigm allows the observer to act in synthetic, computer generated worlds. In contrast to conventional visualization systems, the user may become an active part of the scene.

With the definition of Virtual Reality above in the mind, an analyze about the higher education sector in Brazil using Porter's diamond will be made. Porter's diamond is a useful tool to analyze the competitiveness of a specific sector in a certain country. Porter's diamond consists of four determinant, described in paragraph 11.3 and two additional variables, also described in this section.

The results of the Porter analysis will be compared to the situation in The Netherlands in order to come up with good conclusions. The differences and similarities will then be described in a Similarities and Differences table, which will be used to draw conclusions. In the final conclusion the answer of the research question will be given and an outline of the strong and weak aspects of the higher education sector in Brazil and describe what Virtual Reality could contribute to the development of higher education in Brazil.

First of all an overview of the educational system as a whole in Brazil will be given. This is very helpful to compare the educational systems of Brazil and The Netherlands.

## 11.2 Education in Brazil

The education system in Brazil is organized as follows [EIB03]

Type	Duration	Learning hours/year	Requirements
<b>Infantile Education</b> Day nursery Kinder garden (not compulsory)	Variable 3 years	Variable Variable	Aging 0 to 3. Aging 4 to 6.
<b>Elementary School</b>	8 years	720	Aging 7 or more.
<b>Secondary School</b>	3 years*	2.220	Having finished Elementary School.
<b>University</b> Undergraduation	Variable (2 to 6 years)	Variable	Having finished Secondary School and passed the entrance exams.
Graduation	Variable (2 to 6 years)	Variable	Having finished the undergraduate course.

**Table 11-1: Education system in Brazil.**

As shown the Brazilian Educational is organized into five levels:

- Infantile Education (subdivided into crèches, pre-school and classes in reading and writing),
- Elementary School (lasting eight years),
- Secondary School (three years),
- Higher Education (undergraduation)
- Postgraduate Education.

A total of more than 42 million students receive education in Brazil. 30.5 million of them are in Primary Education. [BRA03] Education is obligated for children in the age from seven till 14 years. Their education extends eight grades, each with an annual minimum of 800 hours. Children should be 7 years old to enroll in the first grade. Entrance at an earlier age is allowed depending on rules and regulations of the educational system.

Checking the obligation is however hardly possible and because of that a lot of children do not receive education. Education is given in Portuguese, the Brazilian mother language. The regular school year covers a minimum of 180 days of effective work, from March till December. In rural areas, schools may organize their school year, excluding tests and exams, in relation to sowing and harvesting seasons. The new National Education Bases and Guidelines Law establishes 200 school days. [UNI03]

When a student is 18 years of age, he or she must attend supplementary education courses. The requirement for entering intermediate school is to have finished fundamental school or the equivalent supplementary schooling. Also in intermediate school, after the regular age limit has been reached (21 years of age), the student may take supplementary courses or examinations.

The Brazilian educational system includes both public (federal, state, and municipal) and private institutions [BRS03]. Public education is free at all levels. There are also non-profit private schools eligible to receive public funding. Since the Brazilian Constitution from 1988 25% of state and local taxes goes to education.

Significant advances have been made in the Brazilian educational structure in the last 25 years. In 1964, there were 10 million students attending school at all levels. In 1990, there were 37.6 million students: 3.9 million in pre-school; 28.2 million at the elementary level; 3.8 million at the secondary; and 1.7 million at university. Illiteracy fell from 50% in 1950 to around 17% in 1995. Around 92% of school age children are currently enrolled in primary education compared with 1950 when the rate was only 36%. Despite this progress, less than 40 percent of the high-school-aged population is enrolled in school.

One of the biggest educational problems in Brazil is school non-attendance. Children from large poor families start working from the age of 10 in order to help their parents, despite the law of compulsory education between the ages of 10 and 14. Other reasons for school non-attendance are the lack of sufficient school places and the high examination failure rate. Malnutrition also materially affects the intellectual development of children, giving them little chance of adapting to an educational environment. [BRS03]

## **11.2.1 Higher education**

### **Organisation of higher education**

Higher education in Brazil is organized in two levels: Higher education and postgraduate education. The educational picture in Brazil is very complicated because the Federal Union, the states and local authorities all have wide-reaching autonomy in the organisation of the respective systems of teaching. In addition, alongside the state schools, there is a broad network of private schools, particularly in Higher Education.

The Ministry of Education has ultimate control over virtually all of higher education. Its principal standard setting agency is the Federal Council of Education. The Federal Government maintains at least one Federal university in each state. [BEL03]

Higher education is provided in federal, state, municipal, confessional and private universities and other institutions. The universities are composed of faculties and schools and their internal organization is based on the department, which is linked to schools, faculties or centres. The two supreme bodies are the University Council (Conselho Universitário) and the Council for Graduate Studies and Research (Conselho de Ensino e Pesquisa).

Upon completion of a secondary education programme, students can apply for admission to an institution of higher education. The higher education in Brazil can be divided in two levels: University level and non-University level. The non-university level consists of technical and vocational education. Specific institutions like the Centres for Technological Education, CEFET (Centros Federais de Educação Tecnológica) offer higher technical courses

that usually last for four years with the possibility of staying on for a further year. [BES03]

### **Non-university higher education**

Students attending vocational education have the choice to complete basic vocational training at the secondary level or specialized technical training. Students who completed the basic vocational training, receive a Certificate of Basic Training (Certificado de Habilitação Básico) which enables them to enter the job market, take the university entrance examination or undergo further technical training (specialized technical training) leading to a Diploma of Intermediate Level Technician (Diploma de Técnico de Nivel Medio) or a Diploma of Technician of the second level (Diploma de Técnico de 2º Grau). [WED03][BED03]

Vocational education in Brazil is comparable with the Hoger Beroeps Onderwijs (HBO) in the Netherlands with the main difference that in the Netherlands the Bachelors degree is rewarded after completion, which is not the case in Brazil.

### **Undergraduate higher education**

Students that wish to enter higher education at the undergraduate level must pass an entrance examination. The student then can attend one of the three types institutions of higher education in Brazil. The first type of institutions is the university, which offers a multitude of degree programmes. The second type is the Federation of Schools. Federations of schools are smaller institutions that do not offer the same range of programmes as are available at universities. The last type of institutions is the type Isolated Schools. These are small schools offering one or two programmes of study.

Enrolment in an undergraduate programme is done by subject, in a non-sequential system of varying duration, depending on the specialization. The duration of the programme may vary from three to six years. For example, the Agriculture programme takes four years, while the medicine programme takes six years of studying. Upon completion of an academic course of study, university students are awarded the Bachelor Degree (Bachelerado). At this point students may take an additional year of teacher training leading to the Licentiate. The Bachelor's Degree is generally awarded after four years' study to students of philosophy, humanities or sciences who wish to become secondary school teachers. [BES03][BED03]

The undergraduate higher education in Brazil has the same structure as the undergraduate higher education in the Netherlands. After three year's of study the Bachelor's degree is awarded to university students. The Bachelor's degree can also be obtained by completing non-university higher education (HBO).

### **Post-graduate Higher education**

Students who have obtained their Bachelor Degree may attend post-graduation education. This is the second stage of university level. A Master's degree (Mestrado) is awarded after a minimum of one years' study

following the Bachelor's Degree or Licenciatura, to students who have followed a certain number of courses, passes examinations and submitted a thesis. The last stage of post-graduation university education leads to the award of the Doctor's Degree (Doutorado). This degree is the highest degree that can be awarded in higher education in Brazil. The requirements for this degree are identical to those for the Master's degree, but this requires three to five year's further study.[BES03][BED03]

Post-graduate higher education in Brazil also has the same structure as the post-graduate education in the Netherlands. In the Netherlands a Master's degree is also rewarded after a minimum of one year's study (social studies). Most technical studies have a Master's programme of two years, and medical studies usually have programmes that take six years of further study.

### **Teacher education**

A part of the higher education system in Brazil is teacher education. This sector can be divided in three parts: training for pre-primary and primary school teacher, secondary school teacher and higher education teacher. Primary school teachers for grades 1 to 4 are trained in three years secondary level training institutions. To teach up to sixth grade, they must study for an additional year leading to the Diploma de Profesor do Ensino de 1º Grau. To teach up to the eight grade, they must complete a three-year course at university level leading to the Licenciatura. Training of secondary school teachers takes place in the faculties of Philosophy, Education of Humanities and Philosophy. These are either incorporated into a university or independent institutions specializing in the training of secondary school teachers. The degree awarded is the Licenciatura. Higher education teachers are trained at the Master's and Doctor's levels. The degrees required vary according to the category of higher education teacher. Auxiliary teachers must hold the first higher level qualification. Assistant teachers must hold a Master's degree and a Doctor's degree in teaching (Professores adjuntos or titulares). The Doctor's degree is also considered a prerequisite to work at postgraduate level. [BES03]

Comparing this to the situation in the Netherlands some similarities and differences are shown. Teacher's training for pre-primary and primary education is given at a non-university higher education level. A student completing this study (PABO) the student may teach all grades (one to eight) of the primary education. To teach secondary education, a student has to complete a first degree teacher training. This training is also given at non-university higher education. After completing this training the student is able to teach a certain course at secondary education level. To teach at the higher education level, a student has to complete post-graduate university education and should have a Master's degree. [OLO03]

### **Non-traditional studies**

In Brazil it is also possible to attend distance higher education. Professional courses of a variable number of years sponsored by private entities and/or agreements with public institutions of education, with a secondary school requirement for admission.



# TALEN PRACTICUM

*dat spreekt*

TWENTTE

As we decided not to go to Belgium or Curaçoa this year, we were confronted with a communication problem: the majority of the Brazilian population usually does not speak a single word of Dutch and we, unfortunately, do not speak Portuguese.

To make sure that we can communicate with the Brazilian population we contacted Talenpracticum Twente B.V. in Enschede to provide us with some Portuguese lessons. Talenpracticum Twente B.V. is a CEDEO-certified organisation. This certificate is a guarantee for customer satisfaction.

Talenpracticum Twente offered us several possibilities for learning Portuguese. We could choose between a course for the duration of a whole year and an intensive course in September.

Courses at Talenpracticum Twente can be attended in The Netherlands or, when you travel a bit longer, in the country of your destination. Talenpracticum Twente offers private courses for the following languages: English, German, French, Spanish, Italian, Portuguese, Swedish, Norwegian, Russian, Greek and Dutch for foreigners.

We chose a course of 10 lessons. Each lesson takes one and a half hours. A group of 27 participants is divided into two different groups each of which receives 15 hours of Portuguese lessons. After attending these lessons we hope to speak Portuguese as fluently as the 28th participant of the tour, Dr. Luís Ferreira Pires...



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In the industry sector it is also possible to attend higher education training. These training courses are sponsored by industry for qualified workers.  
[BES03]

## **11.3 Porter Analysis**

For further analysis of the sector of higher education it is very helpful to use a model. The most recommended model for this is the Porter's diamond. In this theory several criteria like structure, demand and government are distinguished. It should be noted that the description of Porter's diamond suggests that the model is constructed with an industry in mind. This can be concluded from the several references to markets, demand, competitiveness, etcetera. Higher education is, however, not a traditional industrial sector. Some of Porter's factors are not directly applicable. This makes analysis slightly more difficult.

### **11.3.1 Demand conditions**

This first determinant deals with the domestic demand of higher education. In this case, the demand can be split in two kinds of demand: the demand by potential students who want to study and the demand by the companies, government and other organizations that need well-educated employees. The latter is of course heavily influenced by the condition of the economy.

First the focus will be on the composition of these demands: are there differences in demand from potential students in Brazil? Are there differences between sexes, ethnic groups or groups with different incomes? And how is the composition in the demand from the labour market? Which kind of students are needed most?

Secondly the question of growth is discussed. How are both kinds of demand developing in recent years?

#### **Enrolment in Higher Education**

First of all the enrolment rates in higher education in Brazil will be discussed. This subsection will cover the total enrolment of students in higher education, as well as the differences in enrolment between ethnic groups, sexes and students from different income groups.

Table 11-2 shows the percentage of the age cohort in most Latin-American countries in 1980 and 1997. The Age Cohort includes all people that have the age on which they could enrol in higher education. Clearly is that Brazil has grown in the last seventeen years, but still is not on the level its neighbour countries are.

Country	% of Age Cohort in Tertiary education		% Increase in Coverage 1980-1997
	1980	1997	
Brazil	11	15	36
Argentina	22	36	64
Chile	12	32	167
Colombia	9	17	18
Costa Rica	21	30	43
Mexico	14	16	14
Peru	17	26	53
Uruguay	17	30	77
Venezuela	21	29	38

**Table 11-2: Percentage of the age cohort in most Latin-American countries**

This low percentage is mainly due to the fact that the available places in higher education institutions do not suffice the demand. As mentioned before in this chapter, students who wish to attend higher education should take an entrance exam, named the Vestibular. In Table 11-3 an overview is given of the available places in higher education and the demand for higher education, by means of Vestibulars taken.

