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**Brandenburg's Aerospace Cluster: a Benchmark
with Dubai and Singapore**

By

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Abstract

The German federal state of Brandenburg is developing into Germany's third most important aerospace cluster, succeeding the northern German region centred around Hamburg and Bremen and the Bavarian region. Brandenburg is one of the new federal states, the rise of the aerospace industry has taken place over the past twenty years since German reunification. It is both industry and government driven and is of the utmost importance to the state. One question however remains, in an industry that operates on a truly global scale, how well does this cluster fare with its peer competitors? This dissertation gauges the cluster with two very similar regions in Dubai and Singapore. Both these clusters have been developed over the past few decades through business and government cooperation, rather than having developed naturally as could be said of perhaps Seattle, Wichita or Toulouse. The study asks questions of companies that have invested in these clusters, with a view of benchmarking these regions in their attractiveness for foreign direct investment.

The prime focus of the dissertation is the state of Brandenburg, hence after the analysis of the results ascertained, the paper concludes with a strengths, weaknesses, opportunities and threats analysis for this cluster and proceeds to make a number of recommendations on how the local investment promotion agency (ZukunftsAgentur Brandenburg GmbH) can substantiate and accelerate the growth of this aerospace region.

Chapter 1 Introduction

1.1. Introduction

This paper is essentially a study in the comparative advantage of the aerospace industry of the federal state of Brandenburg, benchmarked with the aerospace clusters in Dubai and Singapore. All three regions in question have developed over the past few decades without the advantage of long standing foundations in this industry, compared with the major clusters predominantly found in the United States and the United Kingdom. Although many believe that the region Berlin-Brandenburg was the cradle of the pioneers of flight, any hopes of latching on to this foundation were destroyed in the post-war socialist planned economy of the German Democratic Republic, the relics of which can still today be found in the nationalised structure of the industry, twenty years after reunification.

Today the Brandenburg aerospace cluster boasts over 100 companies with 17,000 employees, of which 5,000 can be directly tied to manufacturing, maintenance, R&D and services. The German air show and trade fair the Internationale Luft- und Raumfahrt Ausstellung (ILA), is a biennial event that takes place in Brandenburg and this along with the new airport under construction in Schönefeld, indicates that Brandenburg is well on the way to achieving many of the specifications set down in Michael Porter's Diamond Paradigm. However, to fully analyse and understand this progress, the paper gauges Brandenburg against Asia's leading aerospace region and a region currently being restructured from an oil and gas dependent economy to an industrial base of which aerospace plays a fundamental part. These regions were chosen because a comparison with the major clusters in Hamburg, Toulouse, Seattle or other locations within the US and UK, seemed inappropriate on account of their historical background and economic strength.

The dissertation is based on primary information taken from interviews with twenty three companies and subsidiaries in the three different locations. The questions posed were on the whole, based around six main aspects to enable a

comprehensive analysis of the competitiveness of the regions and thus define their attractiveness for Foreign Direct Investment. These factors were:

- (i) Business and Investment Environment
- (ii) Market Size and Prospects
- (iii) Costs
- (iv) Agglomeration Effects
- (v) Human Capital, Infrastructure and Natural Resources
- (vi) Government Incentives

It was with the aid of this information that a strengths, weaknesses, opportunities and threats analysis was made for Brandenburg's aerospace cluster and from this evaluation guidelines were created for the local investment promotion agency (ZukunftAgentur Brandenburg GmbH) on how further to substantiate and facilitate the cluster.

1.2. Significance and Purpose of the Research

The significance of the research can only be measured in the gradual development of the cluster in view of its global market share. If the results are taken account of, and the recommendations realised, then all three clusters should undergo a similar benchmarking procedure at a later date, perhaps after a ten year period, to analyse their further development and benchmark them once again. It is only then that, having taken the recommendations to heart, the true significance of the research will become apparent.

1.3. Research Questions and hypothesis

The hypothesis:

“Brandenburg's Aerospace Cluster, whilst gradually developing, still lies behind its peer competitors, Dubai and Singapore”.

The research questions were developed to expose the business and investment environments of the three regions in question, hence laying the basis for a

benchmark comparison. They highlight not only the weaknesses of Brandenburg's aerospace cluster, but also its strengths, giving rise to its development opportunities and the threats posed.

Chapter 2 Analysis of the Regions in Question

2.1 The Federal State of Brandenburg

2.1.1 Background

The federal state of Brandenburg is one of the sixteen German federal states. It lies to the East of Germany and borders with Poland. Until German reunification in 1990, Brandenburg was part of the former socialist German Democratic Republic. At its centre lies Berlin and the area as such is often defined as “Germany’s Capital Region”. Berlin and Brandenburg have a joint population of ca. 6 million with unemployment rates currently at 16% and 14.5% respectively¹. This paper will concentrate predominantly on the state of Brandenburg, as most of the aerospace industry is concentrated in this state as opposed to the city state of Berlin. The region’s sphere of influence reaches not only to the other federal states bordering it but also far into Western Poland, which is also a member of the European Union. The GDP for Brandenburg in 2008 was 54.9 billion Euros (compared to the federal total of 2,404 billion Euros²).

2.1.2 Global Competitiveness and the Business Environment

Brandenburg and Dubai are not nation states but moreover, only regions within such. Therefore when comparing the three regions in question, the country statistics will act as a proxy for the regions, although some statistics may vary somewhat from the actual conditions.

The German market is seen as being the fourth largest and accounts for not only nearly one fifth of the European Union (EU) GDP, but it is also the largest domestic market within the EU. Because the German economy is very export-orientated, it suffered heavily during the global financial crisis from 2008 onwards (US Commercial Service 2009). The change in government in 2009 from the grand

¹ Please see statistical data on the region in the bibliography

²

http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pm/2009/05/P_D09_185_811.templateId=renderPrint.psm

coalition of CDU (Conservative party) and SPD (Labour equivalent), to the CDU and FDP (Liberal Party) has yet to make a real economic impact through new policies. Germany continues to suffer from high unemployment. In 2008 the average rate was 7.8% with an average in the new federal states of 13.1%. This factor is particularly important for the state of Brandenburg because it leads to improved economic conditions for companies. In comparison to the former western states, Brandenburg has lower wages and salaries, longer working hours, fewer annual holidays, a low turnover of employees, minimal sickness rates and very little trade union activity.

Germany is ranked number 7 in the Global Competitiveness Index (World Economic Forum 2008), being seen as a highly innovative region with a high level of business sophistication. The main drawbacks are the tax regulations and rates, restrictive labour regulations and inefficient government bureaucracy. Rather surprisingly, an inadequately educated workforce and the lack of financing also play an important role when ranking Germany.

Germany, and so therefore also Brandenburg, actively seeks foreign direct investment from abroad. No difference is made between national and international companies and all firms are treated equally.

2.1.3 The Aerospace Cluster in Berlin-Brandenburg

It is said that the German aerospace industry originated in the region during the early age of flight, with pioneers like Hans Grade and Otto Lilienthal and even the Wright brothers, who came to Johannesthal (Berlin) to test fly their aircraft.

Brandenburg's aerospace cluster is relatively young and only really developed after the reunification of Germany in 1990. The initial steps which set the cornerstones for the cluster were the acquisition of the GDR airline Interflug by Lufthansa AG, the take over of the VEB Luftfahrttechnik by MTU and the Greenfield investment made by the then BMW-Rolls Royce consortium. The central German aerospace research institution DLR (Deutsches Zentrum für Luft- und Raumfahrt) was founded in Berlin and the German air show ILA (Internationale Luft- und Raumfahrtaustellung) returned home to Berlin after years in exile. In 1998 the local

key players alongside the local government agencies, set up the Berlin-Brandenburg Aerospace Alliance (BBAA), an industry association, to help accelerate the growth of one of the key industries in the region. The BBAA to date counts over 100 member companies associated with the aerospace industry of the region.

Aerospace is one of Brandenburg's most important industries. The sales volume for the year 2007 was 1.18 billion Euros which was proportionally over 6% of the total sales generated by the state. The aerospace industry exports more than any other industry in Brandenburg, with goods exported amounting to 1.34 billion Euros in 2007, which was an increase of over 25.7% when compared to 2006.³ It employs over 5,000 engineers and technicians and over 17,000, in total when all airlines and firms are included that have a direct link to the aerospace industry.

The aerospace cluster in the capital region is currently specialised and can be broken down into eight main spheres, all containing key global players:

Aircraft Engine Production:

OEMs⁴: Rolls Royce Deutschland Ltd. & Co. KG.; MTU Aero Engines GmbH;
Suppliers: Krauss Aerospace GmbH; Reuter Manufacturing GmbH ; KST Kraftwerks- und Spezialteile GmbH; ETN Aerospace Production GmbH; BBAT Berlin-Brandenburg Aerospace Technology GmbH;

Maintenance, Repair and Overhaul (MRO):

Lufthansa Technik GmbH; MTU Maintenance Berlin Brandenburg; Lufthansa Bombardier Aviation Services GmbH; Germana Flugesellschaft mbH; Air Berlin PLC & Co. Luftverkehrs KG; OHS Aircraft Service; Krauss Aerospace GmbH

³ <http://www.mwe.brandenburg.de/cms/detail.php?id=338581>

⁴ Original Equipment Manufacturers

Research and Development:

Companies: AneCom AeroTest GmbH; FTI Engineering; Ferchau Engineering; Quality Park GmbH; Astro- und Feinwerktechnik Adlershof GmbH; P+Z Engineering GmbH; Materials Testing Operations Centre (Rolls Royce PLC); GEVA Gesellschaft für Entwicklung und Versuch mbH

Institutes: Fraunhofer-Einrichtung für Polymermaterialien und Composite PYCO; Fraunhofer Institut Produktionsanlagen und Konstruktionstechnik; Deutsches Zentrum für Luft- und Raumfahrt; Bundesanstalt für Materialforschung und –prüfung (BAM); TÜV Nord Aviation; TÜV Rheinland

Component Manufacturers / Service Providers:

Pratt and Whitney Canada Customer Service Centre Europe GmbH; Pace Aerospace Engineering and Information Technology GmbH; Holmberg (Holmco) GmbH & Co. KG; Franke Aquarotter AG; Lufthansa Technik Logistik GmbH; Matec Gummiwerk GmbH; Atena Engineering GmbH; Philotech GmbH

Aircraft Manufacturers (OEM):

Aquila Aviation by Excellence GmbH; CT- Flight Design Jens Brendel; Stemme AG; Fläming Air GmbH; AirTrike GmbH

Education / Training:

Technische Universität Berlin; Brandenburgische Technische Universität; UTC – Rolls Royce University Technology Centre (annexed to the BTU); Technische Fachhochschule Wildau

TFC GmbH Käufer; Lufthansa Flight Training; Trainico GmbH;

Airlines:

Air Berlin PLC & Co. Luftverkehrs KG; Lufthansa AG; easyJet;
German Wings; ExecuJet; Germania Flugesellschaft mbH;
Windrose Air Jetcharter GmbH

Airports / Airfields:

Flughafen Berlin Brandenburg; Flugplatz Schönhagen GmbH;
Flughafen Süd-Brandenburg Cottbus GmbH; Flugplatz
Eberswalde Finow; Strausberger Flugplatz GmbH; Airport
Neuhardenberg GmbH

The aerospace cluster is centred on the southern periphery of Berlin. It is here that the most significant players have settled. The federal and local governments have invested heavily in the communications, road and rail infrastructure over the past 20 years to bring it up to par with other Western European locations, indeed it could be said that it has now a higher standard than many of its European competitors. One example is the building of the new single airport “Berlin Brandenburg International Airport” at the location of the former East German airport in Schönefeld. This is one of the largest construction projects in Germany to date. Berlin formerly had four main airports following the influence of the four occupying powers during the cold war. Both Gatow and Tempelhof have been closed and Tegel will close with the opening of the new airport in October 2011. The closing of Tempelhof was a very contentious issue as many other capital cities value their inner city airports as an attraction for business aviation and hence for potential investors. When completed in 2011 Berlin Brandenburg International Airport will have a capacity of up to 27 mil. passengers p.a. with an option to extend to 45 mil. p.a. The current passenger figures for 2009 amount to just under 21 mil.⁵ The costs for construction total over 2 billion Euros. This investment will undoubtedly drive the

⁵ http://www.berlin-airport.de/DE/Presse/Pressemitteilungen/2009/2009_12_18_Jahresendpressegespr_ch.html

development of the aerospace cluster, with certain investments affinitive with the airport already occurring.

