

# A technology deployment strategy using value networking

by

Jacobus Johannes de Wet

15258211

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Stellenbosch University

Department of Industrial Engineering  
Faculty of Engineering

Supervisor: Prof. CM Moll

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## **Declaration**

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Compiled by:            Jacobus Johannes de Wet  
Supervisor:            Prof. CM Moll  
Department:            Industrial Engineering  
Degree:                MSc. Industrial Engineering

## **Summary**

This study intends to develop a decision support tool for new business development units in South African consultancies. These consultancies endeavour to out-license their technology assets.

The enterprise engineering model is examined and the rules and boundaries of the Cartesian space is used to derive further functionality (susceptibility, segmentation and competence) from the various enterprise life cycles as measures for business expansion of knowledge organisations.

The reader is presented with an overview of knowledge organisations, more specifically consultancy enterprises and its unique challenges and business models. These firms develop technology for specific market applications to assist them in solving industry specific problems. These technologies are easily modularised and packaged and can be transferred as technology assets to licensees.

The bulk of the dissertation deals with the process phases in externally leveraging technology assets, with a focus on the intelligence phase of this process. The industrial engineering approach provides a suitable mindset for understanding the complexity of global strategy problems. Proposed global strategies are based on combinations of geographic areas that become more desirable over time. Levels of aggregation are defined, and the global eco-socio-political and economical systems are further investigated.

Approaches to global strategy management are investigated, and the PEST framework is used in its broadest sense to conduct an external environmental analysis. Franchising as a method of out-licensing is proposed as a mode of entry into foreign markets.

The development of a decision support tool is supported by the generic system model and more specifically principles from productivity management. Multiple criteria decision modelling is discussed and efficiency and effectiveness are used as the objective and subjective variables. The Brown-Gibson model is used to calculate a weighted evaluation, and the countries of the world are ranked according to these outcomes.

Finally, a sensitivity analysis is conducted on the weighted evaluations providing the reader with graphs indicating what the long and short term focus of consulting firms should be regarding their out-licensing endeavours on a macro environmental level.

In conclusion, this study expands the enterprise engineering model for knowledge organisations (specifically consultancy enterprises) using analytical decision making methods in determining global strategy with a focus on the external environmental analysis.

## Opsomming

Die doel van die navorsing is om 'n besluitnemingsmodel vir die nuwe besigheidsontwikkelingsafdelings van Suid-Afrikaanse konsultasiefirmas te ontwikkel ter ondersteuning van besluite rakende die uit-lisensiëring van tegnologiebates soos rekenaarprogramme en patente.

Die ondernemingsontwerpmodel is uitgebrei met behulp van die reëls en beperkings van kartesiese vlakke. Die veranderlikes, naamlik toeganklikheid, segmentering en bekwaamheid, word afgelei uit verskeie lewensiklusse van die onderneming, en word gebruik as maatstawwe in die uitbreidings-inisiatiewe van kennisorganisasies.

'n Oorsig word gegee van kennisorganisasies, spesifiek konsultasiefirmas, en die unieke besigheidsmodelle en uitdagings wat hulle in die gesig staar. Hulle ontwikkel tegnologie vir spesifieke praktykstoepassings ter ondersteuning van die oplossing van industriëspesifieke probleme. Hierdie tegnologie kan modulêr verpak word en oorgedra word as tegnologiese bates aan lisensieërders.

Die groter deel van die verhandeling is gerig op die prosesfases van die ontginning van tegnologiese bates, met 'n spesifieke fokus op die intelligensiefase van die proses. Die bedryfsingenieursbenadering dien as basis om kompleksiteit te verstaan in die globale strategiese konteks.

Prioritiseringsmodelle is ontwikkel deur die globale omgewings-, sosio-, politiese- en ekonomiese sisteme verder te ondersoek. Globale uitbreidingsstrategieë is baseer op die kombinasie van geografiese areas wat meer of minder aanloklik is met verloop van tyd, aangesien die toestand van die genoemde sisteme heeltyd kan verander.

Benaderings tot globale strategiese bestuur word ondersoek en die PEST-raamwerk (polities, ekonomies, sosiaal, en tegnologies) is breedweg as riglyn gebruik om 'n eksterne omgewingsanalise uit te voer. *Franchising* as 'n metode van uitlisensiëring word voorgestel as 'n manier om nuwe markte te betree.

Die ontwikkeling van 'n besluitnemingsgereedskapstuk word ondersteun deur die generiese sisteemmodel en veral aspekte van produktiwiteitsbestuur. Besluitnemingsanalise van verskeie kriteria is ondersoek en effektiwiteit en doeltreffendheid word gebruik as die objektiewe en subjektiewe veranderlikes. Die Brown-Gibson model word gebruik om 'n geweegde gemiddelde te bereken, en lande van die wêreld word volgens die uitkomstes hiervan in rangorde geplaas.

Grafieke word getoon van verskeie sensitiwiteitsanalises van die berekende geweegde gemiddeldes. Dit verskaf duidelikheid op 'n makro omgewingsvlak ten opsigte van die lang- en korttermynfokus van konsultasiefirmas met betrekking tot uitlisensiërings inisiatiewe.

Ten slotte, die studie brei die ondernemingsontwerpmodel vir kennisorganisasies uit (spesifiek konsultasiefirmas) met die gebruik van analitiese besluitnemingstegnieke om te bepaal wat die globale strategieë moet wees in die lig van die ekstêrne makro omgewing.

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## **Glossary**

Competence - the possession of a required skill or adequacy.

Consultancy – a firm in the practice of giving expert advice within a particular field.

Efficiency – a measure of how well resources are converted, by doing things right.

Effectiveness –the capacity of producing an effect, by doing the right things.

Enterprise - an organization created for business ventures, usually directed toward profit.

Firm – a partnership or association for carrying on a business.

Franchise – a licensing agreement where authorization is granted to a third party to sell or distribute a company's goods or services in a certain area according to predetermined terms and conditions.

Global strategy - an organisation's strategic guide to globalization.

Globalisation - to make global or worldwide in scope or application.

Knowledge organisation – an organisation selling a service of which the success relies on the transfer of know-how proprietary to that organisation.

Segmentation - The process of dividing markets into useful segments, in order to view single segments on its own.

Strategy - a plan, method, or series of manoeuvres or tactics for obtaining a specific goal or result.

Susceptibility - the state of being susceptible or the capacity to be affected.

## List of abbreviations

ACC – Asset Case Centre

AFTA - ASEAN Free Trade Area

AIV – Asset Identification and verification

AM – Asset Management

AMiP – Asset Management Improvement Plan

BCG – Boston Consulting Group

CIA – Central Intelligence Agency

CIMOSA – Computer-Integrated Manufacturing Open System Architecture

CPI – Corruption Perceptions Index

CRM – Customer Relationship Management

EE – Enterprise Engineering

ERP – Enterprise Resource Planning

EU – European Union

GAAP - General Accepted Accounting Principles

GCC – Gulf Cooperation Council

GDP – Gross Domestic Product

HDI – Human Development Index

HR – Human Resources

ICT – Information and Communication Technology

IDV – Individuality Index

IMF – International Monetary Fund

IP – Intellectual Property

IT – Information Technology

JV – Joint Venture

KM – Knowledge Management

KO – Knowledge Organisation

KWh – Kilo Watt hours

LAIA - Latin American Integration Association  
LTO – Long Term Orientation index  
MAS – Masculinity index  
MCDA – Multiple Criteria Decision Analysis  
MCS – Management Consulting Services  
NAFTA - North American Free Trade Agreement  
OAS - Organisation of American States  
OECD - Organisation for Economic Cooperation and Development  
OEE – Overall Equipment Effectiveness  
PaaS – Platform as a Service  
PAM – Physical Asset Management  
PDI – Power Distance Index  
PEST – Political, Economical, Social and Technological factors  
PwC - PriceWaterhouseCoopers  
SA – Sensitivity Analysis  
SaaS – Software as a Service  
SADC – Southern African Development Community  
TI - Transparency International  
TOVE – Toronto Virtual Enterprise  
TRIPs - WTO Agreement on Trade-Related Aspects of Intellectual Property Rights  
UAI – Uncertainty Avoidance Index  
UK – United Kingdom  
WE – Weighted Evaluation  
WTO – World Trade Organisation

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Van der Spuy, for asking the stupid questions and giving great answers.

Sheraan, for the final inspiration.

My parents, for believing in me.

Thank you all for walking this road with me and for being part of my growth.

*"The best way to predict the future is to create it" – Peter Drucker*

# 1. Introduction

*“If you can’t describe what you are doing as a process, you don’t know what you’re doing.” –W Edwards Deming*

This part of the dissertation introduces the reader to the unique challenges in establishing an extended footprint in a service and consulting business.

They are discussed under the following headings:

- Background;
- Research problem;
- Objectives;
- Scope;
- Overview; and
- Research methodology.

## 1.1. Background

### 1.1.1. Introduction

Consulting firms engage in various technology transactions in order to absorb internal and external knowledge. These technology assets are utilised for specific market applications to assist within the consultancies areas of expertise. The leverage of technology assets increases the consultancies success in commercialising knowledge (Visscher, 2001, 2006; Goliath, 2000; Biech, 1999).

The tacit knowledge of the consultants contributes to the company's technology asset base once it is standardised or formulated into a model which can legally be protected (Goliath, 2000). It is important to the stakeholders of the consulting firm for this evolution to take place in order to increase technological knowledge, e.g. new product development, inside the firm.

It is also a more successful approach to depend on technology than on a specific individual's tacit knowledge as the repetitive deployment of technology (the value added service) depends on standardisation (Davenport, 2000). It is shown in *figure 1.1* (Markham,2004) how existing solutions should be branded as products, and that the nature of the consultancy offering should be that of a service in stead of the capabilities of the firm.

Nature of consultancy offering	About services	About capabilities
Product orientation	Solution related	Problem related
Type of branding	Of the product	Of the practice

Figure 1-1. The branding of consultancy offerings.

A consulting firm can start operating as a service company whenever intellectual property (assets) is sold more than once in the form of a standardised technology (Markham,2004). A service firm would have a more marketable and credible value offering than that of a consulting firm as the technology assets can be shown because it is not locked up in the heads of its employees. This study focuses on the external technology exploitation of services firms, who started out as consulting firms, in specific markets.

Outward technology transfer through various contractual forms, particularly out-licensing agreements in knowledge organisations, has recently become a major trend.

By licensing out technology, firms attempt to realize the strategic and monetary benefits of external technology exploitation as seen in pioneering firms such as IBM and Dow Chemicals. Despite the enormous benefits of pioneering firms, most other firms face considerable difficulties in managing external technology exploitation which underlines a strong research deficit (Lichtenthaler, 2008).

Prior research into technology exploitation has focused on the application of technological knowledge internal to the firm, i.e., new product development and R&D. By contrast, research into technology transactions has mainly studied the acquisition of external technology. External technology commercialization represents the opposite type of technology transaction to the absorption of external knowledge.

Due to substantial differences between internal and external technology exploitation, the insights to be gained from prior research are limited.

### **1.1.2. Pragma Holdings (Pty) Ltd.**

Pragma Holdings (Pty) Ltd. (here on referred to as Pragma) is a physical asset management company that started out as a consultancy during the 1990's focusing on the field of maintenance management. Their focus since then changed to becoming a service firm delivering continuous value to their clients as apposed to the traditional model of doing once-off implementations for a clients before moving on to the next.

Their value offering thus changed to selling solution services as a product, in stead of a problem solving service supported by in house capabilities.

Pragma's aim is to supply their clients with timely and relevant information on their physical assets – machines, production and buildings – to enable them to make decisions on improving their assets' performance. The main objectives for Pragma are to:

- Have a thorough understanding of current asset management practices in various industries;
- provide a structured and systematic process for improving these practices; and to
- provide an effective tool with which to manage this process.

Pragma achieves these objectives with the technology deployment of their ON KEY™ software, an enterprise asset management system consisting of a number of functionally rich modules. These modules can be used as a stand-alone system with its own set of tools and functionality, or as a complete integrated system.

Pragma's product offering (Services), supported by the ON KEY™ software and AMiP™ methodology (Technology) includes the asset identification and verification service with optional modular sections. The Maintenance Management modules control the client's



assets through planning and analysing the maintenance needs of all assets. The performance management modules monitor the performance of the client based on the Overall Equipment Effectiveness (OEE). The system will automatically calculate the OEE and other related equations needed to evaluate the client's physical asset performance, as the system gather large amounts of data and rework it into valuable information.

Pragma engaged in a range of outward technology transfer transactions over the past five years through various contractual forms, particularly outlicensing. The latest strategy for Pragma is to use licensing in the form of franchising as a mode of entry into foreign markets. This study aims to add value to Pragma's current strategy by providing a decision support system that would advise on their efficiency and effectiveness in their endeavours to leverage their technology assets through value networking.

### **1.1.3. Application of the enterprise model in consulting**

The application of the enterprise engineering solution space in knowledge organisations like consultancies are under investigation here and a process for its implementation is developed for the software, consulting and services groups in possession of unique software, methodologies, templates and other technologies. Pragma Holdings (Pty) Ltd represents such a group.

The three axes of the enterprise solution space are shown in *figure 1.2* in a Cartesian space. They are applied as follows:

- Technology can be viewed as the intellectual property (like the software and methodologies) being developed for specific market applications.
- Product is the service which the client pays for which is supported by the technology.
- Business represents the industry sectors and markets in which the technologies are being deployed through the services delivered.

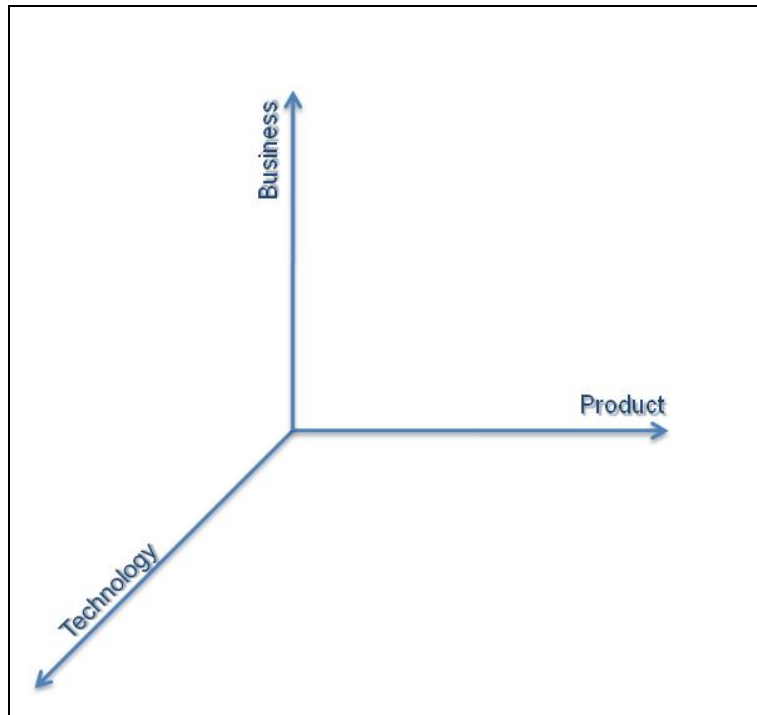


Figure 1-2. The EE solution space.

Technology is the first of the three axes to change due to innovation and the diffusion thereof. This new technology would enable the development of new products and services, or the improvement of existing ones. Business would change last as new markets can now be entered in which new technologies can be deployed with a better product offering as the means.

These developed products compete in various industries where many other players are also present. Therefore, to develop a sustainable enterprise, processes are designed whereby value added service networks are created. By doing so the dimensions of enterprise, product and technology are aligned. This is thus a classic example of implementing the enterprise engineering model.

In developing enterprise engineering strategies, these three elements are explicitly developed:

- The technology deployment strategy from development or acquisition and its application;
- The product development strategy using the technology as a base; and
- The enterprise strategy aimed at maximum leverage from both product and technology.

## **1.2. Research problem**

Local consulting and service firms possess valuable intellectual property which are capitalised upon within the South African market. There are various opportunities for these firms to increase their international footprint. The global presence of a firm creates credibility towards their value offering, a multitude unexploited markets, and the opportunity to collaborate with the best practices and expertise of other nations. Intellectual property rights are neglected and even non-existent in some countries, which poses the risk of dissemination to the owners of the intellectual property. The concern to the local consultancies is: What countries as well as markets within the selected countries to enter, and how to go about doing so?

The modes of entry into the new markets are investigated, in order to maximise the profit from the relationship between the local consultancy and the foreign partner. This would also influence the country selected in which to deploy the technology, as certain modes of entries are impossible in certain markets (such as franchising), while others are illegal (cartel). From a strategic perspective, consultancies want to protect their intellectual property and would not want to lose its core value offering to the offshore competition. It would also be a good strategic decision to form a business relationship with individuals or firms in other countries, as they would have a better understanding of their local markets and the challenges it offers.

**The first research problem attempts to demonstrate how knowledge organisations (KO) can externally leverage intellectual assets through value networks in the form of licensing agreements.**

From an investment perspective, one should ask what country would offer the lowest investment risk to the consultancy, while offering the highest returns in the form of market share. Larger markets would have a lot of competition amongst consultancies, dividing the returns between too many firms. This would be a low risk and low return market, as the market is acquainted with professional services, and willing to pay for quality service and expertise. Smaller markets would offer minimal competition, but can occur within countries with insufficient or unreliable infrastructure for delivering a quality service. Any firm in any industry would only have one chance of succeeding in a new country. If the venture fails, the firm would have a lot more trouble when entering the country for the second time.

There are many analytical requirements for the development of a technology deployment strategy using value networks. This strategy would need to take into account what mode of entry should be selected in order to maximise profit generated from the deployment of technology in a foreign market, as well as the order in which countries should be approached onto whom the technology is deployed.

**The second research problem attempts to prove that the enterprise engineering (EE) model for KO can be expanded using analytical decision making methods in determining global strategy with a focus on the external environmental analysis.**

### **1.3. Objectives**

The objectives of this study are:

- To understand and demonstrate proficiency in enterprise theory, strategy and decision modelling;
- to understand and demonstrate proficiency in the business models of knowledge organisations;
- to develop a strategic framework for technology deployment in knowledge organisations;
- to develop a decision model that would incorporate all the variables required that would assist the analysis phase of the strategic management process;
- to investigate the sensitivity of the relevant variables when using multiple criteria decision analysis methods;
- to contribute to the existing body of knowledge on enterprise theory, technology management and industrial engineering: and
- to place all of the above in a practical context through case study research.

### **1.4. Scope**

Due to the nature of case study research as presented in this dissertation, the scope of the investigation and the consequent findings are focused on:

- Organisations that leverage on knowledge and technology to offer products to selected markets;
- these organisations have already established an enterprise framework and configuration for the deployment of their product offering;
- they understand that the deployment of their product offering can be done in various ways, including licensing, franchising and value added reselling; and
- they understand and pursue global growth opportunities.

Albeit that the research is based on these characteristics, the concepts described in the dissertation can easily be adapted for other similar organisations, and to some extent, generalised.

The dissertation is focused on defining country selection strategy in the consultancy industry, and to view modes of entry into foreign countries with this in mind.

All the countries in the world were considered, and then eliminated from the list when not reaching minimum criteria. The remaining countries were given ratings composed from various indicators, causing the countries to be ranked which would give order or sequence to the way in which countries should be approached by consultancies.

The indicators considered were only included into the model if it was inclusive of all the countries (a global study), freely available (on the internet or in library books where no subscription costs were involved), and updatable (for the model to be used continuously as new data and reports are released).

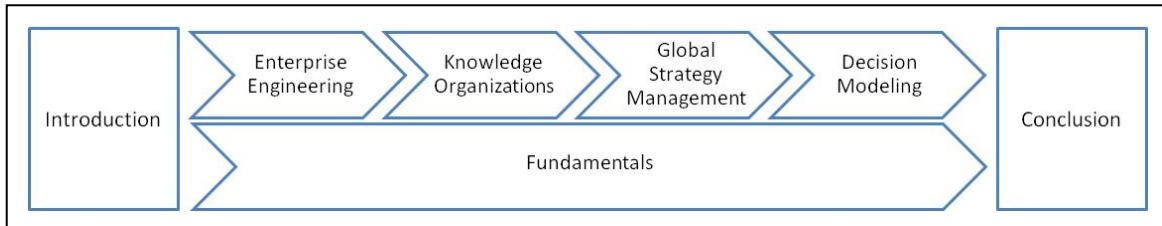
This study evaluates potential countries for expansion, and criteria for including a candidate into the value network are developed.

The following matters were not considered within the scope of the study:

- Making actual contact with potential candidates to include in the value network;  
and
- standardising the service of a consulting firm and its underlying aspects.

## 1.5. Overview

This study is divided into parts according to its content as illustrated below. It is shown in *figure 1.3* that the current focus is on the introduction where the research background, problem and approach are introduced to the reader.



*Figure 1-3. A graphical illustration of the parts of this dissertation.*

### 1.5.1. Fundamentals

In chapter 2, the reader is introduced to research fundamentals as well as the various disciplines which lay the foundation for this dissertation.

### 1.5.2. Enterprise engineering

In chapter 3, the reader is introduced to the Cartesian representation that is used to illustrate the relationship between the axis of technology, product and market. This model represents the enterprise engineering solution space and the planes and space of the Cartesian representation is used to derive new insights into enterprise engineering and industrial engineering.

### 1.5.3. Knowledge organisations

In chapter 4, the reader is introduced to knowledge from an industrial engineering perspective as a resource. Knowledge is of great value and expensive to create or

acquire, but once acquired by a firm, it can be leveraged repeatedly at a very low cost. Consultancies are introduced as knowledge organisations and an in-depth investigation was conducted on consultancies and their business models. Knowledge can also be leveraged if it is in a protected and structured form, and the process phases of externally leveraging technology assets are also investigated.

#### **1.5.4. Global strategy management**

In chapter 5, the reader is introduced to the unique challenges in devising a global strategy as well as the phases in the global strategic management process. These phases are analysis, development and implementation, and the focus was mainly on the external environmental analysis and the variables to be considered in the analysis phase of the process.

#### **1.5.5. Decision analysis**

In chapter 6, variables are derived from the generic system model, and efficiency and effectiveness are selected as objective and subjective variables to be used in a sensitivity analysis.

The planes from the enterprise engineering solution space are defined to either be included in the calculation of the objective or subjective variables. The PEST analysis as part of the external environmental analysis is compared to the planes of the enterprise engineering solution space and data from secondary sources are either part of the product of the objective or subjective variable.

The various indicators from 182 countries contribute to the objective and subjective variables which is used in a multiple criteria decision analysis. The countries are ranked from best to worst according to the values of both the objective and subjective variables. A sensitivity analysis on the objective and subjective variables produces a



graph indicating the sensitivity between the efficiency and effectiveness of the technology deployment endeavour for prospective countries in relation to each other.

### **1.5.6. Conclusion**

In chapter 7, it is concluded that a firm externally leveraging technology assets should first focus on the countries in which the efficiency of the technology deployment process would be high, yet with reasonable outcomes of effectiveness. As organisational learning occurs a company would become more efficient in their technology deployment initiatives, which then allows them to focus on effectiveness causing a shift in the focus of prospective countries to focus on as clients. These results prove that the enterprise engineering solution space for KO can be expanded using analytical decision making methods in determining global strategy.

## **1.6. Research approach**

### **1.6.1. Introduction to the research approach**

Cooper (1984) describes the dimension of research by classifying the styles of thinking on the axis of a Cartesian space. Interpretations, on the one axis, range from idealistic to empiricism, whereas the other axes range from rationalism to existentialism.

This classification is used to derive quadrants on which research can be based namely:

- **Contradiction:** asserting that a statement is true given that there are no aspects that are illogical or inconsistent with each other that opposes or disagrees with that statement.
- **Case study or research:** observing an event or many events and drawing conclusions from actual outcomes of these events.

- **Statistical analysis:** accepting or rejecting a hypothesis in a controlled environment based on statistical analysis, and then drawing a conclusion based on the outcome of the data or information obtained from that controlled environment.
- **Sufficient reasoning:** deriving the truth from existing truths, accepting that nothing happens by chance and that an explanation must be available for everything.

An adapted research classification matrix (Cooper, 1984) is illustrated in *figure 1.4* follows.

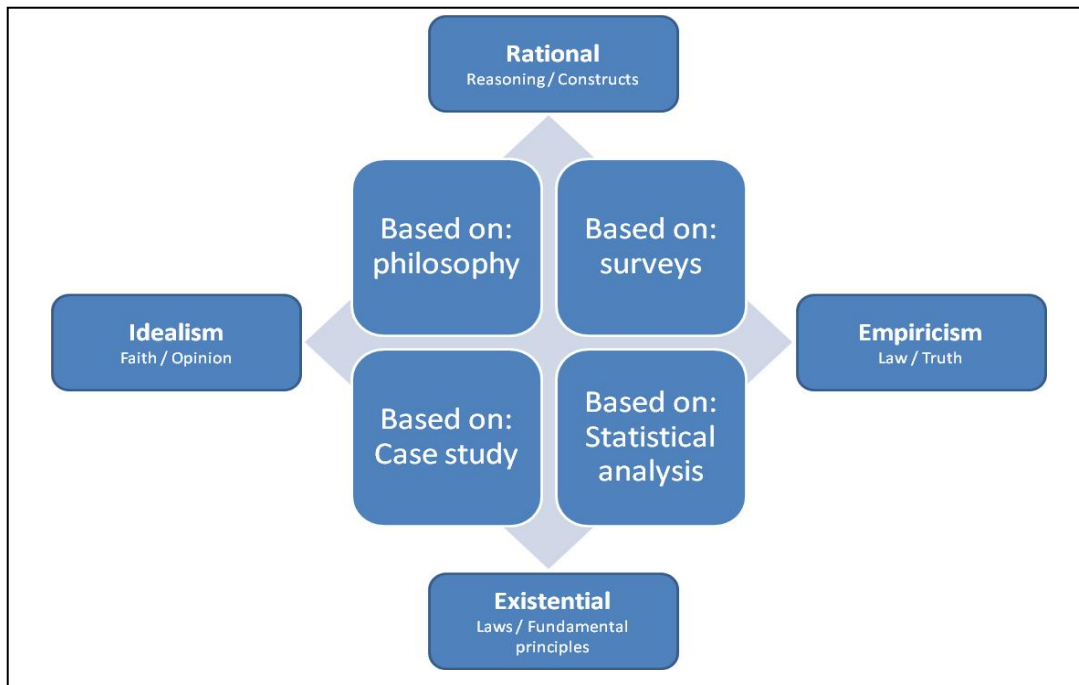


Figure 1-4. Research dimensions.

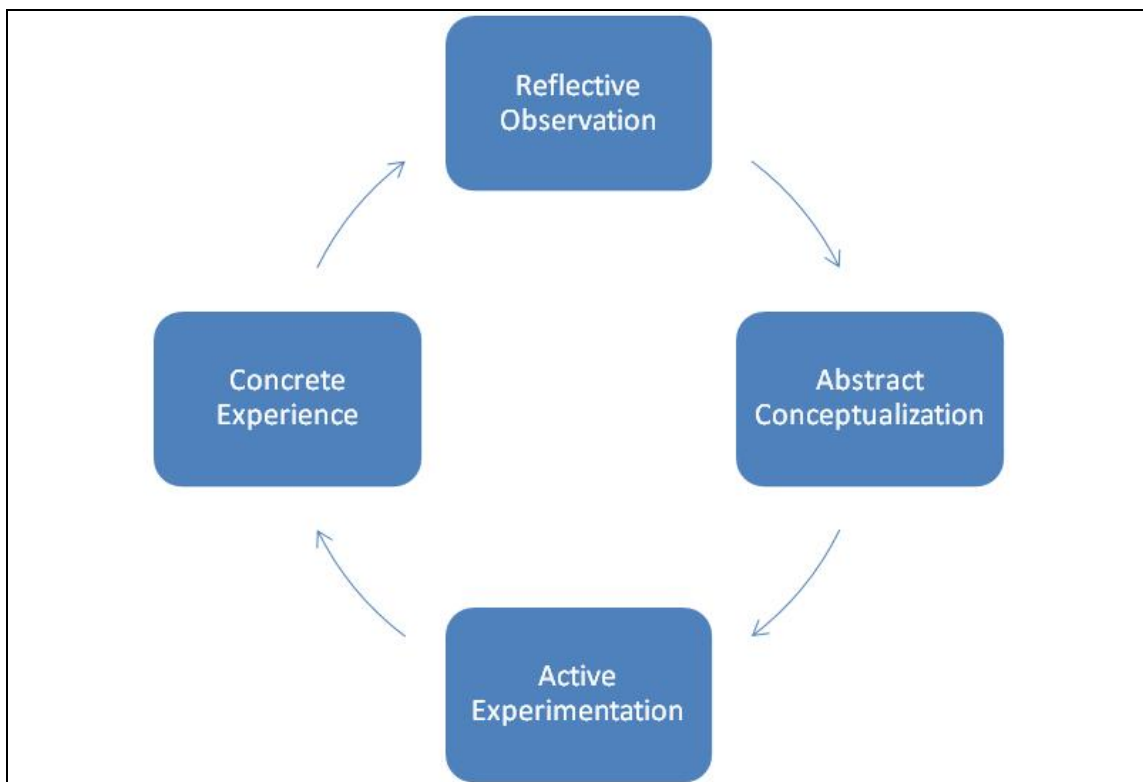
### 1.6.2. Research process

In order to design this research study a process similar to that of Kolb (1984) was used. Kolb's learning cycle is used as a model to the framework of this dissertation. The

learning cycle distinguishes between the following four phases in creating knowledge (Kolb,1984):

- Questions that arise through the reflection on the current reality of a situation (reflective observation);
- a theory or an abstract model that is constructed (abstract conceptualisation);
- testing the theory (active experimentation); and
- examining the outcomes of the experiment (concrete experience).

The learning cycle is illustrated in *figure 1.5* (Kolb, 1984) below.



*Figure 1-5. The learning cycle.*

### 1.6.3. Project plan

A project plan as shown in figure 1.6 was used which followed the phases of Kolb in creating knowledge. The literature study as well as an investigation of the case study firm revealed information with which to define the research problem and gain new insights into the problem. This represents the Reflective Observation phase. A model was constructed using MS Excel™ which incorporates all the variables. This represents the Abstract Conceptualization phase.

Various charts were created after doing a sensitivity analysis on the data, and user inputs were added into the model. This represents active experimentation. The results from the model were interpreted and conclusions were drawn as to what the strategy should be for a company externally leveraging technology assets. This represents a concrete experience.