Year	# Vestibulars Taken	# Places	Vestibular/ Admissions	Students Enrolled	Admissions/ Enrolees
1980	1,803,567	404,814	4.5	356,667	1.16
1985	1,514,341	430,482	3.5	346,380	1.24
1990	1,905,498	502,784	3.8	407,148	1.17
1995	2,653,853	610,355	4.3	510,377	1.21
1996	2,548,077	634,236	4.0	513,842	1.23
1997	2,711,776	699,198	3.9	573,900	1.22
1998	2,858,016	776,031	3.7	651,353	1.19
1999	3,354,790	904,634	3.7	750,168	1.20

**Table 11-3: Overview available places and demand higher education in Brazil**

As shown, the number of places in higher education has grown significantly, but the number of Vestibulars taken (thus the number of students that wish to attend higher education) has also grown, so that approximately one in four taken Vestibulars leads to an admission to higher education. This does not explicitly mean that one in four students that wishes to attend higher education is admitted, because there are no statistics available on the average number of exams each candidate takes. Most likely there is a significant queuing problem. Many students take the Vestibular several years in a row [CAO03].

Looked at the total enrolments in higher education in Brazil, there will be investigated if there are any differences in enrolments between sexes, ethnic groups and groups with different incomes.

One might get the idea that the percentage of males attending higher education is higher than the percentage of females, based on the fact that women are still being underpaid and the most important functions are fulfilled by men. But in table 2-3 [EDS03] is shown that assumption would not be true.

	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Girls' enrolment share (%), tertiary</b>	52.4	52.8	-	-	-	54.9	-	-	-
<b>Gross enrolment rate (%), tertiary, total</b>	11.1	11.3	12.9	14.5	14.8	13.5	14.8	16.5	-
<b>Gross enrolment rate (%), tertiary, female</b>	11.8	12.2	14.0	15.7	16.1	14.9	16.5	18.6	-
<b>Gross enrolment rate (%), tertiary, male</b>	10.3	10.3	11.8	13.2	13.5	12.2	13.1	14.4	-
<b>Population, female (% of total)</b>	50.4	50.4	50.4	50.5	50.5	50.5	50.5	50.6	50.6
<b>Population, male (% of total)</b>	49.5	49.5	49.5	49.5	49.4	49.4	49.4	49.3	49.3

**Table 11-4: Female enrolment in higher education in Brazil**

As shown the share of women in higher education has been higher since at least 1992, even though the population of male and female has approximately been the same these years. Although some figures of these table are not filled in this table because the institute that has computed these numbers did not have the necessary data.

According to Table 11-5 [ETE03], shown is that the difference in percentages hold for Brazil. For comparison, the figures of The Netherlands were added and the percentages of female enrolment were calculated. Concluded can be that the percentages of females attending higher education in Brazil are higher than in the Netherlands, although the differences are not very large.

Country	School Year	Enrolment in Tertiary Education		% female
		Both sexes Total	Female	
<b>Brazil</b>	1998/1999	2,203,599	1,211,171	54.96
<b>Brazil</b>	1999/2000	2,456,961	1,365,159	55.56
<b>Brazil</b>	2000/2001	2,781,328	1,562,153	56.17
<b>Netherlands</b>	1998/1999	469,885	231,629	49.29
<b>Netherlands</b>	1999/2000	487,649	243,634	49.96
<b>Netherlands</b>	2000/2001	504,042	254,539	51.00

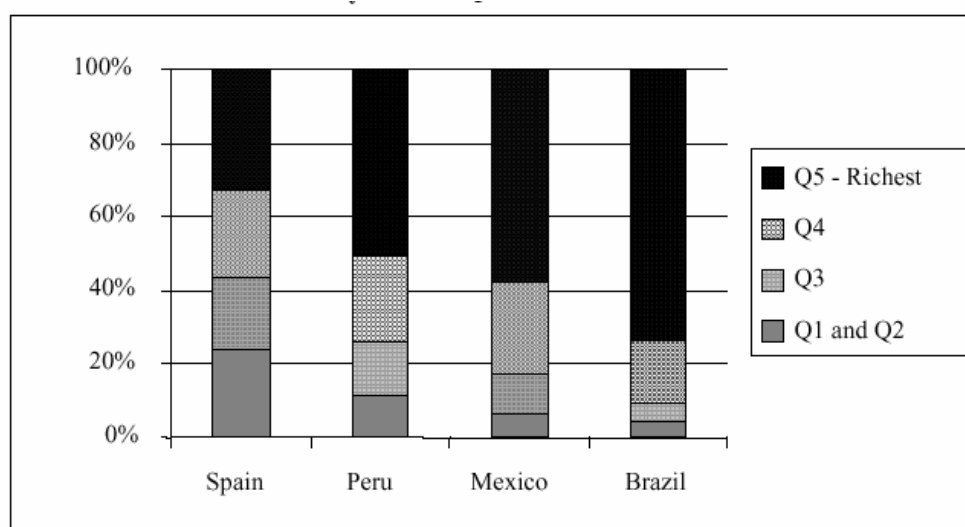
**Table 11-5: Comparison enrolment between Brazil and the Netherlands**

The next question that has been asked in the introduction of this section was if there were any differences in the demand for higher education between ethnic groups. And indeed, there are differences in the enrolment between ethnic groups. In Brazil people of African and indigenous descent are at great socioeconomic disadvantage compared to the rest of the population. Of the Afro-Brazilian people, only 41 percent complete the eight years of compulsory basic education, compared to 64 percent for whites. Also, while 35 percent of white students, who complete secondary education, enter university, just 18 percent of Afro-Brazilian people are able to do so. [DHE03]

In higher education, white students occupy about 79 percent of the places on offer, although they account for 55 percent of the total population of Brazil. Asian students occupy about 2.5 percent of all places in higher education, while they belong to a racial group representing a mere 0.5 percent of Brazil's total population. Afro-Brazilian people account for 39 percent of the total population of which only 17.4 percent will succeed to enroll in higher education. Black students are underrepresented at all levels of education and account 1.4 percent of all enrolments in higher education, while they account for 5 percent of the total population of Brazil. [TBD03]

The difference in enrolments of various ethnic groups in Brazil is partly caused by the difference in income of the families in these ethnic groups. The income of a Brazilian family has lots of influence on the chance for a student to enroll in higher education. Brazil is known as medium income country with astonishing income inequality. The richest 20 percent of the population own 63.8 percent of the total income, while the poorest 20 percent account for 2.5 percent of the total income. In the Netherlands this gap is much smaller with 40.1 percent of the total income for the richest 20 percent of the population and 7.3 percent of the total income for the poorest 20 percent.[ELE03]

Brazil can be divided in five income quintiles, Q1 till Q5. With Q5 being the richest 20 percent, and Q1 being the poorest 20 percent. Looking at the differences between these income groups in enrolment in higher education, there can be seen that the richest 20 percent account for about 75 percent of all enrolments in higher education, while not even 10 percent is being accounted for by the lowest two quintiles, thus the poorest 40 percent of the population. In Figure 11-1 these results can be compared with Spain, Peru and Mexico.

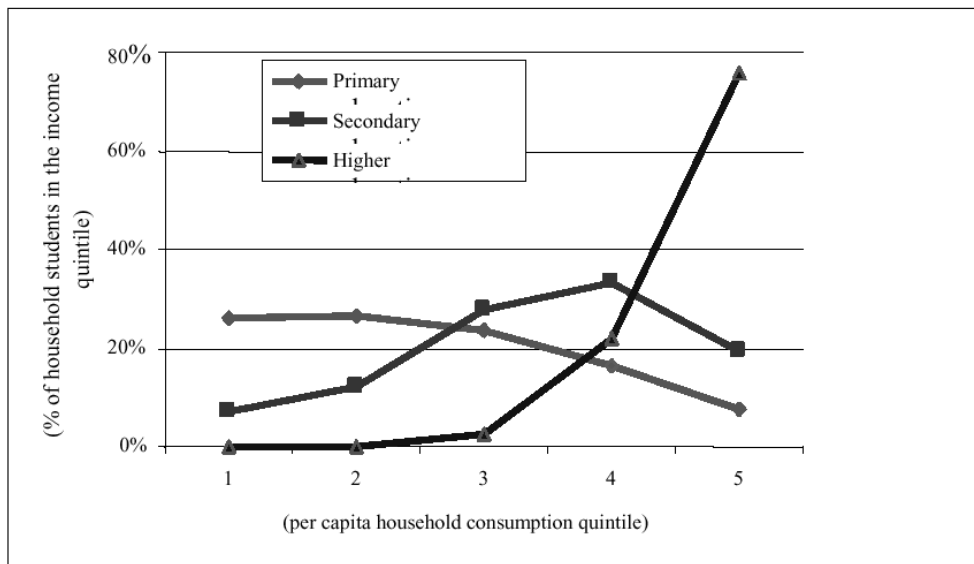


Source: Education at a Glance: OECD Indicators 1998.

**Figure 11-1: Enrolment of 18-24 year-olds in higher education by income quintile**

It is clearly that the inequality in enrolment by income group is the greatest of these four countries.

When compared to the differences in income group in enrolment in primary and secondary education (Figure 11-2), it is shown that the poorest two quintiles of Brazil account for about 30 percent in enrolment in primary education and about 15 percent in secondary education. Again, it is clear that the enrolment in higher education is mainly accounted for in the highest two quintiles.



**Figure 11-2: Distribution of enrolment by Income Quintile [CA003]**

### **Demand from the labour market**

Table 11-6 gives an overview of the existing and prospective labour force with higher education. As shown the prospective labour force in Brazil is not very high when compared to France and the United States of America. Then again, the inflow rate in higher education in the United States is 6.5 times higher than in Brazil.

	<b>Stock (% Total Lab Force with HE 1995-97)</b>	<b>Stock: relative to Brazil = 100</b>	<b>Inflow (HE% enrolment rate)</b>	<b>Inflow: relative to Brazil = 100</b>
<b>Brazil</b>	12	100	12	100
<b>Argentina</b>	12	100	29	240
<b>France</b>	24	200	49	410
<b>USA</b>	37	310	79	650

**Table 11-6: Demand of labour markets in Brazil**

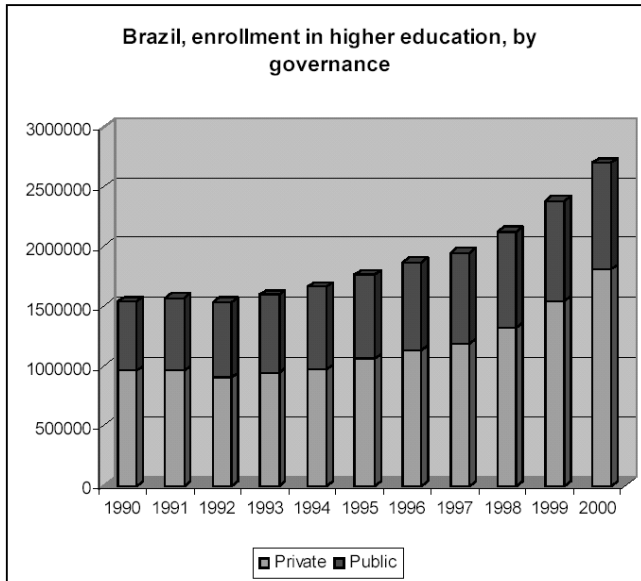
Now the demand of the labour market of Brazil in comparison to other countries is known, the focus can be at the occupations of higher educated people. An overview of the occupations of persons with higher education in 1992 and 1999 is given below. This pattern is similar to what is found in other countries in the region.

<b>Occupation/year</b>	<b>1992</b>	<b>1999</b>	<b>% change 1992-1999</b>
<b>Services to business</b>	9.91 %	14.22 %	4.31 %
<b>Services</b>	4.35 %	5.25 %	0.89 %
<b>Trade</b>	9.75 %	10.67 %	0.92 %
<b>Agriculture</b>	1.74 %	1.74 %	0.00 %
<b>Social activities</b>	34.29 %	33.87 %	-0.42 %
<b>Transportation, communication</b>	2.53 %	2.47 %	-0.06 %
<b>Public administration</b>	12.68 %	12.17 %	-0.51 %
<b>Construction</b>	2.10 %	1.86 %	-0.25 %
<b>Other activities</b>	8.38 %	6.67 %	-1.71 %
<b>Industry</b>	12.26 %	9.61 %	-2.65 %
<b>Other industrial activities</b>	2.00 %	1.49 %	-0.52 %
	100%	100%	
<b>Total</b>	5,292,567	5,677,727	

**Table 11-7: Occupations of higher educated people in Brazil**

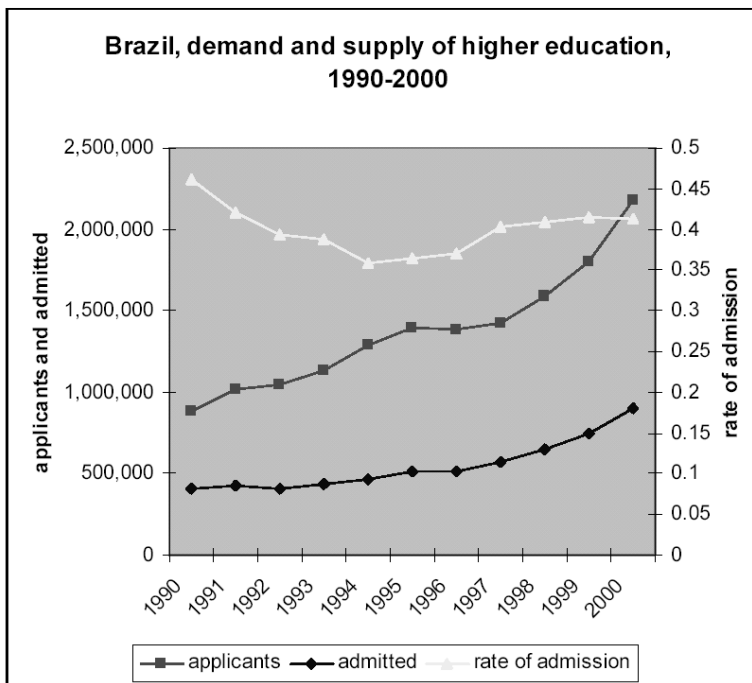
Table 11-7 shows that most employment for higher educated people is in social activities and government. Although the occupation percentages of 1992 and 1999 have not changed dramatically, the total of higher educated population has not grown very fast in the these seven years, only from 5,292,567 to 5,677,727. In the next subsection the main reason for this will be discussed. [DNE03]

**Growth of higher education**



**Figure 11-3: Growth of enrolment in higher education**

As mentioned before, the enrolments in higher education have not grown dramatically in the last years, but the demand for higher education has. As shown in Figure 11-3, the enrolment has grown in the last decade, but Figure 11-4 shows that higher education can not cope with the increasing number of students who wish to attend higher education.