Wildau to the South West of Berlin is rapidly becoming an aerospace campus. The foundation for a fourth incubator for start-up companies specialising in aerospace was laid at the end of 2009. The campus also comprises of the University of Applied Sciences Wildau, as well as a number of highly innovative SMEs. One of these SMEs is the Berlin-Brandenburg Aerospace Technology GmbH (BBAT) which is a consortium of 18 SMEs whose aim it is to supply engine components to Rolls Royce and MTU locally and also on a global scale. The BBAT is meeting the demands of the large OEMs to streamline their businesses by cutting the number of individual suppliers they deal with.

Brandenburg historically has a large number of airfields. Many are no longer in operation or cater for flying schools and very basic general aviation. Nonetheless, Schönhagen to the South of Berlin has heavily invested into its infrastructure, and has been rewarded by ranking one of the most important airfields in Germany. Schönhagen encompasses optimal conditions for general aviation with an attached business and industrial estate. The airfield will further expand, with the opening of the new international airport as a haven for smaller aircraft currently based in Schönefeld.

The aerospace industry itself is growing at a steady pace and the region appears to offer a good business environment. This can be seen in particular with the decisions by Rolls Royce to locate the production of the lucrative V2500 engine in Brandenburg. A further example was the very contentious decision made by Rolls Royce to move one of the core research and development capabilities from its home base in the UK and US to Brandenburg. The Materials Testing Operations Centre started its operation at the beginning of the year. An additional highlight is the decision MTU Aero Engines made to locate the final assembly and testing of the TP400-D6 (the turboprop engine specifically designed to power the new A400M military transport aircraft) at its plant in Ludwigsfelde. This engine is produced by the consortium EPI (Europrop International) which includes MTU, Rolls Royce and Snecma Moteurs. The close proximity to Rolls Royce was undoubtedly a factor for

this decision. It is expected that with the opening of the new airport, a number of MRO companies will also settle in the region, although this number will be dependent on the number of international flight connections.

Similarly the area of training and education is a growing factor in the cluster. Lufthansa Flight Training already has a firm base with eight cockpit simulators for training and the decision of TFC GmbH Käufer to take up the training of cabin personnel in Schönefeld means that the location offers an all round training capability for aircrews. Another Lufthansa unit, Trainico, specialises in training and retraining employees as technicians, for both aircraft production and maintenance purposes. Furthermore, the local universities and colleges are adapting their curriculum to include the increasing demand for engineers in the region.

The Internationale Luft- und Raumfahrt Ausstellung (ILA) is an important factor in the region's aerospace cluster. It is the main trade fair and air show in Germany and ranks third in Europe behind the air shows in Paris Le Bourget and Farnborough in the UK. In 2008 the ILA counted 1,127 exhibitors (of which 448 were international) and over 241,000 visitors (of which 120,000 were trade visitors)⁶. Besides the traditional activities of a trade fair, the ILA also offers specialised conferences for suppliers and for the recruitment of qualified employees. The exhibition has become an integral part of the aerospace cluster and is of the utmost importance to the local industry in its search for customers and suppliers. Negotiations are currently underway to secure the ILA in Berlin-Schönefeld after the launch of the new airport.

Both the national and state governments have identified the aerospace industry as a potential growth industry. Apart from the national support programmes for R&D, in the aerospace industry (LuFo- Luftfahrtforschungsprogramme)⁷, the state of Brandenburg has also implemented a similar scheme on a state level. This is available to all aerospace companies participating in R&D regardless of their size. The subject of financial and other support given to companies will be dealt with later in the paper. The local IPAs, Berlin Partner and the ZukunftsAgentur Brandenburg

⁶ <http://www.ila-berlin.de/ila2010/aussteller/fakten.cfm>

⁷ http://www.dlr.de/pt-lf/DesktopDefault.aspx/tabid-3626/5758_read-8357/

(ZAB) also concentrate their resources on, amongst others sectors, the aerospace industry. The ZAB has a specialised team that deals exclusively with the aerospace and logistics sectors, both in aiming to further strengthen the existing cluster through the acquisition of new members, and through portfolio maintenance.

BBA as an industrial association has grown in strength since its creation and now actively supports and represents its members in lobbying for optimal conditions.

2.2 The Emirate of Dubai

2.2.2 Background

The Emirate of Dubai is one of the seven Emirates that make up the United Arab Emirates (UAE). Dubai has the largest population and the second largest area in the UAE. It is ruled by HH Mohammed bin Rashid Al Maktoum who is also Prime Minister and Vice President of the UAE. It lies directly on the Persian Gulf and borders on the Emirates Abu Dhabi (its main internal competitor) and Sharjah as well as the Sultanate of Oman. In 1971 Dubai gained independence from the protectorate the United Kingdom along with the other seven Emirates. A new currency was introduced for the UAE the Dirham (AED). Dubai currently has a population to date of 1.771 million inhabitants⁸.

Dubai's GDP rose during the first quarter of 2009, despite the growing economic crisis, to AED 68.397 million⁹ (13.576 million Euros¹⁰). Dubai's economy was hit hard by the global economic recession towards the end of 2009, when it announced the deferment of a real estate debt amounting to US\$ 26 billion¹¹. This severely dented confidence in the investment climate of the Emirate. Abu Dhabi

⁸ <http://www.dsc.gov.ae/EN/Pages/DubaiInFigures.aspx>

⁹

http://www.uaeinteract.com/docs/Dubais_GDP_rises_0.3_in_first_quarter_despite_global_downturn/38203.htm

¹⁰ Currency conversion on 15.03.10 (1 € = 5.04 AED) <http://www.xe.com/>

¹¹ <http://www.arabianbusiness.com/581136-dubai-economy-faces-tough-2010---report>

agreed to lend Dubai US\$ 20 billion to help restructure its debts. What effect this has on the fledgling aerospace industry remains to be seen. It is believed that the restructuring process in implementation will not affect non-real estate corporations like for example the Jebel-Ali Free Zone where the majority of aerospace companies are based.

2.2.3 Global Competitiveness and the Business Environment

As previously mentioned the Emirate of Dubai is not a nation state and therefore the UAE will be used as a proxy for comparing competitiveness and the business environment. As a result small deviations may occur.

The UAE wealth is based largely around the country's considerable oil and gas reserves. It is estimated that 10% of the world's oil reserves and 5% of gas reserves lie within the UAE borders, most being in the Emirate of Abu Dhabi (US Commercial Service 2009). The UAE is recognised as being the commercial centre of the Arabian Gulf with one of the world's largest ports in Jebel Ali. It has no corporate taxes for manufacturing companies nor indeed income taxes for employees, and low import duties (5%). The Emirate of Dubai capitalises on its geographical position to trade with Central Asia, the Middle East and Africa. Dubai's Jabel Ali Free Zone (JAFZ) is home to over 2,500 international companies. The US Commercial Service states that oil and gas production will remain the foundation for the UAE economy, although it does state that the economy is slowly in transition, with non-oil products like aircraft and components, IT, medical, construction, engineering and environmental sectors growing on a steady basis. Apart from oil and gas the UAE remains a global trading centre.

The UAE is ranked at number 31 on the global competitiveness Index (World Economic Forum 2008) with a high level of technological readiness and innovation. These figures may of course be adapted for the 2010 report after UAE was especially hit hard during the global economic recession. The main disadvantage of the region appears to be its high inflation, although new figures for 2009 put inflation at 4% as opposed to 10.8% the previous year¹². Further disadvantages are its institutions

¹² http://www.uaeinteract.com/docs/Dubai_inflation_slows_to_4_per_cent_in_2009/39960.htm

(inefficient bureaucracy), infrastructure, macroeconomic stability and, rather surprisingly, access to financing. The problems appear to have been recognised and Dubai is currently in the process of creating its own competitive Council (Bayhan, Arthur 2008). Bayhan, specifically states that Dubai is attempting to take advantage of its geographical location to build a sea and air hub. This is underlined by the creation of the Dubai Strategic Plan 2015 which aims to shift the impetus away from traditional industries to more sustainable long term growth industries (Sulaiman 2009). This point is also taken up by Bayhan who sees oil reserves as finite and the need to invest the financial abundance in a diversified economy.

Dubai is a very competitive location for FDI. The economist Nasser Saidi (Lancaster 2009) highlights the advantages of the free zones (of which Jabel Ali and the Dubai Airport Free Zone are particularly favourable for the aerospace industry). He states that many of the investments to date have gone into the free zones as these offer freedom of access, no need for a sponsor, complete corporate ownership and ownership of land. Furthermore, management may be brought in from abroad without hindrance. According to interviews conducted by the author of this paper, the free zones also offer a legal system based on UK corporate law. Saidi further states that along with these advantages, the lack of corporate and income tax has made Dubai one of the most attractive locations worldwide with the highest level of FDI influx in the world for 2007 (US\$ 16 billion).

2.2.4 The Aerospace Cluster

The aerospace cluster in Dubai is somewhat non-transparent. It is exceedingly difficult to find lists of companies based here. Most of the aerospace companies seem to be based in the two main free zones Jabel Ali and the Dubai Airport Free Zone (DAFZ). However, a catalogue of companies based at these two locations can only be bought at a great expense from consulting companies. It is nonetheless possible through research to filter the main players that have settled in the Emirate, if not exactly what they do and the size of investment. The regional CEO for Rolls Royce is for example used as a testimonial for the DAFZ. There is however no real description of what Rolls Royce is producing here or how heavily they have invested.

It is only through the direct research that this has become, in part discernible. A further example is that the DAFZ to date, is home to over 1,450 companies of which over 13% are deemed to be aerospace companies, all the same, very little information is available to verify these figures¹³.

The mainstay of the Dubai aerospace industry is nevertheless Dubai Aerospace Enterprise (DAE), a holding company¹⁴. It was founded in 2006 by HH Mohammed bin Rashid Al Maktoum to accelerate the growth of the aerospace industry in Dubai as one of the leading industries in the area and one that will be a major focus of Dubai's restructured economy. DAE is split into three different entities:

- i) DAE Capital¹⁵- Aircraft leasing, financing, insurance and management. It currently has a fleet of over 41 narrow and wide bodied aircraft with a further 100 on order from both Airbus and Boeing. The current value of the fleet is estimated at US\$ 2.3 billion with this rising to US\$ 5.5 billion by the year 2012 through the purchase / leaseback of new aircraft. Its customers include international airlines like easyJet, China Southern, Kingfisher, Emirates, Nikki, Wizz, Turkish Airlines and Air New Zealand.
- ii) DAE Engineering (Standardaero)¹⁶ – has one major subsidiary in Standardaero, a company that was founded in 1911, and typically for DAE was bought and merged with three other companies: Garrett Aviation, Associated Aircentre and TSS Aviation. The purchase and merging of already existent companies allows the rapid build up of expertise without the headaches of market acquisition and costly certification. Standardaero is a wholesale MRO company operating on all aspects of MRO including engines, airframes and avionics. It has customers in over 80 countries worldwide and had a sales turnover of over US\$ 1.5 billion in 2009. It has 12 facilities

¹³ <http://www.dafza.gov.ae/>

¹⁴ <http://www.dubaiaerospace.com/portal/>

¹⁵ <http://www.daecapital.com/en/aboutus/overview.html>

¹⁶ http://www.standardaero.com/about_us/docs/STA-Company-Profile_020910HR.pdf

located in, among others, the US, Canada, Europe, Singapore and Australia and employs over 4,000 people.

- iii) DAE Services also currently has one major subsidiary Flugwerkzeug Aviation Software GmbH (F:WZ), which was founded in 1987 to provide a cost-optimising, light planning software for airlines around the world. It is based in Vienna and was wholly purchased by DAE Services in 2006. Its customers include Jet2, Midwest airlines, Swiss, Virgin Atlantic and Turkish Airlines.

DAE will continue to push out into the global market to try and establish Dubai as a major aerospace location. The other major players of the region are: Rolls Royce, Boeing, Airbus, Goodrich, DHL, Thales, Volga-Dnepr, Jet Aviation, Hawker-Pacific Airservices, Emirates, Aerotec, IAL, Ethihad, Finmeccania, Recaro, Maximus Air Cargo, to name a few.

Dubai International Airport is the 26th largest airport in the world and is home to the national Emirates airline. In 2009 it handled over 40.9 million passengers¹⁷ and it is estimated that it will further grow in 2010 by 13.6% to 46 million passengers. Similarly to Berlin-Brandenburg a new airport is currently under construction¹⁸. The new Al Maktoum International Airport will however far surpass the construction project in Brandenburg. It is to be the world's largest passenger and cargo hub, stretching over an area of 140 km² with five runways (4.5 km in length) and a cargo capacity of 12 million tonnes in 16 cargo terminals and a passenger capacity of between 120 and 150 million passengers p.a. It is expected to have a population living and working within its borders of 945,000 people. The project will cost around US\$ 33 billion and is set to become operational in the middle of 2010 and reach its full capacity by the year 2017. The unique selling proposal that the airport offers is undoubtedly the access to cheaper fuel for both airlines and freight carriers. This means once established as a hub it will further emphasise the Dubai cluster above all as an MRO hub.