*Table 1-1. A breakdown of the parts of this dissertation and the learning cycles of Kolb with time allocated to each part.*

<b>Kolb Phase</b>	<b>Dissertation Phase</b>	<b>Time spent</b>
<b>Reflective Observation</b>	Fundamentals	10%
	Enterprise Engineering	20%
<b>Abstract Conceptualization</b>	Knowledge Organizations	20%
<b>Active Experimentation</b>	Global strategic management	30%
<b>Concrete experience</b>	Decision Modeling	20%

It is shown in *table 1.1* that the Kolb phases were followed in gaining a better understanding and insight into the research problem. The chapters of this dissertation correlates to the Kolb phases, and time was divided accordingly to each part to coincide and assure that sufficient time was spent on each of the phases in learning and understanding the problem and the solution.

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## 2. Fundamentals

*“The price one pays for pursuing any profession, or calling, is an intimate knowledge of its ugly side.” – James Baldwin*

This part of the dissertation introduces the reader to the fundamental principles and philosophical approach underlying this study and serves as a foundation for this study.

It is discussed under the headings shown below.

- Research methodology, focusing on:
  - Scientific reasoning;
  - philosophical reasoning; and
  - mythological reasoning.
- Theoretical foundation, focusing on:
  - Strategic management;
  - enterprise engineering;
  - technology management; and
  - marketing management.
- Research classifications; and
- A Technology deployment strategy using value networking.

## 2.1. Fundamentals of knowledge creation

### 2.1.1. Introduction

The approach of foundationalism is used to justify how the knowledge that is being collected becomes relevant. This view in epistemology is that knowledge must be regarded as a structure raised upon secure, certain foundations. Hence, a brief overview of knowledge creation follows.

Dialectics is most fundamentally the process of reasoning to obtain truth and knowledge on any topic, and is illustrated in *figure 2.1*. This process is one of overcoming the contradiction between thesis and antithesis, by means of synthesis; the synthesis in turn becomes contradicted, and the process repeats itself until final perfection is reached (Blackburn,1996).

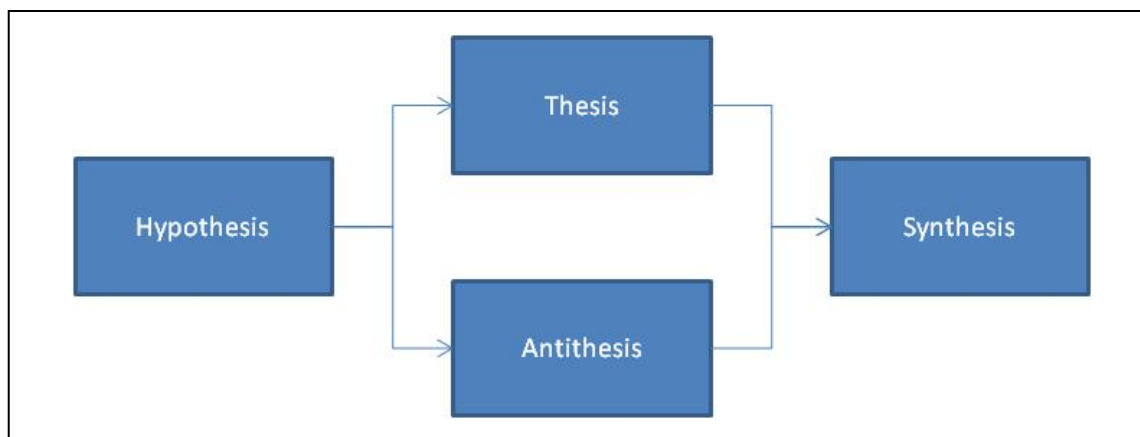
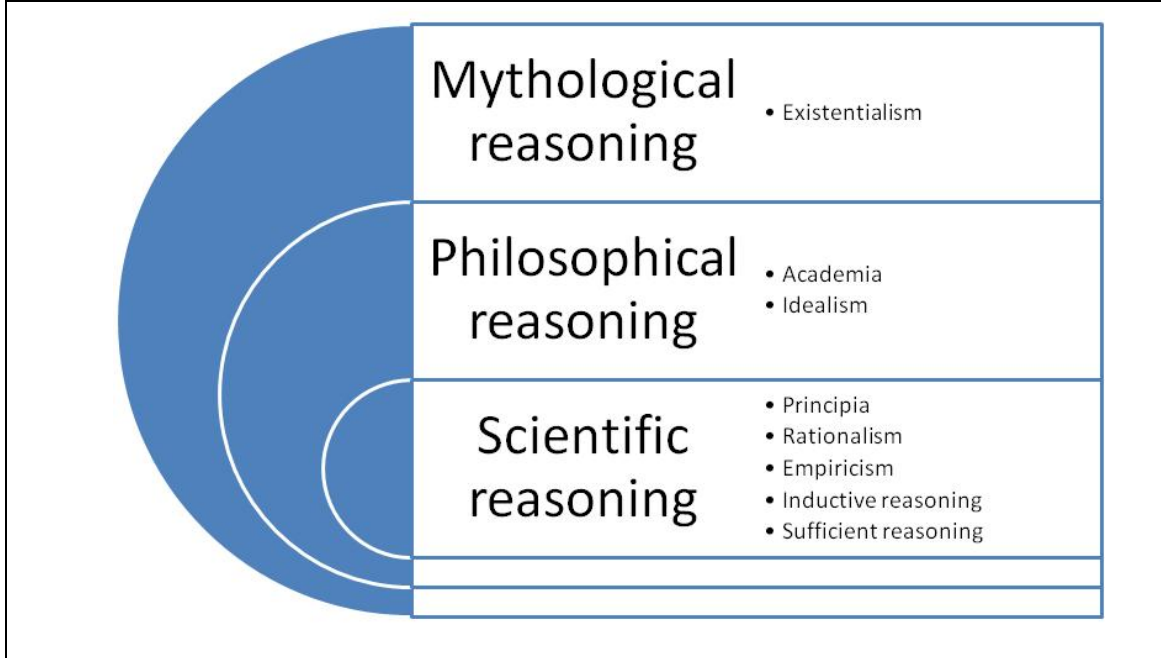


Figure 2-1. Principles of dialectics.

All research is concerned with the pursuit of knowledge. There are three distinguishable ways to expand knowledge namely through mythology, philosophy and science. Each of these is used to gather knowledge and explain phenomena from a specific perspective by elaborating on the fundamentals of this perspective.



They are shown in *figure 2.2* below:



*Figure 2-2. Perspectives on knowledge*

Scientific reasoning or models of scientific inquiry has two functions, first to provide a descriptive account of how scientific inquiry is carried out in practice, and second to provide an explanatory account of why scientific inquiry succeeds as well as it appears to do in arriving at genuine knowledge of its objects.

Philosophical studies are based on studying general and fundamental problems concerning matters such as existence, knowledge, truth, justice, beauty, validity, mind and language. Philosophy is distinguished from other ways of addressing these questions such as mythology by its critical, generally systematic approach and its reliance on reason. (Teichmann & Evans, 1999; Grayling, 1998)

Epistemology (Greek *episteme*, “knowledge”; *logos*, “theory”), is the specific branch of philosophy that addresses the philosophical problems surrounding the theory of knowledge (NODE. 2001). Epistemology is concerned with the definition of knowledge and related concepts, the sources and criteria of knowledge, the kinds of potential

knowledge and the degree to which each is certain, the limits of knowledge, and the exact relation between the one who knows and the object known.

Mythology, dating back to the 15<sup>th</sup> century, deals with the study of myths or a body of stories, ideas, or beliefs that are not necessarily true about a particular place or person. Mythology thus relates to existentialism as it only exists in the imagination and is not real as it often uses experiential beliefs or the supernatural to interpret natural events and to explain the nature of the universe and humanity.

Metaphysical studies, dating back to the mid 16<sup>th</sup> century, are based on speculative reasoning and unexamined assumptions that have not been logically examined or confirmed by observation. It is the philosophy of being, the branch of philosophy concerned with the study of nature of being and beings, existence, time and space, and causality. Metaphysics also form the ultimate underlying principles or theories that form the basis of a particular field of knowledge.

## **2.2. Scientific reasoning**

### **2.2.1. Principia**

In 1687, English mathematician and physicist Sir Isaac Newton (1642-1727) published his most important work, *Philosophiae Naturalis Principia Mathematica* (*Mathematical Principles of Natural Philosophy*) (Encarta, 2007). Principia set out his theory on gravity and planetary motion, but would for this dissertation, refer to it in the context of scientific facts and reasoning.

### 2.2.2. Rationalism

René Descartes (1596-1650), French philosopher, scientist, and mathematician, is often called the founder of modern philosophy (Encarta, 2007). He attempted to apply the rational deductive methods of science, and particularly of mathematics, to philosophy. Before his time, philosophy had been dominated by the method of scholasticism, which was completely based on comparing and contrasting the views of recognized authorities. Rejecting this method, Descartes stated: "In our search for the direct road to truth, we should busy ourselves with no object about which we cannot attain certitude equal to that of the demonstration of arithmetic and geometry." As a result he determined to hold nothing true until he could be absolutely certain of it. His method for discovering a truth of which he could be entirely certain was to use scepticism: he attempted to doubt everything that he believed to be true and investigate if it was indeed possible to disbelieve it (Sorell, 1987).

Rationalism (Latin ratio, "reason"), in philosophy, a system of thought that emphasizes the role of reason in obtaining knowledge, in contrast to empiricism, which emphasizes the role of experience, especially sense perception. Descartes believed that geometry represented the ideal for all sciences and philosophy. He held that by means of reason alone, certain universal, self-evident truths could be discovered, from which a great deal of the remaining content of philosophy and the sciences could be deductively derived. He assumed that these obvious truths were innate, not derived from sense experience (Cottingham, 1984).

Rationalists thought that the senses provided some test of the principles and postulates of reason. They regarded the senses as in themselves a source of mere opinion, rather than of true knowledge. They sought after knowledge that was systematic, consistent and interconnected. Sense experience could at best establish the usual association of certain phenomena; it could not explain why it should happen, though, or confirm that

it had to happen. The rationalists held that truly scientific knowledge would overcome these deficiencies.

Rationalists asserted that the mind is capable of recognizing reality by means of its capacity for reason, a faculty that exists independent of experience. In accordance with reason and logic, rationalism here on is referred to as presented or understandable in terms that accord with reason and logic or with scientific knowledge, as opposed to being governed solely by instinct and appetite. (Cottingham, 1984)

### **2.2.3. Empiricism**

John Locke (1632-1704), English philosopher, founded the school of empiricism and defended the idea of a social contract (Encarta, 2007). His empiricism held that all knowledge other than deductive reasoning must be based on sensory experience. He regarded the mind of a human at birth as a *tabula rasa*, a blank slate upon which experience imprinted knowledge and rejected the belief in innate ideas, a concept that derived originally from Plato. Empiricist ideas were put forward by the English philosopher and statesman Francis Bacon early in the 17th century, but Locke gave the doctrine a systematic expression in his “Essay Concerning Human Understanding” (Lock, 1690). In this work of his, he portrays each individual as a blank slate. Each person’s experiences become notations on the slate and make him or her distinct from other people.

Empiricists generally looked to the experimental natural sciences to illustrate their view of how knowledge is acquired, while in contrast, rationalists often pointed to pure mathematics to illustrate their own view. Empiricists had particular difficulty in explaining how it is possible ever to acquire pure mathematical concepts and knowledge, if all concepts and knowledge had to come from ones senses. In its extreme form, empiricism concludes that not just that all knowledge has to start from

experience, but also can never get beyond one's experience. That is, it is not possible to know anything other than that which comes from experience.

Empiricism, in philosophy, a doctrine that affirms that all ideas and knowledge are a posteriori, that is, derived from and based on experience, and denies that they can ever be a priori, that is, discoverable without having to rely on the senses.

#### **2.2.4. Inductive reasoning**

"It cannot be that axioms established by argumentation should avail for the discovery of new works; since the subtlety of nature is greater many times over than the subtlety of argument. But axioms duly and orderly formed from particulars easily discover the way of new particulars, and thus render sciences active." - Francis Bacon in "Novum organum"

The influential and versatile English writer of the 17th century, Francis Bacon (1561-1626) wrote on a broad range of topics, amongst which the best of his philosophical works are *The Advancement of Learning* (1605), a review in English of the state of knowledge in his own time, and *Novum Organum; or, Indications Respecting the Interpretation of Nature* (1620).

Bacon's *Essays*, his chief contributions to literature, were published between 1597 and 1625, within which he did not propose an actual philosophy, but rather a method of developing philosophy. Bacon's teachings influenced the rise of empiricism. He contributed to the era of modern scientific thought by developing a reasoning process called induction. *Novum Organum* stressed the importance of experimental research and observations in science and formulated the principles of scientific induction (Encarta, 2007).

Induction in logic is defined as the process of reasoning from the particular to the general as opposed to the inverse process of deduction. This means that basis of induction is the assumption that if something is true in a number of observed instances; it is also true in similar, but unobserved, instances. One of the simplest types of induction involves the analysis of opinion polls, in which the opinions given by a small percentage of the total population are projected for the entire country. It is important to note that the probability of accuracy depends on the number of instances observed. Previous logicians had practised induction by simple enumeration by drawing general conclusions from particular data.

In *Novum Organum* Bacon successfully influenced the acceptance of accurate observation and experimentation in science. Because it added significantly to the improvement of scientific hypotheses, his method was a fundamental advancement of the scientific method.

Bacon reasoned that whilst philosophy at the time used the deductive syllogism to interpret nature, the philosopher should instead proceed through inductive reasoning from fact to axiom to law. A prerequisite for inductive reasoning is for the inquirer is to free his mind from certain false notions or tendencies which distort the truth. These are called "idola" or Idols, and there are four kinds:

*idola tribus*, which are common to the race ("Idols of the Tribe");

*idola specus*, which are peculiar to the individual ("Idols of the Den");

*idola fori*, coming from the misuse of language ("Idols of the Marketplace"); and

*idola theatri*, which result from an abuse of authority ("Idols of the Theatre").

The end of induction is the discovery of forms, the ways in which natural phenomena occur and the causes from which they proceed. Bacon and Descartes believed humans had the power to reason out the meaning of their own existence while Newton and Voltaire believed the universe was ruled by natural laws rather than by the direct hand

of God. Their thinking provided the basis for modern secularism in the West, which is the exclusion of religion from a philosophical or moral system.

David Hume, John Stuart Mill, and Charles Sanders Peirce also greatly contributed, with Francis Bacon, in the development of inductive reasoning.

### **2.2.5. Sufficient reasoning**

It is essential to evaluate theories about truth as sufficient reasoning is based on a process of reasoning conclusions from truths. Leibniz identified truth as a proposition in which the predicate (that which is asserted) is contained with the subjects (that which is asserted about). An analytical proposition e.g.  $XY=XY$  is basic logical truth and therefore a fact. Leibniz developed the principle of sufficient reason and argued that without this principle, science and philosophy would both be impossible. He reasoned that one predicate explains another, and therefore many of the predicates that are true of a subject give the full picture as a network of explanations. Further, for every predicate that is true of a subject there would be a set of true predicates, which constitute a sufficient reason for it being true.

Leibniz identified two kinds of truths on which knowledge is based namely truths based on facts, therefore existing truths; and truth based on sufficient reasoning (Blackburn, 1996). The principle of sufficient reasoning from existing truths would be applied in this dissertation to create knowledge from its proposition (Burnham, 2006).

## **2.3. Philosophical reasoning**

### **2.3.1. Academia**

Plato (c. 428-c. 347 BC) has been credited to be the founder of Western philosophy, scholarship and scientific thought. He sought to understand the nature of the genuine knowledge that his teacher, Socrates had professed to lack. He held that such knowledge must be correlated with the nature of the real: as the fully real is fixed, permanent, and unchanging, so must knowledge be certain and immune to revision or correction. Only such knowledge can be teachable. Academia was originally a public garden in the suburbs of Athens where Plato opened a school for the reception of those inclined to attend his instructions. Hence arose the Academic sect and from there, the term Academy descended to our times (Encarta, 2007). This dissertation refers to Academia in its purest sense, as the context of philosophical facts and reasoning, as apposed to the often misdirected use of the term as a collection of study material.

### **2.3.2. Idealism**

George Berkeley (1685-1753), Irish philosopher and clergyman, is generally regarded as the founder of the modern school of idealism, the view that all physical objects are dependent on the mind for their existence. Berkeley held that matter cannot be conceived to exist independent of the mind; the phenomena of sense can be explained only by supposing a divinity that continually evokes perception of them in the human mind. Berkeley's idealism rejected Descartes' division of the world into two realms, the material and the mental, but has problems explaining actions outside of consciousness. In the 20th century, reaction to Cartesian dualism went in an opposite direction, with attempts to compress all reality, including consciousness, into the material realm.



Idealism hereon refers to believing in and the pursuit of perfection as an attainable goal existing in the human mind.

## **2.4. Mythological reasoning**

### **2.4.1. Existentialism**

The 19th-century Danish philosopher Søren Aabye Kierkegaard (1813-1855), played a major role in the development of existentialist thought, and is generally regarded as the founder of modern existentialism (Encarta, 2007). He emphasized the absurdity inherent in human life and questioned how any systematic philosophy could apply to ambiguous human conditions. In Kierkegaard's deliberately unsystematic works, he explained that each individual should attempt an intense examination of his own existence.

The individual's response to this situation must be to live a totally committed life, and this commitment can only be understood by the individual who has made it. The individual must therefore always be prepared to defy the norms of society for the sake of the higher authority of a personally valid way of life. Kierkegaard ultimately advocated a "leap of faith" into a Christian way of life, which, although incomprehensible and full of risks, was the only commitment he believed, could save the individual from despair.

Kierkegaard wrote in his journal, "I must find a truth that is true for me...the idea for which I can live or die." Other existentialist writers have echoed Kierkegaard's belief that one must choose one's own way without the aid of universal, objective standards. Against the traditional view that moral choice involves an objective judgement of right and wrong, existentialists have argued that no objective, rational basis can be found for moral decisions.

The 19th-century German philosopher Friedrich Nietzsche (1844-1900) contended that there are no moral “facts”, only moral “interpretations”, which are bound to vary according to the types of human beings who make them.

Jean-Paul Sartre (1905-1980), a French philosopher, dramatist, novelist, and political journalist, was a leading exponent of existentialism (Encarta, 2007). Sartre’s plays and novels express his belief that freedom and acceptance of personal responsibilities are the main values in life and that individuals must rely on their creative powers rather than on social or religious authority.

They have insisted, accordingly, that personal experience and acting on one’s own convictions are essential in arriving at the truth. Thus, the understanding of a situation by someone involved in that situation is superior to that of a detached, objective observer.

Logic asserting existence hereon refers to, governed by the existential quantifier and thus asserting the existence of something by saying that there is at least one object that possesses the properties specified.

## **2.5. Fundamentals of the relevant theory**

A model is developed as a solution to a problem that encompasses various disciplines. It is therefore important to explore the various fundamentals of each of the most relevant theoretical fields of study in order to ensure that all the aspects of the problem is properly understood and incorporated into the model. This is shown in *figure 2.3* below.

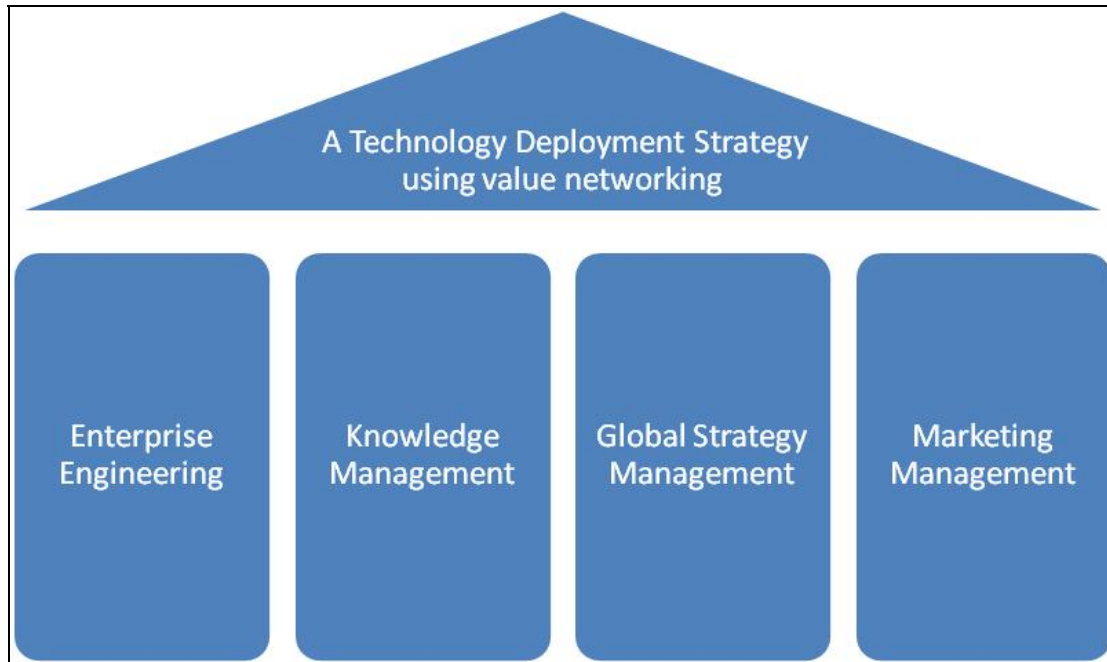


Figure 2-3. Fundamentals of this dissertation.

A brief theoretic overview of each these fields are given as a point of departure.

### **2.5.1. Enterprise engineering**

Enterprise engineering (EE) concerns the analysis, optimisation and re-engineering of all or part of business processes, information systems and organizational structures of an enterprise or of a network of enterprises (Vernadat, 1996). It is a multidisciplinary approach to defining and developing a system design and architecture for the organisation. There is a need for integrated methods to build consistent enterprise models (Faure et al., 1995), and a number of models exist within the computer-integrated manufacturing (CIM) environment.

### **2.5.2. Knowledge management**

Knowledge management is considered a key part of the strategy to use expertise to create a sustainable competitive advantage in the present business environment (Botha

et al., 2008). Many knowledge intensive industries have emerged since the beginning of the 21st century; we enter into a new era of both globalization and the use of knowledge management (KM) in achieving strategic objectives (O'Sullivan, 2007).

O'Sullivan (2007) divided KM studies into four general sections:

- Organization;
- technology;
- organizational learning; and
- leadership.

This approach is consistent with the Four Pillars of Knowledge Management, first postulated by Baldanza and Stankosky in 1999 (Stankosky, 2005). Technology and organizational learning are most pertinent to this dissertation because of its focus on knowledge organisations and the competitive environment accompanying it. It is therefore important to completely understand knowledge management in terms of intellectual assets and technology management.

Nonaka (1994) argues that organisations play a critical role in articulating and amplifying the new knowledge that is developed by individuals. A more detailed investigation on tacit and explicit knowledge follows later in this dissertation as knowledge is assumed to be created because of conversation between the two (Nonaka, 1994). Since technology is such a crucial force, the field of technology management has emerged to address the particular ways in which companies should approach the use of technology in business strategies and operations. Technology is difficult to manage because it is constantly changing, often in ways that cannot be predicted. Technology management is the set of policies and practices that leverage technologies to build, maintain, and increase the competitive advantage of the firm on the basis of proprietary knowledge and know-how. (Carayannis et al., 2006)

The model developed for this dissertation can be said to be a form of business intelligence and thus a technological asset. Business intelligence dates at least back to 1958, and refers to technologies, applications and practices for the collection, integration, analysis and presentation of business information and sometimes to the information itself (Luhn, 1958). The purpose of business intelligence is to support better decision making, and can also be described as a data- driven decision support system (Power, 2007).

Business intelligence thus relates to organizational learning, in which the experience of the organisation is captured with other information of the external environment, in an attempt to use this information as an aid in decision making. Decision support systems couple the intellectual resources of individuals within a firm with the capabilities of computers to improve the quality of decisions. The result is a computer-based support system for management decision makers who deal with semi-structured problems (Marakas, 1998).

### **2.5.3. Global strategy management**

Strategy management is the process of strategic decision making that sets the long term direction for the organization. The central thrust of strategic management is achieving a sustainable competitive advantage. The strategy process consists out of analysis, development, and implementation steps.

A global strategy involves the carefully crafted single strategy for the entire network of subsidiaries, encompassing many countries simultaneously and leveraging synergies across many countries. This stands in contrast to international strategy which involves a wide variety of business strategies across countries, and a high level of adaptation to the local business environment.

Global strategic management is the process of crafting a coherent, coordinated, integrated, and unified strategy that sets the degree to which a firm globalizes its strategic behaviours in different countries through standardization of offerings, configuration and coordination of activities in different countries, and integration of competitive moves across countries.

Globalization is a diverse process embracing economic, political and cultural change which is deepening the integration of the world economy, strengthening political interdependence between countries, and causing values to converge across countries. (Mellahi et al, 2005)

#### **2.5.4. Marketing management**

Marketing deals with identifying and meeting human and social needs. One of the shortest definitions of marketing is “meeting needs profitably”. The American Marketing Association (2004) defines marketing as an organizational function and a set of processes for creating, communicating and delivering value to customers for managing customer relationships in ways that benefits the organization and its stakeholders. Marketing management takes place when at least one party to a potential exchange thinks about the means of achieving desired response from other parties (Kotler & Keller, 2006). This can be described as a process and is not something that happens at random. There are many correlations between this process and that of global strategic management described in 2.5.3 earlier.

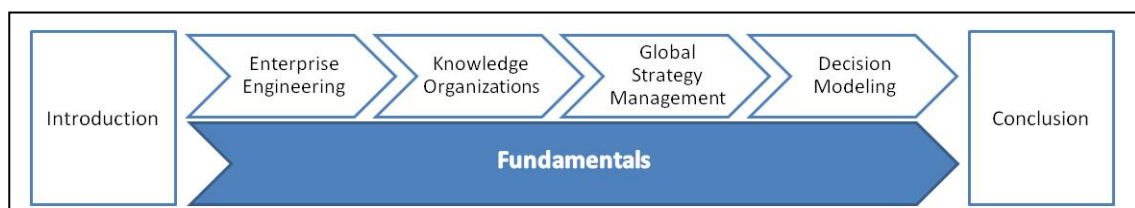
## 2.6. Fundamentals of this dissertation

### 2.6.1. A technology deployment strategy using value networking

Technology is developed by knowledge organisations over time because of the know-how and expertise people acquire within the firm. This technology propriety to the firm, whether acquired or developed in-house, becomes deployed once it is rendered as part of a product. This product can be tangible, or a service delivered which is made possible by technologies.

The success of the firm greatly relies on its ability to deploy their technologies, and in the long run to have their technologies recognised and adapted as industry standards. Firms therefore continuously develop and implement strategies that would create a larger footprint for them in market. One of the more recent developments are for firms to externally leverage their technology assets through various legal agreements i.e. licensing. Value networks can be defined as any web of relationships that generates both tangible and intangible value through complex dynamic exchanges between two or more individuals, groups or organisations (Allee, 2003). Value networking is the use of the links or networks created through which technology is deployed in return for royalties from the licensees.

Following the description of the title of this dissertation, it can now be show in figure 2.3 how the fundamental research areas are applied through the various parts of the dissertation.



*Figure 2-4 The fundamentals of the technology deployment strategy using value networking.*

An enterprise is the vehicle through which technology products are deployed. Enterprise engineering is the process through which enterprises are developed and modelled through the use of systematic and generalised conventions in order to obtain consistency, optimality and to define and develop a system design and architecture for the organisation.

Once knowledge is developed or acquired and becomes propriety to the firm, it can be duplicated with little effort. Knowledge organisations generally sell a service which is that of know-how, and the cost of selling knowledge is very low because it is already in the hands of the firm.

The global strategy management process is concerned with global strategy analysis, global strategy development and global strategy implementation. Within this context, analysis deals with assessing the environments in which firms interact, design is concerned with what systems, structures and agreements needs to be in place to deploy a product, while implementation deals with how structures or networks are utilised or leveraged in order to attain a greater footprint in the market.

A decision method is an axiomatic system, meaning that its truths are taken for granted and serves as a starting point for deducting and inferring other truths. Such a system contains at least one action axiom. A formal model of the given alternatives is formulated, and evaluation of this model produces a formal recommendation and its associated sensitivities from the decision situation.

This outcomes from this dissertation aims to assist a local consulting firm in possession of technology assets to exploit the value of these assets through value networking by



providing recommendations as to what countries should be the focus of their marketing efforts with a focus on the macro firm environment.

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### 3. Enterprise Engineering Framework

*“It is the lone worker who makes the first advance in a subject; the details may be worked out by the team, but the prime idea is due to enterprise, thought, and perception of an individual.” – Alexander Fleming*

This part of the dissertation introduces the reader to the Cartesian space and its uniqueness in representing the life cycles of the enterprise domain. Various investigations are made to determine what functionality can further be derived from the enterprise domain when considering the rules and boundaries of the Cartesian space.

They are discussed under the following headings:

- Introduction to the Cartesian space;
- The enterprise engineering axes;
- The enterprise engineering planes;
- The enterprise engineering space; and
- Pragma in relation to the enterprise engineering framework.

## 3.1. Introduction to the Cartesian space

### 3.1.1. The Cartesian space

René Descartes (1596-1650) devised a system of analytical geometry and in 1637 published the results in the prestigious journal *Géométrie*. Ever since his publication Descartes has been associated with the  $xy$ -plane, which is why it is called the Cartesian plane. The Cartesian plane provides a mechanism for translating pairs of related variables into graphical format.

In the design of experiments, independent variables are those whose values are controlled or selected by the experimenter to determine its relationship to an observed phenomenon (the dependent variable). In such an experiment, an attempt is made to find evidence that the values of the independent variable determine the values of the dependent variable (that which is being measured). The independent variable can be changed as required, and its values do not represent a problem requiring explanation in an analysis, but are taken simply as given. The dependent variable on the other hand, usually cannot be directly controlled.

Controlled variables are also important to identify in experiments. They are the variables that are kept constant to prevent their influence on the effect of the independent variable on the dependent.

In summary:

The independent variable answers the question "What do I change?".

The dependent variables answer the question "What do I observe?".

The controlled variables answer the question "What do I keep the same?".

Thus if there is a mathematical function  $f(x)$ , then  $x$  is an *independent variable*, and  $f(x)$  (or  $y$ ) is a *dependent variable*. The graphic representation of a mathematical function

would present the independent variable ( $x$ ) on the horizontal axis, and the dependent variable ( $y$  or  $f(x)$ ) on the vertical axis. The representation of an additional dependent variable would be represented perpendicular to the horizontal independent and vertical independent variable, usually called  $z$ .

More than three variables can not be represented graphically, and is referred to as  $n$ -dimensions which are usually represented in matrixes.