**Figure 11-4: demand and supply for higher education**



The number of applicants has grown significantly in the last years, while the number of admitted students cannot really keep up with this growth.

One would expect that higher education institutions would adjust their offerings to respond to the demand, and would benefit financially from being attuned to the market. In practice, the private institutions are already squeezed in low cost fields (like social professions and education), where the supply of places is abundant, and have difficulties in entering in fields like medicine and engineering where the costs are higher, and external controls are tighter. As for public institutions, they cannot change their long-term investments and human resources at will, and have no incentives to adjust their offerings to the demand. [DNE03]

### **11.3.2 Factor conditions**

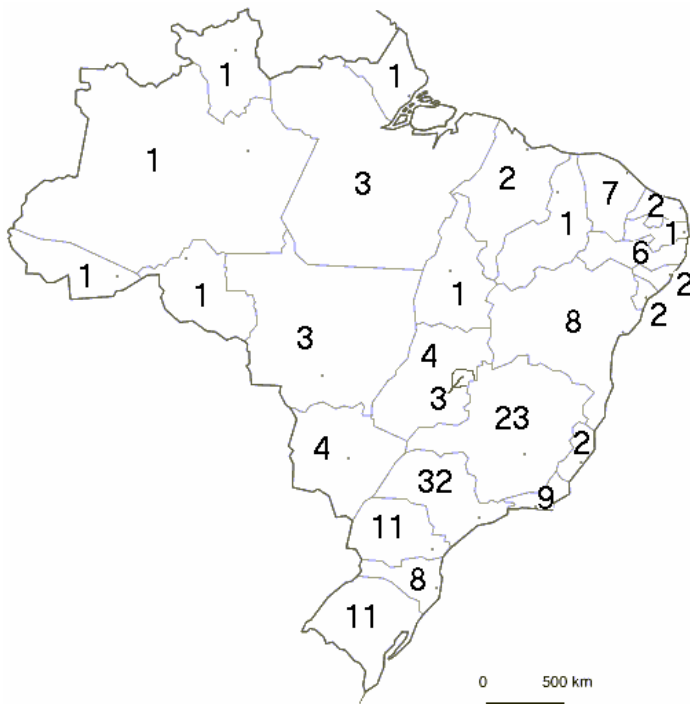
This description of this determinant is the most difficult to apply on a non-trading sector as higher education. Aspects as interest rates and inflation do have effects on this sector, but these effects are hard to measure and good documentation about the relation between different interest rates and higher education is hard to find. However, some factors can be still usefully applicable.

The focus is on the following aspects:

- Geographic aspects. Are the facilities for higher education well spread over the country or is higher education only available in a certain area?
- Infrastructure. This is closely related to the geographic position. How is the infrastructure on and around schools and universities maintained? What about the reachability?
- Labour market & costs. Are there enough teachers and researchers to provide good education at universities and other higher education schools? Is the education of these people high enough, and affordable?

#### **Geographic aspects**

In Figure 11-5 the distribution of universities in the country is showed.



**Figure 11-5: distribution of universities per state [UBS03]**

It is obvious that the distribution of universities in the country is not uniform: most universities are located in the south east, around cities as Rio de Janeiro and São Paulo. This is hardly a surprise, because it is logical that low populated areas tend to have fewer universities than areas with lots of big cities. Therefore, it is wise to make another analysis: compare the number of universities in each state to the population. This results in the following table [SOB03]:

State	Population	Number of universities	Inhabitants per university
Acre	557,526	1	557,526
Alagoas	2,822,621	2	1,411,311
Amapá	477,032	1	477,032
Amazonas	2,812,557	1	2,812,557
Bahia	13,070,250	8	1,633,781
Ceará	7,430,661	7	1,061,523
Distrito Federal	2,051,146	3	683,715
Espírito Santo	3,097,232	2	1,548,616
Goiás	5,003,228	4	1,250,807
Maranhão	5,651,475	2	2,825,738
Mato Grosso	2,504,353	3	834,784
Mato Grosso do Sul	2,078,001	4	519,500
Minas Gerais	17,891,494	23	777,891
Pará	6,192,307	3	2,064,102
Paraíba	3,443,825	1	3,443,825
Paraná	9,563,458	11	869,405
Pernambuco	7,918,344	6	1,319,724
Piauí	2,843,278	1	2,843,278
Rio de Janeiro	14,391,282	9	1,599,031
Rio Grande do Norte	2,776,782	2	1,388,391
Rio Grande do Sul	10,187,798	11	926,163
Rondônia	1,379,787	1	1,379,787
Roraima	324,397	1	324,397
Santa Catarina	5,356,360	8	669,545
São Paulo	37,032,403	32	1,157,263
Sergipe	1,784,475	2	892,238
Tocantins	1,157,098	1	1,157,098

**Table 11-8: Universities compared to population in states in Brazil**

As can be seen, the distribution of university is less unbalanced than one may conclude judging from figure 1 alone. The huge number of universities in São Paulo, for example, is a direct result of the huge population in that state, compared to other states. When the numbers are compared with the number of inhabitants, the number of universities seems normal. It should be noted that every state has at least one federal university, hence the presence of a university in relatively less populated states as Roraima and Amapá.

Yet the number of universities in specific states does not say everything about the number of students that is following higher education in the region. Table 11-9 gives more information [APB03]:

	% of total enrolment	% of teachers	% of full time teachers.	% with a master's or a doctor's degree
<b>North</b>	3.3	3.1	4.8	2.2
<b>Northeast</b>	15.8	16.7	22.0	15.5
<b>Southeast</b>	56.3	55.2	46.6	61.4
<b>South</b>	18.4	18.8	18.8	15.7
<b>Center West</b>	6.3	7.9	7.9	5.1
<b>Total</b>	100%	100%	100%	100%
<b>Total number</b>	1,565,056	133,135	57,728	46,758

**Table 11-9: Students and teachers in the regions in Brazil**

Note that here the various regions are distinguished, while in Table 11-8 the statistics were known per state. The last table shows that the number of students per teacher is steady throughout the country. The average number of students per teacher in Brazil is 11.8, judging from these statistics. The fourth column shows that the number of full time teachers in the Northeast region is fairly high, specifically compared with the Southeast region. By itself this does not say much, but the fifth column gives extra information. Here it is shown that most teachers with a degree work in the Southeast region. The number of teachers with a degree is far more than one could expect based on the enrolment figures of students. Because of the fact that highly educated teachers tend to have other activities besides teaching, for example in research, this relates with the fourth column.

It can be concluded that the geographic distribution of availability of higher education in itself is adequate in Brazil. This is mainly established because of the fact that every state in Brazil has at least one university. It should be noted however, that in some less-populated states the number of inhabitants per university is fairly high, for example in Paraíba. This situation can partly be explained by the nature of the universities. In heavily populated areas, there is room for specialization of universities. In São Paulo for example, there are technical universities as well as more general themed universities [UBS03]. This is only possible because of the high number of potential technical students in the state. In the less populated areas this is not the case and higher education facilities have to be more general and hence tend to have relatively more students.

The reader should be warned however, that while the availability is adequate throughout the country, the quality of education is likely to differ between the various regions. Institutes in the Southeast region employ relatively many teachers with a master's or doctor's degree. The quality of higher education may be assumed higher in that region.

### **Infrastructure**

Important for the development of higher education in Brazil is the infrastructure surrounding it, not only physical (roads, etc.), but also in terms of communication (telephone, internet).

It is known that most higher education is located in urban regions. A tour across the websites of several institutes show that the relative locations of these institutes are similar: they are often located in or near the center of a city. That way students and employees can use facilities that are present downtown, such as railway stations. It can also be seen that, with some exceptions, most universities are split in several campuses around the city. This shows some disadvantages of being located downtown: it is difficult to expand at the same place.

It is hardly a surprise that all major higher education facilities have telephone and Internet connection. Nowadays, the Internet should be a standard facility at universities. However, while every university officially has an Internet address, several of the websites on these addresses are poor, judging from a Computer Science point of view [UCS03] [USP03]

[USB03] [UFR03] [UFM03] [UEC03] [UFS03] [UEP03] [UFC03]. Navigation is difficult and slow and the amount of information is limited, and most universities tend to have no English version of their website. An example of this is the website of the Universidade Federal do Ceará [UFC03].

### Labour market & costs

The quality of the Brazilian higher education is highly dependant of the quality of the professors that teach the students at the institutions. There have been several problems with respect to this factor in comparison to other countries on the continent.

In 2000, an extensive research has been completed to the state of higher education in developing countries, like Brazil [CAO03]. It was initiated by the World Bank and UNESCO. It shows that the quality of education the quality of instruction is below desirable standards. In the Brazilian public system, a lack of coherence in research, teaching, and career advancement policies in public institutions has often led to a concentration of professors doing specialized research at the expense of undergraduate teaching. By contrast, many private institutions are driven by profit, and therefore do not undertake any research or pay salaries necessary to attract and retain high-quality professors.

In the following table [APB03] some statistic information is shown about the employment of teachers in the higher education sector in Brazil.

	% of total enrolment	% of teachers	% of full time teachers	% with a master's or a doctor's degree
<b>Federal</b>	20.5	32.6	60.3	46.6
<b>State</b>	12.9	17.9	26.0	25.4
<b>Municipal</b>	5.3	3.7	2.0	1.4
<b>Private</b>	61.3	45.8	11.7	26.2
<b>Total</b>	100%	100%	100%	100%
<b>Total number</b>	1,565,056	133,135	57,728	46,758

**Table 11-10: Distribution of teachers in higher education sector in Brazil**

This table, originating from the same source as Table 11-9, shows rather drastic differences between the various types of higher education. The differences can be explained if one looks at the history.

In 1968, the higher education system underwent a huge reform operation. The American model was adapted. It led to a system of federal and state institutes, providing full-time employment for professors, creating graduate education programs and limiting the number of students admitted each year. Because of the limitations, students that did not pass the entrance examinations to public institutions, were forced to seek education elsewhere. Private education developed mostly in the Southeastern region, where the demand for higher education overtook by far the availability of places in public institutions. In the poorer regions, public institutions are still the dominant avenue for further education for the few that complete secondary school.

How does this relate to the labour market? Because of the high standards and salaries at federal and state institutes, well-educated teachers are very motivated to work at these facilities. In the table above this can be seen: only 33% of the students attend these forms of public education, while 72% of the teachers with a master's or doctor's degree teach there. Less gifted scholars have to go to private institutes. You can conclude that the labour market is layered: there are good teachers, but they can only be paid by the better funded public institutes. The process is likely to be recurrent: part of the graduated students from public institutes are likely to become the new well-educated teachers at these institutes, while the less gifted students at private institutes will become the institutes' less gifted teachers.

### **11.3.3 Strategy, structure and rivalry**

This determinant deals with the way institutions created, organized and structured. Like the other determinants, a slight adaptation is needed before this can be applied to higher education.

Before the structure of education in Brazil will be discussed briefly, the focus will be on the higher education and underlying reasons for this structure. What is the policy of universities in Brazil?

Next, the mutual competitiveness will be discussed. Are the different universities competitors? Or is there a strong focus on cooperation?