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<http://www.dubaiairport.com/DubaiAirports/English/Media+Center/Press+Release/DANews13Jan10.htm>

¹⁸ <http://www.dwc.ae/site/index.html>

The Dubai Air Show also plays an important role in the cluster. The 2009 Dubai Air Show attracted nearly 53,000 trade visitors and 890 companies from 138 countries. During the show sales to the value of US\$ 14 billion were said to have been closed. The show claims to be the fastest growing show of its kind and will be held again in 2011.

2.3 The Republic of Singapore

2.3.2 Background

Singapore is an island city state located at the tip of the Malay Peninsula. It has a total population of 4.8 million¹⁹. The population is divided into four main groups (Chinese 75%, Malay 13.7%, Indians 8.7% and others 2.6%). It gained independence from Great Britain on the 3rd of June 1959 and has a democratic political system based on the Westminster model led by the elected president Mr S. N. Nathan and the head of the cabinet, the Prime Minister Mr. Lee Hsien Loong. Free general elections are held every five years and Singapore has an independent judicial system with a supreme court and subordinate courts. The local currency is the Singapore Dollar (SGD) and it is home to one of the largest ports in the world and the fourth largest foreign exchange trading centres after London, New York and Tokyo.

2.3.3 Global Competitiveness and the Business Environment

Singapore is the leading economy in Asia. It has a very strong microeconomic basis and sound public institutions including the judicial system (Ketels et al 2009). The high level of global competitiveness for businesses on the peninsula stems from a high level of productivity and innovation and moreover from world class factor input conditions. Singapore invests heavily in its educational system and research institutes, leading to a high level of R&D. Its economy is highly specialised and clustered. Singapore has very strong government linked companies (GLC). However,

¹⁹

http://www.edb.gov.sg/edb/sg/en_uk/index/why_singapore/singapore_facts_and_figures.html#economic

because Singapore has a relatively small domestic market, the GLC which act as private sector companies and therefore dominate this market, causing a detrimental effect on the local entrepreneurship which has difficulties in competing. The small market size means that companies often use Singapore as a stepping stone to commercially cover the whole region. This is supported by Singapore's no tariff rules on industrial goods and textiles; over 99% of all imports that enter Singapore are duty free. The economy in Singapore is innovative, however it is seen as investment driven and is in the process of laying more emphasis on moving towards an innovation driven economy.

The economy is nonetheless still very dependent on international trade which makes it very susceptible to the current economic crisis (U.S. Commercial Service). The economy is one of the most open in the world. The World Bank's "Doing Business 2009" ranked Singapore as the easiest country in which to do business (U.S. Commercial Service). Apart from the emphasis on the GLC the government actively pursues FDI and has implemented a large IPA (The Economic Development Board – EDB) with the aim of attracting high quality manufacturing and service industries. In Singapore, as opposed to Dubai, firms are not required to enter into joint ventures (JV) nor have local residents in the shareholder structure (this does not apply to the Free Zones in Dubai). As previously mentioned, Singapore has a strong judicial system with a regulatory system which is both transparent and executable; furthermore it is seen as one of the least corrupt nations in the world.

Singapore generated a GDP for 2009 of US\$ 161.3 billion (World Economic Forum). It is ranked at number five in the total Global Competitiveness Index for the period 2008-2009, far surpassing the averages for innovation-driven countries in the fields of innovation, infrastructure, macroeconomic stability, higher education and training, technological readiness, sophistication of the goods and financial markets and labour market efficiency. The main negative factors listed for the economy appear to be its high inflation (by far the most problematic area specified), an inadequately educated workforce and restrictive labour regulations and poor work ethic in national labour force (rather surprising considering the above average ratings on the Global Competitiveness Index. This may however be explained by the

positioning of expatriates from Europe and the U.S. holding key management positions).

2.3.4 The Aerospace Cluster

Singapore is the MRO, manufacturing and R&D leader in Asia (U.S. Commercial Service). It has grown a staggering 13% p.a. since 1992 and offers comprehensive MRO capabilities in all fields including airframes, engines, components, avionics and conversions. In 2009 the aerospace industry generated a record output of SGD 7 billion²⁰ (equivalent to 3.6 billion Euros)²¹. The total market size is estimated at US\$ 11,637 million with imports and exports valued at US\$ 6,090 million and US\$ 6,038 million respectively. Furthermore it employs 18,000 staff; it is presumed that these are engaged directly in the industry and does not include airline staff and peripheral industries.

Singapore, similarly to Dubai has a major GLC which drives its aerospace industry. For Dubai it is DAE and for Singapore it is Singapore Technologies Aerospace (ST). ST has two main spheres of interest, on the one hand, the aircraft maintenance and modification and on the other the total support of aircraft engines and components²². It is a globally operating company with branches in the U.S., Europe (Denmark, UK, Italy, Sweden and Norway), Australia and in China²³ with over 7,000 employees worldwide. It has very close links with both the OEM aircraft manufacturers Airbus and Boeing. Other customers include Rolls Royce, Sikorsky, Bell Helicopters, Honeywell, Nippon Airways and Japan Airlines International, to name just a few.

Furthermore, Singapore is in the process of creating a specialised industrial estate called the Seletar Aerospace Park. It is on the site of the former British military base which was decommissioned in 1968. It is currently used by flying schools and charter companies as well as being home to over 30 aerospace companies including

²⁰

http://www.sedb.com/edb/sg/en_uk/index/industry_sectors/Aerospace_Engineering/facts_and_figures.html

²¹ Rates taken from <http://www.xe.com> at 1SGD = 0.52 € 17th March 2009

²² <http://www.staero.aero/>

²³ <http://www.aviationtoday.com/regions/usa/83.html>

ST Aerospace, Goodrich, Jet Aviation, Hawker Pacific Asia and ExecuJet. Rolls Royce, Pratt & Whitney and Eurocopter are also in the process of building facilities on the site.

Changi airport also plays an important role in the cluster as do the airports in Seletar and Paya Lebar. Changi serves 85 different airlines, with 5,000 flights a week totalling 37 million passengers a year. In 2009 the airport handled 1.63 million tonnes of cargo. It has two parallel runways, each 4,000 m in length²⁴. Changi airport also plays host to the Singapore Air Show, a biennial event at the New Changi Exhibition Centre, a site especially created for the show. It is the former site of the Asia Aerospace International Expo before negotiations between Reed Exhibitions and the Singapore government were unable to agree terms, forcing a move to the AsiaWorld Expo in Hong Kong in 2007. Hence the government set up the Singapore Air Show which remains the most popular in Asia. In 2008 the show boasted over 800 exhibiting companies from over 46 nations with a 50:50 split between military and civil aviation. Over US\$ 13 billion worth of sales of aircraft and components were made and an additional US\$ 2.6 billion were generated from other service contracts. Over 43,000 trade visitors attended from 112 different countries.

The government takes an active role in the promotion of the aerospace industry cluster in Singapore. Not only has the EDB made aerospace one of its major focal points but also the Association of Aerospace Industries (Singapore)²⁵ plays a vital role. The non-profit organisation was founded in 2003; it aims to assist expanding and start-up aerospace companies and currently numbers 83 companies. Further proof of the institutional support for the industry was recently shown by the creation of a new fund exclusively aimed at improving standards across the industry by the civil aviation authority of Singapore. It amounts to SGD 100 million specifically for the fields of manpower training and development, cargo and logistics and MRO²⁶.

²⁴ http://www.changiairport.com/changi/en/about_us/fact_sheets/?_locale=en

²⁵ <http://www.aais.org.sg/>

²⁶ http://www.straitstimes.com/BreakingNews/Singapore/Story/STIStory_483884.html

Chapter 3 Literature Review

3.1 Research to date (General)

This paper is essentially a study of the comparative advantage of Brandenburg, benchmarked against the state of Singapore and the emirate of Dubai with regard to the aerospace industry. There is very little or no academic literature on this specific industry with regard to these regions in particular. This chapter attempts to apply the academic theories of competitive advantage directly to both the industry and the locations in question.

Comparative advantage itself has long been the subject of research for many economists dating back to Adam Smith's ideas on why some nations succeed and others fail in international competition (Smith, Adam 1776). It is doubtful that he could have envisaged that over two centuries later his theories would be the basis for research into comparative differences between three very different geographical areas in an industry which would have been unthinkable in his time. His ideas were taken up by the economist David Ricardo who first added the factor labour productivity into the equation of comparative advantage, this was further developed through the Heckscher-Ohlin theory which added different factors of production and the manner in which they were to be implemented in the production of goods, albeit assuming that all factors of production were immobile. During the 1970's the economist Paul Krugman brought forward the New Trade Theory which helped explain why countries of similar status actually traded goods. He put forward the idea that consumers valued diversification. Furthermore he stated that because of economies of scale and the through the "first mover" principal (in which companies which are first to introduce products to the market), firms gain a scale based cost advantage which other later entrants to the market find hard to follow, therefore the economies in question gain an advantage.

Up to the late 1980's two main theories dominated thinking. These were Industrial Organisation (IO) which looks at the structure of markets and the way that firms behave within this structure. The second main school of thought was the Resource Based View (RBV) which examined the resources available to a company

and how this gave the company its comparative advantage. In 1990 Michael Porter published his work *Competitive Advantage of Nations* (Chan 2008) which further develops the RBV stance and combined the competitive strategy with that of international trade and investment. Porter developed the primary determinants of performance and asked the question “Why do some social groups, economic institutions and nations advance and prosper?” (Porter 1990). His theories focus from a macro-economic to a micro-economic level and stated that technology and competition have re-ordered the traditional rules of the nation state which lies in direct competition with other nation states. He states that there are five forces which influence the economic success of a company; these are divided into horizontal and vertical forces. The former being the threat of substitute products, the threat of established rivals and the threat of new entrants and the latter being consumer pressure and the pressure applied by suppliers.

The aerospace industry is however a very established and conservative sector to which these forces do not always wholly apply. The development of aircraft, indeed of all components and procedures, is often very long-term and exceedingly regulated. Hence the threat of substitute products is not really applicable; any such product being brought to market will take a number of years from the initial research to the production of prototypes (which have to undergo rigorous tests) to actual market maturity. These products are then likely to be in service for many decades with the implementation of slight facelifts and therefore require a high level of investment. All the major original equipment manufacturers (OEM) are constantly developing new products; even so the competitors are usually fully aware of these developments, thereby curtailing any surprise effect a new product may have. Strategic discrepancies do exist as can be seen by the main two aircraft OEM in the production of the Airbus A380 and the Boeing 787 Dreamliner. Airbus believes that future air travel will take the form of hub to hub with smaller feeder aircraft supplying the hubs, whereas Boeing believes that point to point will become more popular and have therefore designed their aircraft accordingly. For Brandenburg this means that either a niche product or procedure must be developed, as for example the development and certification of new repair techniques for engines as implemented by MTU or companies must be gain an advantage through cost differentiation.

The threat of established rivals is very apparent, because the number of large aircraft manufacturers with a significant market share has condensed to only two: Airbus and Boeing. There are other manufacturers for military, civil regional and small aircraft; however, these too are limited in number when compared to the automotive industry. The OEM are increasingly focusing on system suppliers who participate in risk sharing. This means that the first and second tier suppliers are also consolidating into larger companies to accommodate this requirement. The region does have a small first tier supplier in Holmberg (Holmco) who specialises in cabin communication. It is their expert know-how and innovative products that keep them in the market.

The threat of new entrants is relatively low in the aerospace industry. Any new entrants to the market on an OEM level or indeed a system supplier, normally take the form of consortiums which are made up of current manufacturers such as EPI (Europrop International) which makes the TP400 D6 for the new Airbus military transport aircraft A400M. This consortium is made up of Rolls Royce, MTU, Snecma and Industria de Turbo Propulsores. A new system supplier was founded in early 2009 called Premium Aerotec. This was however part of an Airbus "Slim-down" in which a number of Airbus locations were sold off, therefore moving from the status of an Airbus factory to a system supplier. Brandenburg can boast a number of suppliers; in 2008 eighteen SMEs mainly from Brandenburg set up the Berlin Brandenburg Aerospace Technology GmbH (BBAT) with the aim of becoming a supplier for the engine industry. It is on this basis that the requirements for entrants into the aerospace industry can be made transparent. Companies branching out must first invest heavily; factory space and machines must be set aside on which only parts for the industry may be produced. This is a major financial hurdle; in addition to this the supplier must be certified not only by the European Aviation Safety Agency (EASA) but also the Federal Aviation Administration (FAA) in the US. These processes are expensive and time-consuming without a foreseeable return on the investments. Once these factors have been dealt with, the potential supplier will then be audited by the OEM themselves and only when it has been accepted onto the list of certified suppliers can it then join the market to compete with those companies with a depth of experience and financial momentum.