The three dimensional Cartesian coordinate system provides the three physical dimensions of space — length, width, and height. The three Cartesian axes defining the system are perpendicular to each other. The relevant coordinates are of the form  $(x,y,z)$ . The axes are depicted in a "world-coordinates" orientation with the  $z$ -axis pointing up. The  $z$ -coordinate is also called *the applicate*.

The  $x$ -,  $y$ -, and  $z$ -coordinates of a point can also be taken as the distances from the  $yz$ -plane,  $xz$ -plane, and  $xy$ -plane respectively. The  $xy$ -,  $yz$ -, and  $xz$ -planes divide the three-dimensional space into eight subdivisions known as octants, similar to the quadrants of 2D space. While conventions have been established for the labelling of the four quadrants of the  $x$ - $y$  plane, only the first octant of three dimensional spaces is labelled. It contains all of the points for which  $x$ ,  $y$ , and  $z$  coordinates are positive.

### **3.1.2. Defining the enterprise engineering solution space**

“Enterprise Engineering is defined as that body of knowledge, principles, and practices having to do with the analysis, design, implementation and operation of an enterprise. In a continually changing and unpredictable competitive environment, the Enterprise Engineer addresses a fundamental question: how to design and improve all elements associated with the total enterprise through the use of engineering and analysis

methods and tools to more effectively achieve its goals and objectives.” (Liles et al., 2006).

Enterprise engineering (EE) concerns the analysis, optimisation and re-engineering of all or part of business processes, information systems and organizational structures of an enterprise or of a network of enterprises. It is the art of understanding, defining, specifying, and analysing and implementing business processes for the entire enterprise life cycle so the enterprise can achieve its objectives, be cost effective and be more competitive (Vernadat, 1996). It is a multidisciplinary approach to defining and developing a system design and architecture for the organisation. There is a need for integrated methods to build consistent enterprise models (Faure et al., 1995), and a number of models exist within the computer-integrated manufacturing (CIM) environment (Williams et al., 1998).

Kim et al (2001) mentions the availability of public domain specifications of EE frameworks and methodologies such as IDEF, GRAI-GIM, ARIS, CIMOSA, PERA and IEM in developing the integrated methodology for enterprise engineering (IMEE). It is apparent that many of these models exist, and the most significant of these models are briefly described for completeness of this dissertation.

The Computer-Integrated Manufacturing Open System Architecture (CIMOSA) models the manufacturing activities of an organisation from the functional, information, resource and organisational perspective which provides an advanced and integrating method for overall enterprise modelling. CIMOSA provides a framework to assist users in modelling business requirements, deriving enterprise system design and finally describing and planning system implementation (Cuenca et al, 2006).

The Purdue Enterprise Reference Architecture (PERA) models the activities of an organisation from the functional and physical perspective that describes graphically the

steps or structure of analysis, design and development of an enterprise integration project (Williams et al, 2001). The Toronto Virtual Enterprise (TOVE) ontology provides a set of modelling conventions and terminology for the modelling of an organisation. The main contribution of these models does not lie in their definition of architecture but rather in the modelling conventions they provide. (Moll, 1998)

According to Du Preez et al (2007), integrating all activities associated with planning, controlling and deploying innovation projects successfully takes place in a solution space that consists of the design life cycles of:

- The Enterprise (hereon referred to as business);
- The Product; and
- Technology.

When industrial software development enterprises are considered, the following classifications are necessary:

- *Technology* is defined as the software, methodologies and templates that are developed;
- *Product* is defined as the value added service that is created to sustain the application of the technology (software); and
- *Business* is viewed as the value added network created to leverage the product (value added service).

The solution space referred to as the enterprise domain consists out of business, product and technology. Technology development changes (increase exponentially) all the time as ideas are converted to innovations rapidly in all fields of business and research. The product life cycle depends on innovation and thus on technology, concluding that technology as the independent variable can be compared to the product as the dependent variable. Furthermore; business evolves over time as technology is



created and as a result improves products. Business is changed by technology and thus dependent on technology.

For the purpose of this dissertation the term business engineering is used in a similar sense as enterprise engineering. It is required to state the difference between new business engineering and business reengineering, as it serves as a valid explanation why development is ongoing and not just the function of a start-up.

New business engineering and business reengineering are the two primary change drivers in business. New business engineering is driven by the need to generate new revenues, either by increasing existing revenue streams or by creating new ones. Business reengineering is driven by the need to improve organisational performance, that is, to increase quality or to reduce cost and time. A good enterprise engineering approach can handle both, but it is useful to separate the two because they require different frames of reference. This would entail that enterprise engineering models and frameworks are equally relevant for new businesses as well as the expansion of current business operations. It does not make sense to have to construct an entire new approach to business change for each different stage in the business life cycle. Shifts in emphasis in the business plan should be entirely sufficient to steer the business engineering process toward new business engineering process towards new business engineering projects or toward business reengineering projects, as the situation requires (Appleton, 1994).

From these findings technology is represented on the horizontal x-axis, with product on the y axis and business on the z axis as depicted in *figure 3.1*.

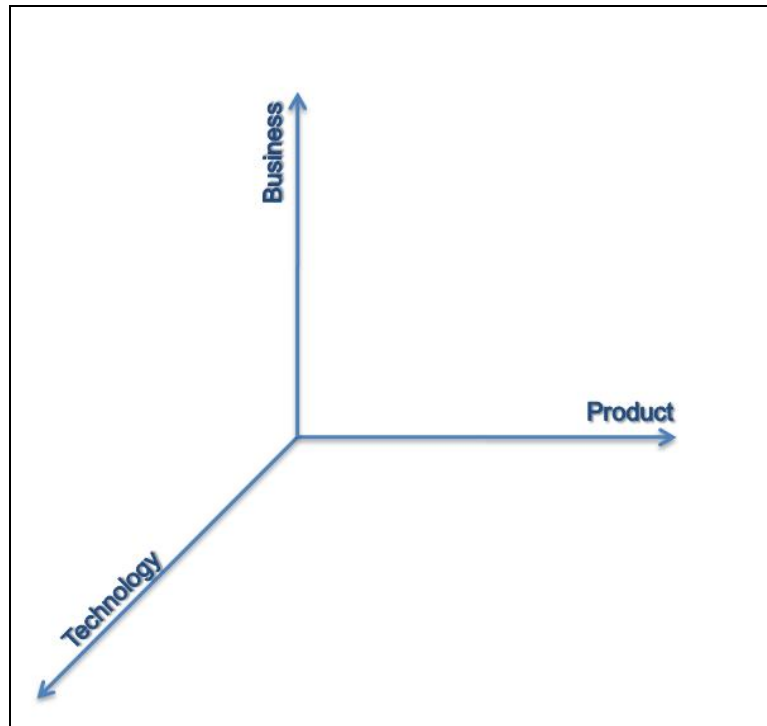
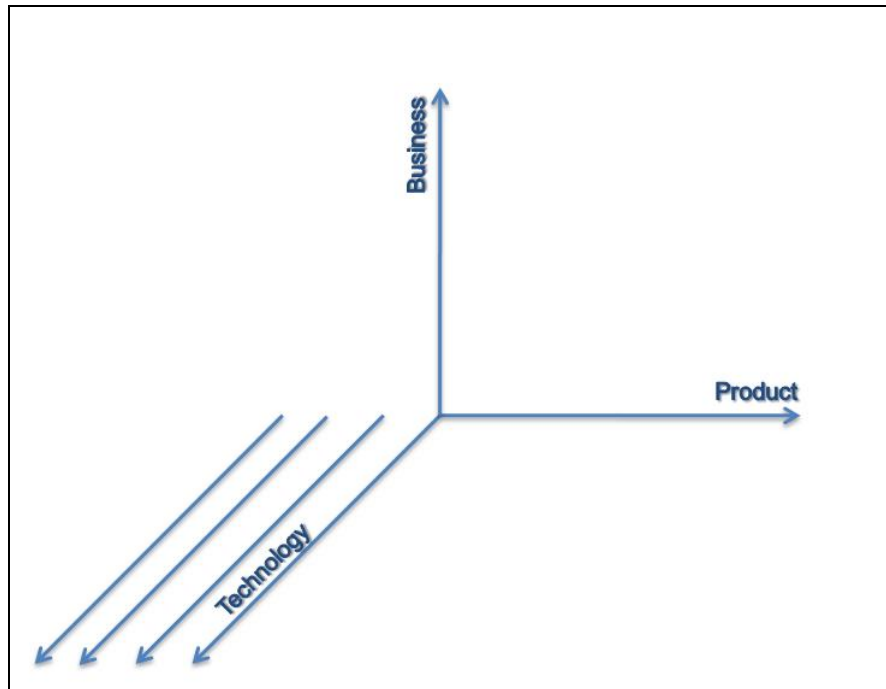


Figure 3-1. The enterprise domain represented in the Cartesian space

The enterprise would predominantly be driven by technology, and thus influenced by changes in technology. As new technology is introduced or developed, the enterprise may decide to adapt to it or to wait until better technology have been developed, or until sufficient testing or verification of the new technology took place. The Cartesian space representing the enterprise domain can thus be adapted to have various x-axes, to illustrate possible adoption options of available technologies. A new axis system has to represent a change in technology every time it changes, as the current axis system would represent the life cycle of the utilized technology, and would no more be of use once the current technology is disposed or phased out. The described dynamics can be represented in the *figure 3.2* as follows.



*Figure 3-2. The enterprise domain represented in the Cartesian space, with the addition of possible technology choices an enterprise might consider to adapt.*

Consulting firms develop technology based products for specific market application. However, these products compete in various industries where many other players are also present. Therefore, to develop a sustainable enterprise, processes are designed whereby value added service networks are created. By doing so, enterprise, product and technology are aligned. This is thus a classic example of implementing the enterprise engineering solution space or paradigm.

In developing enterprise engineering strategies, these three elements are explicitly developed:

- The technology deployment strategy from development or acquisition and its application;
- The product development strategy using the technology as a base; and
- The enterprise strategy aimed at maximum leverage from both product and technology.

### 3.1.3. Life cycle models

A model is a representation of how real situations are perceived, and would be a generalisation of many occurrences of such reality. One of the simplest examples of a lifecycle would be that of life and death. Society agrees that everyone is born and that everyone will die. Therefore one can assume that the difference between the times of the two events would depict the timeframe in which the event occurs. This timeframe can be represented on the x-axis of the Cartesian space, as time is an independent variable. Some performance can be measured against time and this dependent variable can be represented on the y-axis. The dependent variable, as the name suggests, would depend on the independent variable, in this case time which for example can be the age of a person.

If a scientist is interested in the top speed of athletes, he can measure the top speeds of everyone in a population and compare it to their age. The scientist would find that infants can walk, children can run slowly, teenagers can run faster, young adults run faster, adults struggle to keep up, and that old people can only walk fast. Therefore a model can be created representing the running speed of humans throughout their lives. This model would be true within a predetermined certainty, and should at least represent the running speeds of a certain percentage of the population to be regarded as true.

Rogers (2003) defined innovation adopter categorization in 1962 based on the s-curve of adoption. He used the amount of sales of an innovation as an indicator of the amount of adopters towards that innovation. The time element as the independent variable enabled Rogers to classify adopter categories and to draw diffusion curves as illustrated in *figure 3.3* that follows.

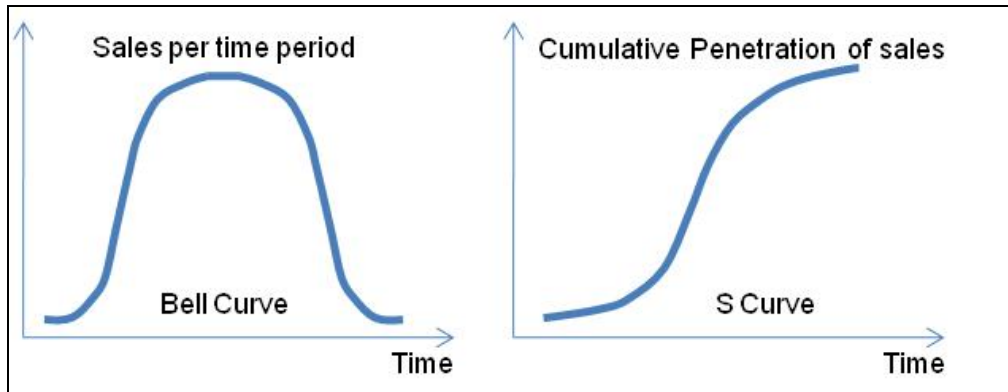


Figure 3-3. The bell-shaped curve and the s-shaped curve representing the adoption of innovation over time.

The adoption of an innovation over time usually follows a bell-shaped curve, whereas the cumulative number of adapters resulted in the s-curve over time (Mitchell, 1997). The formula for the bell-shaped curve is similar to that of the normal probability density function (Anderson et al., 2003):

$$F(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-((x-\mu)^2/2\sigma^2)}$$

where

$\mu$  is the population mean;

$\pi$  is the mathematical constant approximated by 3.14159....;

$\sigma$  is the population standard deviation;

$e$  is the mathematical constant approximated by 2.71828...; and

$x$  is any value of the continuous random variable, where  $-\infty < x < \infty$ .

The formula for the s-curve is a sigmoid function represented by the Gompertz curve:

$$y(t) = ae^{be^{ct}}$$

where

**a** is upper asymptote;

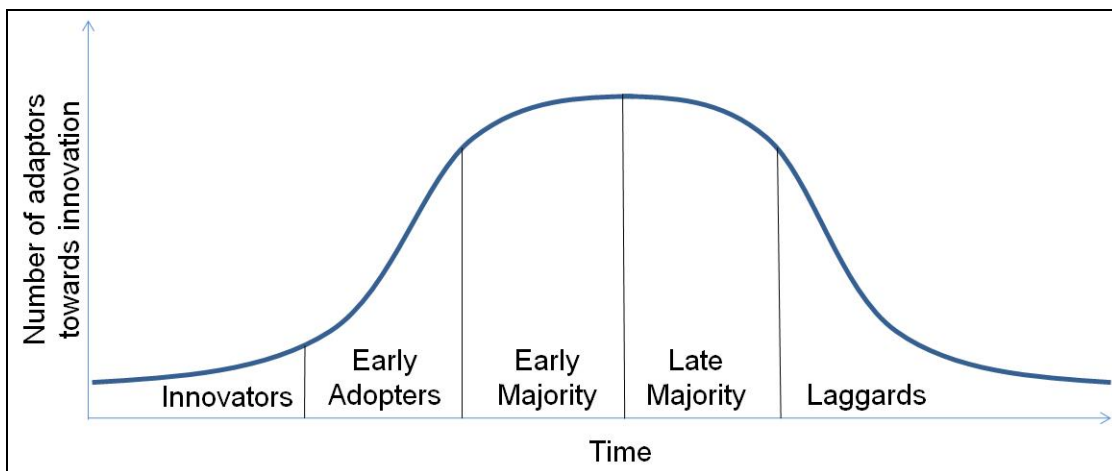
**c** is the growth rate;

**b** and **c** are negative numbers;

**e** is the mathematical constant approximated by 2.71828...; and

**t** is time.

Rogers (2003) further derived adopter categorization on the basis of innovativeness by dividing the bell curve into 5 categories. Geoffrey Moore (1991) also contributed greatly to adopter categories as shown in *figure 3.4* below and diffusion of innovations.



*Figure 3-4. Adopter categorization of the bell curve.*

Innovators are described as venturesome and can deal with high degrees of uncertainty as losses can occur due to an unprofitable innovation. They have the ability to understand and apply complex technical knowledge which usually accompanies new technology and innovations. They are the gate keepers of the flow of innovation into the market.

Early adopters have the highest degree of opinion leadership in most systems as they are considered by many to be the individuals to check with before adopting a new idea. They serve as a role model for many members of the social system and are therefore sought by change agents because they help trigger the critical mass when they adopt an innovation.

One can say that early adapters put their stamps of approval on a new idea by adapting it. Early majority follow with deliberate willingness in adopting innovations but seldom lead. They adopt new ideas just before the average member of a system, and make up one third of the system. They form an important link in the diffusion process of innovation as they are uniquely located between the very early and relatively late adopters (Moore et al., 1991).

Late majority adopts as an economic necessity as well as the result of increasing peer pressures. They also comprise one third of the members of a system and adopt ideas just after the average member of a system. Innovations are approached with scepticism and caution as uncertainty needs to be removed before scarce resources are dedicated towards the idea. The pressure from peers is necessary to motivate adoption.

Laggards possess almost no opinion leadership and are the last in a social system to adopt an innovation. Many are near isolates in the social network of their systems and interact primarily with others who also have relatively traditional values. Their precarious economic position makes them suspicious of innovations and change agents, and cautious in adopting innovations.

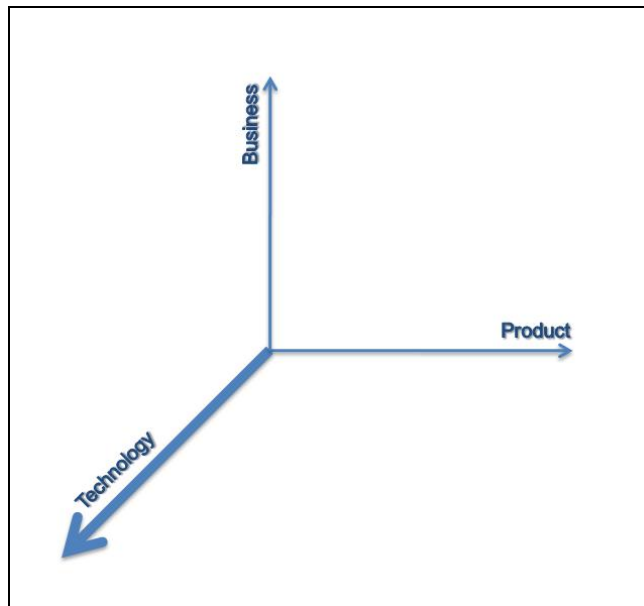
## 3.2. The enterprise domain axes

### 3.2.1. Introduction

It is apparent that the axes of the enterprise engineering solution space consist out of considerations for the life cycle models for technology, product and business as previously shown in *figure 3.1*. This section aims to investigate all the aspects relevant to these life cycle models in relation to externally leveraging technology assets.

### 3.2.2. Technology defined

Technology as a part of the enterprise engineering solution space is shown in *figure 3.5*. A short investigation into the history of technology follows as the foundation of this section.



*Figure 3-5. Technology is depicted as the independent variable in the Cartesian space.*

Stone tools were used 2.5 million years ago to butcher dead animals. The hand axe dates back 1.6 million years and the use of fire 1.5 million years. Clothing dates back



100,000 years, and the domestication of animals 15,000BC. These events were of the first known technologies.

The 1930's Spanish philosopher Gasset identified three distinctive periods in the evolution of technology in an attempt to discern and characterise these periods. Achievements made in the first and longest period were no more than the products of chance, as there were no systematic techniques for the discovery and development of technological devices. Certain technological skills had become sufficiently conscious in the second phase to be passed from one generation to the next by craftsman who had no systematic body of knowledge about their devices. Possession of this kind of knowledge characterised the third period and empowered people to realise their technological goals. This resulted from analytical modes of thought associated with modern science, in a radically different way from previously (Encarta, 2006).

The New Oxford Dictionary of English (NODE, 2001) defines technology as the application of tools and methods, or as a method of applying technical knowledge. The cultural anthropologic view of technology is the sum of a society's or cultures practical knowledge, especially with reference to its material culture. The most appropriate description of technology with regards to this thesis would be machines, equipment and systems considered as a unit that serves a goal.

Technology has the goal of creating and improving artefacts and systems to satisfy human wants or aspirations. Success is judged in terms of considerations such as efficiency of performance, durability, reliability, cost of production, ecological impact, and end-of-life disposability.

Technology is owned by the creator for a certain amount of time. Once the technology is accepted as a given and generalised, like the wheel, it loses its financial value as everyone knows how it works and how to use it. This can be seen in the eras of

developments of society, like the Stone Age, the machine age and then the systems age. Society moves to the next era of development once the known era becomes generalised. This phenomenon supports the idea of technology life cycles, where new technologies are phased out as soon as they become generalised and replaced by newer technologies.

### **3.2.3. The technology life cycle**

The technology adoption life cycle grew out of social research begun in the late 1950s about how communities respond to discontinuous innovations (as discussed in section 3.1.3). These discontinuous innovations are described as new products or services that require the end user and the market place to dramatically change their past behaviour, with the promise of gaining equally dramatic new benefits.

When the model is applied to marketing, the model assumes that when a marketplace is confronted with the opportunity to switch to a new infrastructure paradigm – from VHS to DVD-RW for instance – customers self-segregate along an axis of risk aversion. On the forefront would be risk immune innovators asking and even demanding to be first to try out the new opportunity, while risk-allergic laggards retreat to the rear of the line. In between the innovators and laggards, the model identifies three additional communities; the early adopters, the early majority and the late majority. “The Chasm” is found between the early adopters and the early majority. Graphically the model is represented as a bell curve as shown in the *figure 3.6* below.

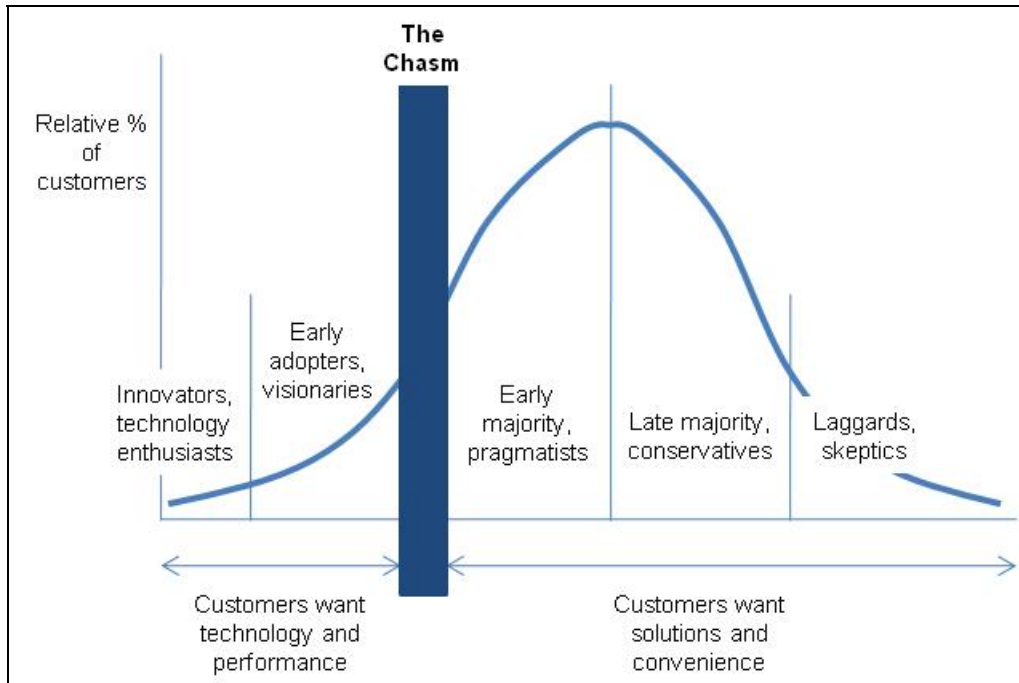


Figure 3-6. *The Technology Adoption Life Cycle (adapted from Moore et al., 1991).*

The idea of “The Chasm” is a simple one. This idea suggests that whenever truly innovative high-tech products are first brought to the market, they will initially enjoy a warm welcome in an early market made up of technology enthusiasts and visionaries but then will fall into a chasm, during which sales will falter and often plummet. If the products can profitably cross this chasm, they will gain acceptance within a mainstream market dominated by pragmatists and conservatives. As for product-oriented enterprises virtually all high-tech wealth comes from this third phase of market development, where crossing the chasm becomes an organisational necessity.

The reason for the occurrence of the chasm can be ascribed to the great differences in the mindset of the visionaries (early adopters) and the pragmatists (early majority). The intuitive visionaries would break away from the pack by taking risks and seeking what is possible, while the analytical pragmatists would stay in the herd by managing risks and pursue what is probable. The visionaries would buy in on a product of which they can

see the value without the product being complete, while the pragmatists would demand a 100 percent solution to their problem called a whole product.

The idea of a whole product has been popularized by Levitt (1983), and is defined in terms of the chasm as the minimum set of products and services necessary to ensure that the target customer will achieve his or her compelling reason to buy.

Moore (1995) states that the key to a winning technology deployment strategy for crossing the chasm, is to identify a single target segment of pragmatists customers in a mainstream market segment and to accelerate the formation of 100 percent of their whole product. The goal is to win a niche foothold in the mainstream as quickly as possible, which would assure a firm to cross the chasm. The transition point (the chasm) is illustrated in *figure 3.7* after which product performance would be seen as sufficient.

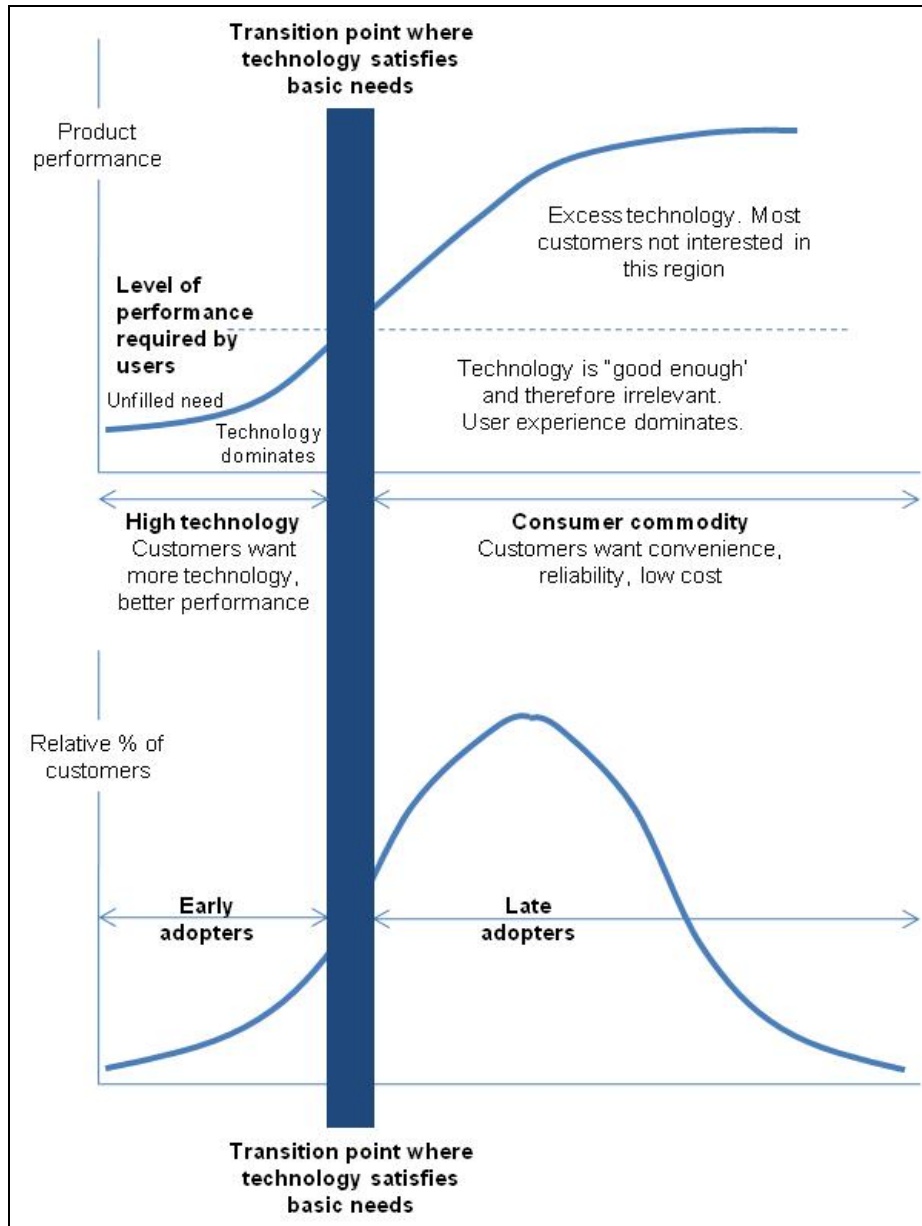


Figure 3-7. The chasm in relation to product performance.

Product performance improvement pursued after crossing the chasm is mostly seen as excess technology as most are not interested in this region. User experience would dominate, with the visionaries and pragmatists adapting to it already causing the technology to be good enough and better product performance would be irrelevant.

### 3.3. Protecting technology

#### 3.3.1. Introduction

In consulting firms, technical aids are developed all the time (technology and innovations) which are captured as the core value adding tools of the business into a “blue print”. In general, consultants appear to be *bricoleurs* (Weick, 1993), meaning that their skills and service offering comes from various disciplines. They have broad repertoires from which they assemble their way of working in a concrete situation. A repertoire is most importantly built through the consultant’s reflection on his or her own experience (Visscher, 2006).

Major consulting firms have a global knowledge network at their disposal, enabling them to solve nearly any specialist problem as an expert on the subject matter would be only a phone call and a plane ticket away. This way of knowledge networking triggers the development of innovations as new solutions are developed across various disciplines by people with unique skill sets.

Consulting firms are also accountable for many publications made in various business reviews. Mckinsey and company publish more papers yearly in the Harvard Business Review than any other consulting firm. They also publish the Mckinsey Quarterly which is well renowned amongst business circles, and according to some, even receive more credit for some of its publications than the Harvard Business Review would receive. Monitor has published more that 80 papers in the Harvard Business Review.

### 3.3.2. Tacit knowledge

Polanyi (1967) describes tacit knowledge as knowing more than we can tell. This means that a person doing a certain task would over time do it in a specific way that works for him, but not be able to explain why he chose that way of doing it. Over time the person would formulate why his way of doing is best, and others can learn from it. Polanyi (1967) stated: *“...we can say that when we make a thing function as the proximal term of tacit knowing, we incorporate our body – or extend our body to include it – so that we come to dwell in it.”*

Polanyi (1969) argues that while tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly applied and thus understood. He concludes that all knowledge is either tacit or rooted in tacit knowledge, and that a wholly explicit knowledge is unthinkable.

Tacit knowledge is shown to account for a valid knowledge of a problem, for the scientist's knowledge to peruse it guided by his sense of approaching its solution, and for a valid anticipation of the yet indeterminate implications of the discovery arrived at the end (Polanyi, 1967). A more recent definition is that of Davenport and Prusak (1998), saying that tacit knowledge is personal knowledge in the form of skills, know-how, experience, intuition, insights, feelings and beliefs.