#### **Structure**

Historically, the Brazilian system, like those of continental Europe, is oriented to provide professional training rather than general or interdisciplinary education. Holders of a first university degree are licensed to practice their profession by virtue of their diplomas. Such systems have been successful, productive, and of high quality under a variety of conditions. However, in Brazil, thanks largely to restrictive labour market regulation, the influence of professional associations in setting the curricula and the numbers of courses and places have limited the supply of professional labour, rather than satisfied the demands of the labour market. Because of the shortcomings, the structure of the higher education system has changed recently. The changes are officially initiated by the government and thus can be treated in that part of Porter's Diamond. However, because it were the universities themselves that took initiative to work out the changes and because it addresses the structure of the sector directly, the topic is discussed in this subsection. [CAO03]

Prior to 1994, higher education institutions were not allowed to define curricula or personnel policies. They could not hire or fire academic, technical, or administrative staff, set salaries, open new courses of study, decide the number of places they would offer, or transfer budget resources among expenditure categories. In 1994 a new law was passed that allows universities to define their own personnel policies, to hire and fire staff directly, and to manage budgets according to the needs of the institution, rather than centralized bureaucratic mandates. The law also creates the framework for a national evaluation system, through which the federal

government can monitor and guarantee the quality of higher education. [CAO03]

Unlike the private institutions, federal institutions are dependant of funding from the government. The basis of these funding are nowadays performance contracts. Improved productivity would be rewarded, by a simple, transparent formula. For the private system, it would provide loans targeted to students who could not otherwise afford to pay.

The various institutions vary in quality. Therefore, each course is graded by several criteria, and those that do not meet minimum quality standards after a probationary period are denied public funding and lose their accreditation.

### **Strategy and Rivalry**

As usual in most parts of the world, higher education institutes in Brazil have goals other than teaching science to students. Innovative research has become more and more important for Brazilian institutes in the last decades. Around 0.7% of Brazils Gross Domestic Product (GDP) is invested in Science and Technology.

The main research centers in the Country are in public universities. Most of the 15,000 PhDs in Brazil work in universities. Consequently it is the universities themselves which generate Brazilian scientific production and, within this universe, public bodies are far more proficient than private educational and research institutions, as already has been pointed out. The strategy of private schools is mainly given by the goal of making profit. Without the help of substantial funding, it is not profitable to invest in research and development. The strategy of these institutes is therefore aimed at teaching students. The strategies of public schools are often wider: scientific research as well as teaching students.[SEB03]

There are no obvious rivalries between public institutes: there should not be any, because all public institutions have the same owner: the Brazilian government. It is very likely of course that there is some competition between universities in terms of achieving the best scientific results, but this only stimulates research. From the previous subsections can easily be concluded that rivalry between the public sector on the one side and the private sector on the other side is less friendly: Private institutions need considerable numbers of students to make profit and therefore need to attract them. This however does not affect the number of students enrolling in the public higher education, because public universities are generally accepted as high quality institutions and moreover, only a small fraction of the potential students is accepted. Because of the nature of their goals, private schools are in competition with each other.

### **11.3.4 Related and supporting industries**

Each sector is in its development dependant on other related sector, and vice versa. So is the higher education sector. There can be distinguished three different related sectors.

The most obvious sector is all education preceding higher education. Cooperation between the various stages of education is crucial for optimal learning conditions for students. Problems with one stage are likely to affect others on the long term. This sector is vertically related to the higher education sector.

In the introduction section is already described the way all education preceding higher education is arranged. Here were shown a great progression compared to the past. Now there is a structured education system, with a lot of possibilities to attend higher education.

Horizontal is the relation between higher education and research. This encompasses all research that is done at universities and technical research institutions. In spite of problems with funding and the lack of investments from the productive sector, Brazil has succeeded in setting up a significant infrastructure for scientific and technological development. One of the reasons is the raising investment in science and technology. Today, the country has the largest R&D system in Latin America, with 4,402 research groups and about 15,000 active scientists and researchers.

Despite the fiscal incentives established to encourage the private sector to invest in R&D during the 1960s, most of the resources for this activity come from the public sector (state and federal governments). There is, however, some evidence that industry's contribution to total R&D costs may be increasing. In 1959, only two Brazilian companies invested in R&D. By 1988, this number had risen to 81. Only 6 percent of the investment in science and technology came from private sources during the period 1981-89. More recent data from the Ministry of Science and Technology indicate that Brazilian firms increased their participation to 22 percent of the total amount [GRA03]

**Table 5. Annual investments in science and technology by source (percent)**

Source	1990	1991	1992	1993	1994	1995
Total (US\$ million).....	3,081.5	3,034.4	2,442.5	4,703.0	4,995.0	5,957.0
Federal government <sup>a</sup> .....	83.9	79	74.8	54.9	51.8	47.1
State government <sup>b</sup> .....	16.1	21	25.2	18.4	15.2	21.8
Public enterprises <sup>c</sup> .....	NA	NA	NA	8.3	9.1	9.3
Private enterprises <sup>c</sup> .....	NA	NA	NA	18.2	23.9	21.8

<sup>a</sup> 1995 value includes an estimate of US\$350,000 for wages of investigators who are faculty members at federal university. The current data collection procedure apparently fails to capture most of these payments. Preceding years do not include this estimate.

<sup>b</sup> The number of states included from 1990 to 1994 was 23, 21, 20, 23, and 27, respectively. Value for 1995 was estimated by the Ministry of Science and Technology.

<sup>c</sup> Estimate based on preliminary results from the first 500 firms responding to ANPEI's latest survey.

**KEY:** NA = not available

**NOTES:** Values were updated based on the gross domestic product implicit price deflator and translated to dollars using the average exchange rate for 1995 provided by the Brazilian Central Bank (US\$1,00 = R\$0,918). Totals for 1990-92 totals show only federal and state government expenditures.

#### Figure 11-6: Annual investments in science and technology

Finally there are the supporting industries. These industries produce all needed books, infrastructure, buildings, etcetera. These industries must be strong to provide good circumstances for higher education.



### **11.3.5 Government**

In higher education the government plays a very important role. Being both the policymaker and the financier, the government is even more important than in regular sectors where Porter's diamond is applied.

In this section the role of the government in the development of the sector of higher education will be elaborated. What is the view of the government on the relation between higher education en lower stages of education? What is the policy regarding funding? What is the policy regarding private schools?

As mentioned earlier in this chapter, Brazil is a Federative Republic, made up of 26 states and the Federal District. The educational system is organized on the basis of a collaboration of the Union, the States, the Federal District and the Municipalities. The Federal Government, represented by the Ministry of Education and Sport, organizes and finances the federal education system and grants technical and financial assistance to the States, the Federal District and the Municipalities for the development of their educational systems. [EIB03]

The different States can have different educational systems, as long as the federal legislation is respected. This means that the principles in the 1988 Brazilian Constitution, which are the guidelines for national education, have to be respected by the States, when they make additional rules for their own education systems. The Federal Government is still in charge of legislating on Guidelines and bases for national education and coordinating and developing National Educational plans.[BED03]

The States are directly responsible for the administration of primary and secondary education, and the Ministry of Education and Sport is responsible for all higher education. The Ministry of Education and Sport has ultimate control over most aspects of higher education. The principal standard setting agency was the Conselho Federal de Educacao (Federal Council of Education). In 1996 this council was replaced by the National Council for Education (CNE). It is regulated by law that 25% of state and local tax revenues to education. [WED03]

As mentioned before the Federal Government and the CNE do not have any jurisdiction over state and municipals. However, the Federal Government does have jurisdiction in the area of curricula because state and municipal universities have to follow the curriculum guidelines issued by the CNE due to the fact that the Federal Government has to recognize the diplomas rewarded by those universities.

The Federal Government of Brazil subsidizes a lot of the educational system in Brazil. The main focus is the funding of primary and secondary education, which is free for every one. Within the exception of a small student loan program that subsidizes private education, all federal spending for higher education goes to the federal university system. The system's budget is about R\$ 6.5 billion per year. About 23 percent of all public spending on education (which is 1.3. percent of GDP), were allocated to higher education, although higher education constituted only 2 percent

of total enrolment in education. Individuals and the private sector spent an additional 0.4 percent of GDP on higher education. Public universities (federal, state and municipal) do not charge tuition.

Two types of private institutions can be distinguished. The first one is non-profit private institutions and the second is profit-oriented private institutions. Both types of institutions do not receive federal funding (except for the student loan program), but profit-oriented private institutions are seen by the Government as businesses and therefore have to pay taxes. The main advantage of this construction is that these institutions are allowed more freedom to run their institutions as they see fit. Non-profit schools, on the other hand, would be held to a stricter set of educational controls within the communities that they are supposed to serve.

The large private higher education sector is subject to considerable governmental control. In the private sector, the CNE controls initial approval to operate as a university or college, the courses of study or programs that can be offered, and the maximum tuition that can be charged. This and no federal funding make private higher education quite tuition dependent - no longer depending on public revenue, but still subject to various public controls.

Brazil has no national program of grant assistance, and loans are available to a small number of students attending private institutions. This financing pattern is partly due to the fact that public institutions in Brazil do not charge tuition. Approximately 19 percent of enrolled students receive aid. This percentage consists for a large part of research assistantships for undergraduates. Also included in this percentage are the tuition discounts given by private institutions. When looked at the distribution of higher education enrolment by income group, it becomes clear that the enrolment of students from higher income groups is a lot more than the enrolment of students from lower income groups. This means that targeted student aid could have a very large effect on this difference.[CAO03]

There can be seen that the Brazilian Federal Government plays a very big role in the development of (higher) education. The Federal Government has the power to control the higher education sector as they see fit. This power is obviously due the facts that a great part of the education system is regulated by law, but also that education is greatly subsidized by the government. However, this higher education system is not (yet) suitable for the needs of the Brazilian people. At this time a Gross Enrolment rate of 15 percent is maintained. This means that there are not enough places in higher education to teach all the students who wish to attend higher education. It is because of the lack of places in higher education that all students who wish to enter higher education have to compete for places through competitive entrance exams known as the vestibular.

### **11.3.6 Chance**

The last factor in Porter's diamond is the influence of chance. In this determinant are accidental circumstances described that influence the sector. These could be wars, political changes, climate factors etcetera.

Brazil is not in war with any country at the moment. It also does not look like there will be any big conflicts in the near future. So this aspect of change hardly will have its influence on higher education. The climate could have influence; natural calamity could have the effect that people have to stay at home. Also educational buildings could be destroyed. As long as such disasters do not frequently happen and do not have great impact, they will only have short consequences.

Brazil's distribution of population is very unequal. 90% of the total population lives in the coastal areas of the north- and southeastern and in the southern. In the Amazon and the western part of Brazil there only live respectively 1 and 2,9 inhabitants to the square kilometer. As shown before almost the same counts for the distribution of universities. So not all people in Brazil will have the same education possibilities.

Another aspect is the enormous increase of population, as you can see in the figure below. This means that also more teachers, study material and buildings could be necessary [BRZ03].

Year	1876	1900	1940	1950	1960	1970	1980	1991	1995	2001
<b>Inhabitants (millions)</b>	10.9	17.3	41.2	51.9	70.1	93.2	121	146	161	175

**Table 11-11: Number of Brazilian inhabitants**

## 11.4 The Netherlands

In the table below you can see the system for education in the Netherlands.

Type		Duration	Requirements
Primary	Kindergarten	2 years	Aging 4 to 5.
	Basisonderwijs	6 years	Aging 6 to 12
Secondary school	VMBO	4 years	Having finished Elementary School.
	HAVO	5 years	
	VWO	6 years	
Higher education	MBO	3 or 4 years	Finished VMBO or higher in secondary school
	HBO	4 years	Finished HAVO of higher in secondary school
	WO	Variable 3 or 5 years	Finished VWO in secondary school

Table 11-12: Education in the Netherlands

### 11.4.1 Primary education

The first kind of school that the Dutch children must follow is the primary school. Primary schools in the Netherlands are for children aged 4 to 12. The eight-year primary-school programme focuses on the development of the child along with the acquisition of essential social, cultural and physical skills. Every primary school draws up its own school work plan, based on criteria laid down by the government.

Besides the regular schools there are special schools for those aged 3 to 20 years, who suffer from physical, mental or social disabilities. As far as possible, they are taught the normal program, but receive extra attention to enable them to enter or return to a normal school.

### 11.4.2 Secondary education

After completion of the primary school the children aged 12 or older may enter secondary education. There are three types of secondary education:

- junior general secondary education and pre vocational education (vmbo)
- senior general secondary education (havo)
- pre-university education (vwo)

Most secondary schools provide more than one of these types of education. VMBO take four years and lead on to senior secondary vocational education (MBO) or apprenticeship programmes. HAVO is a five-year programme and leads on to higher professional education (HBO). VWO takes six years and leads on to university (WO). Pupils in the first three years of secondary school are all taught the same core program. 97.7% of all 17-year-olds in the Netherlands have currently either completed or are still attending secondary school full time.

Anyone with an MBO or advanced apprenticeship certificate may start a business, not only in the Netherlands but also in other EU countries.

### 11.4.3 Higher education

Higher education comprises higher professional (HBO) and university education (WO). Most HBO and WO programmes take four years, but students may be registered for up to six years. 15.2% of those aged 18 to 27 are currently attending some form of higher education full time, and 6.8% are part-time students. Once students have graduated, they may specialise or carry out research. The Netherlands has nine general universities, three technological universities and one agricultural university, all with specialised research institutes.[MIN98][EPI00]

#### Growth of the education

Looking at the enrolment figures from the past 5 years there is a small growth. In the table below you can see the enrolment in WO.

Period	Total	Man	Women	% men	%women
1997/1998	160.720,00	86.100,00	74.620,00	0,54	0,46
1998/1999	160.480,00	85.120,00	75.370,00	0,53	0,47
1999/2000	164.010,00	86.100,00	77.910,00	0,52	0,48
2000/2001	168.150,00	87.150,00	81.000,00	0,52	0,48
2001/2002	174.300,00	89.690,00	84.610,00	0,51	0,49

Table 11-13: Enrolment in WO

In Table 11-14 you can see the enrolment in HBO.