The vertical force of consumer pressure is all too apparent. The major OEM are restructuring the industry, as previously mentioned, by forcing the suppliers to take on risk-sharing and requiring them to have a certain critical mass in terms of financial and manufacturing capability. Supplier pressure is perhaps a lesser factor as these are never single source suppliers i.e. the orders made can be given to a number of companies therefore exposing them to direct peer competition.

To further explain how these company factors influence the decision to settle in a certain location and how local government can enhance these possibilities we must turn to Porter's Diamond and consequently his theories on clusters. Porter believes that companies either seek cost leadership or differentiation; hence there are certain factors which contribute to the ideal location of a company. There are four main determinants that either further or hinder a company's competitive advantage in a location. These are:

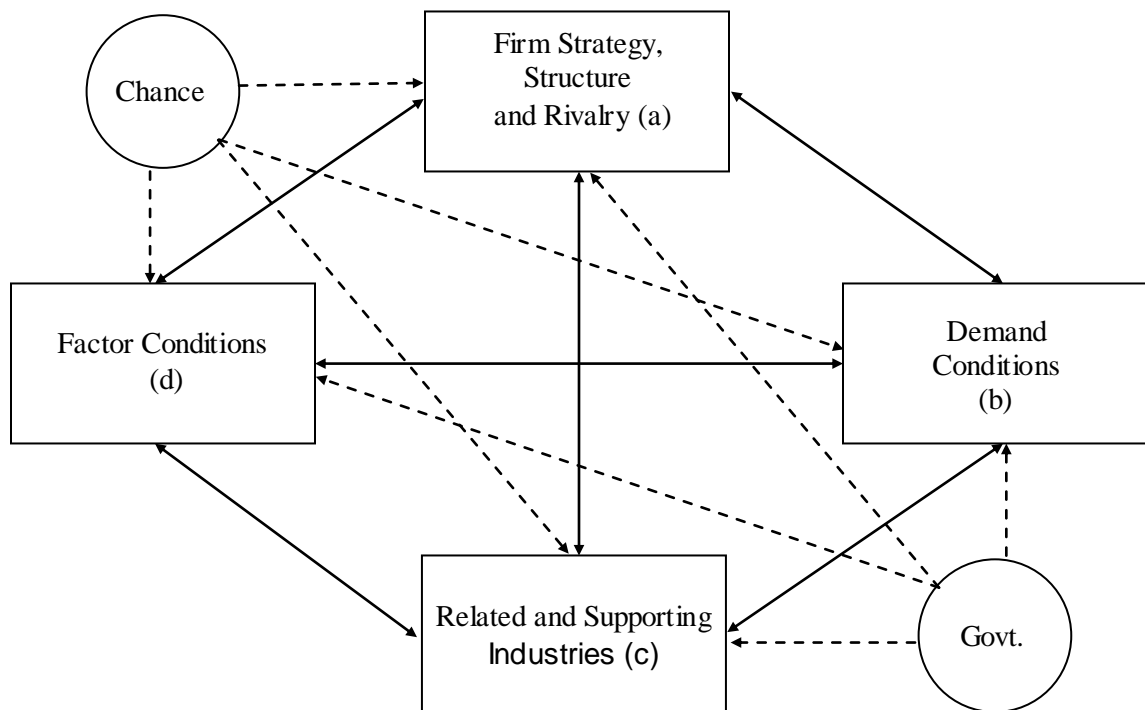
- (a) Firm Strategy and Rivalry – this determinant portrays the way companies are founded, their strategic aims and the rivalry at the home base. Intense rivalry leads to increased innovation and a constant benchmark with peer companies such as Rolls Royce and MTU in Brandenburg.
- (b) Demand Conditions – the existing demand for products i.e. the home market. Again the peer companies play a significant role in the home market, the more sophisticated the market the higher the demand for innovative goods. This may not be as applicable for the aerospace industry as a whole because it is truly global; OEM and suppliers operate outside regional or national markets. Brandenburg may find an increase in the demand for Maintenance, Repair and Overhaul (MRO) services with the beginning of operations at the new airport Berlin Brandenburg International.
- (c) Related and Supporting Industries – High quality and innovative suppliers and service industries may give a company a competitive advantage when operating on a global scale. An example may be the testing facilities of

AneCom Aerotest and MTOC as service providers for both Rolls Royce and MTU in the development of new generation engines.

(d) Factor Conditions – the existing factors of production, these include specifically for Brandenburg the high standard of human resources, infrastructure and the availability of capital.

A further point is the role of government which Porter sees as taking on the role of a catalyst and encouraging, even provoking, industry and the role of chance which by definition are circumstances on which little influence can be brought to bear. Brandenburg, as well as Dubai and Singapore have all made the aerospace industry a fundamental part of their economic development. They support and regulate this ideal accordingly. The role of the determining factor of chance is self-explanatory. All the entities in the diamond are self-reinforcing and can be used to define a cluster.

Figure 1. Michael Porter's Diamond Paradigm



Porter defines clusters as “a geographical proximate group of interconnected companies and associate institutions in a particular field linked by commodities and complementaries” (Porter 1990). The key factors for a cluster can be defined by Simme and Sennet (1990):

- i) A spacial and sectoral concentration of one main industry
- ii) A range of similar industries
- iii) Internal economies of scale which can reduce costs and enhance operations
- iv) A network of private local institutions which support local businesses there
- v) Suppliers of specialised inputs such as components, machinery and services
- vi) Providers of unique infrastructural requirements
- vii) Suppliers of specialised services such as marketing
- viii) Intense vertical and horizontal linkages
- ix) Government and other supporting institutions

When focusing on Brandenburg the first two points can certainly be applied. There is a concentration of aerospace companies in the state, albeit diversified into sub-sections such as engine manufacture, training, testing or MRO. Some of the smaller suppliers like Krauss, ETN and BBAT may also experience economies of scale through business generated by the region’s larger companies. The cluster also has semi-private research institutions which include Fraunhofer, DLR and BAM. The points five to seven can also be acknowledged especially in the fields of testing and training where companies like AneCom Aerotest, GEVA, FTI, MTOC and also Lufthansa Flight Training and TFC Käufer operate. It lacks the strong vertical and horizontal linkages, the reasons for which become apparent when focusing on the structure of the cluster below. Local government has defined the aerospace industry as one of its strong points and is therefore very forthcoming in the support given.

Porter further defines clusters as having a lead or an anchor firm (Wolfe et al 2004). Fundamentally speaking, the three aerospace clusters in Singapore, Dubai and Brandenburg do not necessarily have the depth of the clusters in Seattle,

Hamburg or Toulouse, which have the distinct advantage of having Boeing and Airbus as their lead companies. However the presence of Singapore Technologies, Dubai Aerospace Enterprises and Rolls Royce and MTU do underline this theory. Nevertheless, this is often not sufficient to make a strong cluster, as stated by Breschi and Malerba (in Wolfe 2004) "A key feature of successful high-technology clusters is related to the high level of embeddedness of local firms in a very thick network of knowledge sharing, which is supported by close social interactions and by institutions building trust and encouraging informal relations among actors". Certainly for Brandenburg both Rolls Royce and MTU have taken on the function of a beacon, however their interaction with local companies is still limited. The cluster in Brandenburg is largely made up of small fledgling companies (95% of companies in Brandenburg have less than 20 employees) and large conglomerates like Lufthansa, MTU and Rolls Royce. The medium sized companies with approximately 500 employees did not exist in the planned economy of the former GDR and therefore the economy lacks this foundation. Moreover, these medium sized companies, which are often family run, are not as willing to participate in FDI as larger TNCs may do. They tend to fall below this critical mass in financial capacity and if they do invest abroad it is usually only to produce small components in low-wage countries in Eastern Europe and Asia. This hindrance may become critical for the aerospace cluster in Brandenburg, even though the cluster is being driven by both the government and the businesses.

Some lessons may be learned when looking at the aerospace cluster in Arizona (Waits 2000). This traditional cluster was forced to focus on its economic competitiveness because of globalisation and the rapid change in technology which led to a decline in living standards for the region as a whole. Arizona was forced to analyse and identify the concentrations of related firms and assess the reasons for their presence. It divided its cluster into three layers. The first layer comprised of leading aerospace companies such as Goodyear, Hughes, ICI and McDonnell Douglas. The second layer defined the businesses that provided supplies, specialised services, investment capital and R&D. The third and final layer was based around the essential economic basics such as infrastructure, specialised workforce training, R&D support and risk capital. The aim of the analysis was to understand the customer and define what economic development strategy should be

implemented. Furthermore, it was used as a tool to help leading industrialists engage in the regional strategy, to increase communication and networking and to help identify which specialised services were required of this key industry. “Arizona learnt that quantitative analysis alone might not capture and describe the whole dynamic picture of economic activity in a given region”. Brandenburg must also go beyond a purely quantitative ascertainment of its cluster but, moreover, must look at the fundamental relationships between the various players in the cluster.

The risk that Brandenburg’s relatively young cluster may fall behind others can be clearly seen when asking the question of how absorptive the companies in the cluster are. Guiliani Elisa (2005) states that successful clusters “show a link between the firm’s knowledge bases, the cluster’s absorptive capacity and the potential to grow dynamically”. Technological gatekeepers create growth in the cluster through technology transfer. Yolles (2009) goes one step further, believing that “culture is a harbour for knowledge through which meanings are generated”. Knowledge transfer might take the form of spin-offs, employee transition and cooperation with other firms in the cluster but the management in the region must be open for all types of transfer be it intrinsic, explicit or tacit etc. for real competitive advantage to be achieved. This does however not solve the problem that Brandenburg lacks a tier of medium-sized companies to absorb this knowledge.

Chapter 4 Research Methods and Results

4.1 Research Methods

The paper has involved a number of different types of research methodologies, in part it has been qualitative being based on a number of different theoretical principals mainly centred around the ideas of Michael Porter and in part quantitative in the form of data collected and then analysed. This paper follows the observational method of research, in particular the retrospective method, as Dubai and Singapore are both established aerospace clusters and Brandenburg is in the process of becoming one. The samples used for the data collection were very much focussed and not randomly taken. The specific research method used was the case study method which is restricted in its scope. It is an inductive method which should support or oppose the various theories on investment promotion which are gathered in the literature review in chapter two. It is a comparative case study where one set of questions, both descriptive and multiple choice was used for all interviewees.

The companies and organisations interviewed had to meet certain criteria:

- i) Companies had to have invested in one of the locations in question
- ii) Companies had to be active in the aerospace industry

Initially it was thought that the research achieved would be wider reaching and would include factors like the size, the origin, and the type of investment (i.e. Greenfield, merger and acquisition – (M&A) or joint venture – (JV). This, however, proved to be unworkable, in part because the scope of the samples taken were not large enough, meaning that information gathered on, for example the country of origin, would not lead to a meaningful result. Furthermore, it was very difficult to get appointments and the interviews, although kept to a minimum, these were time consuming. The interviews in both Singapore and Dubai were carried out during the respective air shows which enabled contact with high-ranking officers of each company but also very much limited the time available as meetings with potential customers and suppliers were of a higher priority. In addition to manufacturing and MRO companies

the research also includes the branch-specific business organisations, local investment promotion agencies (IPA) and in part independent consulting companies with specialist knowledge of the aerospace industry in the particular region in question. The data collected was analysed together. Splitting the analysis between firms and IPAs was deemed unproductive, even when taking into account the fact that local IPAs, when being interviewed by a potential competitor (the author), were understandably more likely to throw a positive light on the region than is necessarily the case. Nevertheless, as all regions were treated equally by taking both the views of the IPAs and the business associations into account the results were “corrupted” comparably. These interviews were nonetheless valuable in a sense that it was possible to see which incentives and basic conditions were available in the areas, as many companies would not necessarily have known about or accessed everything on offer. Ideally the sample should have included a far greater number of firms to make it more representative. Thirty companies split into SME and corporations would have been an ideal scope, with a follow up ascertainment after a number of years.

Initially it was proposed to only include companies that could be classified as FDI (Foreign Direct Investment). This proved unworkable as there are still very few SME that have the financial capability to expand abroad.

4.2 The Results

The questionnaire was drawn up to gain the best possible results from the interviewees in the shortest possible time. (Please see Appendix I). The multiple choice questions were a measure of how the factors in question influenced the decision to invest in the region. The questions were scaled from 1 to 5, with 1 having very little influence and 5 being a major factor in deciding to invest.

4.2.1 The General Questions

The first page of questions aimed to gain background knowledge on the type, size, and origin of the company and similarly of the investment. Interviewees were forthright in answering the questions on country of origin, number of employees, headquarters, the type of aerospace company and type of investment. Many

companies however withheld information on the turnover/ profit and the monetary dimension of the investment made.