Tacit knowledge can thus be described as the gut feel that one develops for a problem, and can also be said to be the intellectual consequence of practical experience. The New Oxford Dictionary of English (NODE, 2001) defines tacit knowledge as: ‘understanding, implied, existing without being stated’.

Intellect can be seen as the consultant and thus the consulting firms' greatest attribute. Information used to do business with can be: publicly known; company classified

information; or protected by law. It is shown in *figure 3.8* (Schweitzer. 1996) how these various elements of information are interrelated in the information universe.

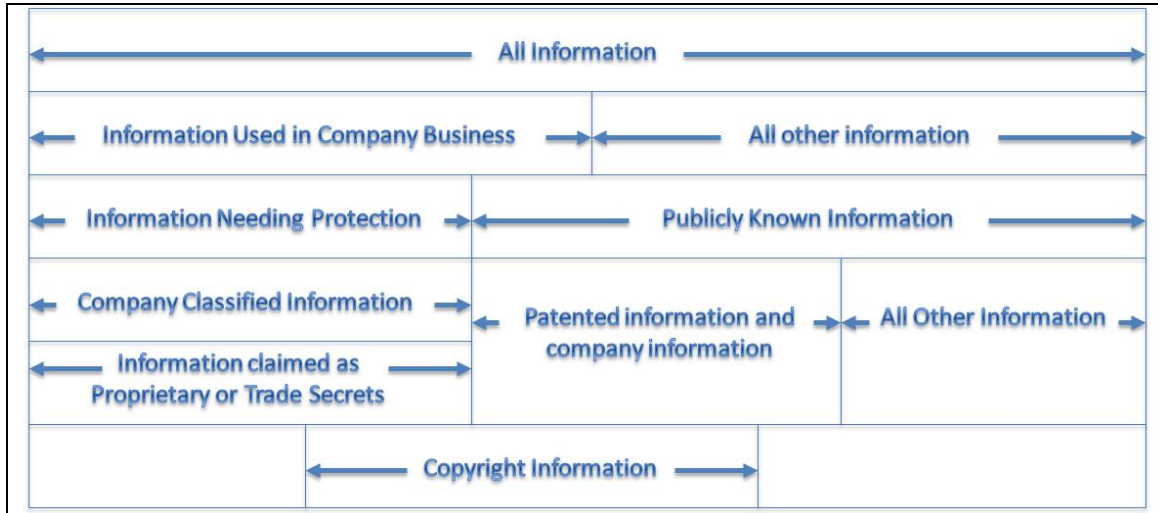


Figure 3-8. The information universe.

The New Oxford Dictionary of English (NODE, 2001) defines intellect as: knowing or understanding, the capacity of knowledge for rational or highly developed use of intelligence. The order of importance of intellect in a firm shows that intellect clearly resides in the firms' human brains as shown in *figure 3.9* (Earl et al., 1995).

Intellect in a firm shown in increasing importance is:

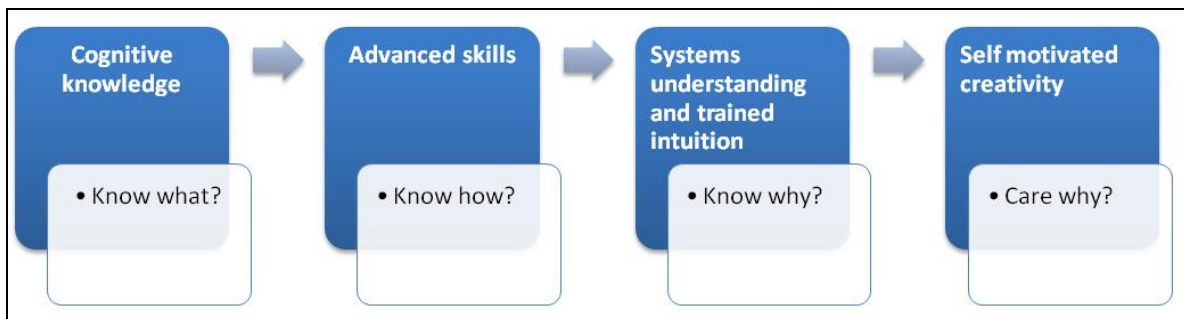


Figure 3-9. Intellect in a firm shown in increasing importance.

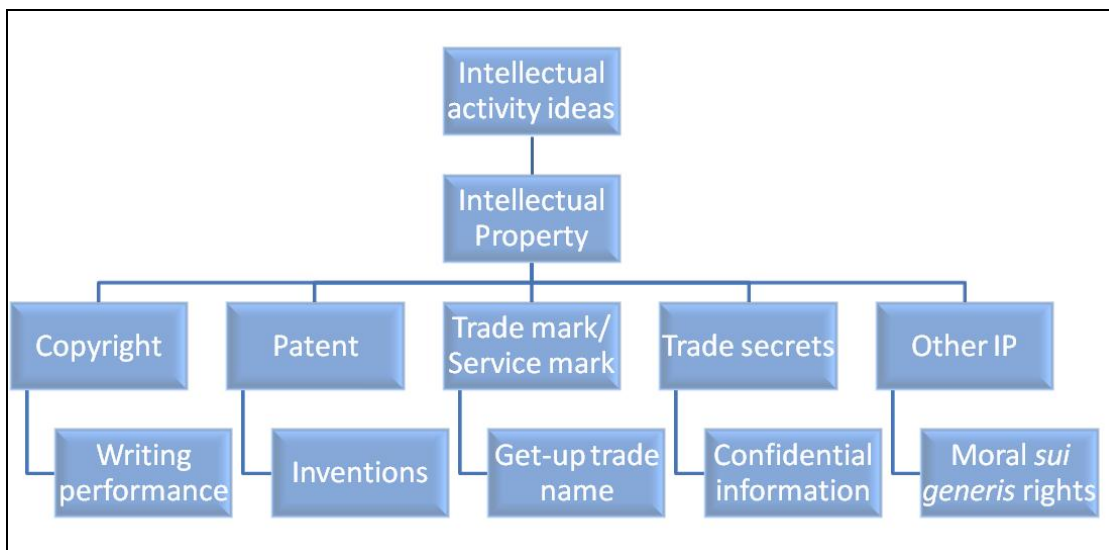


Quinn et al. (2005) states that the value of a firms intellect increase markedly as one moves up the intellectual scale from cognitive knowledge towards self motivated creativity. As the firm and the individuals' intellect evolve, motivated creativity has the potential to create IP, which is claimed to be proprietary or trade secret.

### 3.4. Intellectual assets

#### 3.4.1. Intellectual property

Proprietary information is that which has some commercial value and is closely held (Schweitzer 1996). Certain kinds of information can be protected by law as shown in the following information categories in *figure 3.10* (Cho & Hoyle, 1999) that follows.



*Figure 3-10. The intellectual property continuum.*

Protecting IP is crucial as it forms a great share of the assets owned by a company, especially in consulting firms whose business is knowledge in doing. The copyright system in most countries of the world rests on this fundamental principle of intellectual property. This provides a mechanism for the orderly buying and selling of rights, their

transfer or assignment, and the control of their use nationally and, to some extent, internationally.

Copyright is the legal right of creative artists or publishers to control the use and reproduction of their original works. (Encarta Dictionaries) Copyright does not have to be registered. Once a work piece has been created in tangible form—a book, painting, programme, or recording of a piece of music—the creators or rights owners can keep to themselves (or authorize to others) the exclusive right to copy, publish, perform, broadcast, or adapt their work. The duration, or legal term, of copyright varies internationally, but “life-plus-50-years” is common in many parts of the world—that is, copyright exists in a work for 50 years from the end of the year in which the author died.

The author or creator of a work is typically the owner of the copyright, unless he or she assigns that right to someone else, or completes the work in the course of employment, in which case the employer will own the copyright and be entitled to all the economic (but not the moral) rights in that work. There are few effective mechanisms so far for protecting this. Many regard the creation of sites on the World Wide Web as a way of promoting sales of their more valuable copyright material, through on-line journal subscriptions or marketing books and CD-ROMs (Microsoft Encarta, 2007). In South Africa, copyright is protected by the Copyright Act No. 98 of 1978.

In 1449 King Henry VI granted the first English patent to John of Utynam, giving him a monopoly on the making of stained glass for a period of 20 years. In return, John was required to teach the details of the invention to others, so that they too could use the technique to eventually establish a new industry in England (Microsoft Encarta, 2007). Patent protection is an exclusive right officially granted by a government to an inventor to make or sell an invention for a limited amount of time. The principle of granting a patent in exchange for revealing the details of the invention is still applied today, and is in most countries still limited to 20 years. More than 35 million patents have been

published over the past century, making patents the largest single source of technical information available in the world today. In South Africa, patents are protected by the Patents Act No 59 of 1978.

There is no copyright in a name or in the title of a book, however the owners of brand names and devices, or commercial catchphrases, may well have registered them as trademarks, which are protected in the United Kingdom by the Trademark Acts of 1938 and 1994. In addition, the law of passing off prevents misuse of someone's name, or of the design and overall appearance of a product, where confusion is caused or deception can be proved. Trademarks and service marks are protected in South Africa by the Trade Marks Act No 194 of 1993.

Trade secrets are secret formulas or techniques that are used to make a product, known only to the company that manufactures it, e.g. the secret recipe of the Coca Cola soft drink. Broadly speaking, any confidential business information which provides a firm with a competitive edge may be considered a trade secret. The subject matter of trade secrets is usually defined in broad terms and includes sales methods, distribution methods, consumer profiles, advertising strategies, lists of suppliers and clients, and manufacturing processes. While a final determination of what information constitutes a trade secret will depend on the circumstances of each individual case, clearly unfair practices in respect of secret information include industrial or commercial espionage, breach of contract and breach of confidence. Depending on the legal system, the protection of trade secrets forms part of the general concept of protection against unfair competition or is based on specific provisions or case laws on the protection of confidential information (WIPO, 2006). In South Africa, the Competition Act No 89 of 1998 protects firms against unfair competition, and thus the unauthorised use of a trade secret.

In the rest of the intellectual property sphere there are rights which are known as being *sui generis* to owners of a small class of works, such as intellectual property rights in mask works, ship hull designs, databases, or plant species. Encarta Dictionary defines *sui generis* as unique or occupying a class of its own, which means that intellectual property that cannot be classified under the previously mentioned mechanisms are protected as *sui generis* IP.

The situation in countries such as China, where it is politically (and financially) expedient to disseminate all intellectual property, whether or not it belongs to the individual concerned, can only lead to intellectual and electronic anarchy. The trading system becomes corrupt, the standard value of original creative work disappears, and the world's store of intellectual property—both current and future—would permanently and irreversibly bankrupt. Dissemination of the business processes of a firm would enable anyone to duplicate the business of that firm, removing its competitive advantage. It is therefore crucial for a firm to protect its IP, and more importantly, not to do business in countries without mechanisms to protect its IP.

As noted earlier, laws protecting intellectual property are drawn up nationally. However, some international conventions have attempted to create a system of common protection for IP. The most important for owners of IP are the Berne Convention of 1886 and the Universal Copyright Convention which dates from 1952, to which South Africa adheres to after becoming part of the World Trade Organisation (WTO) on 1 January 1995. South Africa is also a member of the World Intellectual Property Organisation and undersigned the Patent Cooperation Treaty (WIPO, 2002). The WTO currently has 153 undersigned members (countries) who have, by becoming members of this organisation, undertaken to govern and protect IP of firms doing business on their soil (WTO,2008).

Elaborate descriptions of technology were discussed earlier, but for now two definitions of *technology* (Microsoft Encarta, 2007) are of relevance to this section. One, being “*the study, development, and application of devices, machines, and techniques for manufacturing and productive processes*”, and the other “*a method or methodology that applies technical knowledge or tools.*” It can thus be argued that consulting firms, because of its workers’ intellectual capacity and tacit knowledge, create technology. This technology is protected by law as intellectual property with commercial value.

### **3.4.2. Technology deployment**

Technology in consulting firms, as described earlier, are either created or obtained through an exchange (through a purchase or exchange, or a merger or an acquisition). Technology has no commercial value unless it is deployed in order to add value to an endeavour in exchange for something. Technology starts with an idea which is developed (Product invention). The development concept is approved (Development of product and support phase) and sold in the deployment phase (Establish product and support delivery capability phase). Deployment of a technology is usually followed by implementation (Enterprise supply and support product), which enables its practical use. Whenever the technology becomes redundant, it is phased out as it is replaced by a better technology.

This study focuses on the deployment phase in the technology deployment strategy, which is represented in the (establish product and support delivery capability) phase in *figure 3.11* (adapted from Rottier, 1999) below.

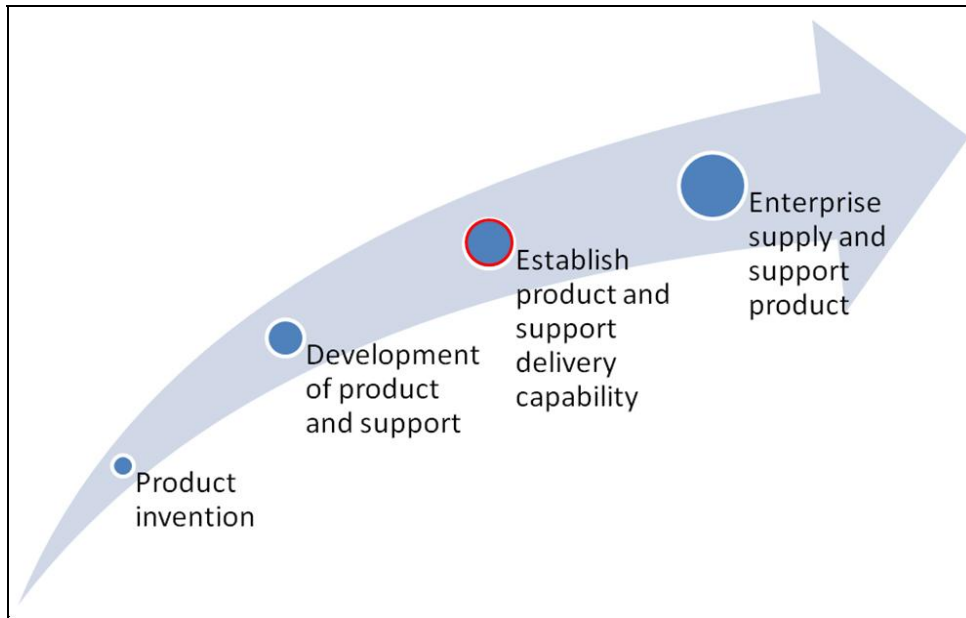


Figure 3-11. Conventional life cycles of an enterprise.

Alternatively, another perspective to this process is given by Du Preez et al.(2008) that is represented in the Fugle innovation process in *Figure 3.12* below.

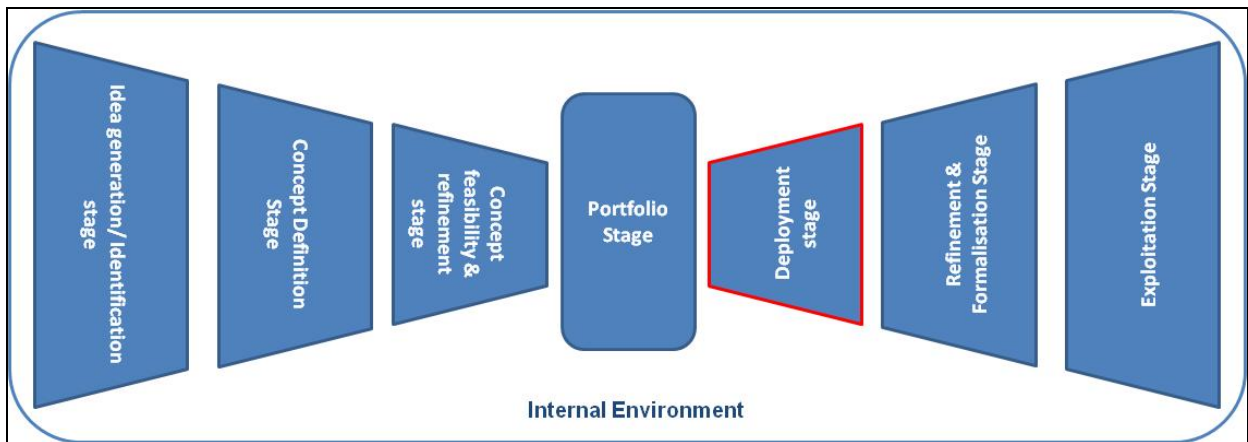


Figure 3-12. Phases in the Fugle Innovation Process.

Technology must be proven before it can be commercialised. Firstly, the owner of the technology must determine if the technology holds economical value and if it is commercially viable to develop and deploy the technology. Secondly, the technology must be technically viable and in most cases comply with certain pre-determinate standards of a system (Rottier, 1999).

Technology can be classified according to its compliance to the standards of a system (OA/OIT, 2007). Brief descriptions of these classifications are as follows:

- Research or emerging technologies are technologies that have the potential to become current. At the present time, they should be used only in pilot or test environments where they can be evaluated. Emerging technologies are likely to become a standard within 3 years of deployment. Research technologies are less widely accepted and it is too early to determine if they will become a standard.
- Current technologies are recommended for use as it is supported by standards and meet the requirements of architectures.
- Contain technology are no longer standard and will be phased out over time.
- Retire technologies are being phased out and a date for discontinuance has been set. At this stage possible risk such as vendor support is involved.

Firms therefore develop strategies to introduce new innovations into the market before old innovations are phased out, to ensure a constant flow of income. If technologies are introduced at the right times, then the income from growth of innovators to early adopters of a new technology, would compensate for the loss of sales from the previous technology shifting from the late majority to laggards. The following phenomena can be illustrated using sigmoid curves as shown in *figure 3.13*, where three different

technologies are strategically introduced over time in order to assure constant income over time.

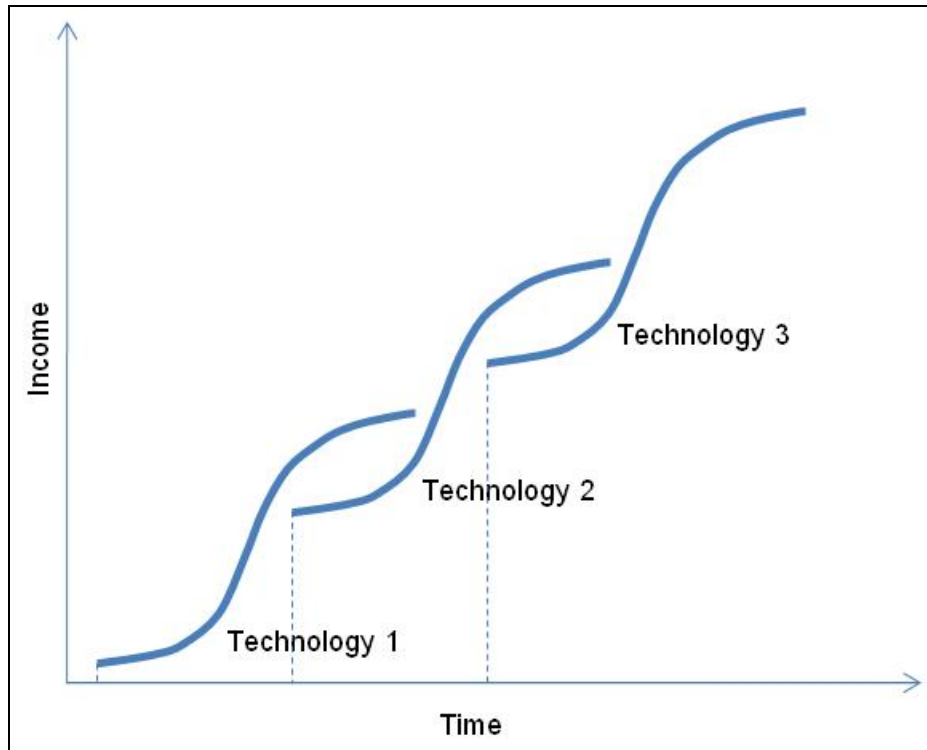


Figure 3-13. Three technologies are introduced at different times to ensure a continuous income stream.

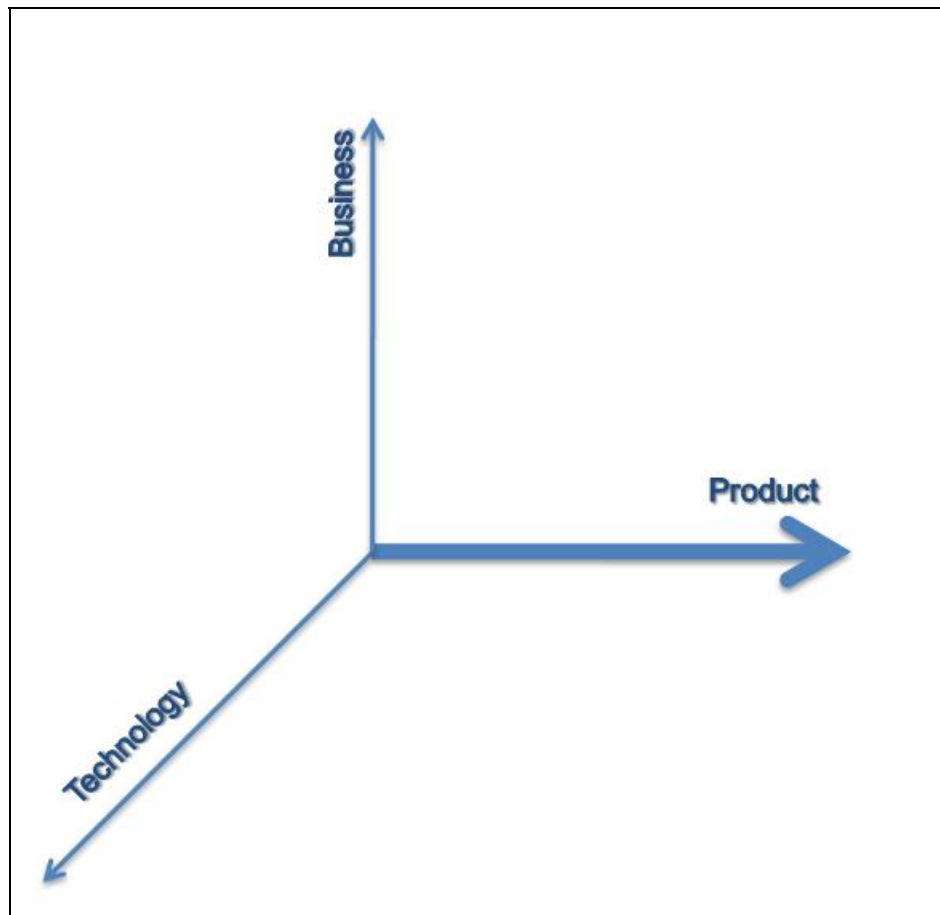
The deployment phase thus deals with how the development phase can be transformed towards implementation, which in short means the product (knowledge as a service) is sold.

### 3.4.3. Product

A product is comprised of various technologies. Hence, the sigmoid curve found in the technology life cycle therefore corresponds to that of the product life cycle. A product depends on technology and is thus represented on the y-axis of the Cartesian space as depicted in *figure 3.14* as the dependent variable. Products are no longer just single objects that are traded as commodities, and are the solution to the needs or desires of a



client in the form of hardware and services. One can argue that everything perceived as a product is actually a service which can include hardware. The facility that makes the obtainment of a product possible, like the availability of a cold drink in a vending machine, is actually a service of which the cost is included in that of the product. As this dissertation deals with knowledge organisations, the author would hereon refer to “product” as the value that a client would receive in exchange for payment, which includes any combinations of services and/or products.



*Figure 3-14. Product is depicted as the dependent variable on the Cartesian space.*

### 3.4.4. Product life cycle

The adoption of products can, like technologies, also be measured over time. Instead of measuring adoption over time, one would use sales per product over a certain amount of time as this measurement is much better defined, quantifiable, and more accurate than just using the latter. Like technologies, products can also be categorised according to where it stands in its life cycle. The product life cycle is generally divided into four sections: introduction; growth; maturity; and decline.

It is important to the decision makers in the firm to know where each one of their products are in its product life cycle as better strategies can be derived with the availability of this information in order to keep profitability high. Introduction is when a product is developed and introduced into the market. Growth occurs when consumers learn about a product and more people purchase it. The product becomes more competitive through modification, price adjustments, wider distribution and other initiatives. Fewer adjustments are made to the value offering in the maturity phase. Competing products might pose as a threat, and the product may be modified or marketed in a new way to keep profits strong. Sales decrease during the decline phase because of market saturation, obsolescence or other factors. Price discounts can be offered during this phase, or distribution can be widened. The product life cycle is illustrated in *figure 3.15* that follows (adapted from Moore et al., 1991).

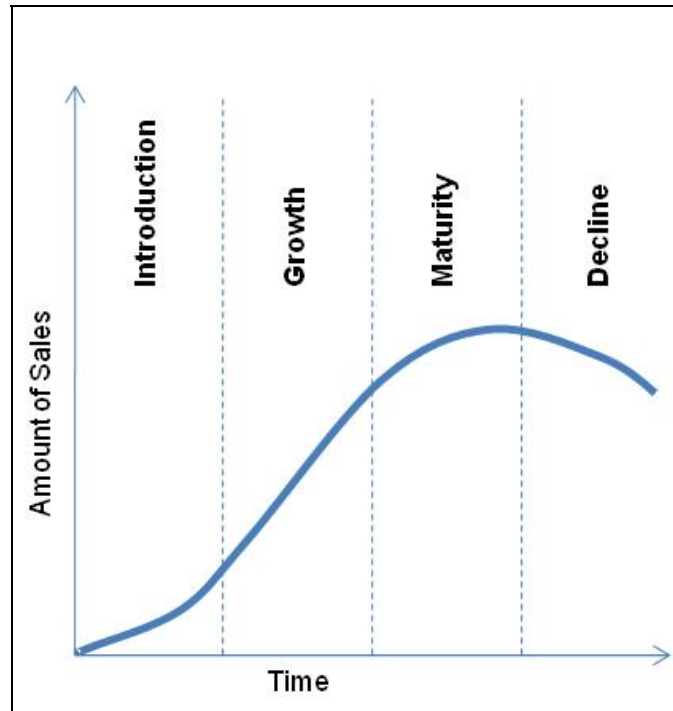


Figure 3-15. The product life cycle.

A process that parallels the product life cycle is that of market evolution. Industry follows stages that mirror the five stages of the product life cycle as a product category matures. Introduction is parallel to market crystallization where the latent demand for a product category is awakened with the introduction of the new product. Growth is parallel to market expansion, when additional companies enter the market and more consumers become aware of the product category. Maturity is parallel to market fragmentation where industry is subdivided into numerous well populated competitive groupings as too many firms enter the market. Decline is parallel to market consolidation when firms start to leave the industry due to stiff competition, falling prices and falling profits. Without sales the market will terminate because consumers no longer demand the product and companies stop producing it.

Alternative strategies to the product life cycle way of thinking are that of positioning strategies. There are three variations of positioning that can be used to break free from product life cycle thinking, with the goal of changing how consumers perceive the

product by positioning or often repositioning their products in unexpected ways. Three positioning strategies that marketers use to cause a mental shift at consumers are Reverse, Breakaway, Stealth Positioning (Young & Moon, 2005).

Reverse Positioning removes "sacred" product attributes while simultaneously adding new attributes that would typically be found only in a highly augmented products. This strategy is recommended for service companies, for example IKEA does not deliver products nor offer sales consultancy but added children drop-off, cafes and toys to their value offering.

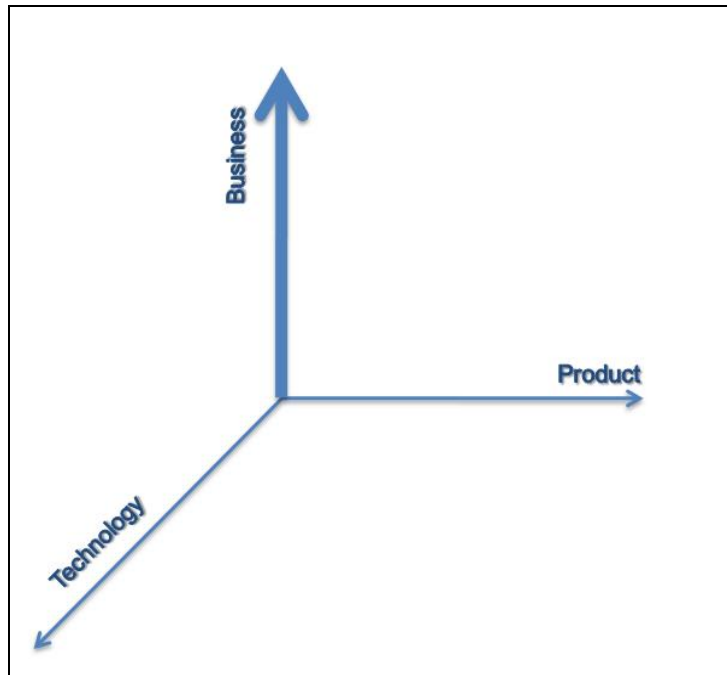
Breakaway Positioning associates the product with a radically different category and is recommended for packaged goods companies. By manipulating the cues of consumers of how they perceive and categorize a product, a firm can change how consumers perceive a product; for example Swatch is no longer sold as Swiss watches but as fashion accessories.

Stealth Positioning gradually interests consumers for a new offering by hiding the product's true nature, and is recommended for technology companies. Sony's AIBO robot was for example positioned as a lovable pet that shifted consumer's attention away from its major limitations as a household aide. It apparently even turned elderly people into early technology adopters when they were purchasing a house hold aid positioned as a robot pet.

### **3.4.5. Business**

In the 1960's the Boston Consulting Group (BCG) offered a new way to look at strategic planning activities by approaching views of the firm as a portfolio of businesses, with each one offering a unique contribution to growth and profitability. These largely independent units have strategic direction that can be addressed separately as opposed

a single firm strategy (Hax & Majluf, 1983). Business as a part of the enterprise engineering solution space is shown in *figure 3.16* below. Better technologies would result in better products, products that are correctly positioned would result in better sales, and more sales would result in a growing market share and profits to the firm.



*Figure 3-16. Business is depicted as the applicate on the Cartesian space.*

The market share owned over time by these firms, as depicted in *figure 3.17*, are influenced by the value offering to the client, which corresponds to the sigmoid curve found in the technology and product life cycle (Shewe & Smith, 1980).