Period	Total	Man	Woman	% men	% woman
1997/1998	279000	140000	139000	0,50	0,50
1998/1999	288000	142000	146000	0,49	0,51
1999/2000	299000	146000	153000	0,49	0,51
2000/2001	309000	149000	160000	0,48	0,52
2001/2002	314000	152000	162000	0,48	0,52

Table 11-14: Enrolment in HBO [CBS01][ENS03]

Besides the usual educational system there is a possibility for adults and international student to attend education.

#### Adult education

Adult education encompasses most of the types of education described above. Adults may attend part-time or full-time programmes, during the day or in the evening, and at either secondary or higher level. The Open University, with its wide variety of programmes, plays a special part in adult education.

#### International education

For children who have received part of their primary or secondary education abroad, there are schools where the whole curriculum is taught in English, French or German. In addition, the Netherlands has ten university institutes offering specialist programmes to foreign postgraduate students in English and occasionally in French or Spanish.[MIN98]

### **Geographic aspects.**

The country is a lot smaller than Brazil. In several hours, you can reach every point of the country from every other point without using airplanes. Hence, the geographical distribution in the Netherlands is less important than in Brazil. Still, the thirteen universities in the Netherlands are well-spread across the country: the universities of Groningen, Twente and Maastricht are examples of universities that are located in less urban regions than the Randstad. The University of Twente was even planned to be located in the east, because of the absence of universities in that region. So the government have paid attention to the distribution.

### **Infrastructure.**

In Comparison to the Netherlands campuses are less usual than in Brazil. Several universities and “hogescholen” have areas with faculties on it (VU Amsterdam, TU Eindhoven, Saxion Hogeschool Enschede), but these campuses do not facilitate student dorms. Others (RU Groningen) are spread throughout the country. Only one (University of Twente) has a campus in the most complete sense: faculties, student dorms and other facilities, the form that is usual in Brazil.

### **Chance**

As mentioned before the chance factor consist of accidental circumstances that influenced the sector (e.g. war, changes in the political environment)

When looking at the Netherlands you can see a stable country with a small possibility of getting into war. So this aspect will not have a major influence. Viewing the population of the Netherlands there is a slow growth of the population. There are a lot of elderly people in the Netherlands that can influence the sector. Where used to have enough people to educate the children there is a shortage of teachers in the primary education. On the second place the current economic situation is not an advantage for the educational system. The government have to reduce the expenses and have to cut on the budget.

<b>Jaar</b>	<b>Inwoners</b>
1995	15 493 889
1996	15 567 107
1997	15 654 192
1998	15 760 225
1999	15 863 950
2000	15 987 075
2001	16 105 285

**Table 11-15: Number of inhabitants Netherlands**

## **11.4.4 The role of the government.**

The government is of course responsible for supervising the educational system. School attendance is compulsory for children aged five to 18, though in the final two years they are only obliged to attend part time. The subjects taught in all types of school are laid down by law, as are attainment targets. This enables the government to ensure that qualifications are uniform throughout the country.

Schools set up by public authorities - usually municipalities - are called public-authority schools. All other schools, founded by private bodies, are called private schools. More than 75% of Dutch schools are private, but the government awards funding in the form of block grants to all schools meeting certain criteria. Similarly, teachers' salaries are decided nationally. In 1998, the Netherlands spent 5.5% of its GDP on education. Children of compulsory school age receive education free of charge, although schools may ask parents to contribute to the cost of extra-curricular activities. All parents, irrespective of income, receive a state allowance called child benefit.[CBS02][ENS03]

Students aged 18 or older have to pay for their education. Fees for most higher-education programmes are the same. All students aged 18 or older receive a basic state grant, which they may supplement with a loan. The amount of the loan will depend on the student's income (or that of his/her parents) and his/her educational performance. Students aged 18 or older are also entitled to a public transport season ticket at a reduced price. 15.2% of those aged 18 to 27 are currently receiving some form of higher education full time, and 6.8% are part-time students. Few Dutch schools, colleges or universities provide accommodation for their students (e.g campus or other facilities), and there are no dress codes or school uniforms.

It seems the government has a controlling function. A part of the education is regulated by law and the other part can be filled in by the University. At this moment there are enough places for the students to attend higher education. The geographical position of the schools is in difference with Brazil well located. [MIN98]

## 11.5 Comparison

What	Brazil	The Netherlands
Percentage of the people who study in higher education (2001)	6,6 %	3,6 %
Length of school (elementary + Secondary)	14 years	12-14 years
% women higher education	55%	51 %
% men higher education	45 %	49 %
Financial support student	None	Yes (StuFi)
Growth of education last 5 years (measured in available places)	40%	2%
Compulsory education	7-14	5-18
Investments government	Invest only in Schools	Invest in schools and student
The demand for high educated personnel	High	Normal
Amount of private schools	High	Low
Distribution of education	Not structured	structured
Length of study	Approximate 5 years	Approximate 5 years
Availability of Knowledge	Focused on big cities	divided over the universities
Rivalry	Moderate	High

**Table 11-16: Comparison table Netherlands - Brazil**

Comparing the Dutch situation with the Brazilian situation, it shows a difference in the structure of the Education. In general there are no differences but when looking a little bit closer the Brazilian education system is more complex than the situation in the Netherlands. For example in the Netherlands there is one school for the students aged 4-12. On the second place the requirements to enter a school are different. (e.g. the students in Brazil must pass an entrance exam to attend a school after they've passed the previous one).

In the Netherlands there are in generally no entrance exams to enter a school and a student has the possibility to choose between different schools. However in some cases there are requirements necessary. (e.g. medicine) It is due to this fact and the better financial support by the government that the demand for education in the Netherlands is almost equal to the offer of the education. In the Dutch situation the student can choose between universities instead of being chosen (the Brazilian situation). It is likely to think that the amount of universities isn't growing, but when looking at the last 5 years there is a growth of 40%. If you look at this number you may think that there isn't a significant difference between the offer and the demand of education. When looking a little bit closer you can see that only the private schools are growing rapidly instead of the public schools. This means that the offer of education will not increase.

The last major difference is the interference of the government. In the Netherlands the government gives some guidelines for the schools and after a year the school must have reached a present level. In the Brazilian situation the school can decide what they want to teach and how they want



to do it. This means that there are great differences between the various schools. (this will not give a great amount of well educated people).

## 11.6 Conclusion

Education in Brazil has made good progress last decades, nowadays there is a pretty good educational system. Students have the change to use their talents and enrol in higher education. So far everything seems good, there are however still weak aspects. The most important ones are the low enrolment into lower education and the shortage of higher-educational services.

Children from poor families start working in stead of getting education. However there is a law of compulsory education, almost nothing is done to make sure these children are at school instead of at the land or in a factory. They never get the change to enroll in higher education, which results in low-educated people having an important share in the Brazilian population.

Also can be concluded that there is a shortage of school places. There are more students than places, so entrance exams are necessary before one can attend public higher education. These exams are to difficult for a lot of the students. These students often choose private higher education institutes, which do not have these exams. Private institutes are driven by profit, therefore they do less research and pay less time to the education. Compared to the public institutes they can not achieve the same results

An other important difference is found in the geographical area. Brazil is an enormous country compared to the Netherlands. It also has a lot of different geographical areas, with most people concentrated in the South-East. This resulted in a not uniform distribution of educational institutes like universities, of which also the most are located in the South-East. This situation led to higher quality of education in this area compared to the rest of Brazil.

Now will be looked how virtual reality can contribute to the development of these weak aspects and to higher education in common. The definition of virtual reality was:

*Virtual Reality is a way for humans to visualize, manipulate and interact with computers and extremely complex data.*

Looking at the situation in Brazil and this definition, the following possibilities can be given:

With the use of virtual reality an (teacher independent) education environment can be created. Using this environment students should be able to study without being limited by time or location.

This would help to improve some of the weak aspects mentioned above. The same knowledge can be shared across the whole country. Hereby all student will have the disposal of the same facilities and are not limited by the huge distances in Brazil. This environment could be used at

educational institutes, but also at a students home. With education at home the lack of places at schools and universities can be decreased. In projects like Tele Immersion users at geographically distributed locations can work in an real-time, simulated environment, like they were together in one room[TELO3]. This can be used to create virtual classrooms. It can be used to start education projects for the children of poor parents, which would give them possibilities to get proper basic education and eventually enroll in higher education. With virtual reality can make information more real, so things are easier to be learned and understood[VIR03].

Virtual Reality can also be used to in the research sector, for example research at universities. Virtual environments can be used to test for example models or prototypes more dynamically and in extreme situations. Also people at different places can work together on one project.

Overall virtual reality can increase the quality of higher education in Brazil and help to decrease the weak aspects. Real interaction with virtual reality is however still hard to realise[BVE03]. This relation also counts in the opposite direction. Higher education is one of the reasons why the use of virtual reality increases. Research and studies at universities help to improve its usefulness in lots of applications and fields of study.

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# **12 Motion picture, video & computer game production and distribution**

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## Chapter contents

<b>12.1</b>	<b>Introduction</b>	<b>358</b>
<b>12.2</b>	<b>Research question</b>	<b>359</b>
<b>12.3</b>	<b>Sector definition</b>	<b>360</b>
<b>12.4</b>	<b>Video game industry</b>	<b>362</b>
12.4.1	Porter's diamond	362
12.4.2	Comparison	366
12.4.3	Conclusion	369
<b>12.5</b>	<b>Motion picture industry</b>	<b>370</b>
12.5.1	Brazil	371
12.5.2	The Netherlands	376
12.5.3	Comparison	377
<b>12.6</b>	<b>References</b>	<b>379</b>

## **12.1 Introduction**

This chapter is splitted up in two parts. Part one is about the video game industry and part two about the motion picture industry. The reason why it is splitted up, is because the two parts are to different to combine.

The chapter will start with a research question for the motion picture, video & computer game production and distribution. This is de whole sector which will be researched in this chapter, so before the parts will be described there will also be a sector definition.

For both parts there is first a short introduction and Porter's diamond will be used to research the industry. After the Porter's diamonds there will be made a comparison between the situation in the Brazil and the situation in the Netherlands, so a conclusion can be made in the last paragraph of the part.

## **12.2 Research question**

The following research question is used for this part of the chapter:

*“What are the strong and weak aspects of the Motion picture, video, computer games production and distribution sector in Brazil and what could Virtual Reality contribute to the development of these sectors?”*

To try and find an answer to this question, the following sections will be an analysis of several factors on the subject of the Motion picture, video, computer games production and distribution in Brazil. Then a comparison to the situation in the Netherlands is made.

The factors found will be fit into the framework of Porter and strong and weak aspects of the sector are identified.

Finally all strong and weak aspects are concluded and an assessment will be done how “Virtual Reality” can have an influence on them.

## 12.3 Sector definition

This chapter focuses on the sector video industry, motion picture and video production and distribution. According to the Standard International Trade Classification [SIT95] this sector is defined as sector 9211 “Motion picture and video production and distribution”.

This sector can be described as followed [UNS03]:

- 9 Other community, social and personal service activities
  - 92 Recreational, cultural and sporting activities
    - 921 Motion picture, radio, television and other entertainment activities
      - 9211 Motion picture and video production and distribution

This class includes the production of theatrical and non-theatrical motion pictures, whether on film or on video tape, for direct projection in theatres or for broadcasting on television. It usually involves production in a motion picture studio or in special laboratories for animated films or cartoons. The products may be full-length theatrical films, documentaries, shorts, etc., for public entertainment, for advertising, education, training and news information as well as religious pictures, animated cartoons of any kind, etc. Also included are auxiliary activities on a fee or contract basis such as film editing, cutting, dubbing, etc.

Distribution of motion pictures and video tapes to other industries but not to the general public is also classified here. This involves the sale or rental of movies or tapes to other industries, as well as activities allied to the distribution of films and video tapes such as film and tape booking, delivery, storage, etc.

Exclusions: Film duplicating as well as audio and video tape reproduction from master copies except standard motion picture film are classified in class 2230 (Reproduction of recorded media).

Retail trade of tapes is classified in the appropriate class of group 523 (Other retail trade of new goods in specialized stores) or 525 (Retail trade not in stores).

Renting of tapes to the general public and renting of scenery and costumes are classified in class 7130 (Renting of personal and household goods n.e.c.).

Film processing other than for the motion picture industry is classified in class 7494 (Photographic activities). Agency activities are classified in class 7499 (Other business activities n.e.c.).

Production of films or tapes normally produced in television studios is classified in class 9213 (Radio and television activities).

Motion picture, video & computer game production and distribution

Activities of own account actors, cartoonists, directors, consultants and other technical specialists, etc., are classified in class 9214 (Dramatic arts, music and other arts activities).

## **12.4 Video game industry**

The Brazilian video game industry possesses principles and patterns that are very similar to those used in conventional businesses. It tends to reproduce the political economy of the system of relations in both the structure (economical level) and the superstructure (ideological level), at least in the case of Brazil and the rest of Latin America. [LUG02]

There has been much optimism in this region with regard to the potential of starting new economies. It was optimistically in the sense that it was an opportunity for Latin America to develop its own game industry, or at least, as a chance to develop value-added products and services in this dynamic sector. However, evidence suggests that main components were shipped from abroad with very little added value from the local industry community. In the following paragraphs this phenomenon will be discussed in more detail.