4.2.2 The Multiple Choice Questions

The multiple choice questions, although scattered randomly throughout the questionnaire can be categorised into five different sections (Engammare 2008).

- i) Business and Investment Environment
- ii) Market Size and Prospects
- iii) Costs
- iv) Agglomeration Effects
- v) Human Capital, Infrastructure and Natural Resources

4.2.3 Business and Investment Environment

This section deals with all aspects of the local business and investment climate of the region in question as seen through the eyes of the investor. These aspects include factors such as the legal and administrative environment, property rights, judicial system, macroeconomic stability, etc. all aspects that an investor has to deal with when implementing the project.

Table 1.

Stable Social and Political Environment									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	5	4	3	5	2	4		4,00
Singapore	5	5	5	5	4	5	5	5	4,88
Brandenburg	4	4	4	5	4	4	5	5	4,38

Singapore scores extremely well which is understandable, however Dubai’s results are comparatively poor leading to the belief that perhaps not all is well in the Emirate. This may be a reflection on the recent financial problems suffered by the Emirate.

Table 2.

Ease of Doing Business									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	3	3	3	4	2	4		3,43
Singapore	4	5	4	5	5	5	5	4	4,63
Brandenburg	4	4	3	3	3	3	4	3	3,38

Singapore's reputation as one of the freest economies in the world accounts for its high score. Both Brandenburg and Dubai lie more than a point behind, although Dubai does claim to be one of the most business friendly economies. This result is surprising considering the implementation of special free zones to bypass most of the bureaucracy which accompanies investments outside these zones.

Table 3.

National Taxes									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	1	5	1	5	2	5		3,43
Singapore	4	5	3	4	5	4	5	5	4,38
Brandenburg	3	3	4	3	2	2	3	2	2,75

Once again Singapore heads the list. The Global Competitiveness Index (GCI) rates the UAE national taxes as being the 12th most problematic factors for doing business. This is surprising considering the Emirate claims to have no corporate or income tax; it suggests that there is a form of taxation which is hidden. Alternatively for this survey the decision to invest in Dubai was perhaps not dependent on the taxation factor. Brandenburg, as part of Germany obviously suffers from a high level of taxation which is verified by the GCI in which tax regulations and tax rates themselves make up two of the top three most problematic business factors.

Table 4.

Level of Corruption									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	5	3	3	5	3	5		4,00
Singapore	5	5	5	5	5	5	5	5	5,00
Brandenburg	4	5	5	5	5	5	5	5	4,88

In both Singapore and Germany the level of corruption is set as 0.1% on the GCI. In UAE 1.6% of all firms interviewed saw corruption as being a significant factor. None of the percentages are large when compared on a global scale; however, these figures do verify those collected in the survey.

Table 5.

Crime Levels / Safety									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	4	5	4	5	2	4		4,14
Singapore	5	5	4	5	5	5	5	4	4,75
Brandenburg	4	5	4	4	4	4	4	5	4,25

Dubai is supposedly a region with very little crime. The figures collected see Brandenburg ahead of Dubai, which is especially surprising considering the very strict regulations and execution of laws in both Singapore and Dubai. These figures are also correlated by the GCI which identically ranks the regions in this order.

Table 6.

Standard of Living									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	5	4	4	5	4	4		4,43
Singapore	5	5	4	5	4	4	5	5	4,63
Brandenburg	4	5	4	4	4	4	3	5	4,13

This is a very important factor for all the regions in question as a good standard of living is essential when trying to attract skilled employees and

management to work in the region. The majority of those interviewed in Singapore and Dubai were expatriates who enjoy a different standard of living to those guest and migrant workers from developing countries. Nevertheless it shows that when persuading staff to move, Brandenburg is less attractive than the other regions although the discrepancy is not as large as it might have been.

Table 7.

Openness of the Economy									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	3	1	3	3	4	4		3,14
Singapore	4	4	4	4	4	5	5	5	4,38
Brandenburg	4	4	3	4	4	4	4	3	3,75

Singapore claims to be one of the most open economies, it is therefore rather surprising that five interviewees only accredited it four points. Dubai fares comparatively poorly with one company even denoting a one for this factor. Dubai aims to become a global hub and an area from which businesses can branch out to Asia, the rest of the Middle East and Africa. These results do not substantiate these ideas. Brandenburg's result most probably stems from the large administrative workload which companies have to handle in Germany.

Table 8.

Investor Rights									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	4	2	3	3	4	4		3,29
Singapore	4	5	3	4	4	5	5	5	4,38
Brandenburg	3	5	4	4	4	5	4	5	4,25

This is once again a rather surprising result for Dubai when taking into consideration that the vast majority of companies interviewed were situated in the free zones. Dubai does have restrictive policies outside these free zones with shareholder participation amongst other factors. This is a positive result for Brandenburg as it keeps pace with the leader Singapore.

Table 9.

Exchange Rate Stability									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	2	4	5	5	4	4		4,14
Singapore	5	5	5	5	4	5	5	5	4,88
Brandenburg	3	2	3	4	4	4	3	5	3,50

Brandenburg does poorly in comparison to the other two regions in this sector. This is however, very easily explained as the UAE Dirham is directly pegged to the U.S. Dollar and the Singapore Dollar is government controlled and fully backed by international assets. Brandenburg, as with most of the European Union members has the Euro. Although the Euro is a strong currency, virtually all the aerospace business is conducted in U.S. Dollars (even in dealing within the EU) making it very susceptible to exchange rate variability. A weak U.S. Dollar can mean that European products are suddenly overpriced.

Table 10.

Interest Rate Stability									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	4	4	4	3	4	4		3,86
Singapore	5	5	3	5	4	5	5	5	4,63
Brandenburg	3	4	3	4	4	4	4	5	3,88

This factor is particularly important for potential investors with borrowing from local banks to finance the investment. Both Dubai and Brandenburg compare similarly, however this may be a pre-financial crisis view. Singapore once again heads the field.

Table 11.

Repatriation of Profits									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	5	4	5	5	2	4		4,14
Singapore	5	5	5	5	5	5	5	4	4,88
Brandenburg	3		4	5	4	4	4	5	4,14

Companies in all three regions questioned have few issues with the repatriation of profits. Only one company in Dubai appeared to have an issue with this factor.

Table 12.

Property Rights									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	4	2	2	3	2	4		2,86
Singapore	4	5	5	3	5	5	4	5	4,50
Brandenburg	3	5	5	5	4	4	5	3	4,25

This section clearly shows the restriction on companies owning land in Dubai. Nevertheless the free zones claim that foreign investors may purchase land here. It is not known which factors have to be fulfilled to accommodate this.

Table 13.

Intellectual Property Protection									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	5	3	2	2	2	4		3,00
Singapore	5	5	5	4	5	5	5	5	4,88
Brandenburg	4	5	5	4	4	4	4	5	4,38

Dubai is developing and restructuring its aerospace industry continuously. One of the key methods to strengthen innovation is technology transfer, which implicates a spill-over of knowledge, either through mobilisation of personnel or through local firms adapting new technologies demonstrated by those foreign firms who have

settled in the area. The comparatively low score in IP protection may well be down to firms believing that some of their kernel know-how is being duplicated.

Table 14.

Operable Legislation									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	3	3	4	2	1	4		3,00
Singapore	4	5	4	4	5	5	5	5	4,63
Brandenburg	4	5	4	5	5	4	4	4	4,38

Brandenburg does surprisingly well in the section, especially considering that in many fields of economic development it is tied to the rather restrictive EU laws and regulations. For Dubai again, it seems to be either a lack of transparency or even a circumventing of the laws in place which would be in accordance with the ease of doing business and corruption factors.

Table 15.

Availability of Local Financing									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	2	4		4	4			3,80
Singapore	3	4	3	5	4	5	5	5	4,25
Brandenburg	3	3	3	4	4	3	4	5	3,63

As previously described in the background information on the cluster in Singapore, the government institutes have recently set up a fund of SGD 100 million to optimise certain areas in the aerospace industry (this is apparently not unusual). It seems appropriate that it scores well on this factor. In addition, the strong trade background and stock exchange would construe readily available venture or seed capital. It is therefore all the more surprising that Dubai is not in a similar position, especially when taking into account the massive real estate projects that have been and are being carried through at the moment. For Brandenburg it is one of the factors which will have to be closely examined.

Table 16. A Comparison of the Average Values for Business and Investment Environment

	Dubai	Singapore	Brandenburg
Stable social and political environment	4,00	4,88	4,38
Ease of doing business	3,43	4,63	3,38
National taxes	3,43	4,38	2,75
Level of corruption	4,00	5,00	4,88
Crime levels / Safety	4,14	4,75	4,25
Standard of living	4,43	4,63	4,13
Openness of the economy	3,14	4,38	3,75
Investor rights	3,29	4,38	4,25
Exchange rate stability	4,14	4,88	3,50
Interest rate stability	3,86	4,63	3,88
Repatriation of profits	4,14	4,88	4,14
Property rights	2,86	4,50	4,25
Intellectual property protection	3,00	4,88	4,38
Operable legislation	3,00	4,63	4,38
Availability of local financing	3,80	4,25	3,63

Figure 2.

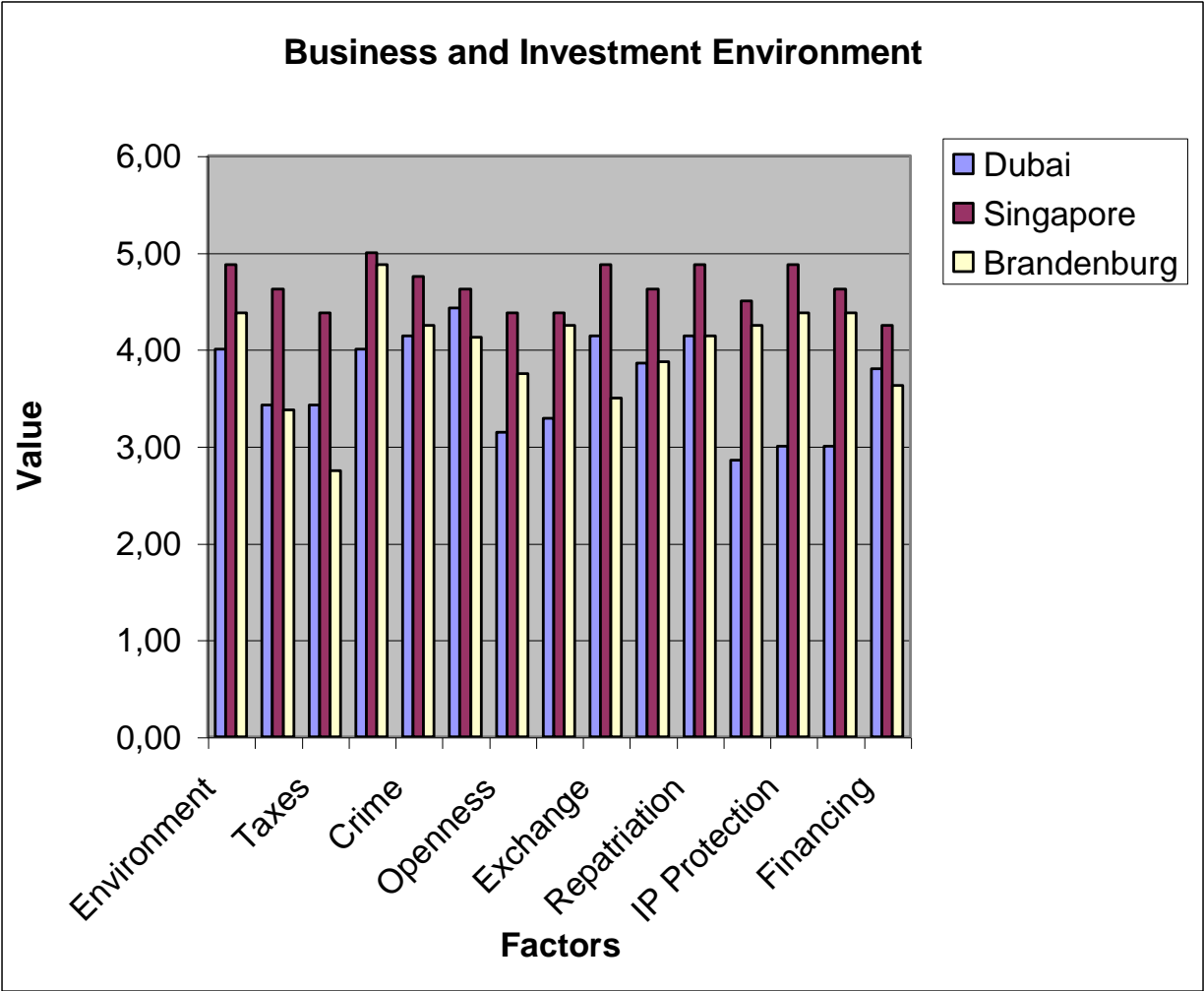


Table. 17 Total Average for Business and Investment Environment

Dubai	Singapore	Brandenburg
3,64	4,64	3,99

When looking at the business and investment climate of the three areas, Singapore scores highly in all areas and is at the forefront of the regions in all the factors. When looking at the averages it appears that Brandenburg provides a better or more solid climate than Dubai.