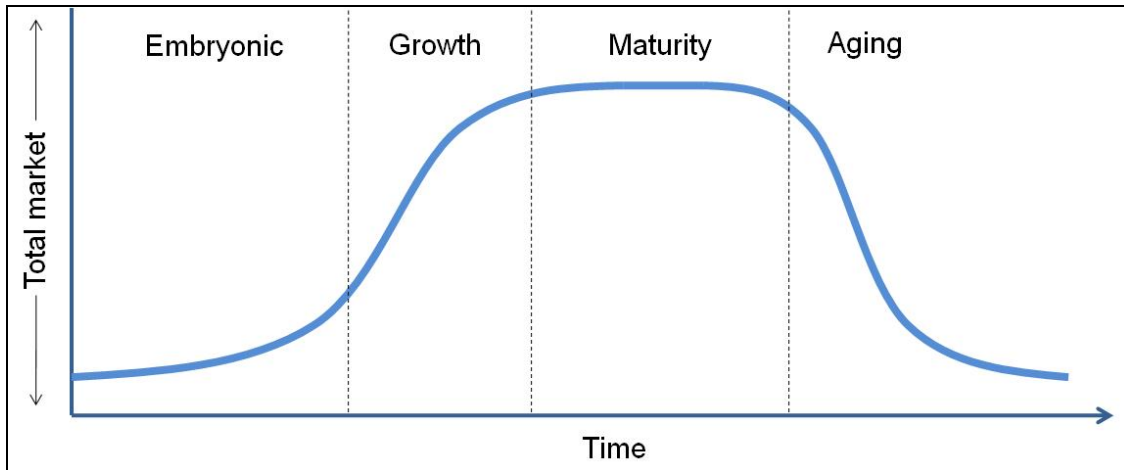


Figure 3-17. The business life cycle and its four stages.

The business life cycle postulates that business follows a process of evolution with four stages: embryonic, growth, maturity and aging. The key indicator to the attractiveness of a business is the market growth for the industry in which the business operates. When the whole industry is growing fast a firm can penetrate that industry aggressively and increase its market share significantly without automatically eroding the sales of competitors. Sales will continue to grow for the majority of the key competitors in the industry but it can happen at the same time that their market share is shrinking. High growth businesses can be separated from low growth businesses by comparing the growth for that industry with the growth of the business. Businesses above that point can be classified as high growth businesses, and businesses below that point can be classified as low growth businesses. These business life cycle concepts are consistent with service firms as well as manufacturing firms (Henz, 1986).

There are many challenges for knowledge organisations in determining their share of the market as it is firstly difficult to quantify knowledge and profit on the knowledge deployed, and secondly complicated to classify a knowledge organisation according to the industry in which it competes.

## 3.5. The enterprise engineering planes

### 3.5.1. Planes in the Cartesian space

The Cartesian space can be used to illustrate up to three dimensions. In enterprise engineering, the Cartesian space is traditionally used in this way to show a point that represents a current scenario of a firm regarding the different life cycles. Something more complicated than coordinates in the Cartesian space are lines depicting vectors indicating the magnitude and direction of change. Vectors are thus used to indicate the magnitude and direction of change that should occur in order for the firm to find itself in a different (preferred) state. Other shapes can be represented in this space as well, and this study attempts to use planes in order to further the understanding and insights with regard to the enterprise engineering space.

The area of a plane perpendicular to an axis is equal to the product of the other two axes. The magnitude of the area is determined by the magnitude of the axes values, and is thus a linear reflection of how changes occur in the value of the axes. The challenge in expanding the enterprise engineering space is to determine what the planes on the Cartesian space can represent, and what representations would add value to the model. It is therefore suggested to use an indicator that can be measured to greater detail than just the various lifecycles, and that would take into account the combination of these various life cycles of where a business may find itself. The author suggests as shown in *figure 3.18*, that competence, susceptibility and segmentation are the most appropriate descriptions of the three planes.

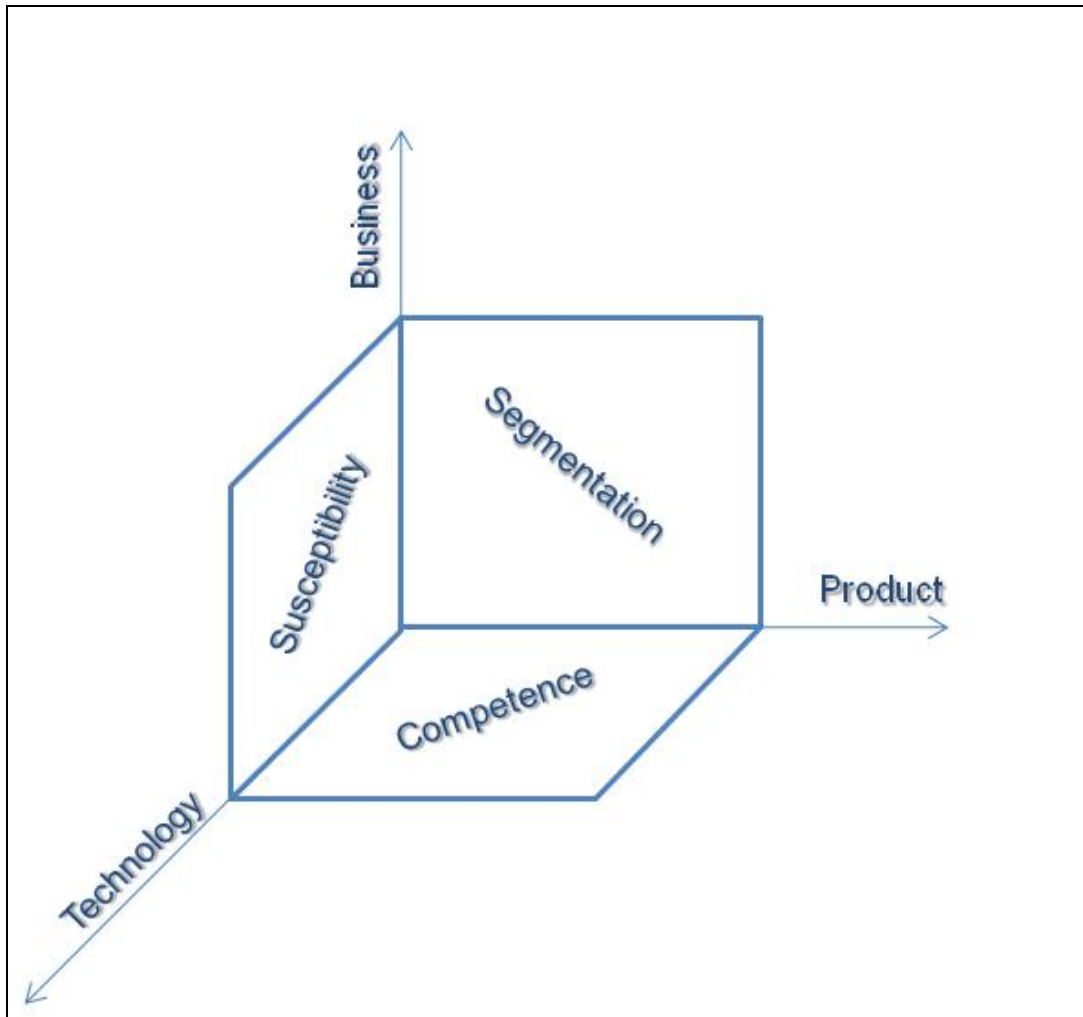


Figure 3-18. The planes and axis of the enterprise engineering solution space.

The proofs of these definitions on the Cartesian planes of the enterprise engineering space are made by means of mathematics and reason. A few assumptions and definitions follow:

T = an array of technologies consisting out of m technologies and  $T_m$  a singular technology.

P = an array of products consisting out of n products and  $P_n$  a singular product.

B = an array of businesses consisting out of o businesses and  $B_o$  a single business.

therefore,



$$T = \{T_1, T_2, T_3, \dots, T_m\}$$

$$P = \{P_1, P_2, P_3, \dots, P_n\}$$

$$B = \{B_1, B_2, B_3, \dots, B_o\}$$

where m, n, and o are integers larger than 0.

### 3.5.2. Competence

From a geometric perspective, the area of the competence plane is determined by the product of technology and product. The size of this plane then represents what is needed for the conversion of technology into product. From a mathematical perspective, it can be said that:

$$\text{Competence} = [\text{Technology}] \times [\text{Product}]$$

$$= \{T\} \times \{P\}$$

$$= \{T_1, T_2, T_3, \dots, T_m\} \times \{P_1, P_2, P_3, \dots, P_n\}$$

$$= T_1 P_1 + T_1 P_2 + T_1 P_3 + \dots + T_1 P_n + T_2 P_1 + T_2 P_2 + T_2 P_3 + T_2 P_3 + \dots + T_2 P_n + T_3 P_1 + T_3 P_2 + T_3 P_3 + \dots + T_3 P_n + T_m P_1 + T_m P_2 + T_m P_3 + \dots + T_m P_n$$

$$= \text{Competence}_{11} + \text{Competence}_{12} + \text{Competence}_{13} + \dots + \text{Competence}_{m \times n}$$

Which can also said to be:

$$\text{Competence} = \begin{pmatrix} T_1 P_1 & T_1 P_2 & \dots & T_1 P_n \\ T_2 P_1 & T_2 P_2 & \dots & T_2 P_n \\ \dots & \dots & \dots & \dots \\ T_m P_1 & T_m P_2 & \dots & T_m P_n \end{pmatrix}$$

thus,

$$\text{Competence}_{11} = T_1 P_1$$

Therefore, a certain competence ( $\text{Competence}_{11}$ ) is required to convert or deploy a certain technology ( $T_1$ ) into a specific product ( $P_1$ ). The cross product of the array of technologies and array of product gives a matrix of competencies required to convert the various technologies into various products. This is a very simplified way in which to approach the relation between competence, technology and product, and basic assumptions will immediately rule out some solutions in the matrix. The same goes for all matrix calculations in the rest of this chapter.

Competence is defined as the ability to do something well, measured against a standard, especially ability required through experience or training (NODE, 2001). The conversion of technology into a product is relevant to consider in terms of enterprise engineering, is measurable and requires a certain level of human skills and experience.

It is therefore argued, as shown in *figure 3.19*, that the measurement of competence would rightfully project the success that a firm would have in converting a technology into a product.

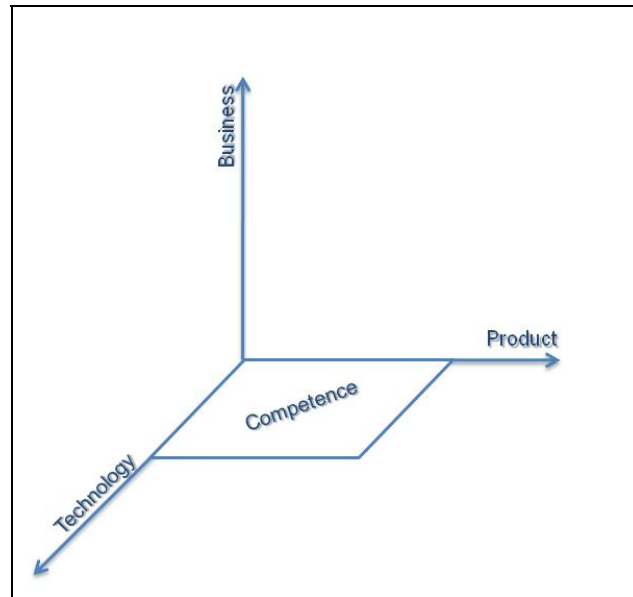


Figure 3-19. Competence as the plane between Product and Technology in the EE solution space.

The competence of a firm can be argued to be a function of the resources and capabilities of the firm. During the early 1990s, ideas concerning the role of resources and capabilities as the primary basis for firm strategy and the primary source of profitability combined into what has become known as the resource based view of the firm (Barney, 1991., Collins & Montgomery, 1995). Resources would be an indication of the amount of tangible resources, intangible resources, and human resources dedicated to a cause, and capability would be an indication of the qualification, skill, and experience of the human resource. Capability therefore represents a facility to carry out a particular set of operations, whereas the amount of resources would refer to the level of empowerment of the workforce to be more efficient by providing a source of help or information.

### 3.5.3. Segmentation

It is shown in a similar fashion that the area of the segmentation plane is determined by the product of business and product as depicted in *figure 3.20*. Thus, from a mathematical perspective the same argument follows:

$$\text{Segmentation} = [\text{Business}] \times [\text{Product}]$$

Concluding in the same way as with Competence that,

$$\text{Segmentation} = \begin{pmatrix} B_1P_1 & B_1P_2 & \dots & B_1P_n \\ B_2P_1 & B_2P_2 & \dots & B_2P_n \\ \dots & \dots & \dots & \dots \\ B_oP_1 & B_oP_2 & \dots & B_oP_n \end{pmatrix}$$

thus,

$$\text{Segmentation}_{11} = B_1 P_1$$

A product ( $P_1$ ) needs to be deployed in the market in order to create business ( $B_1$ ), and the segmentation of the market would enable positioning ( $\text{Segmentation}_{11}$ ) of the product. The cross product of the array of business and array of product gives a matrix of segmentations required. Adherence to these segmentations would focus business strategies to more specific targets and creates measurable targets for marketing initiatives, as this would indicate what segments are ruled out by certain assumptions and what segments will deliver value.

The size of this plane then represents the level of segmentation required to know with ease how products can be positioned within the right markets. Segmentation is defined as the division of something into segments, where products are allocated to market segments in which business will best commence.

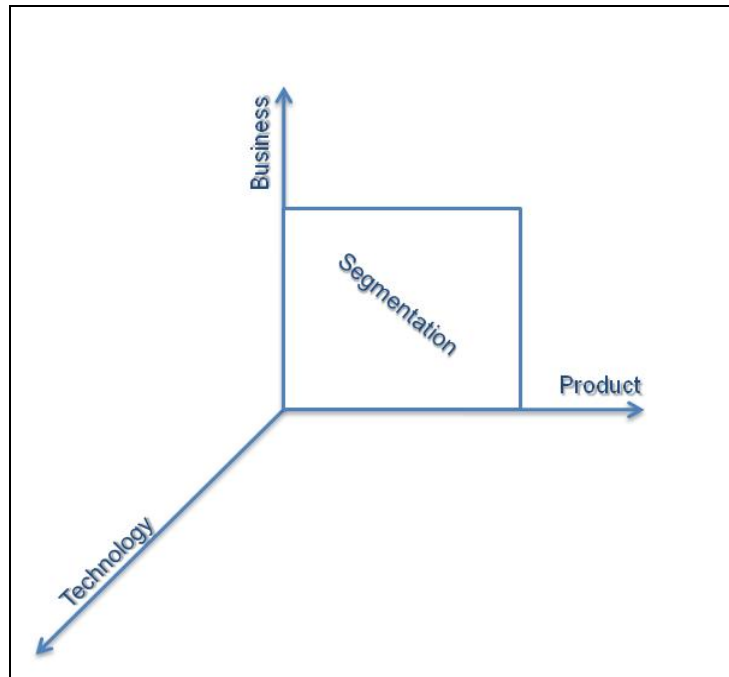


Figure 3-20. Segmentation as the plane between Product and Business in the EE solution space.

Segmentation of the market roots back to the fundamentals of marketing management, and serves the following functions:

- To identify segments large enough to serve profitably;
- to identify segments that can effectively be reached by marketing efforts; and
- to help develop marketing programs.

Firms risk wasting expenditures of marketing and prospecting on disinterested people when a clear target is not defined. There are four major variables used in segmenting consumer markets: geographic, demographic, psychographic and behavioural.

Geographic segmentation divides a market by country, state, region, county, and city. Demographic segmentation divides a population based on age, gender, income, education, and ethnicity just to name a few, to reach a homogeneous group of people. Markets that are not consumer markets would focus on business to business marketing,

and would execute demographic segmentation based on the size and nature of the firm e.g. by taking into account the annual turnover, number of employees, and industries served. Psychographic segmentation divides the market by psychological differences like lifestyle and personality. Firms, like humans can also be segmented in this way by taking corporate culture or climate into account. Behavioural segmentation divides the market by observable purchase behaviours like usage, purchase occasion (e.g. consumables vs. seasonal purchases), brand loyalty and responsiveness to price and promotion. Firms can like humans, be segmented in this way by focusing again on corporate culture and climate.

Marketing segments must comply with the following criteria before being considered a target:

- Measurability – the segment can be identified and quantified.
- Accessibility – the segment can be reached logistically as well as with marketing initiatives.
- Substantiality – the segment is large enough making it worth the effort.
- Profitability – there are enough profits to make targeting it worth while.
- Compatibility with competitors – competitors are not as interested in the segment or it is not worth their effort.
- Effectiveness – the firm has adequate capabilities to service the desired segment.
- Defend ability - the firm can defend itself against a competitors attack.

It is thus shown that segmentation has a significant impact on the product and business life cycles.

### 3.5.4. Susceptibility

It is shown in the same fashion that the area of the susceptibility plane is determined by the product of business and technology as depicted in *figure 3.21*. Thus, from a mathematical perspective the same argument follows:

$$\text{Susceptibility} = [\text{Business}] \times [\text{Technology}]$$

Concluding in the same way as with Competence that,

$$\text{Susceptibility} = \begin{Bmatrix} B_1T_1 & B_1T_2 & \dots & B_1T_m \\ B_2T_1 & B_2T_2 & \dots & B_2T_m \\ \dots & \dots & \dots & \dots \\ B_nT_1 & B_nT_2 & \dots & B_nT_m \end{Bmatrix}$$

thus,

$$\text{Susceptibility}_{11} = B_1T_1$$

A new technology ( $T_1$ ) introduced into the market by a firm ( $B_1$ ) needs to be adopted by firms within that market, and the size of the susceptibility plane then gives a measure of how open or susceptible ( $\text{Susceptibility}_{11}$ ) that market is to adopt new technologies. The cross product of the array of business and the array of technology gives a matrix of susceptibility required in each business sector in order for it to adopt the specific technology.

Susceptibility is defined as the likelihood of being affected or a tendency to be affected by a specific thing.

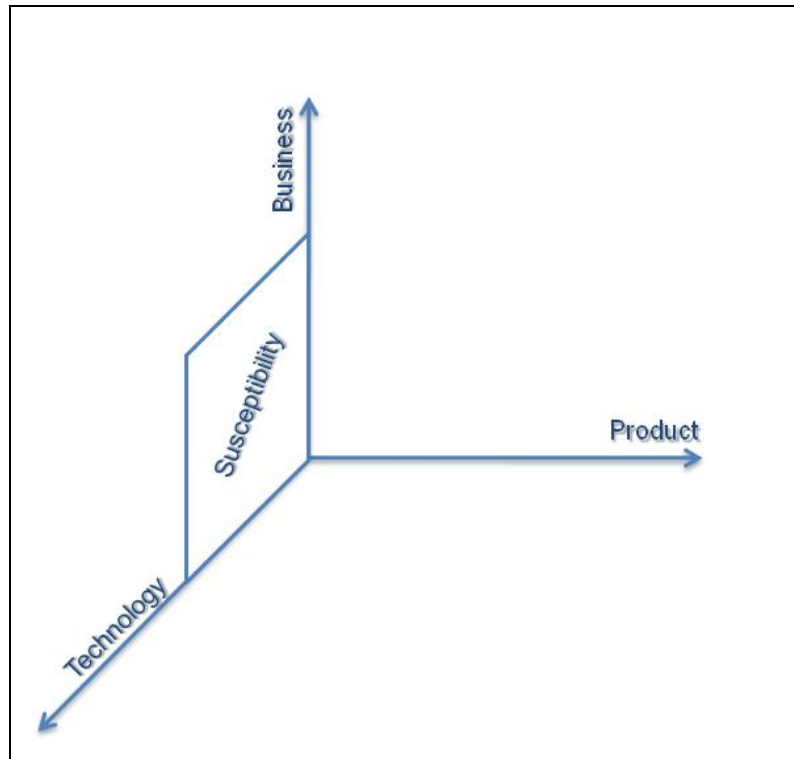


Figure 3-21. Susceptibility as the plane between Technology and Business in the EE solution space.

An example of a variable that can be used to measure susceptibility would be the South African crime rate in the security industry. Manufacturers of burglar bars would only enter markets with high crime rates, which would be an indication of how well users will adopt the new product. The chasm needs to be crossed for any technology to be successful, which means that adaptor patterns needs to shift from that of visionaries to pragmatists. Any indication providing proof to pragmatists as to why they should adopt a certain technology would be a good indicator to use for measuring susceptibility.

### 3.6. The enterprise engineering space

#### 3.6.1. The value proposition

The volume of a cube or shape in the Cartesian space would represent the value proposition of the firm as depicted in *figure 3.22*. The area of this cube can be



determined if any two of the three planes are known, because all three axis values must be known in order to know the area of two planes.

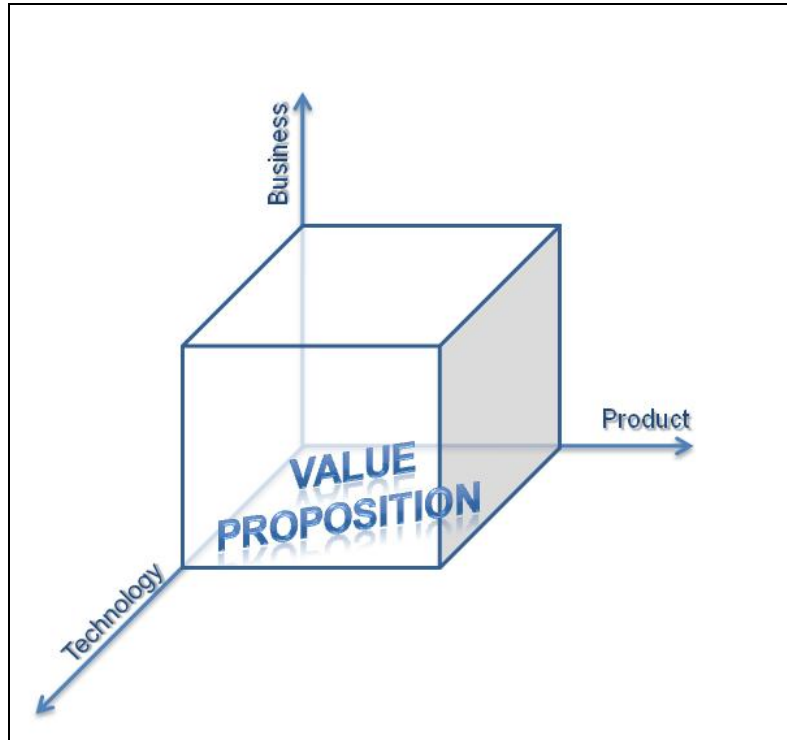


Figure 3-22. The value proposition represented in the Cartesian space, determined by technology, product and business.

The value proposition can interchangeably be used with core competence for the purposes of this dissertation. Core competence is calculated with the cross product between competence and business.

$$\text{Core competence} = [\text{Competence}] \times [\text{Business}]$$

$$= \begin{Bmatrix} T_1P_1 & T_1P_2 & \dots & T_1P_n \\ T_2P_1 & T_2P_2 & \dots & T_2P_n \\ \dots & \dots & \dots & \dots \\ T_mP_1 & T_mP_2 & \dots & T_mP_n \end{Bmatrix} \times \{B_1, B_2, B_3, \dots, B_o\}$$

=

$$\left\{ \begin{array}{l} B_1T_1P_1 + B_1T_1P_2 + \dots + B_1T_1P_n; B_2T_1P_1 + B_2T_1P_2 + \dots + B_2T_1P_n; \dots; B_oT_1P_1 + B_oT_1P_2 + \dots + B_oT_1P_n \\ B_1T_2P_1 + B_1T_2P_2 + \dots + B_1T_2P_n; B_2T_2P_1 + B_2T_2P_2 + \dots + B_2T_2P_n; \dots; B_oT_2P_1 + B_oT_2P_2 + \dots + B_oT_2P_n \\ B_1T_3P_1 + B_1T_3P_2 + \dots + B_1T_3P_n; B_2T_3P_1 + B_2T_3P_2 + \dots + B_2T_3P_n; \dots; B_oT_3P_1 + B_oT_3P_2 + \dots + B_oT_3P_n \\ \dots \\ \dots \\ \dots \\ B_1T_mP_1 + B_1T_mP_2 + \dots + B_1T_mP_n; B_2T_mP_1 + B_2T_mP_2 + \dots + B_2T_mP_n; \dots; B_oT_mP_1 + B_oT_mP_2 + \dots + B_oT_mP_n \end{array} \right\}$$

thus,

$$\text{Core competence}_{11} = B_1T_1P_1 + B_1T_1P_2 + \dots + B_1T_1P_n$$

This means that a specific core competency or value proposition of the firm (Core competency<sub>11</sub>) is the sum of all its products within a market in which a specific technology is deployed ( $B_1T_1P_1 + B_1T_1P_2 + \dots + B_1T_1P_n$ ). An example of this can be the ability of a network services provider to deploy cell-phone services technology in Mozambique through various products offering the service of connectivity. They (the network services provider), therefore possess a certain core competency or value proposition which enables them to deploy a technology in a market with various products.

The total value proposition is all the factors that contribute to the value of the firm. The value added is the difference between the cost of inputs and the market value of outputs. It is the value that a firm adds to its bought-in materials and services through its own production and marketing efforts within the firm. The firm would be distinguished from others by its core competency, which refers to the combination of individual technologies and production skills that underlie a company's multiple production lines and critically underpin the firm's competitive advantage. Core competencies concern communication, involvement, and deep commitment to working across organisational boundaries (Prahalad & Hamel, 1990).

## **3.7. Pragma's relation to the enterprise engineering framework**

### **3.7.1. Pragma as a case study**

Pragma's purpose is to improve the performance of physical assets by providing physical asset management services to its clients. By optimising the performance of physical assets they empower firms to maximise their return on assets. These firms do not have accurate reliable data to make informed decisions on performance improvements.

Pragma delivers a complete asset management solution throughout the life of the asset, which comprises a long term physical asset management service partnership. Pragma's aim is to take full responsibility of all physical asset management business processes via the Pragma Asset Care Centre (ACC). The Pragma ACC is concerned with the collection, analysis and interpretation of physical asset management information in order to optimise asset performance.

### **3.7.2. The axes of Pragma – Technology, Product and Business**

The axes refer to the axes of the solution space which are technology, product and business. The ACC service relies on methodologies, processes and software as their enabling technologies. These technologies are:

- AMiP™ - Asset Management Methodology
- AIV methodology – Asset Identification, Verification and Condition Assessment methodology
- Change management process; and
- Enterprise asset management system – ON KEY™

The product is deployed by an ACC assigned to a client in the form of a service. At each ACC, a team of professional engineers with the necessary supporting infrastructure, tools, technology and administrative support) are completely responsible for each client's asset care needs and the asset management improvement process. The ACC deliver the following services:

- Maintaining an up-to-date Asset Register
- Maintaining the physical asset management business processes
- Maintaining work execution to service requirements.

These services are intended to facilitate the long-term improvement of asset performance throughout its life cycle. Business therefore comes from big asset owners globally, who and are divided according to the industries they serve:

- Fast moving consumer goods ;
- Packaging and bottling;
- Petro chemical;
- Mining and manufacturing; and
- Medical services.

### **3.7.3. The planes of Pragma – Susceptibility, Segmentation, and Competence**

The planes of the solution space derived interesting measures. Susceptibility deals with how well the technology will be accepted by business. Various industries (and therefore businesses) respond differently to this value proposition. Big assets are usually found in mining and manufacturing operations, and these kinds of firms are very susceptible to the PAM service. A newer industry to make use of PAM is the medical industry, where smaller yet more expensive machines are serviced as assets. A culture of asset management still needs to be fostered among IT and Telecommunication firms, as they

are not adopting this service as well as other industries even though they own as big assets.

Perceptions also differ among countries and cultures when it comes to asset management and preventative maintenance. Some nations are more likely to outsource their asset management improvement processes than others, and measures of susceptibility are thus very useful in new business development initiatives.

Segmentation deals with how well a product (or service) can be deployed for a client that belongs to a certain industry. Pragma clustered the various industries around Mining and Manufacturing, FMCG, Petrochemicals, Packaging and Bottling and Medical. A good breakdown of industry and of services would allow segmentation initiatives to take place that will indicate what industries and services are most lucrative.

Competence deals with how well a technology can be deployed as a service. This measure of competence has to do with the resources and capabilities available to the firm. A professional engineer possesses over the required capabilities required to deliver the service, which in turn is made possible by the resources that provides the infrastructure for making the service profitable.

#### **3.7.4. The area of Pragma – value proposition**

This explanation of the solution space of Pragma creates a picture of all the ingredients to their value proposition. An engineer at an ACC will for instance install the ON KEY™ software at a winery that belongs to the packaging and bottling industry in order to monitor the condition of the bottling machines. A service is therefore delivered using a technology in order to deliver knowledge to a firm belonging to a specific industry.

Pragma, in the simplest sense, tries to answer at least 9 questions that are required in order for their clients to effectively manage their physical assets:

- What does the client own?
- In what condition are the clients' assets?
- What are the clients' assets worth?
- Where are the clients' assets located?
- Who are using the clients' assets?
- Are the clients' assets used correctly?
- What are the clients' remaining asset lives?
- What are the clients' ongoing maintenance costs?
- What are the clients' future asset needs?

Pragma delivers the service of answering at least these 9 questions as their value proposition.

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## 4. Knowledge Organisations

*“(Knowledge)..is the only thing that can be stolen from you which you’ll still have after the theft has been committed.” – Anton P. Botha*

And yet, the theft of knowledge has an inherent opportunity cost, including loss of competitive advantage.

This part of the dissertation introduces the reader to the unique challenges in establishing an extended footprint in a service or consulting firm.

They are discussed under the following headings:

- The multiplication of knowledge;
- Consultancies as knowledge organisations;
- The consulting profession;
- The value disciplines of market leaders;
- Process phases in externally commercializing technology assets; and
- Pragma as a consultancy.

## 4.1. The multiplication of knowledge

### 4.1.1. Introduction

Waterman (1993) articulates that the goal of artificial intelligence (AI) scientists had always been to develop computer programs that could in some sense think, that is, solve problems in a way that would be considered intelligent if done by a human. Turban and Frenzel's (1992) definitions of data, information and knowledge in artificial intelligence are:

- *Data*, i.e. numeric (or alphanumeric) strings that by themselves do not have meaning. They can be facts or figures to be processed.
- *Information*, i.e. data organised so that it is meaningful to the receiver of the information.
- *Knowledge* has several definitions: A clear and certain perception of something; Understanding; Learning; All that has been perceived or grasped by the mind; Practical experience and skill; Acquaintance or familiarity; Cognisance, recognition; and Organised information applicable to problem solving.

The relationship between the above can be illustrated graphically as depicted in *figure 4.1* (Botha et al., 2008) as follows.