### **12.4.1 Porter's diamond**

Traditionally, Latin America has been defined as the backyard of the US. In terms of the video games industry and new media, Latin America is a contradictory and changing market. As seen in the macro assignment, Brazil experienced deep and dramatic changes in their political and economical structure in the past two decades. The country has gone from a highly politicized society with a strong role for the state-owned companies to a formal representative liberal democracy that are increasingly privatizing their economies and attempting to gain entry into the global market. One of the latest and most important changes was the privatization of the communications and media sector in the mid 1990s. Significant amounts of capital were allocated to telecommunications, media and computing sectors.

#### **Factor conditions**

One factor that influences the video game industry is the availability of an Internet Infrastructure that enables customers to order video games and to use the multiplayer option that many video games offer nowadays. Low Internet and PC penetration in Brazil limits e-commerce growth. Narrow bandwidth and convoluted backbone systems slow connection speed and handicap on-line retailers' presentation capabilities. Improvements in inter-city connections flowing from privatized fixed line investment will improve telephone service but limited digital (and even analog) last-mile infrastructure prevents existing telephone systems from achieving potentially wider bandwidth [INF03].

Another opportunity lies in delivering Internet access through television. Brazilian television penetrations rates rival those of any market in the world. Unfortunately, web-TV and other TV based innovations, although cheap to purchase, still require fixed line cable or fiber optics to deliver their mega bandwidth content.

Another factor condition to take into account is Brazil's production capabilities for video games. Evidence suggests that companies such as Microsoft and Nintendo are investing in Mexico, Costa Rica and Brazil in order to develop low-cost production centers capable of exporting to the US market using the opportunities that NAFTA and other inter-regional agreements provide. This simply repeats the way in which traditional industries moved their production operations to low cost-centers in the Far East in the 60s and 70s.

This factor condition offers of course great opportunities for the Brazilian video game industry. Because of the low-cost environment Brazil has to offer, most part of the development of video Games can take place in Brazil. Another important factor condition that should be considered is the availability of skilled personnel to produce video games. The technology that is needed to create video games should also be considered as a factor condition.

### **Demand conditions**

For the telecommunication and computers sector, Latin America is today one of the fastest growing regions in the world today, even though it is still a marginal market in comparison to the US, Europe and Asia. The investment in local information and communications technology (ICT)-related industries by US companies seem mainly to be made in order to improve export competitiveness, since US high-tech companies are interested in both the current potential of the local market and the future use of Latin America as a platform to the US and Canada. [LUG02]

Furthermore, Latin America comprised just 3.2 percent of the 165 million worldwide users of the Internet in 1999. In Brazil, the penetration of phone lines was at 13 percent in 1999. Digital phone lines, cable, PCs, Internet- and satellite connections were all at about 3 percent in that year. In 2001, the penetration of telephone lines in Brazil rose to 20 percent, slightly above the 17.3 percent average of the region. In the same year, 53,000 Brazilians had access to broadband Internet. In other words, the region is not exactly ahead in the use of ICT. [LUG02]

Nevertheless, the contradictions of the apparent under-developed market emerge when comparing specific production areas from specific countries. The potential for the video games industry in Latin America not only lies with the market itself, but also with the unrealistic perception of the region as a possible platform for exporting and improving global sales. [LUG02]

Consequently, there are factors that indicate that the development of a video games industry in Latin America could respond more to its potential as a low-cost producer and exporter rather than to its potential as a consumer-market. These factors are suggested by the fact that accessories for the US\$ 13.3 million video game market in Japan were worth only US\$ 4 million more than the sales on the Brazilian market in 1999. Moreover, the Brazilian market indicated a 3-year growth rate, while in the same period the Japanese market slightly declined. [LUG02]

### **Related and supporting industries**

The video game industry has strong connections with other industries. When considering the business to consumer chain, you can recognize supporting industries without which the chain cannot reside. The production of video games involves the use of advantage Information Technology. The Internet Infrastructure has already been recognized as a factor that enables the video game industry. Next to Infrastructure the video game industry also makes use of computer hardware. New developments in the computer hardware industry can have its effects on the development of video games. As known, due to the increasing power of computers and the increasing capabilities of video cards computer games cannot only be produced in a faster way, also consumers have capabilities of playing video games. A third contribution of the Information Technology is the development of software that enables the producer of video games to develop more complex and realistic video games.

Another supporting industry which the video game market needs is a decent distribution network, which is needed to bring the video games to the shelves and to the customers in the end. In Brazil the distribution network is improving. It used to suffer from weaknesses in infrastructure and distribution, a consequence of the country's severe inequalities, with most of the poor living in the rural northeast of the country [ADA03]. Nowadays governmental measurements have effected in a fairly good distribution network with good competing transportation services.

Currently, there are some well-known video game producers that have invested in the Brazilian video game industry. Nintendo and Microsoft manufacture hardware in the country and Sega has an association with a local firm called Tec Toy for software production. Sega signed other partnerships with VTech, Tiger, Nikko and Tyco. In general, it appears that global corporations do not directly manufacture their own products, but rather sub-contract them to local firms and then resell them with their logo stamped. A model used in the past by multinationals like Nike, Adidas and other clothing companies in the Far East. [LUG02]

### **Firm strategy, structure and rivalry**

Market perception plays a key role in motivating investment and the development of the industry as a whole. Brazil has potential conditions created by the NAFTA and other economic reforms that were taking place in Latin America. Furthermore, the region and thus Brazil have the advantage of a unified customs area, homogeneous tax regimes and a competitive labor force. Several remarks can be made when looking at the video game industry in Brazil.

Although it seems that software provides opportunities to develop a new industry with low investment and risk, the reality is very different. Brazil has knowledge, technology and a manufacturing capability to develop hardware, but this is not necessarily the case with software. Development of sophisticated software and applications for computer games needs important investments in research and development. Also, high tech equipment for graphical processing and people with skills demanding high salaries are needed. This is not the case with hardware, because you will be



probably doing it under license, with distribution channels already guaranteed and better financial conditions for the investment. Which is also a reason why local entrepreneurs in the country would be less willing to invest in software than in hardware.

Despite all the negativity, development of software for video games is not impossible and that it can be done is shown by some interesting examples in the educational area. A more stable political and institutional framework needs to be built and the process of privatization and the deregulation of telecommunications and services will rapidly improve the situation. This is not the case concerning legal security for investments since courts and legal systems are still perceived as incompetent, highly politicized and susceptible to corruption. Piracy is perceived as the major threat to the future of the video game industry in Brazil. [LUG02]

The *Associação Brasileira das Empresas de Software* (ABES) is a covering software authority established in 1986. Today, it is an organization which protects the interests of its 600 members amongst whom producers, wholesalers and distributors of computer software and service. They organize seminars to inform both their members and software users and provide juridical help for their members. On the ABES website [ABE00] they plead for legal software and warn potential 'pirates' for the consequences of their actions. In 1998 the ABES enacted the Brazilian software bill to protect the authors' rights and intellectual property in a computer program.

The ABES became an ally of its global counterpart, the Interactive Digital Software Association (IDSA) in 2002, to step up against game software piracy in the country. The IDSA stated "Brazil represents an important market for the members of IDSA due to the immense popularity of interactive entertainment among Brazilians. Unfortunately, Brazil also ranks among the most significant problem countries in the world when it comes to game piracy, with the piracy rate exceeding 70%. The goal of the IDSA in launching a more aggressive enforcement campaign in Brazil is to contribute to creating a more legitimate market for video and computer games so U.S. and Brazilian developers and publishers of game software can make a major contribution to the growth and health of the Brazilian economy generally, and the high tech sector specifically." [IDS02]

However, several sources state that Brazil is not only a source of video game piracy, it is also receives mass quantity shipments of pirated software from countries in the Far East like Thailand, Malaysia and Singapore. [IDS02] [IDS97] [SII00a]

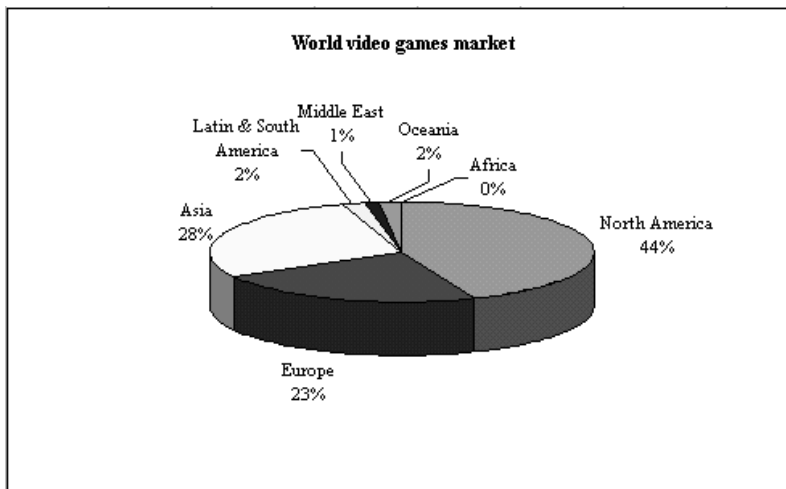
### **Government**

The Brazilian government or Industry can contribute significantly to the deployment of a decent Internet infrastructure and thereby creating a factor that stimulates the use and consumption of video games in the Brazilian society.

## 12.4.2 Comparison

Obviously, the Dutch video game market is much larger than in Brazil. Just look how many record and electronic shops there are that selling video games, even apart from the increasing online sales. But this is also exactly the difference between Brazil and the Netherlands. Brazil is seen as a potential location for the manufacturing of software and hardware for video games, thus as a producer, whereas the Netherlands serve as consumer for the games industry. Production of the games is outsourced to the countries with lower cost of labor.

The Dutch electronic infrastructure and the much higher penetration of PC's, cable and digital phone lines can be seen as one of the reasons for this difference. Another reason is that the investment climate in the Netherlands is better, because of the political and economical stability that is offered by the trading agreements within the European Union. The latter also provides the legal security supported by the global software associations, to prevent from software piracy.



**Figure 12-1: World video games market**

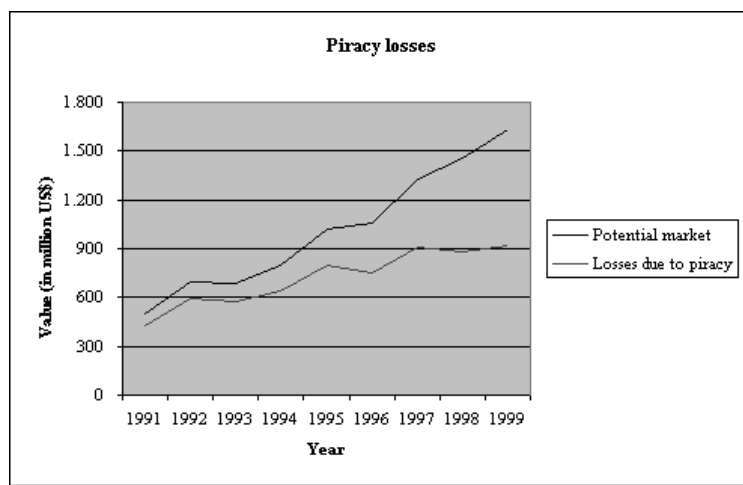
As shown in Figure 12-1: World video games market, the Latin American market only represents a marginal segment of the world sales: only 2 percent of the world consumption for software and hardware, compared to almost a quarter for the European continent..

Table 12-1 shows the huge amounts that are lost due to software piracy in Brazil [ABE00]. The last column shows the piracy index, which is the percentage of illegal (pirated) software from the total market potential. However, when recalculating the values of the last column a deviation of a few percents since 1994 is found, compared to the data as shown in the table .

	<b>Market potential</b> (US\$ Millions)	<b>Efficient sales</b> (US\$ Millions)	<b>Piracy losses</b> (US\$ Millions)	<b>Piracy Index</b> (%)
<b>1991</b>	500	70	430	86%
<b>1992</b>	700	105	595	85%
<b>1993</b>	690	118	572	83%
<b>1994</b>	800	160	640	77%
<b>1995</b>	1.020	226	794	74%
<b>1996</b>	1.055	304	751	68%
<b>1997</b>	1.330	420	910	62%
<b>1998</b>	1.454	574	880	61%
<b>1999</b>	1.635	715	920	58%

**Table 12-1: Software piracy indexes 1991-1999**

Based on the figures in Table 12-1, the amounts that are lost due to piracy and the amount of the potential market are shown in Figure 12-2. One can see that in the early nineties, the losses involved with software piracy followed the trend lead by the potential market. The effects of the Brazilian software bill enacted February 19th 1998 was immediately visible and in the table it resulted in slightly lower losses. In the period 1997-1999 the losses remained stable at an amount of US\$ 900 million.