4.2.4 Market structure

This section deals especially in the aspects of the market structure, not necessarily with the size of the market. The aerospace business is very much a global business and therefore the local market is more often than not slightly less relevant than in other industries. Most companies have little or no contact with the final consumer which in this case is the airline passenger. It is safe to say that the industry is largely B to B orientated rather than B to C. This nonetheless implies that the importance lies in the local access to customers (i.e. other companies; either sub-suppliers, OEMs, airlines or leasing companies) and the importance of access to suppliers.

Table 18.

Access to Customers									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	5	5	5	5	5	5		4,71
Singapore	5	4	5	5	4	4	5	5	4,63
Brandenburg	4	4	2	4	5	2	3	1	3,13

It becomes apparent from this table why both Dubai and Singapore are successful aerospace clusters. Many companies have moved into the area because of the proximity to their customers. This may be to improve the services they offer or in the case of multinational corporations (MNC), as part of a sales deal. This is known as Offset and is the most probable reason for companies like Airbus and Boeing and even Goodrich and Rolls Royce to have set up in the region. Singapore Airlines was the lead customer to the Airbus A380.²⁷

Table 19.

Access to Suppliers									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	4	4	4	5	4	4		4,00
Singapore	5	5	4	4	5	5	4	4	4,50
Brandenburg	3	4	3	4	4	3	2	5	3,50

²⁷ Although most companies interviewed claimed that their investment was not part of an Offset deal.

Singapore and Dubai both head the table in front of Brandenburg. If the large corporations move into the area then the suppliers are often forced to move into their close proximity. Dubai openly supports this principal as does Singapore, however the latter has an added advantage. The aerospace industry seems to willingly accept high logistics costs; this can be seen in Brandenburg where MTU Maintenance services the engines for the American low cost airline Air Wisconsin. The engines are removed from the wing in the US and shipped to Brandenburg, dismantled, repaired and serviced and assembled and re-shipped in less than 50 days. Because Singapore has such well developed trade mechanisms it seems to just have the edge. If Dubai does manage to establish itself as a major freight hub, it will undoubtedly further strengthen these figures.

Table 20.

Access to Local Supply Chains									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	5	4		5	4			4,20
Singapore	4	5	4	4	5	5	5	4	4,50
Brandenburg	4	4	3	4	4	3	2	5	3,63

This question is very similar to the question above and was placed further down the questionnaire as a test to see if both questions were coherent. As can be seen from the results the placing of the regions remained the same, but Dubai and Brandenburg seemed to improve their results somewhat.

Table 21. A Comparison of the Average Values for the Market Structure

	Dubai	Singapore	Brandenburg
Access to customers	4,71	4,63	3,13
Access to suppliers	4,00	4,50	3,50
Access to local supply chains	4,20	4,50	3,63

Figure 3.

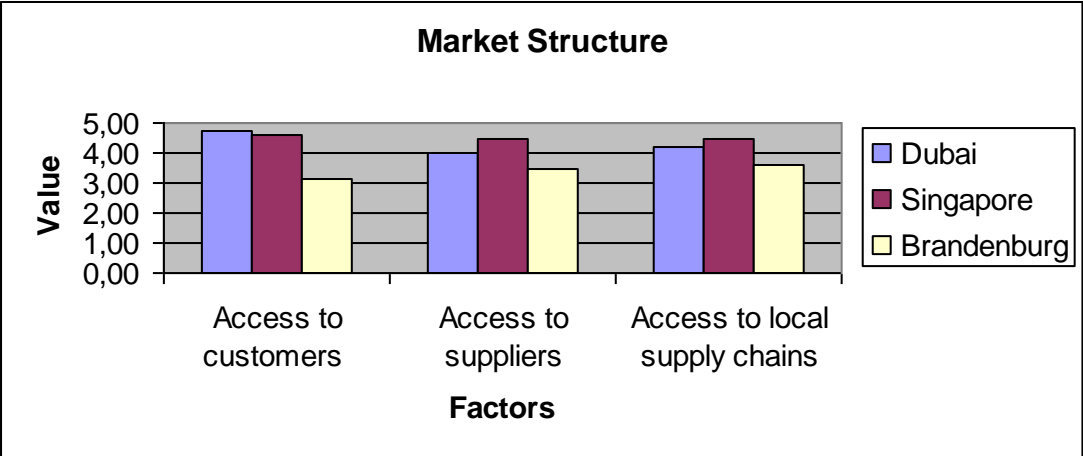


Table 22. Total Average for Market Structure

Dubai	Singapore	Brandenburg
4,30	4,54	3,42

Dubai and Singapore both lead the way for the market structure by nearly one whole point.

4.2.5 The Costs

This factor was chosen to try and weight the importance of costs in the aerospace industry for investments by region. The aerospace industry is perhaps second to none when it comes to certification, regulation and safety, and therefore the ability to produce or maintain cheaply is relatively limited. However, many of the leading OEMs have moved parts of their component production to “cheaper” countries with very mixed results.

Table 23.

Cost of Utilities									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	2	1	3	3	3	3	3		2,57
Singapore	2	4	2	4	4	3	4	4	3,38
Brandenburg	4	2	4	2	2	3	2	3	2,75

None of the regions rated particularly highly, leading to the impression that all companies believed that the regions had relatively expensive utilities. The poor ranking for Dubai could be partially explained by the fact that Dubai itself has an inadequate infrastructure which is burdened further by its rapid growth and large scale real estate projects leading to higher prices and unreliability of the utilities.

Table 24.

Cost of Labour									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	1	1	4	5	2	4		2,86
Singapore	2	4	3	4	3	4	3	4	3,38
Brandenburg	3	3	3	3	2	2	3	3	2,75

None of the regions are low wage labour markets. For Singapore and especially Dubai, this is due to the need to bring in specialists and management from abroad who have to be paid accordingly. Brandenburg still has lower labour rates than the old federal states in the west (by approximately 21% gross employer cost), but obviously not as low as the other two regions in question.

Table 25.

Cost of Real Estate									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	1	2	1	3	2	2	4		2,14
Singapore	2	3	5	3	2	3	4	3	3,13
Brandenburg	3	3	4	2	1	4	4	5	3,25

The costs for actually buying land seem to be cheapest in Brandenburg and in Dubai, especially the free zones, it appears to be most expensive.

Table 26. A Comparison of Average Values

	Dubai	Singapore	Brandenburg
Cost of utilities	2,57	3,38	2,75
Cost of labour	2,86	3,38	2,75
Cost of real estate	2,14	3,13	3,25

Figure 4.

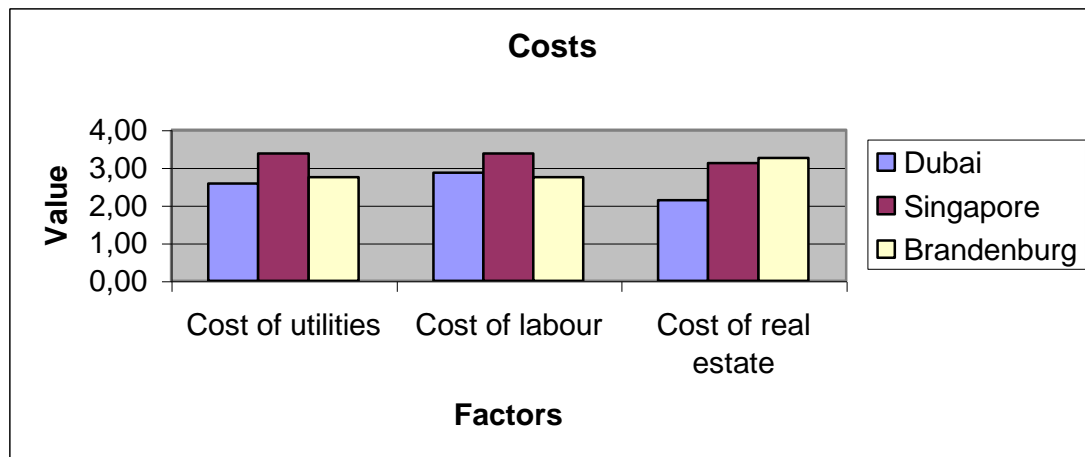


Table 27. Total Average for Costs

Dubai	Singapore	Brandenburg
2,52	3,29	2,92

When asked about the costs of various factors, many interviewees will undoubtedly have a subjective view point. It is always felt that costs are too high so this accounts for the relatively low scores of all the participants. Nevertheless, Brandenburg does seem to be competitive in this section.

4.2.6 Agglomeration Effects

This section concentrates on whether the presence of other aerospace companies or indeed a mature cluster, influences the decision to settle in the region.

Table 28.

Presence of an Aerospace Cluster									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	1	1	4	5	4	4		3,14
Singapore	5	4	4	4	5	5	5	5	4,63
Brandenburg	5	5	3	5	3	3	3	5	4,00

The presence of a structured aerospace cluster is very important for companies settling in Singapore and in Brandenburg. The Dubai Department of Economic Development did not appear to cater specifically for this industry, as opposed to both Singapore and Brandenburg. This is perhaps a reflection of the poorer values gained in this section.

Table 29.

Strength of the Aerospace Cluster									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	2	1		5	4			3,20
Singapore	5	4	4	4	5	5	5	5	4,63
Brandenburg	5	3	2	4	3	3	3	5	3,50

This question was a test of the coherency of the above question. It does, nonetheless show that Brandenburg's firms are aware that a cluster exists, though they, rate it as being relatively weak.

Table 30. Comparison of Average Values for Agglomeration Effects

	Dubai	Singapore	Brandenburg
Presence of an Aerospace Cluster	3,14	4,63	4,00
Strength of the Aerospace Cluster	3,20	4,63	3,50

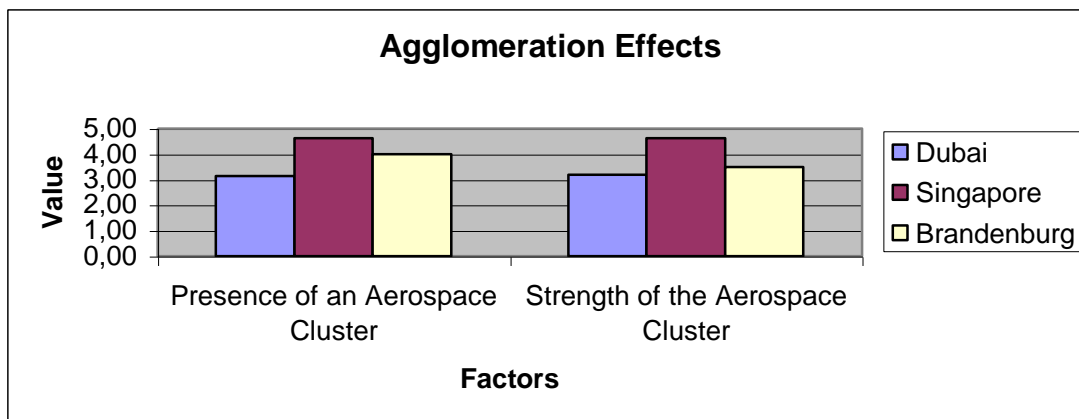


Table 30. Total Average for Agglomeration Effects

Dubai	Singapore	Brandenburg
3,17	4,63	3,75

Companies settling in Dubai on the whole are unaware of the presence of an aerospace cluster or it is not of particular importance to their enterprise. For Brandenburg most companies do know of the existence, however rate it as being relatively weak. In Singapore the cluster is definitely a factor influencing their decision.

4.2.7 Human Capital, Infrastructure and Natural Resources

This section is largely concentrated around the input factors available to the companies in the various locations. They include the availability management, of skilled labour, educational and training facilities, infrastructure and access to raw materials. These are factors that can be enhanced by government policies to improve the attractiveness of the location.

Table 32.

Ability to Hire Professionals									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	2	1	4	5	4	4		3,57
Singapore	4	5	4	4	3	5	5	5	4,38
Brandenburg	5	4	2	3	4	3	2	3	3,25

According to the companies interviewed Singapore is an attractive location for management personnel and there are an increasing number of local inhabitants that are suitable to be employed at this level, it is therefore ranked number one. For Dubai the availability of local management is limited. Nevertheless it is undoubtedly able to attract highly qualified personnel because of the high standard of living. Brandenburg does comparatively poorly in this section. Qualified staff in the region does tend to move to other areas of Germany and abroad due to the lack of jobs available. Furthermore the region cannot be compared in attractiveness to the other two.

Table 33.