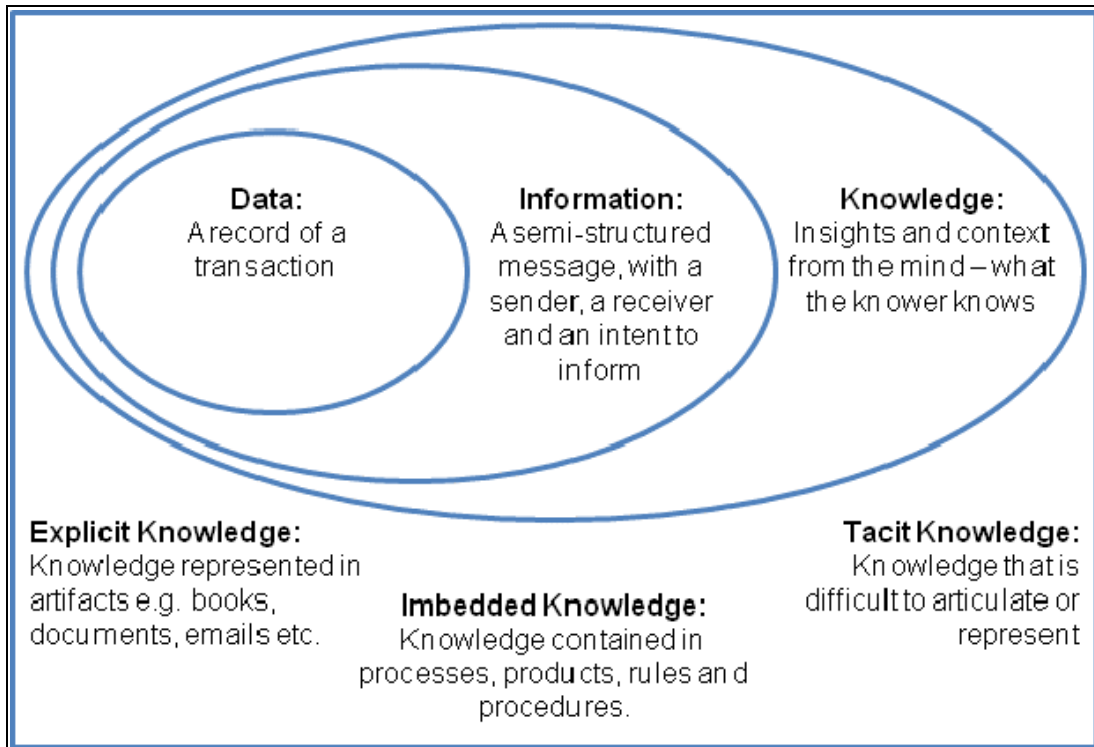


Figure 4-1. Data, information and knowledge.

In business and organisations in general we mainly encounter knowledge in three forms:

- *Explicit knowledge*, as represented in databases, memos, notes, documents, etc.;
- *Embedded knowledge*, which is encountered in business rules, processes, manuals, in the organisations culture, codes of conduct and ethics etc.; and
- *Tacit knowledge*, which is present in the minds of human stakeholders.

It can be seen that there are various perspectives on the notion of knowledge and its uniqueness and counterintuitive nature. As an industrial engineer, it is important to see knowledge as a resource and realise that it is much different from the key ingredients of the 'old' economy - capital, labour and land – in many important ways.

Coleman (1997) describes these differences and characteristics of knowledge as opposed to traditional resources in many ways such as:

- The ability of knowledge to multiply;

- if knowledge is shared it belongs to all who share it;
- knowledge costs little to reproduce but is expensive to create;
- spreading knowledge electronically e.g. via email is virtually free;
- knowledge is difficult to measure, weigh or count;
- knowledge measurement happens indirectly such as the number of patents issued;
- a key characteristic of knowledge is its time value; and
- knowledge and insight only holds value for a short time before it is replenished.

Knowledge comes in tacit and explicit varieties with the following characteristics:

- *tacit*
  - owned by individuals and very personal;
  - a set of skill, understanding, experience and insights;
  - also embedded in products or in the company's processes;
- *explicit*
  - can be owned by organisations, individuals or groups;
  - can be recorded or described;
  - documentation is often in electronic form in corporate documents, PC's or on the internet.

Multinational firms are intensive in the use of knowledge based assets, which caused the emergence of the 'knowledge-capital model' of the multinational enterprise (Markusen, 1995, 1998). This theory is constructed around the three important properties of these assets, and the idea that multinational firms are intensive in the use of knowledge based assets. These are as follows:

- *Transportability or fragmentation* – knowledge based assets can be supplied to geographically dispersed production facilities at low cost;
- *Factor intensity* – knowledge-based assets are skilled labour intensive relative to production; and

- *Jointness* – knowledge-based assets can be supplied to additional production facilities without reducing their value in existing facilities.

The traditional view of industrial engineers is that they are involved in manufacturing environments and that the resources they are allocating to processes are tangible and directly measurable. The nature of an organization based on knowledge rather than industrial society notions of land, labour, or capital are not well understood (Savage, 1990). We are experiencing a rapidly changing business environment with the increase in the number of knowledge and service organisations since the emergence of the internet as opposed to the number of manufacturing organisations. This forces organisations to reinvent themselves in various ways, and especially to grow and exploit the intellectual assets of the organisation. Knowledge workers and knowledge work have been described by Drucker (1974) more than 30 years ago, yet firms are only recently recognising that knowledge is becoming the true differentiator for an organisation to survive and be successful in the highly competitive modern economy. It is therefore crucial for organisations to exploit their knowledge assets, create new ones, as well as grow an environment of knowledge awareness, continuous learning and sharing of knowledge (Botha et al., 2008).

## **4.2. Consultancies as knowledge organisations**

### **4.2.1. Introduction**

New consulting firms are established every day, resulting in a growing number of small firms (Gilley et al. 1989). In 1998, the top three consulting firms in America alone employed more than 100,000 consultants (Financial times, 2000).

Management consulting is comprised out of strategy consulting and operations consulting, and may involve the identification and cross-fertilization of best practices,

analytical techniques, change management and coaching skills, technology implementations, strategy development, or operational improvement. Management consulting refers to both the practice of helping companies to improve performance through analysis of existing business problems and development of future plans, as well as to the industry composed of firms that specialize in this sort of consulting.

As the need for professional and specialized advice grows, other industries such as government, quasi-government and non-profit agencies are turning to the same managerial principles, frameworks and methodologies that have helped the private sector for years.

It can be hard to definitely distinguish between management consulting and other consulting practices such as information technology consulting and human resource consulting because these fields directly support business operations and often overlap the field of management consulting.

#### **4.2.2. The rise of management consulting**

Management consulting grew with the rise of management as a unique field of study. A chronological overview follows:

The first management consulting firm was founded in 1886 by Arthur D. Little, an MIT professor who named the firm after himself (ADL, 2007). Even though the firm later became a general management consultancy, it originally specialized in technical research.

In 1914 Edwin G. Booz, a graduate of the Kellogg School of Management at Northwestern University, found Booz Allen Hamilton. This management consultancy was the first to serve both industry and government clients (Booz Allen Hamilton, 2007).



In 1926, McKinsey was founded in Chicago by James O. McKinsey, a professor at the University of Chicago Graduate School of Business, but the modern McKinsey was shaped by Marvin Bower, who believed that management consultancies should adhere to the same high professional standards as lawyers and doctors. McKinsey is credited with being the first to hire newly minted MBA's from top schools to staff its projects whereas older firms would hire older industry personnel. The first pure management and strategy consulting company was McKinsey & Company (McKinsey, 2007).

In 1937, Andrew T. Kearney, an original McKinsey partner, broke off and started A.T. Kearney.

In 1943, during Britain's war effort, Personnel Administration was founded by three Englishmen: Ernest E. Butten, Tom H. Kirkham and Dr. David Seymour. After World War II a number of new management consulting firms formed.

The most notably consultancy of that time, the Boston Consulting Group (BCG) was founded in 1963 (BCG, 2007). BCG brought a rigorous analytical approach to the study of management and strategy. A time line of this brief historic overview of management consulting firms is shown in *figure 4.2* below.

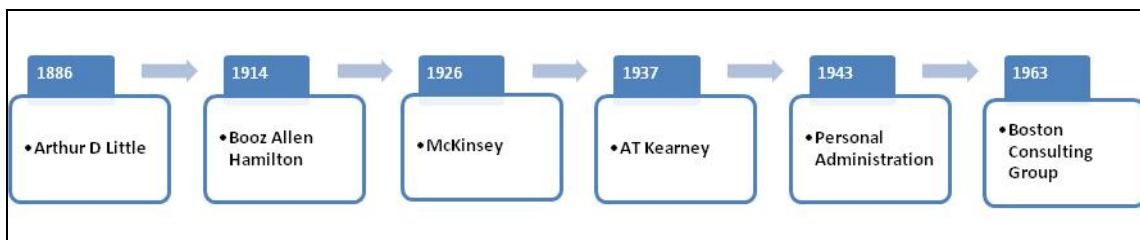


Figure 4-2. The birth of management consulting.

Work done at Booz Allen, McKinsey, BCG, and the Harvard Business School during the 1960s and 70s set the groundwork for many consulting firms to follow because they

developed the tools and approaches that would define the new field of strategic management.

It was only after World War II, in the wake of the development of the international trade led by the USA, that management consulting emerged in Europe. Bain & Company is another firm of a more recent fame, whose focus on shareholder wealth set it apart from its older counterparts.

Also significant was the development of consulting arms by both accounting firms, such as Accenture of the now obsolete Arthur Andersen, and global IT services companies, such as IBM Global Services, which acquired PriceWaterhouseCoopers (PwC) Consulting. Though not as focused on strategy or the executive agenda, these consulting businesses were well-funded and often arrived on client sites in force. McKinsey, Bain, and BCG retain their strong strategy focus, while many other generalist management consultancies such as Accenture and Capgemini are broadening their offering increasing into high volume, lower margin IT work such as system integration (Vault, 2007).

The current trend in the market is a clear segmentation of management consulting firms. Another branch of management consulting is Human Resource consulting. Such firms provide advice to their clients regarding the financial and retirement security, productivity, health, and employment relationships of their global workforce.

Areas in which a human resource consulting firm may advise on include: communication, surveys on employee opinion research, executive compensation, global mobility, government human services, HR Outsourcing, HR service excellence, HR technology, health care & group benefits, human capital strategy, job analysis, investment, legal, mergers & acquisitions, multinational & global issues, performance measurement, personal financial planning, Physical Ability Test Development, retirement benefits, sales effectiveness, surveys & benchmarking, talent management,

and workforce compensation. Companies in the field include Watson Wyatt Worldwide, Mercer Human Resource Consulting, Hay Group, Hewitt Associates, PricewaterhouseCoopers, Deloitte and Towers Perrin.

### **4.2.3. Internal consulting groups**

Added to these approaches are corporations that set up their own internal consulting groups, hiring internal management consultants either from within the corporation or from external firms. Many of these corporations have internal groups of as many as 30 full-time consultants.

Internal consulting groups are often formed around a number of practice areas. The more common areas are: organizational development, process management, information technology, design services, training, and skills development.

The advantage of an internal consultant approach is chosen for three reasons, being; avoiding large fees typically associated with external consulting firms, keeping certain corporate information private, and they want a group that more closely works with, and monitors, consulting firm relationships.

Often, the internal consultant proves to be more efficient on a project due to familiarity with the corporation, and is able to guide a project through to implementation, a step that would be too costly if an external consultant were used.

There are several potential problems facing internal consultants and the firms who employ them. The internal consultant may not bring the objectivity to the consulting relationship that an external firm would have, as well as bring to the table best practices from other corporations. When the consulting industry is strong, it can be difficult for internal consulting divisions to recruit candidates who are of the same high calibre as

those working for outside consulting firms. The other extreme would be that when financial times get tough, often the internal consulting group is the first to face layoffs.

#### **4.2.4. Conflicts and credibility**

Firms focusing mainly on accounting activities, created large professional consulting branches generating about 35% of its fees. Even though it was cyclical, Management Consulting Services (MCS) was the fastest growing and often most profitable area of the practice. The major cause for growth in the Nineties was the implementation of complex integrated enterprise resource planning (ERP) systems such as SAP R/3 for multi-national companies. PwC came under rising pressure to avoid conflicts of interests by not providing consulting services to its audit clients. Since it audited a large share of the world's largest companies, this was beginning to limit its potential market.

These conflicts increase when additional services such as the outsourcing of ERP systems were offered. For these reasons, in 2000, Ernst & Young was the first of the Big Four to sell its consulting services, to Capgemini (Vault, 2007).

### **4.3. The consulting profession**

#### **4.3.1. Consulting as a service**

The word “consultant”, from the Latin word *Consultare* which means “to discuss”, describes a person who delivers a service in his or her specific area of expertise. The American heritage dictionary describes a consultant as one who gives expert or professional advice (dictionary.com). In essence, consultants help to effect constructive change in private or public sector organisations through the sound application of substantive and process skill (Barcus et al., 1986). Norman R. Augustine (1935 - ) stated

a consultant offers the advantage of generally having had no firsthand experience in the matters of interest, thereby assuring a clear mind uncluttered by any of the facts.

A consultant is not always an independent agent, and would traditionally start their consulting career as a partner or an employee of a consultancy. The consultancy, also known as consulting house or consulting firm, is a company that provides consultants to clients on a larger scale or in multiple, though usually related skill areas. This has advantages both to the client and to the consultant by providing a pool of talent that can be quickly mobilized as required. The consultancy would have a database of specialists, reassuring the client about the quality of the consultants supplied. Bill Bain who started Bain & Company in 1973 for instance had the policy to only work with one client per industry to avoid potential conflicts of interest. The client receives access to the experience and methodologies of the whole consultancy rather than an individual. In turn the consultant as an individual would be introduced to new experiences and techniques which may, eventually, permeate through the consultancy as a whole.

A consultant giving training and career advice to an individual or a team in a firm is often termed a coach, and a consultant assisting a firm to develop a new strategy or solve a particular problem is sometimes referred to as a facilitator.

Strategy consultants are common in the upper management circles of many industries. There are also independent consultants who act as interim executives with decision-making power under corporate policies and statutes. They may also sit on specially constituted boards or committees.

#### **4.3.2. Characteristics of consultants**

As for any profession, there is no perfect model against which every entrant can be measured, but there are certain characteristics that affect the consultants' chance of

success and personal job satisfaction. Other occupations would also demand a high level of technical knowledge and skill, but would have different methods of applying it. Consultants thus require distinguishing characteristics for their unique challenges. Particular importance is attached to analytical and problem-solving abilities, as well as to competence in the behavioural area, in communicating and working with people, and in helping others understand the need for change and how to implement it (Kurb, 2002).

Kurb (2002) singles out four characteristics of the consultant. He names the first the “Dilemma analysis” ability, as an organisation that uses a consultant may well be facing a situation that appears insoluble and requires a special type of diagnostic skill. There would not be a need for a consultant if the problem could easily be solved. Thus the consultants’ role is to discover the nature of the dilemma and to determine the cause of it, rather than what is thought to be the cause.

Secondly, intuition is needed in sensing the organizational climate otherwise the consultant can run the risk of becoming a pawn in a game of organisational politics. A consultant who has the ability to recognise and understand the dynamics of the internal power and political relationships can use them in pursuit of whatever change objectives client and consultant conclude are appropriate. The consultant needs imagination and experimental flexibility to adapt and tailor concepts to meet real-life demands, so consequently with intuition is strong implementation skills a prerequisite. Courage to experiment and the flexibility to try as many approaches as needed to solve the problem are important ingredients in the practitioner’s make-up.

Thirdly, personal attributes are important as the consultant would regularly be put into new environments with unique problems causing confusion as well as high levels of frustration. This exposure and the first acquaintance with an organisational problem require integrity as the consultant is becoming part of the organisation for the duration of a project. Maturity and a good sense of reality are necessary to avoid experiencing

the symptoms of defeat and withdrawal that commonly accompany the failure of a person's sincere efforts to help others.

Lastly, timing is crucial as the best conceived and articulated plans for change can be destroyed if introduced at the wrong time. A stable personality and well-developed interpersonal skills are needed as consulting obviously involves dealing with people in an atmosphere of tact, trust politeness and friendliness rather than with mathematical formulas or machines. The success of the engagement would depend on the persuasiveness and tact of the consultant in dealing with the client.

Only a very mature and exceptionally capable and versatile person can possess all the qualities mentioned. It is therefore necessary to consider what qualities the person must possess on recruitment, and what qualities he or she will be able to acquire, or improve, through training and experience.

### **4.3.3. Internal structures and recruitment in consulting**

Consultants are either recruited from school or from industry. Many consulting firms would offer undergraduates internships where they can complete their practical training as research associates. A junior consultant is typically a recent college graduate and is expected to have an enthusiasm for problem-solving and an analytical skill-set. The *consultant* role is a more senior role; most consultants join a consulting firm with an MBA, either directly from school or from industry.

In some cases, *consultants* are former *junior consultants* who went to business school and are returning to the original firm. Unlike the *junior consultant* role, the *consultant* role is a longer-term career path, feeding the firm's management ranks, with *consultants* eventually moving to roles of *senior consultants* and *principals* as depicted in *figure 4.3* below.



*Figure 4-3. The structuring of consultants in a consultancy.*

Case interviews are common in interviews with new candidates applying for a position at a consulting firm. Here the applicant for the position is given a seemingly real problem and is given limited time to solve it. The idea of a case interview is not as much to see if the candidate can solve the problem, but rather to see how he goes about solving it. This way of conducting an interview would give a better representation of the candidates' competency rather than only the representation of character as in traditional question-answer interviews.

Bain and Company extended their recruitment and hiring process beyond traditional face-to-face interaction into the virtual world of podcasts and Second Life. In Second Life, the company has created a "virtual recruitment centre complete with networking areas, auditoriums and information stands where visitors can watch videos and slide shows and download information." The ability to interact in a Bain virtual world brought



ease and efficiency to the recruitment process while showing these recruits that Bain is consistently one step ahead of the competition.

#### 4.3.4. The consulting engagement

The consulting process applies to engagements having widely varying characteristics, and six relevant dimensions of a consulting engagement is formulated by Barcus (1986) as shown in *figure 4.4* (Barcus et al., 1986) below.



*Figure 4-4. Dimensions of a consulting engagement.*

The nature of the problem usually takes the form of any of the following three situations. A corrective problem involves a situation in which conditions have worsened, and it is expected that the consultant suggests corrective action that will return the situation to its previous state. A progressive problem involves an existing situation that can be improved even though no sudden deterioration has occurred. Lastly, an

opportunistic problem involves a situation in which a future opportunity resides which can be both more risky and rewarding than the previously mentioned problems.

Service delivery areas may be described in innumerable ways, but the most practical description of the engagement would be the function or activity in which the problem situation exists. When one considers Porters value chain (Porter, 1985) as shown in *figure 4.5*, primary and support activities can be derived from the original model as shown in *figure 4.6* (adapted from Porter, 1985) below.

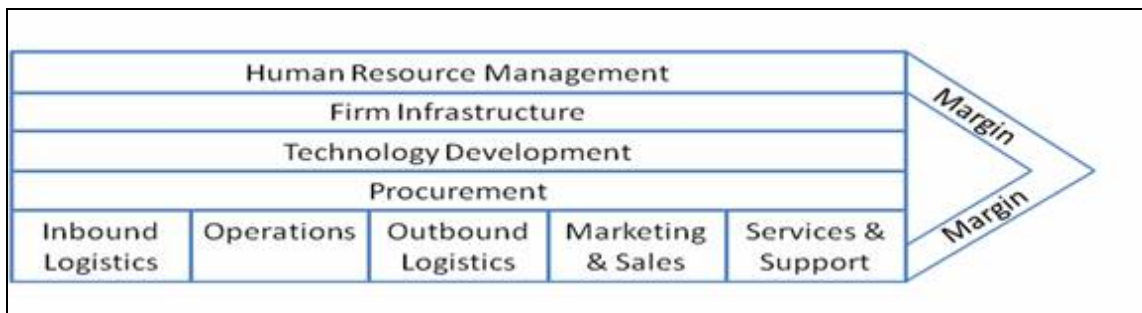


Figure 4-5. Porter's value chain.

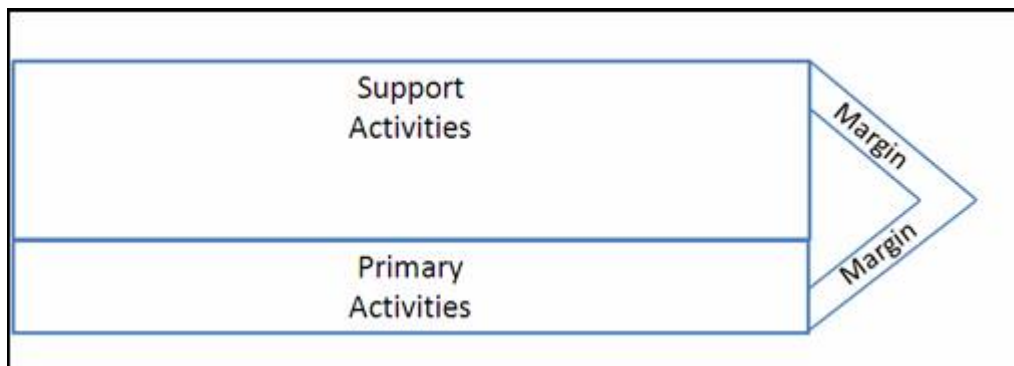


Figure 4-6. Primary and support activities within the value chain.

Primary activities would be those tasks that are directly involved with the product (front office activities like a worker building a table in a furniture factory). Support activities are those actions that keep the primary activities functioning (back office activities like the hiring and firing of employees). A consultants value offering can be applied in all these areas should corrective problems occur, but firms are less likely to let an outsider

deliver an ongoing service (outsourcing) of their primary activities. Interrelations amongst the activities can be a further subdivision.

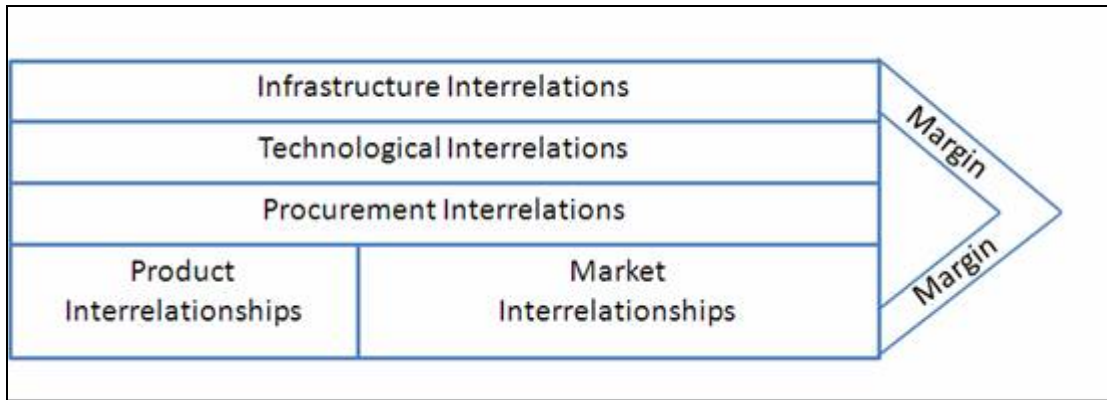


Figure 4-7. Interrelationships within the value chain.

A consulting firm would typically market to, and engage in, problematic activities within a specified service delivery area of a firm as shown in *figure 4.7* (adapted from Porter, 1985). Over time some consulting firms become notorious for having the ability to solve industry specific problems more effectively and efficiently when compared to the counterparts in the market. A good example would be that of an IT consulting firm who develops and implements solutions that are technologically related and supports IT infrastructure within the entire organisation.

Consulting firms are many times a spin-off from core businesses, as seen earlier with Deloitte consulting, IBM Global services, BearingPoint and Capgemini which are IT consulting firms derived from accounting firms.

#### 4.3.5. Phases in consulting

The phases of the analytical process during consulting cannot be isolated, but could typically involve one or more of the following phases shown in *figure 4.8*.

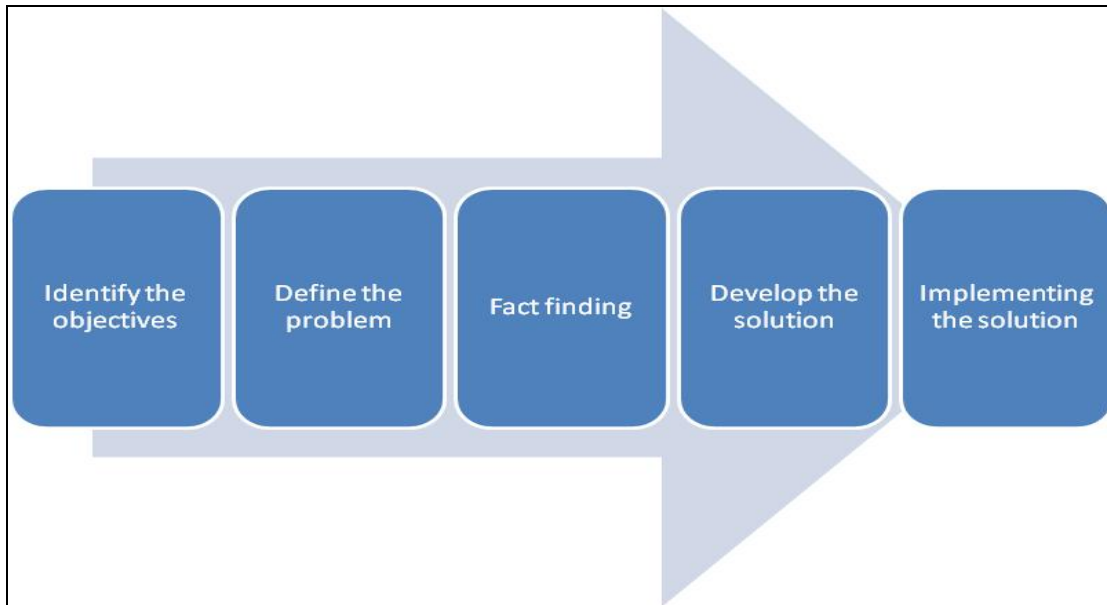


Figure 4-8. Phases of the consulting process.

The amount of time dedicated to each of the phases would depend on the client and the nature of the problem. A client can for instance already know what the problem is, or might want to implement the solution themselves.

The client who is the subject of the engagement can be classified as a member of an industry group depending on their endeavours. Various organisations have attempted to classify industries, of which the most basic classification is that of products and services. Products means that a production firm would produce a tangible product and that there would most likely be suppliers of raw material, a process and a final product that needs distribution. A service firm requires different infrastructure as there are no tangibles to their service, yet they would add value to the client by providing internet connectivity, wash their cars, clean their pools or provide transport. The most common characteristics of a service is that it is susceptible to human deliverance, its intangible, it can not be stored, it can not be used again and must be standardized.

Consulting firms usually specifies to what industry groups they deliver their services, or only deliver their service to one company per industry to avoid conflicts of interest (as

previously mentioned in the case of Bain and Company). A global standard for industry classification have been formulated by the United Nations and is assumed to be the most commonly used for industry classification.

Consulting firms can have their engagements restricted to a location or to multiple locations, depending from where they operate their business. Online consulting or telephone consulting does not have this restriction, but would limit the consultant to only observing the problem electronically. Consulting firms would establish a head office, and open offices globally as their business grows.

#### 4.3.6. Classification of consulting firms

There exists a lack of credibility in the consulting industry, and various layers for the classification of consulting firms have therefore been identified.

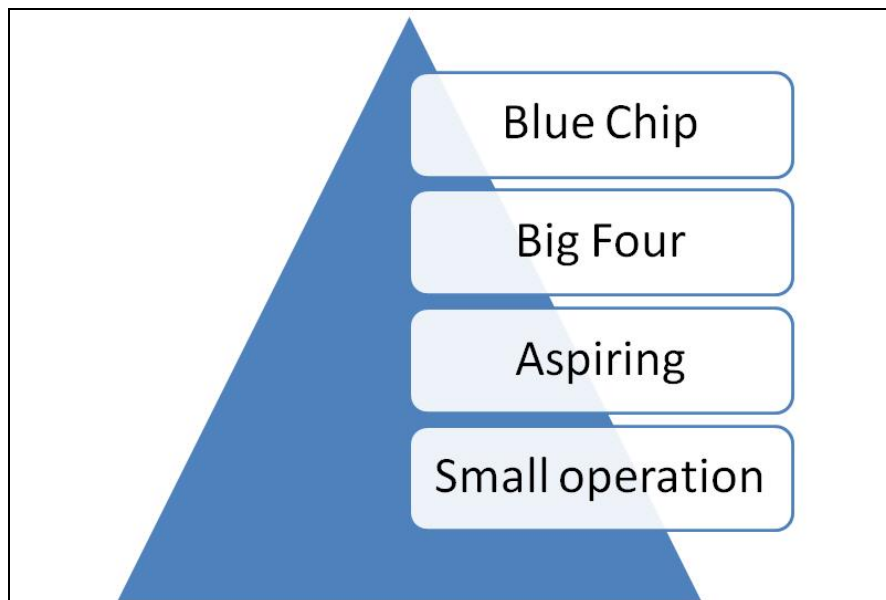


Figure 4-9. Various layers by which consulting firms can be classified.

This chapter explores each layer of the model shown in *figure 4.9* in an attempt to group consultancies according to their similarities.

#### **4.3.7. Blue chip consulting firms**

**Blue chip** consulting firms are in the fortunate position of being able to choose with whom they want to be associated with and would turn down business should they consider a client not to be ideal for them to do business with. They are world renowned for their projects globally, as well as for papers published in accredited journals as the Harvard business review. These companies include McKinsey & Company, Boston Consulting Group (BCG), Bain & Company, and Monitor.

McKinsey & Company consultants designed the initial organisations of many well known firms, inter alia NASA, advised the Vatican on its banking system and specified the systems supporting the Frankfurt's stock exchange. McKinsey & Company has written more articles for the Harvard Business Review than any major consulting firm. They have 90 locations in 51 countries, and are linked by industry and functional practices that concentrate their knowledge and expertise on the topics of interest to their clients wherever they do business. McKinsey & Company currently have around 13000 employees who contribute to the \$3.8 billion yearly revenue (Vault, 2007, McKinsey, 2007).