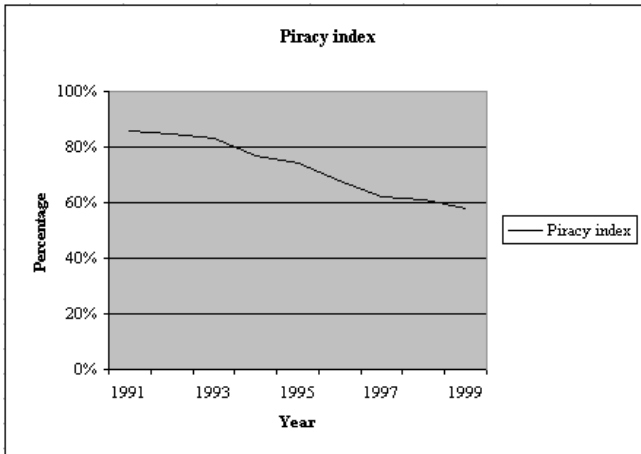


**Figure 12-2: Losses due to software piracy, Brazil 1991-1999**

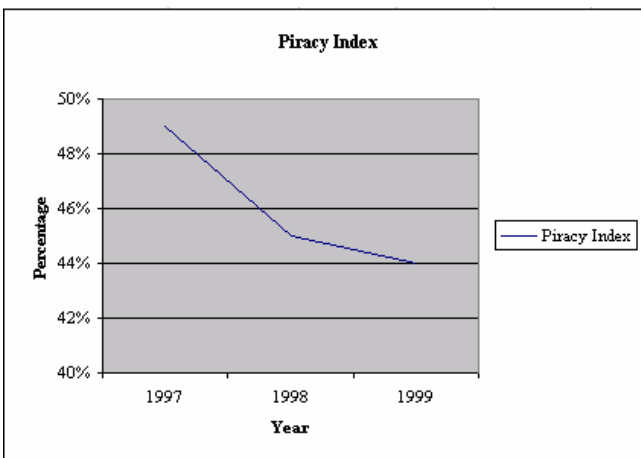
Not only Brazil is notorious for its software piracy, the Netherlands was ranked only just after Brazil at the 10<sup>th</sup> position in 1999. And what about the university network of the University of Twente that was world news in 2001? At the time sources stated: “several students were apprehended and are suspected of trading in illegal software, misuse of computer facilities at the university, and being members of a criminal organization. [...] Twente University has been identified by members of the underground community as one of two major hubs for communications between pirate groups.” [CNE01]

To make a better comparison between the situation in Brazil and in the Netherlands, the piracy indexes from both countries are displayed in Figure

12-3 and Figure 12-4. Table 12-1 provided the information on the Brazilian indices and the Dutch figures are taken from [SII00b]. Note that the Dutch timeline starts in 1997.



**Figure 12-3: Brazilian software piracy index 1991-1999**



**Figure 12-4: Dutch software piracy index 1997-1999**

As shown in the figures, both piracy indices decline. When assuming the total market potentials were still rising, which is at least true for Brazil, it means that the losses due to pirated software are also getting lower and lower. This means that organizations like ABES, IDSA and SIIA are really more aggressive in their quest against software piracy.

### **12.4.3 Conclusion**

The conclusion can be made that under the current conditions it would be very hard for Brazil to develop a competitive games industry for both hardware and software. Access to the US market is the most important element to address and a free trade agreement would not only mean wider access to the US, but would also translate into a more politically stable and legally secure environment for investment

Evidence already suggests that companies such as Microsoft and Nintendo are investing in Mexico, Costa Rica and Brazil in order to develop low-cost production centers capable of exporting to the US market using the opportunities that NAFTA and other inter-regional agreements provide. There is reason to believe that, in the near future, Brazil can offer an investment space that will allow certain industries to avoid legal constraints and regulation and take full advantage of the exportation facilities to the US market.

## **12.5 Motion picture industry**

Motion pictures are being made in Brazil for almost a century. The industry has had its flourishing days, but nowadays the Brazilian audience is mainly watching American films. In this chapter an analysis is given of the motion picture industry in Brazil, compared to the Netherlands. This analysis consists of an overview of the aspects that influence this industry. An accurate way to do this is by using Porter's diamond, which relies on four basic determinants and two additional variables, which are:

- Firm strategy, structure and rivalry
- Factor conditions
- Demand conditions
- Related and supporting industries
- Government
- Chance

The chapter is divided into analyses for each country. In these parts, every aspect of Porter's diamond will be discussed in more detail.

## **12.5.1 Brazil**

### **Firm strategy, structure and rivalry**

The market for Brazilian movies is almost completely an internal market. This means there is only a small market for the sales of the movies. Because of the Portuguese language used in the movies there is some export to for example Portugal itself.

The last few years this is changing and Brazilian movies are getting more attention at international cinema festivals. [GNC03]

Movies made in Brazil often portray [MOR00] nationalistic themes. The spoken language is almost always Portuguese except for movies which are an international collaboration.

At this moment 3194 [IMD03] titles for Brazilian movie productions are indexed. The market is small and not very attractive to other suppliers. The biggest and almost only supplier of other productions is the United States.

Brazil's media sector is in the throes of one of its biggest crises in years. With the economic slowdown in the second half of 2001, advertising revenues plummeted while costs rose. The exchange rate between Brazil's real and the US dollar has also affected companies that raised funds abroad, something that most large Brazilian media corporations do. Financial costs also have increased by high domestic interest rates, with the Central Bank again tightening monetary policy this year. Faced with a credit crunch, the highly indebted media companies are having a difficult time of it. Indeed, some are close to bankruptcy. [EVD02] The economic position of the movie industry is very limited but growing better. More international interest is starting to show.

In order to improve the situation in the business, there have been some recent developments in the Brazilian movie industry such as the Brazilian Cinema Promotion, which is one of them. Its aim is to gain foreign attention of the Brazilian movie industry. So far it is very successful; relatively many Brazilian movies were programmed on festivals like those in Cannes and Berlin. In Rotterdam and London there have been special cinema festivals around Brazilian productions.

So far the market orientation of the movie industry had been Brazil itself and sometimes Latin America. Currently there is an effort going on to attract more foreign attention. [GNC03]

Companies involved in the production of movies are funded by investors which buy a share in the movie costs and profits.

Only the last few years Brazil is effectively trying to get into the international market with success. The traditional market was only aimed inwards.

The trend for Brazilian movies is getting better, it had always been a respectably large industry but with support of the government. When this support fell away there was a significant dip in the industry but recently the situation is getting better rapidly. [GNC03]

### **Factor conditions**

Materials for producing movies are easily available. Professional equipment is likely to be imported from other countries because of the very limited movie industry at this moment.

The climate in Brazil is suitable for producing movies during the whole year. Except during the rain season when there might be heavy rains which could produce problems.

Cost of labour of film personnel was between 350 and 1000 Real a week in 1996 [STI96]. This is between 100 and 300 Euro a week.

The Brazilian labour market is in general a market with many cheap labourers. There might not be many really qualified actors available because the movie industry is very limited currently in Brazil, but on the other hand there could be many jobless actors/directors available from the period before 1990.

There is however an union for Brazilian movie technicians called STIC (Sindicato dos Trabalhadores na Indústria Cinematográfica) [STI96]

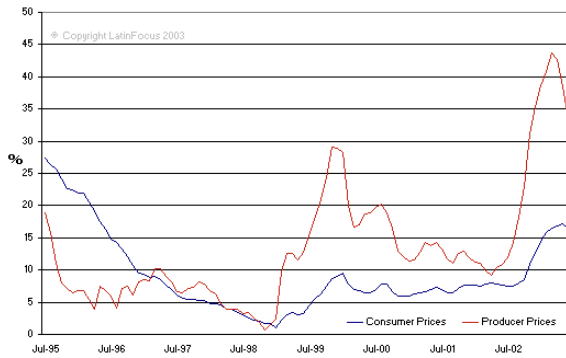
One limiting factor might be the lack of qualified personnel. As in particular American movies are popular in Brazil instead of national productions, this might indicate directors or actors are not offering as much as American directors and actors. There are however relatively many Brazilian movie actors, directors and technical personnel at work in Hollywood. [BRU98]

Capital is generally available for profitable projects. Since the decline of the movie industry this could produce a problem. Profit of movies is very uncertain and because of the small industry unpredictable. This scares many investors of capital away.

In February 2002 a bill to allow foreign companies to own up to 30 percent of local media groups in Brazil won its second approval in the lower house. [EVD02]

Inflation has been a big problem for Brazil in the past and could return. The country is much more stable now so the risk is not as big as it used to be although recent developments show a rapid increase of production costs due to the devaluation of the Real compared to the US dollar.





**Figure 12-5: Inflation in Brazil [LAT03]**



**Figure 12-6: Exchange rates of Real and US dollar [LAT03]**

### Demand conditions

There has always been demand for movies in Brazil. However, international movies were and are nowadays a lot more popular than the national ones. [MOR00]

The movie market is composed of international co-productions and full Brazilian productions. During the dip after 1990 almost the only way to get a full production was to do a co-production. The productions itself can be divided into normal theatrical productions and adult content movies. After the seventies the adult entertainment was a large portion of the total production. Nowadays it is just the normal theatrical productions that make up the total production.

Until 1990 there was a steady government supported market for movies in Brazil. After this period the production collapsed. Since the last few years (2000 – current) the production is picking up again with 30 productions in 2001 and 50 in 2002.

The total domestic demand is keeping up with international demands. There is a healthy demand situation which is offered a variety of mostly American movies.

Market share of Brazilian movies in Brazil itself is very small compared to the import of American movies. There is no real foreign market share.

### **Related and supporting industries**

The Brazilian movie industry is largely dependent of investors and thus the money market.

Furthermore there is a supporting network for the distribution of films to theatres.

### **Government**

In 1956 the government decided to actively support national film industry. President Kubitschek created the Federal Film Commission to provide the industry with adequate means for its stability and development, taking into consideration the position of cinema in the cultural and artistic as well as economic fields. This commission was replaced with every change of power, and because of this it never had a long life.

Although the Federal Film Commission did not exist for a long time, it did have some effects on the atmosphere for Brazilian cinema. Foreign distributors were forced to pay Profit Remittance. Different tax rates were used for this: the Free Market Rate and the Official Exchange Rate. Foreign movies were classified into various categories of essentiality, where less essential films had to pay the higher Free Market Rate. This idea of protecting the internal market did however not work as good as expected as only 30% of imported films were categorized for more taxes. Because of this, most foreign film distributors could compete directly with the national film industry, which did not have the solid financial base as the foreign industry had.

As time passed, many regulations appeared regarding support from the government for the Brazilian cinema. For example, in order to provide film production financing, it was determined in 1962 that 40 percent of a foreign distributor's income tax on profits derived from the exhibition of foreign films should be deposited, optionally, in the Banco do Brazil for possible use by the distributor in the co-production of national films. In 1966 this deposit became obligatory.

More measures that had been taken were for example a law that made it mandatory to show a short national film before a foreign film, and another rule that introduced several days per year that had to be devoted to national cinema, the so-called quota system. And besides these rules, the Brazilian government also issued awards to movies in the form of subsidies. [MOR00]

In September 1968 a government initiated movie group called "Embrafilme" was installed. This group was to promote the Brazilian movies in foreign countries but soon changed to the promotion of production and co-production of movies in Brazil itself. [KIR03]

Nowadays the government is barely supporting the movie industry. During President Collor's government in 1990, the only company "Embrafilme" that supported Brazilian film was terminated. And the structure that existed in terms of Brazilian film distribution and production was thrown away overnight. Embrafilme was stopped at that time. Film production during this period has been reduced to nearly zero. [BRU98] One regulation that

still does support the industry is a trade agreement which is called MERCOSUR (The south common market). Other members are Argentina, Paraguay, Chile, Bolivia and Uruguay.

For over five years now, Brazil's Congress has been discussing a constitutional amendment that might represent some hope for embattled media companies. A bill to change the law was first drafted six years ago, but has not gone far since then. This was mainly due to the opposition of domestic media companies, such as Organizacoes Globo, which feared foreign competition. Faced with the problems outlined above, the Brazilian media industry as a whole has radically altered its stance towards allowing foreign capital into the sector as a matter of survival. As well as offering potentially attractive opportunities to foreign investors, the bill has the potential to change the face of the Brazilian media forever. New management and industry practices would no doubt be introduced by foreign investors, modernising and shaping the Brazilian media in an unprecedented manner. No date is yet set for a vote in the Senate. [EVD02]

Another form of influence from the government occurred during the periods of dictatorship. Certain movies with a critical stand regarding the current situation were banned from theatres. [BRU98]

Probably because of the very small number of movies (around 2 a year [KIR03]) there are no special collective labour agreements known for movie productions.

### **Chance**

The atmosphere for cultural and artistic development in Brazil has been a whole lot better in Brazil than in its surrounding countries. The reason for this is that Brazil never had a bloody revolution like Mexico, neither did it have a political revolution as the one in Cuba, and also the guerrillas found in countries like Colombia and Venezuela do not have as much influence as in a lot of the other South American countries.

The absence of these factors makes Brazil quite a stable country for cultural development, which is important for film production. Figures can confirm this perception as Brazil had periods where it produced several hundreds of movies within one decade while other countries like Honduras and Panama only created very few during the nation's whole history. [MOR00]

Brazil is a big country with a lot of different landscapes varying from big cities, beautiful beaches and dark rainforest. This varied nature of Brazil provides a lot of beautiful settings where a motion picture can be shot.