Ability to Hire Skilled Labour									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	3	2	1	4	4	3	4		3,00
Singapore	3	4	5	4	4	3	5	5	4,13
Brandenburg	5	4	4	3	3	3	4	2	3,50

Singapore also has a depth of blue collar workers which cater for the aerospace companies. Dubai tends to import staff, which is expensive, and therefore not really applicable for these types of workers, leading to a deficit in this section. Although Brandenburg has a high unemployment rate, skilled workers are still not in abundance.

Table 34.

Availability of Universities / Technical Training									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	2	1	1	2	2	3	4		2,14
Singapore	5	4	4	4	4	5	5	4	4,38
Brandenburg	4	4	3	4	5	4	3	5	4,00

Both Singapore and Brandenburg have attempted to cater for the companies in the region by offering suitable the higher education syllabuses. Singapore is more advanced in this sector, however Brandenburg is close behind. The Dubai Aerospace University was founded in 2006 to readdress the deficit in university participation, it

appears to have been disbanded in August 2008. There are no reasons given, but it does go some way to explain Dubai’s poor rating in this section.

Table 35.

Labour Reliability (Union Activity)									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	5	5	1	5	4	4		4,14
Singapore	5	5	4	3	5	4	4	5	4,38
Brandenburg	4	4	5	4	4	4	4	3	4,00

Germany does have strong union and worker participation regulations. It is therefore all the more surprising that it rates so well against the other two regions. One explanation for this may be that the union participation in the new federal states is nowhere nearly as high as in the western part of Germany and on the other hand the shop stewards committee is normally included in all major decisions made by the management, leading to a less militant workforce than perhaps in other European countries like the UK or France.

Table 36.

Quality of Infrastructure									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	5	4	5	4	3	4		4,29
Singapore	5	5	4	5	5	5	5	4	4,75
Brandenburg	4	5	5	3	4	5	4	4	4,25

The infrastructure in all three locations appears to be of a very high standard. Both Dubai and Singapore have invested heavily in their infrastructure. Brandenburg has benefited from the “Solidarpakt” (Solidarity Agreement) which was passed after reunification. As part of this agreement the federal government has invested heavily in the infrastructure of the former GDR states to bring them on a par with the west. It therefore follows that Brandenburg has an excellent road, rail and communications infrastructure, often indeed surpassing the former western states.

Table 37.

Reliability and Quality of Utilities									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	5	4	4	3	2	3		3,57
Singapore	5	5	5	4	5	5	4	5	4,75
Brandenburg	4	5	4	4	5	5	4	5	4,50

The geographical nature of the Emirate of Dubai seems to be the main reason for the lack of both reliability and quality of the utilities required by companies. Much of the infrastructure created has been somewhat artificial and extremely fast-moving. Many of the interviewees questioned stated that the rapid growth of the emirate has meant that some sectors of infrastructure have not been able to keep pace, the utilities appearing to fall into this category. Brandenburg and Singapore seem both to have a very high standard.

Table 38.

Availability of Land with Services									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	5	5	5	4	1	1	4		3,57
Singapore	5	4	5	3	4	5	4	4	4,25
Brandenburg	3	4	3	4	3	4	5	5	3,88

Brandenburg is a relatively large state with a low ratio of inhabitants per km² (86)²⁸. It is therefore all the more surprising that it rates so poorly against the other two regions. Singapore is a highly-populated city state and Dubai must invest heavily to regain land from the desert. One explanation for this scenario may be the tight regulations imposed by German law defining commercial and industrial land usage. This, in addition to the high demand for land around the periphery of Berlin, may be an explanation why Brandenburg does not rate more highly.

²⁸ <http://www.statistik-berlin-brandenburg.de/>

Table 39.

Access to Raw Materials									
	Co. 1	Co. 2	Co. 3	Co. 4	Co. 5	Co. 6	Co. 7	Co. 8	Average
Dubai	4	5	4	1		3	4		3,50
Singapore	4	5	1		4	4	4	5	3,86
Brandenburg	3	5	2		4	3	4		3,50

Raw materials did not really play a significant role for the aerospace companies interviewed. The industry is very logistics intensive with many customers and suppliers being situated at great distance. Both Singapore and Dubai have a strong focus in logistics, with the airports and the sea ports being a major growth factor in the regions. Brandenburg is also defined as a logistics hub, specifically the east-west road and rail traffic, the majority of which runs through the state. This logistics infrastructure secures the access to all raw materials required.

Table 40. Comparison of Average Values for Human Capital, Infrastructure and Natural Resources

	Dubai	Singapore	Brandenburg
Reliability and quality of utilities	3,57	4,75	4,50
Ability to hire professionals	3,57	4,38	3,25
Ability to hire skilled labour	3,00	4,13	3,50
Quality of infrastructure	4,29	4,75	4,25
Access to raw materials	3,50	3,86	3,50
Availability universities / technical training	2,14	4,38	4,00
Availability of land with services	3,57	4,25	3,88
Labour reliability (Union activity)	4,14	4,38	4,00

Figure 6.

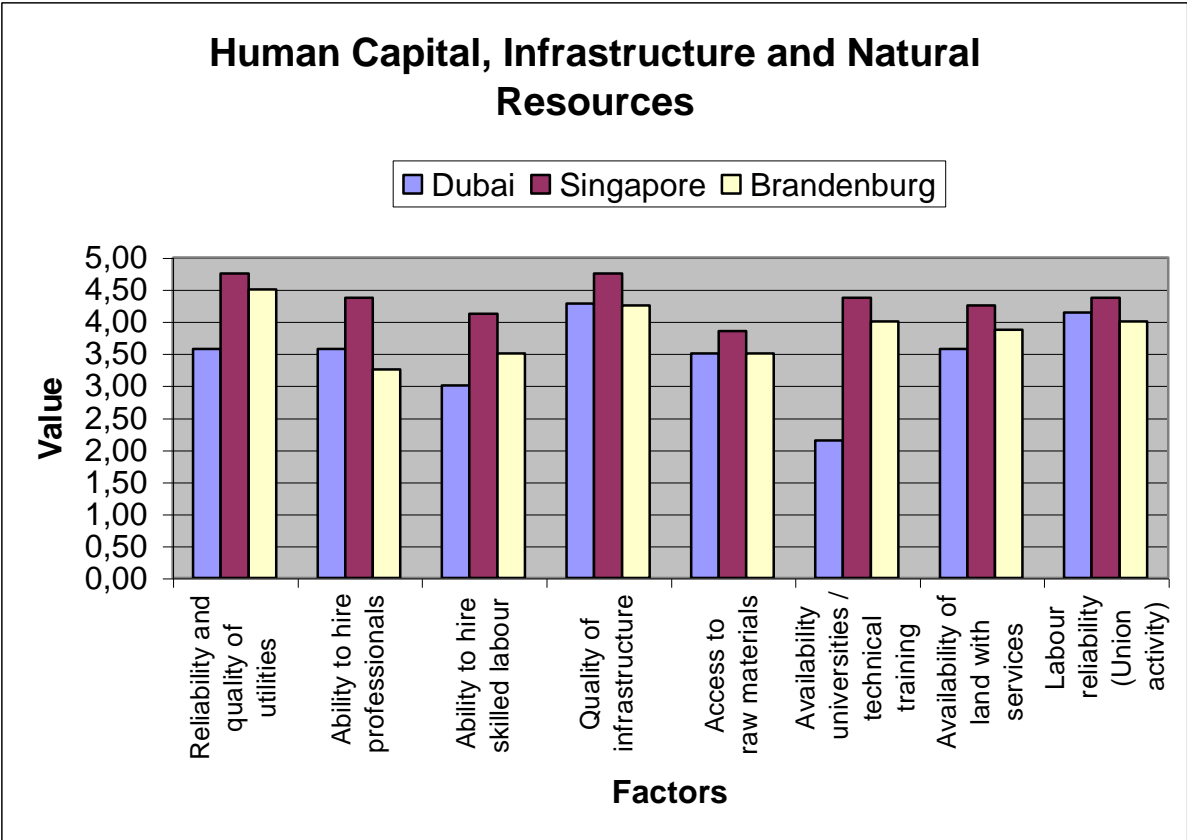


Table 41. Total Average for Human Capital, Infrastructure and Natural Resources

Dubai	Singapore	Brandenburg
3,47	4,36	3,86

Once again Singapore heads the field in this sector. Brandenburg does well in the field of higher education and must seek to expand on this area further; this also applies to the availability of skilled labour. Although Brandenburg does not do as well in the statistics on the ability to hire professionals this appears to have improved markedly since the early 1990s. The so called soft factors which the Berlin Brandenburg region offers i.e. expansive leisure and cultural opportunities coupled with a good standard of living at a very inexpensive rate (Berlin is one of the world’s cheapest capital cities), has made recruiting foreign staff to the region somewhat easier. Nonetheless, the emphasis must be laid on “home grown” management in the future.

4.2.8 Government Incentives

Government incentives are implemented to offset an inadequate investment climate. Brandenburg is a Task 1 area as defined by the European Union which allows the highest quotas in support. The UNCTAD has two definitions of what incentives are:

- i) “Any host country measure designed to influence investment decisions and which has as its objective the attraction of investments”
- ii) “Any measurable economic advantage afforded to specific enterprises or categories of enterprises by, or at the discretion of, a government in order to encourage them to behave in a certain manner”

The subsidies can be split into six main sections which are financial (i.e. grants etc), fiscal (i.e. tax holidays etc), regulatory, subsidised services, market privileges and foreign exchange privileges. During the interviews the companies were asked if they had taken advantage of either financial or fiscal incentives or market privileges with the aim of determining whether or not these correlated with the results of the other questions listed above.

Table 42.

Government Incentives Averages	Dubai	Singapore	Brandenburg
Investment Grants	0,0%	25,0%	100,0%
Tax Holidays	0,0%	75,0%	0,0%
R&D Support	0,0%	87,5%	62,5%
Training Grants	0,0%	87,5%	87,5%
Soft Loans	0,0%	75,0%	25,0%
Free or Reduced Rate Buildings or Land	14,3%	37,5%	12,5%
Purchase Contracts	0,0%	12,5%	0,0%
Government Contracts	0,0%	37,5%	12,5%
Recruiting Support	0,0%	37,5%	62,5%
Start-Up Support	0,0%	37,5%	37,5%
Securing Intellectual Property (Patents)	0,0%	37,5%	12,5%
Other	0,0%	0,0%	0,0%

What becomes apparent is that Singapore offers a wide range of incentives across the board. As with Brandenburg not all companies took advantage of all the incentives, but every company questioned had received an incentive in some form. Brandenburg is tied to the federal government and European Union regulations governing incentives, which are very strict. Hence the portfolio of support is not as wide ranging as that of Singapore. It is for example not possible to grant tax holidays to a company and the one company that stated it had participated in government contracts did this on a federal and not a state level. Dubai has no form of support, the argument here is that neither companies nor employees pay taxes and a high level of infrastructure is provided, these factors are an incentive in their own right.

Chapter 5. Strengths, Weaknesses, Opportunities and Threats

5.1 SWOT

Any strategic planning or development will ideally be based on a SWOT analysis. This gives transparency to the actual “as-is situation” and derives from this not only the opportunities which are achievable but also the threats which may hinder this success. This is an essential tool when developing a strategy to improve the aerospace cluster in Brandenburg. Benchmarking Brandenburg against two other aerospace regions offers a direct comparison and enables an appraisal of the actual situation.

5.1.1 The strengths and weaknesses of the Aerospace Cluster in Brandenburg

Brandenburg as one of the sixteen federal states of Germany is ranked in seventh place on the global competitiveness index, making it one of the most attractive locations for FDI worldwide. When specifically looking at the surveys carried out, Brandenburg only managed to score more highly than Singapore on one single factor, however, it did in general manage to bypass Dubai on most factors.

With regard to the business and investment environment Brandenburg was seen by most companies as having a good stable social and political environment, very little corruption, relatively low crime rate, with a good standard of living and an operable legislation. It also scored well on the investor and property rights factors as well as intellectual property protection. Most companies, nevertheless, saw Brandenburg lacking on the factors of ease of doing business and openness of the economy, for which the state, federal and European bureaucracy must be held responsible. This is not a direct contradiction to the operable legislation, which indicates that the legislation is successfully implemented and applicable for all, moreover, it emphasises the administrative burden which is carried by the companies. The repatriation of profits was possible in all regions. National taxes are comparatively high in Germany and especially the aerospace industry suffers from exchange rate fluctuations, as most business is done in US\$. Interest rate stability in Brandenburg did not compare as well as in Singapore. One reason for this may be that the Singapore government shows more leniency in allowing the rate to be

defined by the market rather than artificially manipulating the prime rate which is usual within the EU. There also appears to be a lack of local financing available which is a factor that must in future be amended.