Boston Consulting Group (BCG) operates in 63 countries including the Middle East, South Africa, America, Asia and the Pacific. One of their core competencies is developing branding strategies. In the last decade, shareholder value creation has moved to the top of the agenda for public companies. BSG's Corporate Development practice has been at the forefront of the value management revolution. BSG has a proprietary value-management methodology based on the concept of total shareholder return. In 1999 BSG conducted an extensive study of value creation at some 5300 large public companies and concluded that the most successful value creators first improve their cash-flow margins, then increase their asset productivity, and finally invest for profitable

growth. BCG's Global IT Research Centre monitors emerging technology trends and innovation through independent research and links with respected authorities in the field. They employ around 4200 workers and has a yearly revenue of around \$1.8 billion. (Vault, 2007, BCG, 2007).

Bain & Company has been named by *Consulting Magazine* as the *Best Firm to Work For* in 2003, 2004, 2005, 2006 and 2007, and is recognized as one of the leading business institutions in the world. As mentioned in a case study from Harvard Business School, "In addition to its exceptional growth record, Bain distinguishes itself from competitors like BCG and McKinsey with its notion of results-oriented consultancy." At financial year end the company revenue accumulated to \$1.3 billion (Vault, 2007, Bain, 2007).

In 2007, the firm expanded its number of worldwide offices to 37, with the opening of offices in Kyiv, Moscow, Helsinki and Frankfurt in Europe, and worldwide consulting staff increased to approximately 2,700. The new millennium also brought changes to Bain's traditional "generalist" approach to solving clients' business problems. The firm developed areas of specialization with its deep industry "Practice Areas" in order to better serve the varying needs of its increasingly diverse multinational client base. Through targeted industry hires, Bain & Company added industry experts to each of these new "Practice Areas", significantly raising its profile in fields such as Financial Services, Healthcare, IT and Media and Entertainment industries.

Bain & Company's major competitors include the Boston Consulting Group and McKinsey & Company. The firm also occasionally competes with specialist boutiques such as Monitor or diversified consulting firms such as Booz Allen Hamilton and AT Kearney.

Monitor was founded in 1983 by six entrepreneurs, including Harvard's Michael Porter and the company's current Chairman Mark Fuller. The amount of IP and tacit knowledge in

the firm is remarkable as they have published more than 80 articles in the Harvard Business Review, and some of the most influential business strategy books of the last 25 years have been written by Monitor authors as shown in *table 4.1* below.

*Table 4-1. Some of the influential books by Monitor authors.*

Title	Author	Year
Competitive Strategy	Michael Porter	1980
Competitive Advantage	Michael Porter	1985
Overcoming Organizational Defenses	Chris Argyris	1990
The art of the long view	Peter Schwartz	1992
The Theory of the Firm	Michael Jensen	2000
Inevitable Surprises	Peter Schwartz	2003
Real Options	Tom Copeland	2004

With offices in 30 countries and 1500 employees around the globe, they have a track record of doubling growth rates for relationship clients. Consequently 85% of their revenue comes from repeat clients, and they also invest in and run companies (Monitor, 2007, Vault, 2007).

#### **4.3.8. The Big Four consulting firms**

The “**Big Four**” accounting firms consist out of Deloitte Touch Tohmatsu, KPMG, Pricewaterhouse Coopers (PwC), and Ernest &Young (E&Y). Goliath (2000) investigated management consulting firms in 2000 in completion of his MBA at the University of Stellenbosch Business School. His work, “The marketing strategies and tactics of management consulting firms”, included the “Big Four” just mentioned. Today all of them are without a management consulting branch, accept Deloitte Touch Tohmatsu, as they believe that it would bring about conflict of interest in their business. The “Big Four” are associated with auditing services and consulting as a result thereof, with PwC and Deloitte also offering Human Resources (HR) consulting.



Deloitte Touch Tohmatsu, better known as Deloitte, has offices in Africa, Asia, Australia and the Pacific, Canada, Central America and the Caribbean, CIS, Europe, Mexico and South America, Middle East, and the United States. The complete extend of services that they deliver, range from Auditing, Consulting, Enterprise Risk Services, Financial Advisory, as well as Tax and Tax handling. The industries they venture into are very diverse, ranging from Aviation and Transport, Consumer Businesses, Energy and Resources, Financial Services, Manufacturing, Public Sector and much more. They also utilize software solutions as the technology enabler for competitive new business strategies.

The consulting branch of their service, Deloitte Consulting, have utilised their global network of certified Baan consultants for nearly a decade. Programmes used by Deloitte Consulting have included FastTrack for Baan, IndustryPrint, ValuePrint and SkillPrint. Past experience is captured in comprehensive business process models through IndustryPrint, with which key industries are identified, translated into specific business solutions and mapped to Baan applications. ValuePrint is used to quickly examine the business value of continuous process improvement initiatives, and return on investment. SkillPrint is a database-driven skill management solution that describes, by job and role, the skills necessary to carry out new processes developed during implementation.

More recent trends like SaaS can be seen in the many software packages that Deloitte developed themselves. These packages include: IQP Center (Online community for executives), Deloitte International Tax Source (DITS), IFRS eLearning (Free online education), Dbriefs Webcasts (Online education), Deloitte OnLine (Client extranet demonstration), HotelBenchmark.com (Access to data), Petroleum Services (Access to business intelligence), as well as Deloitte Accounting Research Tool (online

demonstration) As of 2007, Deloitte had a total of almost 155,000 professionals at work in 142 countries, bringing revenue to \$23.1 billion (Deloitte, 2007, Vault, 2007).

KPMG, with over 3 000 staff and more than 250 partners, is one of the largest Audit, Tax and Advisory firms in South Africa. Their long term vision is to enable organizations to manage and integrate the flow of information, money, and products within and beyond the enterprise. Globally they employ 19,600 people in 93 offices, and had revenue of \$4,700 million in 2005 (Vault, 2007) KPMG Consulting was established in January 2000, and committed to provide their clients with maximum value by applying complete e-engineering solutions, (which includes ERP implementation) in an effort to overcome the most challenging situations then in the digital economy. On October 2, 2002, the company was re-named BearingPoint and the next day began trading on the New York Stock Exchange (BearingPoint, 2007).

PricewaterhouseCoopers (PwC) employs approximately 166 000 employees with a presence in 165 countries who provide a full range of business advisory services to public institutions and leading global, national and local firms. These services include audit, accounting and tax advice, management, information technology and human resource consulting, financial advisory services including mergers and acquisitions, business recovery, project finance and litigation support, business outsourcing services, and legal services through a global network of affiliated law firms. Advisory services are organized, like in most consultancies, by country and industry sector.

PwC also has developed several broader consulting initiatives in the Enterprise Risk Management (ERM) framework, including a global effort to assist corporations with outsourcing, as well as a global political risk assessment and risk management service with the Eurasia Group, a political risk advisory firm. Two advisory services offered by PwC include the actuarial consultancy departments Actuarial and Insurance Management Solutions (AIMS) and a sub branch of "Human Resource Services" (HRS). These actuarial advisory departments cover mainly 4 areas: pensions, life insurance,

non-life insurance and investments. AIMS deals with life and non-life insurance and investments while HRS mainly deals with pensions.

The actuarial functions supplied by PwC include advice to the PwC accountants on insurance company financial reporting, advising buyers and targets on mergers and acquisitions and financial modelling. The firm provides a range of industry specific e-business services (like systems and application design and implementation), designed to provide total solutions to global companies and start-ups.

Though the firm's core business is audit, it had created a large professional consulting branch, as did other major accountancy firms, generating about 35% of its income. Management consulting services was the fastest growing and often most profitable area of the practice, though it was cyclical. The major cause for growth in the Nineties was the implementation of complex integrated ERP systems such as SAP R/3 for multi-national companies. However, PwC came under increasing pressure to avoid conflicts of interests by not providing consulting services to its audit clients. Since it audited a large proportion of the world's largest companies, this was beginning to limit its potential market. These conflicts were going to increase when additional services such as the outsourcing of ERP systems were offered.

PwC therefore planned to capitalize on management consulting services' rapid growth through its sale to Hewlett Packard (for a reported \$17 billion) but negotiations broke down in 2000. PwC announced in May 2002 that its consulting activities would be repackaged as an independent entity. Wolff Olins, an outside consultancy, was hired to create a brand image for the new entity, called "Monday". The firm's CEO, Greg Brenneman described the atypical name as "a real word, concise, recognizable, global and the right fit for a company that works hard to deliver results."

These plans were however soon revised. In October 2002, PricewaterhouseCoopers sold the consultancy business to (International Business Machines Corporation) IBM for approximately \$3.9 billion in cash and stock.

Today, PwC brands its remaining consulting activities as Advisory Services, directed globally in PwC London. PwC serves the U.S. Federal Government through their Washington Federal Practice (WFP), and has over 2000 professionals based in the Washington Metro Corridor. WFP's mission is to become the U.S. Federal Government's favoured provider of advisory and assurance services. WFP helps Government agencies solve complex business issues, manage risk, and add value to performance through PwC's service offerings in financial management, program management, operations improvement, and security and data management (PWC, 2007, Vault, 2007)

Ernst & Young helps companies globally to identify and capitalise on business opportunities. They employ more than 114 000 consultants around the world, and coordinate more than 450 professionals in their global corporate finance network in 31 countries. Ernst & Young built up its consultancy arm heavily during the 1980s and 90s. The U.S. Securities and Exchange Commission and members of the investment community raised concerns about potential conflicts of interest between the consulting and auditing work amongst the major consulting firms of that time. Ernst & Young then advertise their consulting service as "Think" services, "Build" services, and "Operate" services. "Build" services helped clients to implement strategies that transformed business processes, technologies, operations, and culture. They also provided clients with capabilities that include business transformation, supply chain management, and package-enabled reengineering (SAP, Oracle, Baan, PeopleSoft etc.). In May 2000, Ernst & Young was the first of the major consulting firms to formally and fully separate its consulting practices via a sale to the French IT services company Cap Gemini for \$11 billion, largely in stock, creating the new consulting firm of Cap Gemini Ernst & Young, which was later, renamed Capgemini. Today 65% of Ernst & Young's revenues come

from their Assurance and Advisory Business Services which is comprised out of assurance (audit), risk advisory services and business advisory services. They also focus on tax advisory services and intellectual property dispute resolution services (E&Y, 2007).

#### **4.3.9. Aspiring consulting firms**

**Aspiring** consulting groups are the likes of Information Technology (IT) or Human Resources (HR) companies who started with consulting as a spin-off from their core business. These include IBM, Accenture, BearingPoint, Capgemini, Booz Allen Hamilton and Mercer (Vault, 2007).

IBM is a multinational computer technology and consulting corporation with revenue \$91.4 billion. The company is one of the few information technology companies with a continuous history dating back more than a century. IBM manufactures and sells computer hardware and software, and offers infrastructure services and consulting services in areas ranging from mainframe computers to nanotechnology. With over 350,000 employees in over 170 countries, IBM is the largest information technology employer in the world and holds more patents than any other U.S. based technology company. IBM Research has eight laboratories worldwide and employees have earned three Nobel Prizes, four Turing Awards, five National Medals of Technology, and five National Medals of Science. (IBM, 2007)

Accenture Ltd. is a global management consulting, technology services, and outsourcing company with more than 170,000 employees in 49 countries. With reported revenues of US\$19.7 billion in 2007, Accenture is the largest consulting firm in the world (Vault, 2007) and is one of the largest computer services and software companies on the Fortune Global 500 list just after Microsoft and Electronic Data Systems (Fortune 500, 2007).

Their product offerings include both "off the shelf" solutions, as well as custom software developed in house, specifically for the construction industry. Software like BidPoint XL, Bidworx, and BidScreen XL are used to support their operations, as well as hardware like Super L II Plus, and Rollup II. Working in conjunction with technology industry affiliates and partners, they provide technology hardware, equipment and accessories to solve the most complex issues of the construction industry. Ongoing services from their boutique of business process management offerings are available, like business process outsourcing.

BearingPoint is organized around three industry business units – Public Services, Commercial Services and Financial Services – with two solution units – Management Consulting and Technology Solutions. Its regional operations are the Americas; Europe, Mid-East and Africa; and Asia Pacific providing jobs for 17000 employees. BearingPoint Inc. is one of the world's largest providers of management and technology consulting services to Global 2000 companies and government organizations in 60 countries with revenue in 2006 of \$3.4 billion. In February 2006, BearingPoint announced the first industry teaming arrangement with Google to offer products to help enterprises find internal data more easily. The company also works with software vendors Microsoft, Oracle, CA and SAP, and hardware vendors HP and IBM, and several dozen smaller partners (KPMG, 2007).

Capgemini is a major French company, one of the world's largest information technology, management consulting, outsourcing and professional services companies with a staff of 75,000 members operating in 30 countries. It is headquartered in Paris and was founded in 1967 by Serge Kampf, the current chairman. The regional operations of Capgemini include North America, Northern Europe & Asia Pacific and Central & Southern Europe with revenue of €7.7 billion in 2006. Services are delivered

through four disciplines: Consulting, Technology, Outsourcing and Local Professional Services.

Booz Allen Hamilton (also called Booz Allen) is one of the oldest management consulting firms in the world, found in 1914, with over 100 offices on 6 continents. The firm has two distinct consulting cultures namely Commercial and Government, and offers three primary career models (Strategy, Design staff serve commercial clients, Transformation staff serve government clients). The firm has 5 business units organised according to markets (Global Commercial Markets, Global Government Markets, Global Functional Capabilities, Global Integrated Markets, and Global Operations)

With deep expertise in both strategy and technology, Booz Allen Hamilton surpasses the conventional categories of consulting. Booz Allen's Commercial business serves leading corporations on projects involving strategy, operations, organization and change, and information technology. Booz Allen's Government business primarily serves global governments, agencies, Non Governmental Organisations (NGOs), as well as nearly every part of the U.S. Government and military infrastructure. The firm's top competitors include Bain & Co., The Boston Consulting Group and McKinsey & Co. in the strategy consulting market; and then Accenture, IBM, Lockheed Martin, SAIC, and other systems integrators and defence contractors in the government and technology consulting markets.

Booz Allen's double digit growth rates reflect perennial growth in its public sector business and a resurgent commercial business, resulting in total revenues of over \$4 billion in 2007. In 2006, the firm had 131,000 applicants and 1176 new jobs, which translates to less than 10% hire rate. The firm believes that their global breadth of proficiencies is grounded in the first-hand knowledge they gain from serving clients. The firm's notable intellectual contributions include the HBS-honoured OrgDNA framework, the PERT management technique and the product lifecycle theory.

Marsh & McLennan Companies, Inc. (MMC) is a diversified risk, insurance and professional services firm comprised of the various companies shown in *table 4.2*.

*Table 4-2. Companies part of the Marsh & McLennan Companies, Inc. (MMC).*

Company	Description
Marsh Inc.	a risk and insurance brokerage
Mercer	a collection of consulting and services firms (including Mercer Human Resource Consulting, Mercer HR Services, and Mercer Investment Consulting);
Guy Carpenter & Company	a reinsurance intermediary
Oliver Wyman Group	a collection of management consulting firms (including Oliver Wyman - formerly Mercer Management Consulting, Mercer Oliver Wyman and Mercer Delta, as well as Lippincott and NERA Economic Consulting)
Kroll Inc	a risk and security consulting firm.
The Medisure Group Ltd.	a medical administration company.

Marsh & McLennan Companies was ranked the 207th largest corporation in the United States by the 2007 Fortune 500 list, and the 5th largest U.S. company in the Diversified Financials industry with its 57,000 employees and annual revenues of \$12.069 billion (MMC, 2007).

Mercer Human Resources (HR) Consulting is best known for publishing the often quoted “worldwide cost of living survey”, and is the global leader for HR and related financial advice, products and services. With more than 15000 employees, they serve clients in over 180 cities and 41 countries and territories worldwide. As a wholly owned subsidiary of Marsh & McLennan Companies, Inc., they can also provide access to the complementary services of their sibling companies, Marsh, Kroll, Guy Carpenter and Oliver Wyman.



#### **4.3.10. Small operations in consulting**

**Small operations** are based on individual competencies in firms, who would not have started with operation within the consulting sphere of services was it not for these competencies. These small consulting firms would be a derivative from core businesses divisions such as IT, HR, finance or of a technical nature with the focus on specific industry problems in the supply chain. These companies include Arthur D. Little, and AT Kearney which is a spin off from a larger consulting firm. Technical consulting can also include an in house consulting branch within the firm.

Arthur D. Little is the world's first management consulting firm founded in 1886 with about 1000 employees across 30 offices around the world. They typically manage around 2000 assignments in 60 countries every year together with partners at Altran Technologies. This partnership enables their clients with 17,000 professionals at their clients' disposal. Altran Technologies is a European consulting firm founded in 1982 in France with administrative and information consultancy accounting for a third of its turnover, and strategy and management consulting making up the rest.

AT Kearney is an international management consulting firm with 2450 employees and revenue of \$798 million in 2005. Dating back to 1926, A.T. Kearney began as a branch of McKinsey & Company when Andrew Thomas Kearney joined James O. McKinsey's firm 3 years after it was founded in 1926. At the time, McKinsey & Company was one of the only firms that focused on management consulting for top level executives rather than specialized in other consulting areas such as accounting. In 1937 James "Mac" McKinsey died unexpectedly at the age of 48 due to pneumonia and while the company continued to operate as before, Tom Kearney and the remaining partners disagreed over how to run the firm.

The company was split in 1939. A.T. Kearney continued renaming the firm McKinsey and Kearney and operated the Chicago office, while Marvin Bower continued the practice in New York and retained the rights to the name McKinsey & Company in all areas other than the Midwest. In 1947, Bower purchased the exclusive rights to the name McKinsey & Company from Kearney, who renamed his firm A.T. Kearney & Associates.

A.T. Kearney is particularly well known for its thought leadership in procurement strategies across all industries and clients include 70 percent of the Fortune 1000 companies, governments and other non-profit institutions. As with most of the consulting firms, A.T. Kearney primarily recruits from the top US and international universities with a very rigorous recruiting process. Two rounds of interviews usually involve case interviews, personality or fit interviews, and a mock presentation after which an offer is made to successful candidates. The firm has 48 offices located in major business centres in 32 countries with top competitors such as McKinsey & Company, Bain & Co., and The Boston Consulting Group. A.T. Kearney is also renowned for publishing the Foreign Policy magazine, and the annual Globalization Index.

#### **4.3.11. Software and services in consulting**

There are many synergies among big consulting firms who operate globally and certain services and ways of doing business have stood the test of time. It is apparent from the short description of each of these firms that they use software and methodologies in support of their service, and also that some of their services are ongoing services while others are only for the duration of a project.

Software providers also tends to become involved in consulting engagements as they are able to sell total solutions to clients as well as assist with the implementation. Salesforce.com is a market leader in customer relationship management (CRM), and provides their software solutions through platform as a service (PaaS) and software as a

service (SaaS). More than 35,500 companies worldwide depend on Salesforce to manage their sales, marketing, customer service and other critical business functions. This way of selling is different from the conventional Microsoft way of selling off-the-shelf software solutions that needs to be upgraded all the time. Instead a customer subscribes to the online service by paying a monthly fee, and receives access to the programs and tools they need through a website. Customers never download or own the software as it is on a local server and accessed through the internet. Thus customers merely use the service as they need it and don't need a large capital investment for an initial CRM platform. The success of an implementation, according to Salesforce, is based on consulting, support and education. Software as a service (SaaS) is seen as the future of software sales, and many consulting houses are already making use of this mode of deploying their services.

Other SaaS companies trading on the stock exchange include Concur Technologies, Taleo, AthenaHealth and Cisco (Copeland et al.,2008).

Concur Technologies web-based package automates the filing and payment of travel and business expenses which eliminates manual reports and ensures that employees hew more closely to company policy.

Taleo offers web-based talent management software that simplifies performance reviews and hiring, which lowers human resources' costs and helps identify the employees who are most essential.

AthenaHealth provides their physician clients with a set of web-based tools that automate billing, collection and medical records.

Cisco is known as the networking company focusing on corporate collaboration. Its WebEx subsidiary is software for online meetings that adds audio and video to the experience.

Consultants are thus still selling total software solutions and its implementation, even though it is packaged as a service. Education of clients is based on online curricula, but can also involve training at an “Academy” owned by the consulting firm or its holding company. The support business function deals with customer queries for problems occurring after the implementation phase, and usually happens over telephone, video calls or the internet and is administered by a call centre.

## **4.4. The value disciplines of market leaders**

### **4.4.1. Rules of value disciplines**

According to Treacy and Wiersema (1995), there are four rules that competing companies must obey in order to become market leaders through their value offering:

Firstly, a company must provide the best offer in the marketplace by excelling in one specific dimension of value. Market leaders first develop a value proposition, one that is compelling and unmatched.

Secondly, the threshold standards on other dimensions of value must be maintained. Performance in other dimensions should not deteriorate so much that it impairs the attractiveness of the company's unmatched value.

Thirdly, the market must be dominated by improving the value year after year. Once a company focuses all its assets, energies and attention on delivering and improving one

type of customer value, it can nearly always deliver better performance in that dimension than another company that divides its attention among more than one.

Lastly, the company should develop or acquire an operating model dedicated to delivering unmatched value. In a competitive market, the customer value must be improved. This is the imperative of the market leader. The operating model is the key factor in raising and resetting customer expectation.

With these four rules in place, a company must choose one of the following generic value disciplines as shown in *figure 4.10* and consistently and vigorously act upon it.

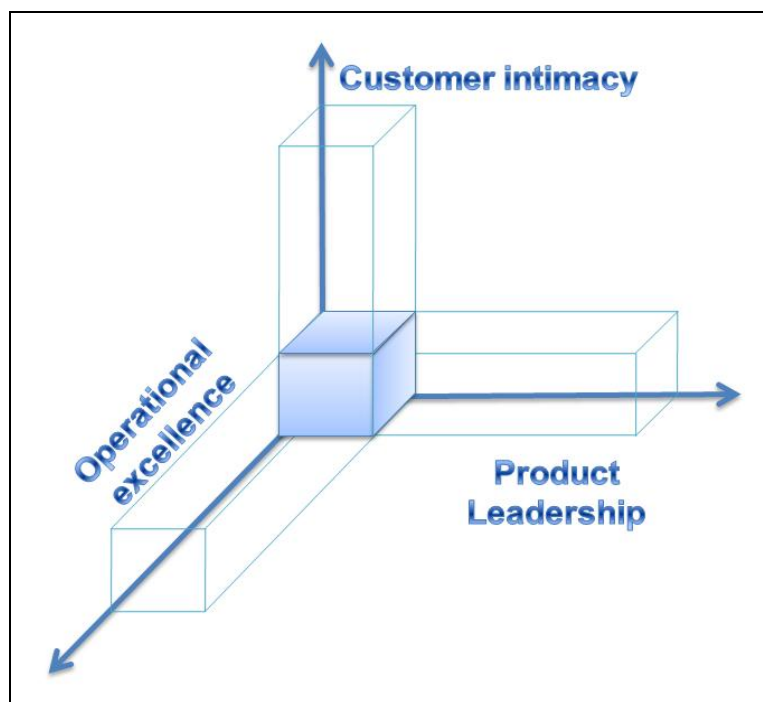


Figure 4-10. The value disciplines.

#### 4.4.2. Operational excellence

*Operational Excellence* and the superb execution thereof depend on a reasonable quality at a very low price. The focus is on efficiency, streamlined operations, Supply

Chain Management, no-frills, and high volume is important. Most large international corporations are operating out of this discipline. Measuring systems are very important for this value discipline, and extremely limited variation in product assortment is allowed.

Accounting and IT consulting firms focus on efficiency of streamline operations and high volume is important. These firms are known for their operational excellence by delivering reasonable quality at a very low price.

#### **4.4.3. Product leadership**

*Product Leadership* focuses very strongly on innovation and brand marketing. These firms operate in dynamic markets where the changing need of the client is addressed. The focus is on development, design, innovation, the time to market, and high margins in a short time frame.

Blue Chip consulting firms address the changing need of the client and the focus is on development, design, and innovative thinking in finding new solutions. These firms are known for their product leadership, which is also the reason for their many publications in accredited business journals.

#### **4.4.4. Customer intimacy**

*Customer Intimacy* is the focus of firms who excels in customer attention and customer service. Its products and services are tailored to individual or almost individual customers. They have large variation in product assortments, and the focus is on: CRM, deliver products and services on time and above customer expectations, lifetime value concepts, reliability, and being close to the customer. Management of these firms give

decision authority to employees that are close to the customer. (Compare: Customer Relationship Management)

Technical consulting as well as HR consulting would give more decision authority to regional managers as they have a better understanding of the regional needs of clients based on culture, business climate, and geographical differences in the business environment. Cultural differences between regions make it difficult to implement standard solutions where human capital is involved. Its products and services are tailored to individual or almost individual customers, causing these firms to be known for their customer intimacy.

Small operations would focus on some or all of the value disciplines, depending on the competencies within the firm. They are therefore un-plotted self employed individuals, focusing on different value disciplines for different types of customers.

The Value Disciplines model is quite similar to the 3 generic strategies from Porter (1980) (Cost Leadership, Differentiation, Focus). However there is at least one major difference: according to the Value Disciplines model no discipline may be neglected: threshold levels on the 2 disciplines that are not selected must be maintained. According to Porter (1980), companies that act like this run a risk to get "stuck in the middle", by not knowing how to allocate limited resources between the three disciplines.

#### **4.4.5. Intellectual resources as technology assets**

It has been shown that consultants generate IP over time through their experience when tacit knowledge is captured into models that can be duplicated. It is to the advantage of the consultancy for this evolution to take place as it keeps their value offering relevant, up to date, and competitive. The unique nature of knowledge makes it

easy to replicate and consultancies can deploy IP as a service the moment the IP is standardised in the form of explicit knowledge.

It is therefore crucial for consultancies to exploit their knowledge assets (technology), create new ones, as well as grow an environment of knowledge awareness, continuous learning and sharing of knowledge. This dissertation deals with technology deployment by means of external exploitation of technology assets.

## **4.5. Process phases in externally commercializing technology assets**

### **4.5.1. Introduction**

Simard et.al. (2007) describes the five functions of a knowledge-service organization as:

- Generate content;
- transform content into useful products and services;
- preserve and manage content to enable organizational use and external transfer;
- use content to achieve organizational goals; and
- transfer content externally, in the form of products and services.

The third function namely, to preserve and manage content to enable organizational use and external transfer, is of note here. A firm is limited by its own capabilities to exploit this useful content while external technology transfer in many cases presents a more fruitful endeavour. External technology exploitation refers to commercialising technological knowledge exclusively or in addition to its application in a firm's own products (Teece, 1998, Lichtenthaler, 2005). Outward technology transfer by means of various contractual forms, e.g. outlicencing agreements, has recently become a major trend in industrial firms (Fosfuri, 2006).



It goes far beyond a minor activity of commercialising residual technologies as firms attempt to realize the strategic and monetary benefits of externally leveraging technology (Chesbrough, 2003; Kline, 2003). Regarding strategic benefits, external technology exploitation may help firms set industry standards, gain access to external knowledge and realize market entry (Teece, 1998; Arora et al 2001). Many of the strategic benefits, e.g. setting industry standards, are essential for firms but are less important in university technology transfers (Markman et al., 2005).

Many firms experience major difficulties in the stages prior to the technology exploitation process (Lichtenthaler, 2005). Many insights from university technology transfer may not directly be applied to industrial firms, where external technology exploitation constitutes a compliment to applying technology in a firms own products (Teece, 1998).

Various pioneering firms like IBM initiated active out licensing programs by establishing external technology exploitation when they faced financial difficulties (Lichtenthaler, 2008). Thus, they moved from considering external technology exploitation as an improvised operation towards regarding it as a strategic activity. These companies first established a systematic external technology exploitation process before the extent of these activities rose significantly.

Lichtenthaler (2008) developed a theoretical model of the external technology exploitation process that comprises the following five stages:

- Planning,
- intelligence,
- negotiation,
- realization, and
- control.

Prior research has suggested that these five stages represent the central stages of the external technology exploitation process. (Lichtenthaler, 2005) Usually, the process stages do not follow one another sequentially but iteratively with feedback loops. The sequential model presented in *figure 4.11* (adapted from Lichtenthaler, 2008) does not completely reflect the complexity of practice but it is a helpful means to discuss the challenges of external technology exploitation.



*Figure 4-11. The process phases in external technology exploitation.*

Currently, most firms manage negotiation and realization more proficiently than planning, intelligence and control. The managerial deficits in planning and intelligence are considered the greatest challenges of successful external technology exploitation (Escher, 2003). A brief overview of the process phases follows.

#### **4.5.2. Planning**

The planning stage constitutes the crossing point between corporate planning processes and the planning of external technology exploitation. Professional planning refers to a high-quality process of strategic planning, target setting, resource allocation and technology customer preselection (Lichtenthaler, 2005). When exploring the possibilities of a particular technology transaction, firms need to set clear targets; clarify which resources it may contribute to it (Grindley and Teece, 1997); and afterwards select potential technology customers (Dyer et al., 2001).

During this phase, consultancies would decide on the amount of resources to allocate to the technology exploitation endeavour, what intellectual property they want to exploit, and do a scanning of potential technology customers.

### **4.5.3. Intelligence**

A professional intelligence process comprises out of the identification of technology commercialization opportunities and the scanning and monitoring of a firm's technological environment with an emphasis on the markets for technology. A professional intelligence stage therefore includes the prior identification of information needs, the subsequent information evaluation and communication of the results to the relevant person who facilitates current and future external technology exploitation. Professional intelligence processes that go beyond an ad-hoc identification of technology commercialization opportunities likely enhance a firm's performance in external technology exploitation (Lichtenthaler, 2008).

Thus, this phase includes the identification of potential risks and the analysis of a firm's environment. An analysis of the firm's environment can be expanded to an industry as well as an external environmental analysis, which is very important for the application of this dissertation. Consultancies would therefore develop their value offering to potential technology customers during this phase, as well as determine who these customers are.

### **4.5.4. Negotiation**

Firms need to develop particular negotiation capabilities to successfully realise the technology commercialization opportunities that were identified by means of intelligence. Technology transactions are decided upon after negotiating with the potential technology customers through pre-negotiations and detailed negotiations. The

pre-negotiation stage develops a fundamental understanding and mutual trust between the firm and the potential technology customer e.g. licensee or franchisee (Dyer et al., 2001), while the firm attempts to get a clearer view of its compatibility with the potential technology customer.

During this phase firms realise the monetary and strategic opportunities of external technology exploitation; pre-negotiations moves over to detailed negotiations after a collaborative agreement is set up between the two parties. Consultancies would adapt their value offering depending on the needs of the technology customer, and finalise what technology would be transferred in the collaborative agreement in the detailed negotiations.

#### **4.5.5. Realization**

The realization phase starts after an agreement with a technology customer has been set up, and refers to a high quality execution of the design and implementation tasks. The particular technology is modularised as far as possible to facilitate its subsequent flow (Teece, 1998), and the implementation task then refers to the actual technology transfer, which represents the purpose of the technology transaction.