## **12.5.2 The Netherlands**

At this moment 2002 [IMD03] titles of movie productions are indexed.

### **Firm strategy, structure and rivalry**

As in Brazil, the Dutch movie industry is also oriented to the national market. As most productions are still Dutch-spoken, these movies don't get much attention from abroad.

Productions are often about typically Dutch themes, which makes it harder to enjoy these films for outsiders. Other productions are internationally oriented and English spoken, but still not spread very widely. It seems that the demand in other countries is also aimed at Hollywood.

### **Factor conditions**

The Dutch situation provides a suitable context for the production of films: capital is available, there is enough qualified (technical) personnel and suitable accommodations are also available. Disadvantages are the cost of labour which is relatively high, and maybe the lack of good actors.

In The Netherlands the economical situation is stable with small inflation and steady exchange rates; things that the Brazilian economy lacks.

### **Demand conditions**

As in Brazil the demand for native movies is small. The situation does not differ significantly from Brazil.

### **Related and supporting industries**

Again, the situation is similar to the Brazilian movie industry; the Dutch business also depends on investors and thus the money market. And it is ofcourse important that theatres play the productions and thus the distribution network is of great significance.

### **Government**

The Netherlands are an active member of both the European Union and World Trade Organization. This means there are certain rules and procedures regarding the export of goods. The impact of this on the production of movies is small since this is not one of the focus areas of neither European Union nor World Trade Organization.

There are some "CAO" agreements, collective labour agreements, for actors in movies. This supports the actors by setting limits on working hours and minimum wage. The supervisor of the movie project also has to follow ARBO procedures regarding the health safety of the labourers.

Essentially the Dutch government does not interfere with motion picture industry; national film productions do not receive protection from foreign films. The rules of the free-market economy apply here. It is however possible in the Netherlands to request subsidy for a motion picture

production project. These subsidies are often assigned to non-commercial projects which have a certain value for Dutch culture.

There are also some financial possibilities to get funding for a movie on the money market. The government has set some tax discounts for investors which invest in a movie production. Recently there have been discussions in the new government whether this should continue since this tax advantage is being abused by financial companies. They use the discount to provide customers with a construction with a guaranteed profit rate. Because of this abuse situation and saving measures the government decided to discontinue the advantage from 2004 on. [NRC00]

As in many other countries there are certain rules to obey when producing a movie. For example animals can't be harmed during the shooting of a movie.

### **Chance**

The possibility of an event with a substantial influence on the Dutch movie sector such as a war in which the Netherlands are involved is very unlikely. Currently the Netherlands have very good relations with neighbouring countries and are protected by structures like the United Nations.

The Dutch movie market at this moment is promoted by government by several constructions. Change in government parties during elections could bring an end to this. It is unlikely however that a major change in government type is possible within the next years with a major impact on the movie industry.

Dutch climate factors are an element to consider when shooting a movie. There are however very few extreme weather situations in general. There is a slight chance that floods can occur but the probability that a large scale flood occurs, as those typically found in tropical countries, is small. Other extremities like tornados are unlikely to occur and thus influence the movie production.

The Netherlands have recently changed their currency from the traditional guilder to the European Euro. This means that the area of the currency is greatly expanded. This implies that the Dutch currency exchange rate is affected directly by more countries because they share the same currency. On one side this gives the currency more strength in the world economy but on the other hand the currency is also depending on weaker countries which share in the Euro project. Still it is unlikely an exchange rate crisis will occur because of the very cautious actions taken by the European bank to protect the Euro area.

### **12.5.3 Comparison**

The situations in Brazil and The Netherlands show a lot of similarities:

- Demand for native movies is almost only national;
- Demand for motion pictures in general is comparable;
- Suitable atmosphere for cultural development;

- Comparable availability of capital.

The different economical climate, however poses some differences between both countries:

- Netherlands:
  - Expensive labour;
  - Lack of good actors (only a few).
- Brazil:
  - Lack of qualified personnel;
  - Various protection mechanisms by the government in the past.

This information shows that the Brazilian situation at the moment does not provide a very suitable context for the use of Virtual Reality in the Motion Picture industry. The main reasons for this conclusion are:

- Low budgets compared to the USA due to national character of movies and low market share of native films;
- Lack of qualified personnel (the better personnel from before 1990 is active in the American industry).

The technical development is not that far as it is in the United States and the differences between the budgets for a movie production by either country are that big that it is hard to compete for Brazil. However, as the situation in Brazil is improving, and the industry is getting more internationally oriented, the potential for Virtual Reality is growing. When the industry has grown big enough in the future there are no big impediments left for the use of more advanced technologies. The last obstacles such as the lack of qualified personnel can be solved by attracting people from abroad who can pass their knowledge to local technicians.

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# 13 Contract research



## Chapter contents

<b>13.1</b>	<b>Introduction</b>	<b>384</b>
<b>13.2</b>	<b>Companies and assignments</b>	<b>385</b>
13.2.1	CLM Solutions	385
13.2.2	Cultura	386
13.2.3	MAG Productions	386
13.2.4	Neopost	386
13.2.5	Océ	387
13.2.6	Strukton	388
13.2.7	University of Twente	388
13.2.8	Wageningen University	388

## **13.1 Introduction**

The study tour is mainly funded by Contract Research assignments, which are carried out by the participants. The following paragraph give a short description of the assignments carried out. The assignments will be described by company. We would like to thank the companies mentioned below for their cooperation., which has made the study tour possible.

## 13.2 Companies and assignments

The companies and assignments will be described below.

### 13.2.1 CLM Solutions

CLM Solutions provides companies an integrated Closed Loop Marketing System. Closed Loop Marketing is a method that give companies insight in their customers on an individual level. It measures online the interest and privileges of the customer and then provides directly the essential information for this specific customer.

#### **Assignment: Internetpolling**

Participants: Johan Smit

Company contact: dhr. Arjan Kuiper

#### *Description:*

Internet polling is to gather online the opinions of customers or visitors on the internet. CLM Solutions wonders what the possibilities of internetpolling are? Also new developments in internet polling must be reviewed, and which kind of applications or polling tools are being used at the moment.

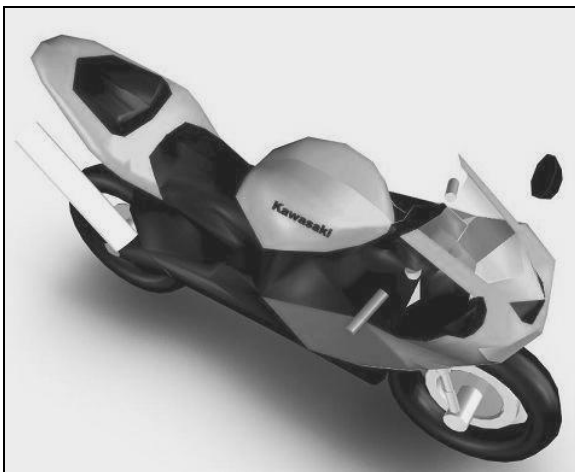
#### **Assignment: Kawasaki 3-D Demo**

Participants: Herbert Beltman

Company contact: dhr. Arjan Kuiper

#### *Description:*

The assignment consisted of researching the possibilities of 3d-visualisation of Kawasaki products. An inventarisation of current tools and techniques was made. Based on this inventarisation, a demonstration model of one of the Kawasaki motorcycles was constructed. The figure below is a screenshot of the programme.



**Figure 13-1: A 3d-visualisation of a Kawasaki motorcycle**

### **13.2.2 Cultura**

Cultura is the umbrella organization of all cultural activities in Ede. It is located in the centre of Ede and consists of a library, art centre, theatre and a music- and dancing school.

#### **Assignment: Data interactions and web-based developments**

Participants: Maarten van Schagen and Michel Boedeltje

Company contact: dhr. Christien Veeneman

#### *Description:*

To improve the communication between the separate branches of Cultura, Cultura would like to have a clear overview of the data interactions between these branches. Also the students must investigate new developments in web-based solutions for Cultura.

### **13.2.3 MAG Productions**

MAG Productions is aimed at the development of user-friendly and innovating web applications, in this context MAG Productions has developed a next generation Content Management System. This application enables its users to build rich websites without any knowledge of even the most common Internet Technology.

#### **Assignment:**

Participants: Karel-Henk Nijhuis

Company contact: dhr. Martijn Verhoeven

#### *Description:*

The assignment that was carried out to support the S@mba studytour consisted of the documentation and enhancement of the MAG Content Management System. Next to this assignment the participant got involved into the development of a new version of [www.vakantiehuisje.nl](http://www.vakantiehuisje.nl) and [www.eurofewo.de](http://www.eurofewo.de), this MAG Productions initiative is offering bungalows all over Europe and is attracting a lot of tourists for over three years now.

### **13.2.4 Neopost**

Neopost sells mailing, document and logistics systems, and provides customized mail processing solutions covering both letters and parcels to a wide range of customers in the corporate, public and professional sectors. Neopost offers advanced solutions for online or off-line postage, large volume mail insertions, occasional parcel delivery and logistics management and traceability

#### **Assignment: Micro Controller Platform**

Participants: Erwin Elling and Rene Bloemberg

Company contact: dhr. Jelle Westendorp and dhr. Jan de Vries

#### *Description:*

Neopost uses at the moment 8 bits and 16 bits-micro controllers to control their postage machines. These controllers are capable to handle 2000 events per second. Because new developing machines require higher requirements,

up to handle 10000 events per second, Neopost needs a better processor that can meet those requirements. The students will review the essential requirements and will test selected micro controllers on the different system aspects.

**Assignment: PC Tracer**

Participants: Reinder Attema and Laurens Satink  
Company contact: dhr. Jelle Westendorp and dhr. Jan de Vries

*Description:*

The developed machines of Neopost have a strong interaction with the external environment. Paper is always in the machine and it is not always predictable which situation when will occur. A tracer will be used during a system test to retrieve the exact state of a state machine. The students will make software, to save and retrieve this data on a PC.

### **13.2.5 Océ**

This company very well know for its printers, copiers, scanners and plotters, owns a large-scale research institute in the southern part of the Netherlands. As Océ is aiming at Information Technology to develop new, easy to use applications, they benefit from a fresh view of our academic students

Overall company contact: dhr. Dik Prenger

**Assignment: Agents architectures**

Participants: Hugo Jansen and Henk Jan Linthorst  
Company contact: dhr. Roel Brand

*Description:*

Increase a clearer insight of the usability of agent architectures. Which kind of problems are mainly important for using agents. Especially the aspects as developing speed, flexibility and maintainability should be investigated.

**Assignment: Semantic network**

Participants: Arno Wellink and Kenneth Rovers  
Company contact: dhr. Samuel Driessen

*Description:*

Building a web interface for a semantic network. The semantic network can be accessed by Océ R&D and will be used for daily support of their work. The semantic network should be accessed on several ways: Visual and by using queries.

**Assignment: Color usage CAD/GIS**

Participants : Ron Hakvoort and Menno Holtkamp  
Company contact: dhr. Maarten van Gestel

*Description*

By developing color printers for the CAD/GIS market it is important to know which type of colors are used by the customers of Océ.

Océ wonders if there are standards or norms of color-usage in certain business areas or countries (Europa vs VS). Because this has a direct effect of the discernment between the colors and the total color space that the printer must support.

### **13.2.6 Strukton**

Strukton is an important player in the construction market in the Netherlands and is one of Europe's largest specialists in rail infrastructure. Strukton is a solid company with decentralized operating companies that operate in the following markets: Rail infrastructure & Information Systems, Civil Engineering, and Building & Real Estate

#### **Assignment: Monitoring System**

Participants: Mischa Jonker

Company contact: dhr. Menno Herkes

*Description:*

For improving reliability in rail infrastructure systems, a monitoring system has been developed. By measuring signals using galvanically separated sensors the railway system itself remains uninfluenced by this monitoring system. Although there are some important elements that are being monitored already, the system is not finished yet. Because of the requirement that the existing railway system may not be influenced at all, monitoring additional systems poses some difficulties. The research is aimed at finding a way to implement monitoring of the power supplies which feed the trains, into the monitoring system.

### **13.2.7 University of Twente**

Teletop is the electronic learning environment used widely at the University of Twente. Students can apply electronically for courses. At specific teletop sites, colleges-sheets and other course information can be retrieved.

#### **Assignment: Support of Teletop**

Participants: Bram van Twist

Company contact: dhr. B.T. Swennenhuis

*Description:*

Within the faculty of Computer Science there's a Teletop-team active, consisting of students, that will support teachers to organize their Teletop site. Bram will give his support in the area of Business Information Technology courses.

### **13.2.8 Wageningen University**

Wageningen University and Research Centre is an internationally knowledge institution, making contributions to the quality of life with research and innovative teaching programmes in the areas of nutrition and



health, sustainable agrosystems, a viable environment and processes of social change.

**Assignment: Article review application**

Participants: Matthijs van der Kooij and Mark Olthof

Company contact: dhr. Emiel van Loon

*Description:*

This contract research assignment was about a article review application. The students had to create a simple application which could be used by editors and reviewers to review or edit a (scientific) paper. Basicly the application was designed to replace the old fashioned way, pen and paper, by a digital one.