Brandenburg does poorly in the market structure factors. The companies questioned did not believe that they had a particularly good access to either customers or suppliers in Brandenburg. This may reflect the true composition of the local aerospace cluster which means, leading on from Porter's theories, that there is a lack of vertical integration between companies.

The factor cost was mixed, Brandenburg was also deemed as being expensive for utilities and labour, although on the former less so than in Dubai. Nevertheless, it actually managed to beat Singapore on the cost of real estate.

The Aerospace cluster in Brandenburg is prominent, however it was deemed as being weak by most companies.

Higher education and technical training was well-rated by the interviewees as was the reliability of utilities and the quality of infrastructure. Labour reliability was also regarded highly, which is perhaps at first glance a little surprising considering Germany's well organised unions and regulations on employee participation. Nonetheless, when compared to the western part of Germany, employees in Brandenburg do have fewer holidays, work longer hours, earn less and don't take sick leave as often. In addition, union participation is markedly weaker than in the west. These factors are undoubtedly important in attracting FDI. On the down side Brandenburg did poorly on three very important factors. It seems companies could not easily hire management and technical staff and that, although land was cheaper, it was not readily available. Access to raw materials was seen as being relatively neutral across the board.

Generally speaking the aerospace cluster in Brandenburg does have a good collection of key players in the sectors of engine manufacture and maintenance, in aircraft MRO, testing, training and supporting research institutions. Furthermore, it has a state of the art infrastructure including incubators specialising in aerospace and the best financial incentives within the European Union. Similar to Singapore the local government has made aerospace a focus industry, especially designating part of the local IPA to attend to the cluster's needs. The negative aspect is undoubtedly the lack of interaction between aerospace companies and the lack of medium sized companies, with the majority being either large or small.

5.1.2 Opportunities and Threats

The main threat to the aerospace cluster in Brandenburg is its size. The aerospace industry in the UK is the second largest in the world (Danford 2007), in 2005 it had a turnover of 29 billion (GBP) with a total of 276,000 employees of which 124,000 were directly employed by aircraft, engine and equipment manufacturers with the rest employed by suppliers and service providers. Brandenburg in comparison had a turnover of 1.18 billion Euros (1.02 GBP)²⁹ in 2007 and has 5,000 employees directly employed with aerospace companies (not including pilots, flight attendants and other peripheral service industries). The high barriers to entering the aerospace industry have made it hard for companies in other sectors to branch out into this industry and those that have are still very much in a fledgling status. The structure of the cluster with a few large companies at the top, no real medium sized companies in the middle and a large number of small companies at the bottom makes the cluster somewhat fragile. Attracting such SMEs from outside the region is a major hurdle, as they often lack the financial capability to participate in FDI. The large companies have invested heavily in the region and appear to be settled. However these are multinational corporations, that do suffer a substantial loss in situations like the SARS epidemic, the Gulf war, the 9/11 attacks or the current financial crisis, which may lead them to reconsider Brandenburg as a location for their businesses. In such a case the aerospace industry in Brandenburg would disintegrate.

The local governments of Berlin and Brandenburg have put an emphasis on this industry, nonetheless the closing of the inner city airport in Tempelhof and the apparent disinterest in keeping the German air show, the ILA, in the region has sent out diverse signals to the industry. This is something that must undoubtedly be rectified.

There are of course opportunities. Bhadra and Wells (2005) state that, a region benefits from having an airport located in its proximity. It increases productivity, attracts high-tech industries and has a multiplier effect. The construction of Berlin Brandenburg International Airport will undoubtedly further substantiate the aerospace cluster and attract companies specialising in airport services, MRO and training.

²⁹ Currency conversion on 22.04.10 (1 € = 0.866874 GBP) <http://www.xe.com/>

These sectors along with the increasingly important testing and engine maintenance and production sectors will further allow the industry to grow in Brandenburg. The new airport aims to be the third hub in Germany after Frankfurt am Main and Munich airports. Tegel and Schönefeld together are already in third position in Germany regarding the number of passengers handled each year. With the proposed increase in intercontinental flights and the catchment area in Western Poland, the airport will undoubtedly reach its aim.

The long term prospects for FDI remain high despite the current economic crisis (World Investment Prospects Survey- WIPS) with 68% of companies questioned intending to increase investments abroad in the next three years. Among the most important factors for FDI are the size of the local market and the quality of the business environment which includes skilled labour, suppliers, infrastructure and government support. Germany as a whole is in the top ten most favoured countries for FDI. This means Brandenburg has an opportunity to benefit from this growth, especially as it can offer the trade mark “Made in Germany” at far better conditions than its counterparts in the West. This is particularly true for the field of R&D, when questioned 21% of companies (WIPS) believed that they would be outsourcing over half their R&D capabilities abroad by the end of 2010.

Chapter 6. Recommendations and Conclusions for the IPA in Developing Brandenburg's Aerospace Cluster

*“God, grant me the serenity
To accept the things I cannot change;
The courage to change the things that I can;
And the wisdom to know the difference”*

Reinhold Niebuhr

The aerospace industry is one of the main growth industries in the region and the leading export industry in Brandenburg. It is therefore obvious that the utmost support be granted to this industry to substantiate it and develop it further. These recommendations can be split into six different sections.

i) Image Building

The cluster has set the ambitious goal of becoming Germany's third aerospace region behind the northern German cluster set around Airbus and behind the Bavarian cluster. This has been politically communicated for a number of years and is starting to be accepted in the industry. The region is already the leading area for engine maintenance and manufacture. In addition the cluster must become known for its training and research and development facilities. It is paramount that the image portrayed is in accordance with the actual facilities available and not exaggerated in any way. Building the image can take the form of conference and trade fair participation, in particular at the air shows in Le Bourget (Paris), Farnborough, Singapore, Dubai and perhaps the Asian air show in China, as well as at the aero testing and aircraft interiors trade show in Hamburg. The BBAA already organises an annual Aerospace Day, at which important international speakers should be invited.

One aspect that should be highlighted as part of the image building process are the so called “Soft Factors”. These focus on the high standard of living that Brandenburg and the capital city Berlin have to offer. These may be the very reasonable house prices, the large number of high quality international schools and

universities, as well as excellent recreational facilities. This makes Brandenburg an attractive location for highly skilled employees and helps realign the balance when compared with both Singapore and Dubai.

ii) Generating Investments

The ZukunftsAgentur Brandenburg GmbH (ZAB) needs to be embedded within the industry and build-up long term relationships with the companies inside the cluster. This opens up channels of information, i.e. which suppliers or services they would like to see in the region. In addition, the ZAB must become known within the industry and promote the region as well as promoting the companies within the cluster at every conceivable opportunity. Trade fairs are ideal for so called “cold acquisition”, possibly with the help of the local economics minister or prime minister, to show the importance levied at the industry. Indeed the ZAB may offer a platform for the cluster to present itself on such occasions. Follow-up procedures should also be in place to ensure that the contacts gained remain part of the network and which could lead to a first mover advantage, should the company look for a new location at a later date. The focus here must be on the quality of the contact and not the quantity. The companies should be critically vetted and targeted, this process is ongoing. The targets for Brandenburg’s acquisition abroad should first and foremost be the engine sector, testing and R&D as well as training and MRO. This is not to say that promising contacts outside these fields should not also be pursued.

It is obvious from the surveys made that Brandenburg has higher personnel costs for lower-skilled labour when compared with some of its peer competitors, however this may be the stimulus to attract the high tech sectors of the aerospace industry such as R&D or testing.

The information gained from these activities should also be analysed critically to help improve the economic climate for this specific industry. The ZAB must be in a position to offer tailored solutions for a company interested in Brandenburg and to provide specific and detailed information on the location itself. The ZAB must conduct itself in a professional manner and be credible as most of the decision makers it is dealing with are on a top management level.

iii) Facilitating the Investment Process

The ZAB must have a clear view of what the companies within the cluster specialise in and be in a position to offer expert advice. It must act as a mediator between potential suppliers and potential customers. It should also provide technical and expert advice to companies settling in the region. It should specifically act as a guide through the whole bureaucratic process from planning permission to applying for grants to acquiring additional financing. In short, it must be a one-stop agency for all requirements of the firms with a “one face to the customer” principle. This can only be implemented through the creation of a close network of partners such as job agencies, banks, venture capitalists, industry associations etc.

As Singapore appears to have a bureaucratic structure that makes doing business easier, it is important that the ZAB increase their portfolio with specialised staff to accompany the investors through the administrative process.

iv) Aftercare Services

The ZAB should stay in close contact with the FDI company after the initial investment has been implemented. It must be in a position to anticipate its needs and identify the success factors and be able to appraise the investment climate in Brandenburg. This will aid it to improve conditions and set aside potential hindrances as well as facilitating future investments by the firm. It may also gain information on the other potential investors through the company’s network. Aftercare services must include trouble-shooting and thereby giving the company a chance to air grievances. This may help in its retention should it contemplate settling in a new location. Furthermore, the ZAB must act as a mediator to assist companies in gaining access to suppliers, supply chains and potential clients from within the cluster and the appropriate networks.

v) Policy advocacy

The ZAB must have a formal mandate for policy advocacy. It must be in a position to convey the information gained from the companies and investors to the policy makers in the local government and take the initiative to make suggestions for measures aiming to further develop the investment environment of the region. This means a formal channel of communication between the ZAB and the Ministry for Economics and European Affairs and the Investment Bank of the State of Brandenburg. Any regulations passed should ideally first be vetted by the ZAB as only they bridge the gap between firms and administration. Any laws passed without such an exchange may be detrimental to the business and investment climate of Brandenburg. The ZAB may have to increase its personnel portfolio with specialised staff such as chartered accountants or import / export experts.

vi) Performance Management

The ZAB should constantly monitor and evaluate the services it offers, indeed of all the institutes such as the Investment Bank, the Ministries, etc through feedback from the companies. It is only through such measures that the ZAB can realistically evaluate the relationships between the businesses and the administration.

Appendix

- (i) Questionnaire
- (ii) Author's Declaration
- (iii) Confidentiality Declaration

Msc. IPED Dissertation Questionnaire

Name of the Company _____

Country of origin _____

Number of employees _____

Turnover / Profit (€/\$) _____

Headquarters

Type of aerospace Company:

- i) OEM
- ii) Supplier
 - a) 1st Tier
 - b) 2nd Tier
 - c) 3rd Tier
- iii) Service
- iv) MRO
- v) R&D
- vi) Airline
- vii) Leasing / Financing

Type of Investment

- a) Greenfield
- b) Joint Venture
- c) M & A

Size of investment

- a) Monetary _____
- b) No. employees _____

What kind of investment was made?

On a scale of 1 (Not at all) to 5 (Very much) how did the following factors influence the decision to invest in the United Arab Emirates / Singapore / Brandenburg ?

	Not at all				Very Much
	1	2	3	4	5
1) Access to customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Stable social and political environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Ease of doing business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) Reliability and quality of utilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) Cost of utilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) National taxes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Ability to hire professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8) Ability to hire skilled labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9) Level of corruption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10) Cost of labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11) Crime levels / Safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12) Quality of infrastructure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13) Access to raw materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14) Availability universities / technical training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15) Cost of real estate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16) Availability of land with services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17) Access to suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18) Labour reliability (Union activity)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19) Presence of an aerospace cluster	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20) Standard of living	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21) Openness of the economy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22) Investor rights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23) Exchange rate stability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24) Interest rate stability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25) Repatriation of profits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26) Property rights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27) Intellectual property protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28) Operable legislation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29) Availability of local financing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30) Access to local supply chains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31) Strength of the local aerospace cluster	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Has the investment been a success and if so why?

Did the company have to adhere to any performance requirements?

Would you invest again? What would you do differently?

Did you receive any incentives from the government?

If so die these take the form of:

	Yes	No
a) Investment grants	<input type="checkbox"/>	<input type="checkbox"/>
b) Tax holidays	<input type="checkbox"/>	<input type="checkbox"/>
c) R&D Support	<input type="checkbox"/>	<input type="checkbox"/>
d) Training grants	<input type="checkbox"/>	<input type="checkbox"/>
e) Soft loans	<input type="checkbox"/>	<input type="checkbox"/>
f) Free or reduced rate buildings or land	<input type="checkbox"/>	<input type="checkbox"/>
g) Purchase contracts	<input type="checkbox"/>	<input type="checkbox"/>
h) Government Contracts	<input type="checkbox"/>	<input type="checkbox"/>
i) Recruiting support	<input type="checkbox"/>	<input type="checkbox"/>
j) Start-up support	<input type="checkbox"/>	<input type="checkbox"/>
k) Securing Intellectual Property (Patents)	<input type="checkbox"/>	<input type="checkbox"/>
l) Other	<input type="checkbox"/>	<input type="checkbox"/>

and if so what?

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