Consultancies would therefore design the value offering by breaking down all the technology that needs to be transferred into modules, and transfer these modules to the client as specified in the detailed negotiations phase. This process is probably the most resource intensive at first, as it is difficult to capture all the technology in a medium that is easy to transfer to the customer. Because of organisational learning this process becomes easy as the modules can be resold to other technology customers.

#### **4.5.6. Control**

The control stage encompasses the evaluation and control processes of technology exploitation, which is interdependent particularly on the planning and the intelligence process stages (Dyer et al., 2001). Similar to the latter, proficient control processes comprise the identification of information needs, information generation, information evaluation and information communication (Lichtenthaler, 2005). After the results are communicated, a decision is taken whether the activities will be continued or whether particular technology transactions should be redirected or finished.

### **4.6. Pragma as a consultancy**

#### **4.6.1. Pragma as a company**

Pragma Holdings was formed in 1990. It is a global physical asset management company that reaches markets around the world through partnerships with leading asset management service companies. Currently Pragma Holdings consist of two operating companies:

Pragma Africa is a fully BEE compliant company concerned with service delivery within Africa. The company is jointly owned by Pragma Holdings and Nokusa Investments, a black-owned company with interests in the professional services and ICT industries. Pragma Africa's headquarters are in Johannesburg with regional offices throughout Southern Africa.

Pragma Products is a full subsidiary of Pragma Holdings and is positioned to develop packaged physical asset management service solutions in support of their global strategy. This dissertation deals with how Pragma Products can externally leverage their technology assets through value networking.

#### **4.6.2. Technology assets developed and owned by Pragma**

Pragma invested significant efforts in structuring a broad mass of knowledge to create a methodology that focus on an asset management improvement outcome. This maturity growth model is referred to as AMiP™ - the Asset Management Improvement Program.

AMiP™ is a comprehensive framework within which to define current asset management maturity, set realistic improvement goals and developing a roadmap for achieving this. This approach delivers optimum results with minimum effort by focusing on best practices. It is concerned with all the key issues pertaining to the operation and care of physical assets, meaning the complete oversight of the life of an asset to achieve optimum life cycle cost with the maximum availability, performance efficiency and the highest quality.

The objectives of AMiP™ are to:

- Get a thorough understanding of current asset management practices
- provide a structured process for improving these practices; and
- provide an effective tool with which to manage this process.

AMiP™ is supported by a software tool called PRAGMA ON KEY™. ON KEY™ is an enterprise asset management system consisting out of functionally rich modules. Each of the modules can be used as a stand alone system with its own set of functionality and analysis tools, or as a totally integrated system. This allows for a scalable solution appropriate to the Pragma's client's specific needs and ensures that clients with limited assets only 'pay for what they use'. ON KEY™ integrates seamlessly with ERP packages and other systems such as SCADA and Condition Monitoring.

The most frequently deployed ON KEY™ modules are:

- ON KEY™ Asset Register;
- ON KEY™ Asset Identification and Assessment Module
- ON KEY™ Asset Care Plan Developer
- ON KEY™ Maintenance Manager
- ON KEY™ Performance Manager

Together, these ON KEY™ modules are all about empowering real time enterprises.

### **4.6.3. Standardizing the service**

The Pragma ACC service has been standardised and is delivered in the same way around the world. A brief overview of this service process follows.

The ACC takes complete responsibility for the asset management improvement process. The process is started off with benchmark assessments using AMiP™. The Asset Management Improvement Program (AMiP™) is Pragma's proprietary methodology that was developed from the lessons learned during hundreds of client interventions. This provides the roadmap for establishing the current asset management position of firms and charts the way forward towards the goal of asset management excellence.

The first step is the alignment of the asset management strategy with the corporate and operational strategies of the client to ensure that all efforts are channelled towards the achievement of the corporate objectives. The asset management framework is selected or developed next that will be used as a guideline for the assessment, planning and improvement activities.

A maturity profile is then mapped, providing an objective benchmark of the asset management function's maturity in relation to industry benchmarks. Improvement targets are set that defines the desired state and creates a common vision. An improvement master plan is developed and documented based on the improvement targets and the common vision. This master plan then forms the foundation for a comprehensive service level agreement which serves to govern the various roles and responsibilities in the partnership.

Business processes are systematically aligned to the master plan, and an asset identification and verification project often occurs early in the process. Staff from client organisations receives the required training in both the systems and in asset management theory to ensure adoption of the new process, and Pragma's outsourced services and software tools are introduced.

Once the master plan has been fully implemented, a continuous improvement phase is initiated. A follow up assessment is also conducted to identify where goals were achieved or not. New targets are then set and a new master plan is developed.

#### **4.6.4. Planning and intelligence in technology deployment**

Pragma owns powerful technologies that are modular and standardised. These technologies are already out-licensed, and Pragma plans to extend its footprint in the market by out-licensing technology in a franchise format. This dissertation deals with the planning and intelligence phase of the process phases in externally leveraging technology assets. The outcome would therefore be a strategy for dedicating resources to predetermined markets around the world, as well as in what specific order to do so. Pragma currently has a presence in more than 7 countries, and wishes to double this number within the next 5 years.



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## 5. Global Strategy Management

*“A global strategy involves the carefully crafted single strategy for the entire network of subsidiaries and partners, encompassing many countries simultaneously and leveraging synergies across many countries. This stands in contrast to international strategy, which involves a wide variety of business strategies across countries, and a high level of adaptation to the local business environment” -Mellahi et al., in Global strategic management, Oxford University Press (2005)*

This part of the dissertation introduces the reader to the global strategic management process and how it is applied by the Multi National Enterprise (MNE) in order to extend its footprint in the global marketplace.

The process and its application are discussed under the following headings:

- Drivers for a global strategic perspective;
- Global strategy analysis;
- Global strategy development;
- Global strategy implementation; and
- The Pragma strategy.

## 5.1. Drivers for a global strategic perspective

### 5.1.1. Introduction

The extent to which a multinational firm adopts a global strategy is determined by three broad factors: macro globalising drivers, namely globalisation and information and communication technology; industry globalising drivers, namely market drivers, cost drivers, government drivers, and competitive drivers; and internal globalising drivers, namely global orientation and international experience.

The macro drivers have an overall impact, and are not specific to particular industries or organizations. The industry globalising drivers determine the globality of a sector, industry or market. The internal globalising drivers determine the globality of a firm (Mellahi et al., 2005). These drivers are shown in *figure 5.1* (adapted from Mellahi et al., 2005) below.

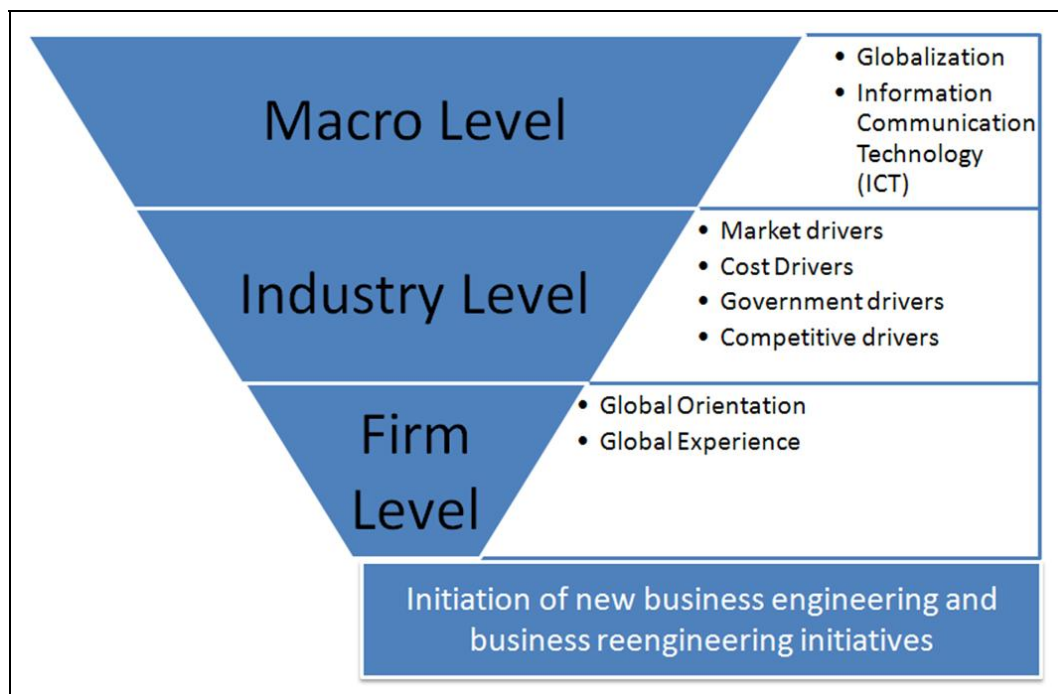


Figure 5-1. Drivers for a global strategic perspective.

Each of these drivers is briefly discussed, and their combination will be unique for each sector and more unique for each multinational firm.

### **5.1.2. Macro globalising drivers**

Globalisation and information and communication technology (ICT) are the two key macro globalising drivers. Globalisation is undeniably a multi-faceted process, embracing economic, political, and cultural change which is deepening the integration of the world economy, strengthening political interdependence between countries and causing values to converge across countries. ICT serves as a catalyst for globalisation by speeding up processes for example: Geographical distance is not significant for the transportation of information, and hence global firms are able to collect information about their global activities faster and cheaper. ICT changed the conduct of global business in fundamental ways by shrinking distances, eliminating intermediaries between producers and consumers, and bringing about closer integration of the world economy.

### **5.1.3. Industry level drivers**

Industry globalisation drivers considered in this section are: Market globalisation drivers, cost globalisation drivers, government globalisation drivers and competitive drivers.

When considering *market globalisation drivers*, Yip (2002) states that several markets are converging around the world. First, the Gross National Product (GNP) per capita in the developed world is converging with markets sensitive to wealth and levels of income such as cell phones, television sets and passenger cars. Second, customer tastes, perceptions and buying behaviours are converging as predicted by Levitt (1983) in his landmark article 'The Globalisation of Markets'. Levitt (1983) argued that this would



happen because generally consumers would prefer standard products of high quality and low price to more customised higher priced products. Third, multinational firms are increasingly favouring global standardization of marketing and advertising efforts in the quest to build a global brand and company (Zou and Cavusgil, 2002). This does not mean identical marketing and advertising campaigns, but the use of similar themes that send the same message across the world like Coca Cola and Apple advertisements.

*Cost globalisation drivers* directly influence the price of the product like economies of scale, sourcing efficiencies, and country cost advantage. Economies of scale arise when a product or a process can be performed more cheaply at greater volume than a lesser volume. Sourcing efficiencies enables large firms purchasing large volumes to have more influence with their suppliers than their small rivals. Bargaining power of the firm can thus reduce the price of key resources used in the production process, having a strong impact on the cost of the product or service. Some country cost advantages are low cost of labour, low cost of raw material, or low cost of transportation because of location, causing multinational firms to locate their activities in different countries to benefit from these advantages.

*Government globalisation drivers* refer to the different policies for different industries that governments create in order to lower trade barriers and regulation. The contrary can also be true for highly regulative governments causing technical standards to become similar around the world like accounting standards.

*Competitive drivers* force firms to adapt a globally centred awareness of their competition in stead of a nationally centred awareness, which causes competitors to create competitive interdependence among countries (Yip, 2002). This interdependence forces multinational firms to engage in competitive battles and to promote attacks in different countries. Cross-subsidization is only possible if the multinational firm has

global strategies that monitor competitors centrally rather than on a country-by-country basis.

#### **5.1.4. Internal globalising drivers**

The internal factors influencing the extent to which a multinational firm adopts a global strategy are *global orientation* and *international experience*. *Global orientation* is the believe that success comes from a worldwide globally integrated strategy rather than from one operated on a country-by-country-basis. This forms part of the multinational firms' culture, where globally integrated tactics are followed when similarity between markets and synergies across countries exist. *International experience* would increase the likelihood of a firm to adapt a global strategy. Experience gained over the years enables the multinational to take advantage of the comparative advantages of various countries, to spot and capitalise on synergies between subsidiaries in different countries, and to establish common needs among the customer segments worldwide so that core product features are kept intact (Hill, 1996).

#### **5.1.5. The strategy management process**

Strategic management is the process of strategic decision-making that sets the long-term direction for the firm in order to achieve a sustainable competitive advantage. The strategy process consist out of the analysis, development and implementation steps as shown in *figure 5.2* below with the addition of a feedback loop.

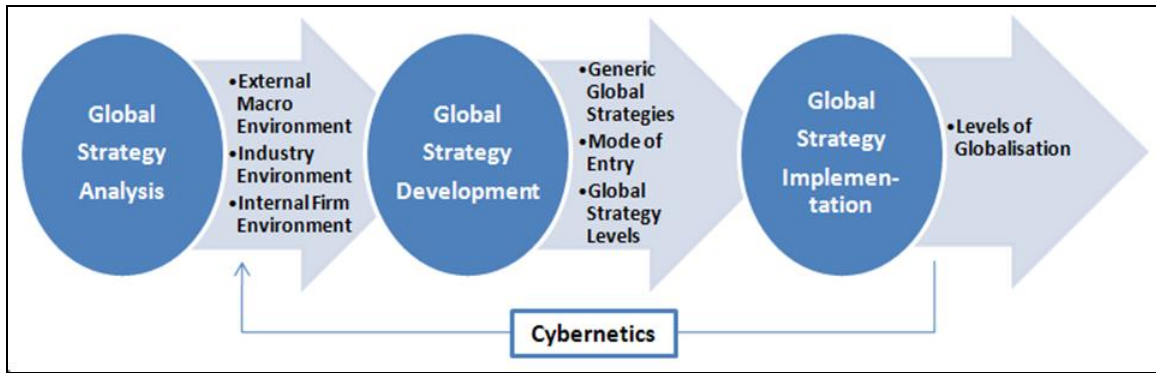


Figure 5-2. The strategy management process.

Cybernetics is the science or study of communication in organisms, organic processes, and mechanical or electric systems. In the strategy management process, cybernetics serve the function of delivering the results from the implementation phase back to the analysis phase in order to verify or adapt the current strategy based on its performance or results. Very few strategies are executed exactly as planned, and are adapted as circumstances change. Cybernetics is therefore important as the crafting of a successful strategy is an ongoing process dependent on the continuous feedback of information.

This dissertation devised a framework for assessing the external business environment in order to assist South African consultancies and service firms with the development of their global strategy for entering a country. Therefore only a brief overview would be given of the development and implementation of strategy, and focus more broadly on analysing countries and prospective markets in which technology can be deployed.

## 5.2. Global strategy analysis

The business environment consists of all factors inside and outside the firm which influence the firm's competitive success. The business environment can be divided into three categories: the external macro environment; the external industry environment; and the internal firm environment as shown in *figure 5.3* below.

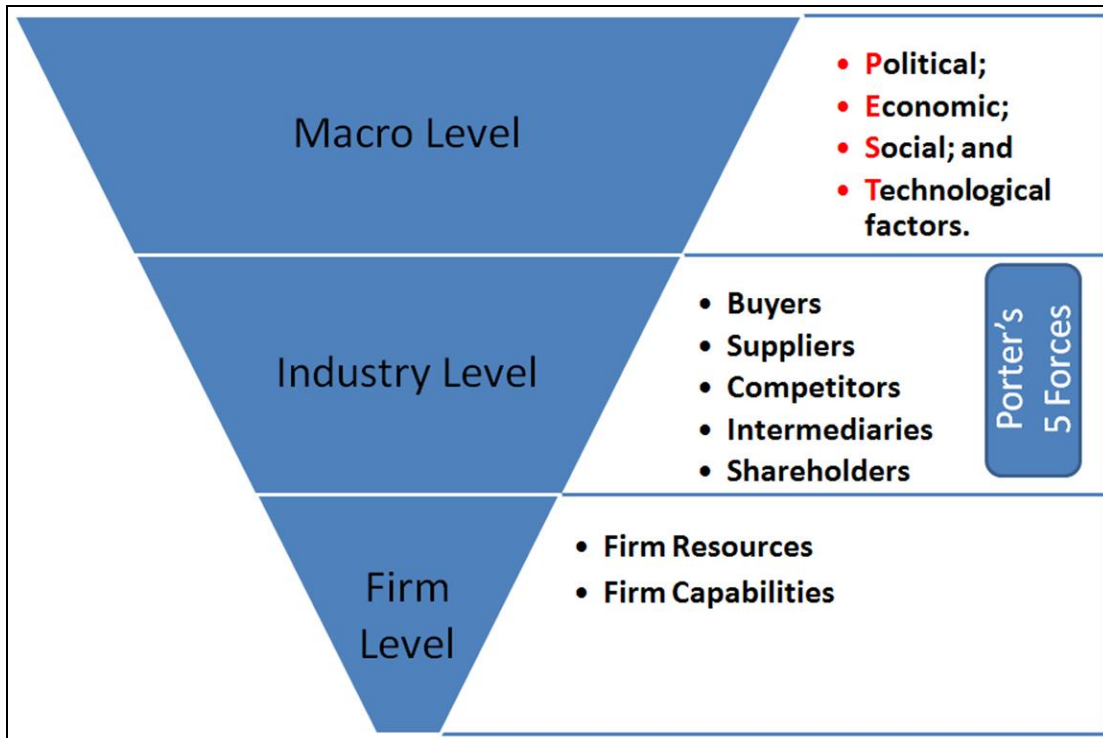


Figure 5-3. The elements of an environmental analysis.

### 5.2.1. The external macro environment

Multinational firms need to adapt the organisation to the external environment as they usually have little control over demographic changes, cultural norms, or government policy. Adequate attention needs to be paid to the external environment as it can provide the firm with both opportunities and threats. Opportunities refer to events or processes in the external business environment which may help the firm achieve competitive success. Threats refer to events or processes in the external business environment which may prevent the company from achieving competitive success. The task of the strategic decision maker is to develop strategies based on what the multinational firm can do to exploit opportunities and counter threats in the external business environment. A successful strategy is about strategic fit; matching the resources and activities of a firm to the external environment in which it operates. Organisations which do not possess a minimum degree of strategic fit are bound to fail

(Galbraith and Kazanjian, 1986). A common way of assessing the macro environment is through the analysis of PEST (Political, Economic, Social and Technological) factors shown in *table 5.1* below.

*Table 5-1. Issues to consider when conducting a PEST analysis.*

Political Factors	Economic Factors	Social Factors	Technological factors
<ul style="list-style-type: none"> <li>• Global political institutions</li> <li>• Regional integration</li> <li>• Government legislation</li> <li>• Political risk</li> </ul>	<ul style="list-style-type: none"> <li>• Cost of production</li> <li>• Currency exchange rates</li> <li>• Cost of capital</li> </ul>	<ul style="list-style-type: none"> <li>• Social change</li> <li>• Global convergence</li> </ul>	<ul style="list-style-type: none"> <li>• Global technology scanning and technology clusters</li> <li>• The knowledge-based economy</li> <li>• The spread of the internet</li> </ul>

This broad framework can assist the firm as a checklist to identify what types of external influences firms could encounter in the international marketplace. It is noted that some sources assert that there are more factors to consider than PEST, but PEST is used here in order to demonstrate a method and in this context, is defined in its broadest and most inclusive form (Czinkota et al., 2007).

### **5.2.2. Political factors**

The international political and legal environment influence business on various levels and is therefore broken down into several sub segments. The separation of legal form

political is somewhat artificial because laws are generally the result of political decisions.

Regulations are imposed on multinational firms in every country, as governments can change the levels of taxation on import duties, provide subsidies to certain firms, or impose regulations which require multinational firms to change how they operate. Together with this, business strategies are also affected by global institutions such as the World Trade Organisation, the International Monetary Fund (IMF), the World Bank and regional economic blocks such as the European Union (EU) (Mellahi et al., 2005).

The most important regional blocks are the EU, NAFTA (North American Free Trade Agreement), AFTA (ASEAN Free Trade Area), and MERCOSUR (Southern Cone Common Market). Trade blocks differ, but can include strategic advantages to firms such as abolishing some trade restrictions between members, allowing free movement of people and capital between members, and also harmonising government policies of member states on many issues such as anti-competitive behaviour by firms. In order to benefit from lower barriers to trade, some firms invest in a given country in order to be able to sell goods and services to other countries in the same regional blocks.

Various laws, tariffs and agreements exist to regulate the import and export of goods. This study deals with knowledge organisations and would therefore not consider the latter, and focus on intellectual property rights, political risk and bribery and corruption to consider as political factors in this dissertation.

Intellectual Property (IP) refers to a legal entitlement of exclusive rights to use an idea, piece of knowledge, or invention. The subject of such legal claims must be a product of mind, potentially profitable yet an intangible form of property. In earlier years, intellectual property laws were usually territorial meaning that the registration and enforcement of rights to certain knowledge had to be pursued separately in each

country. Luckily IP laws have recently become increasingly harmonized across nations greatly due to TRIPs, or the *WTO Agreement on Trade-Related Aspects of Intellectual Property Rights*. This agreement introduced intellectual property law in 1994 into the international trade system for the first time (Czinkota et al., 2007). This agreement included minimum standards for copyrights, appellations of geographic origin, industrial designs, trade marks and even trade secrets. The TRIPs requirements apply equally to all WTO member states, and unlike other international agreements on the subject has powerful enforcement mechanisms at its disposal. Only members of the WTO, who thus undersigned TRIPs are considered in this investigation.

Political risk is defined as the risk of loss when investing in a given country caused by changes in a countries political policies or structure, such as tax laws, exploitation of assets tariffs, or restriction in repatriation of profits. No single indicator currently exists that incorporates all the political factors for all the WTO members that are suitable for this study.

The issue of bribery and corruption has taken on new momentum since 1995 when the Organisation of American States (OAS) officially condemned bribery. In 1999 the Organisation for Economic Cooperation and Development (OECD) agreed to change the bribery regulations amongst its member countries not only to prohibit the tax deductibility of improper payments, but to prohibit such payments altogether. Even the WTO has for the first time decided to consider placing bribery rules on its agenda. Much of this progress can be attributed to the work done by the non profit organisation Transparency International (TI), who regularly publishes information about the perception of corruption in countries around the globe. The Corruption Perceptions Index (CPI) of 2005 published by TI is used in this study.

### **5.2.3. Economic factors**

Changes in the economic business environment greatly influence the success of a firm, let alone during a firm's expansion. Economic growth or recession can be the determining factors with expansion initiatives or even factory close downs as a result. Other economic factors such as the rate of inflation, disposable income and rates of unemployment also need to be considered. The cost of production and currency exchange rates of countries would have a much greater affect on firms producing physical goods as apposed to services and knowledge intensive industries, because the latter are not importing, transporting or storing physical inventory. The cost of capital in a country would be relevant when wholly owned subsidiaries or joint ventures are considered as a mode of entry into the foreign market, but less relevant in the typical licensing agreements that knowledge organisations tend to pursue.

The starting point for assessing the market potential would be to consider the economic variables relating to various market characteristics like population, income, consumption patterns, infrastructure, geography, and attitudes toward foreign involvement in the economy. These data are readily available but should be used in conjunction with other more interpretive data, because the firm's plans often require a long term approach. The data used for this study is obtained from secondary sources, as most governments freely provide information on these variables through their national statistics division. Other bodies like the World Bank, the United Nations and the Central Intelligence Agency of the USA generate reports based on current as well as historical economic data, which is accurate and freely available to the general public.

The most important indicator for firms and especially marketers are the Gross Domestic Product (GDP) of a country, as this is one of the measures of national income and output for a given countries economy. The most common approach to measuring and understanding GDP is the expenditure method:



$$GDP = \text{consumption} + \text{gross investment} + \text{government spending} + (\text{exports} - \text{imports})$$

or

$$GDP = C + I + G + (X - M)$$

where,

**C** is private consumption in the economy,

**I** is defined as investments by business or households in capital,

**G** is the sum of government expenditures on final goods and services,

**X** is gross exports, and

**M** is gross imports.

GDP is also considered the sum of value added at all the intermediate stages of production of all final goods and services produced within a country in a given period of time, given as a money value. This money value is not taking people into consideration, and a more realistic view of the success of a nation would be the GDP per capita as shown in *figure 5.4*, which is the GDP of a country divided by the average population of that country for the same year.

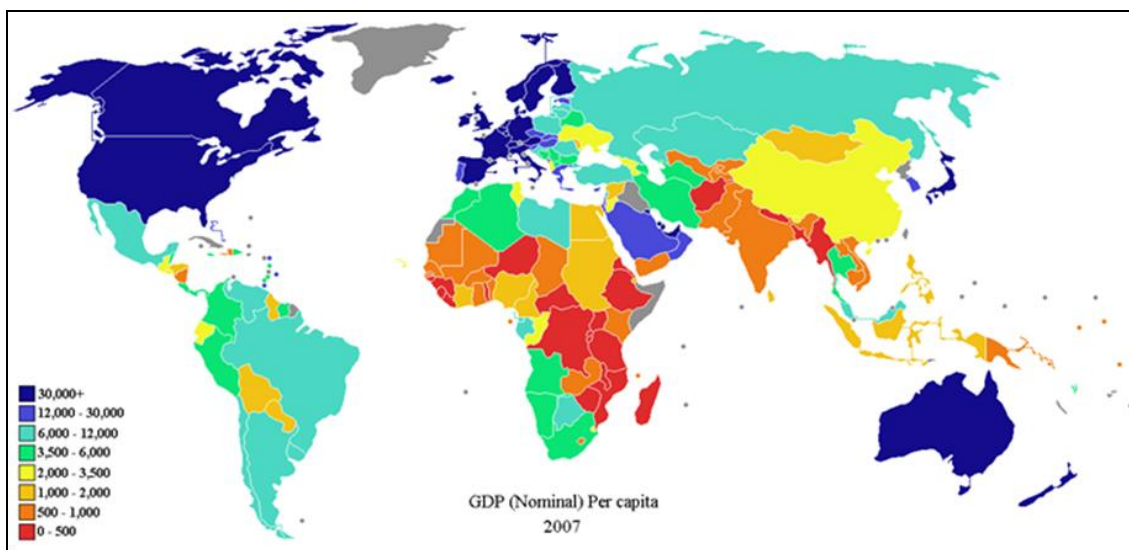


Figure 5-4. GDP (Nominal) Per capita 2007 according to the International Monetary Fund as of April 2008.

Many industry sectors contribute to the GDP of a country, and the most basic segmentation of contributors would be that of industry, services and agriculture. By segmenting the various industry sectors one can get a better view of what is the nature of the economic activity influencing the GDP of a country.

The Human Development Report that is renowned for determining the Human Development Index (HDI) and uses a GDP index as one of its variables in order to determine human development per country. The GDP index is calculated using adjusted GDP per capita. In the HDI income serves as a surrogate for all the dimensions of human development not reflected in a long and healthy life and knowledge (Watkins, 2007 Human development report). Income is therefore adjusted in this report because achieving a respectable level of human development does not require unlimited income.

All the economic variables described here are relevant, accessible, fairly accurate and available as a secondary data source to indicate the economic well being of a country.

#### **5.2.4. Social factors**

The global strategies of firms are greatly influenced by social factors such as social change and global convergence. There are claims that the tastes and needs of customers in different countries are becoming increasingly similar, which have been labelled 'global convergence' (Levitt, 1983). At this point in history one should be careful about the idea of 'global convergence', as some experts claim that there are still huge cultural and other differences between countries (Douglas and Wind, 1987). Elements of culture are important to consider in a knowledge organisation as the success of such a firm relies on the transfer of know-how, which is dependent on human interaction and mutual understanding. The challenge in measuring culture is the difficulty in determining quantitative data as apposed to qualitative data. This study gives

preference to quantitative data as nearly all of the countries in the world are compared with each other, which would be difficult to do with qualitative data.

Elements of culture are defined as verbal and nonverbal language, religion, values and attitudes, manners and customs, material elements, aesthetics, education, and social institutions (Czinkota and Ronkainen, 2007). Initiatives by the United Nation Development Program managed to quantify education indicators of countries in the Human Development Report 2007/2008. These are useful indicators for knowledge organisation as much of their success depends the users or employees' understanding of the products or services offered. The education index measures a country's relative achievement in both adult literacy and combined primary, secondary and tertiary gross enrolment. An index for adult literacy as well as one for combined gross enrolment is calculated. These two indices are then combined to create the education index, with two thirds weight given to adult literacy and one third weight to combined gross enrolment (Watkins, 2007).

The Human Development Index is a summary measure of human development, and is calculated by determining the average between the education index, the GDP index and life expectancy index.

The most successful measures of culture thus far can be said to be the decades of work done by Hofstede in correlation with major global firms such as IBM. His study demonstrated that there are national and regional cultural groupings, that affect the behaviour of societies and organisations, which are very persistent over time. Five dimensions of culture related to values are defined namely power distance, individuality, masculinity, uncertainty avoidance and long term orientation (Hofstede, 2001).

The Power Distance Index (PDI) is the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally. This represents levels of inequality defined from below, not from above, and suggests that a society's level of inequality is endorsed by the followers as much as by the leaders. Power and inequality are extremely fundamental facts of any society and anyone with some international experience will be aware that 'all societies are unequal, but some are more unequal than others'.

Individualism (IDV) is measured against collectivism and concludes the degree to which individuals are integrated into groups. On the individualist side there are societies in which the ties between individuals are loose: everyone is expected to look after him/herself and his/her immediate family. On the collectivist side, there are societies in which people from birth onwards are integrated into strong, cohesive in-groups, often extended families (with uncles, aunts and grandparents) who continue protecting them in exchange for unquestioning loyalty. The word 'collectivism' in this sense has no political meaning and refers to the group, not to the state. The issue addressed by this dimension is an extremely fundamental one, regarding all societies in the world.

Masculinity (MAS) is measured against femininity and refers to the distribution of roles between the genders which is another fundamental issue for any society to which a range of solutions are found. The IBM studies revealed that women's values differ less among societies than men's values; and that men's values from one country to another contain a dimension from very assertive and competitive and maximally different from women's values on the one side, to modest and caring and similar to women's values on the other. The assertive, competitive pole has been called *masculine*, and the modest caring pole *feminine*. The women in feminine countries have the same modest, caring values as the men, yet in the masculine countries they are somewhat assertive and competitive, but not as much as the men. The latter therefore confirm a gap between men's values and women's values in different countries.

Uncertainty Avoidance Index (UAI) deals with a society's tolerance for uncertainty and ambiguity, and ultimately refers to man's search for Truth. It indicates to what extent a culture programs its members to experience either discomfort or comfort in unstructured situations. Unstructured situations are novel, unknown, surprising, and different from usual. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures, and on the philosophical and religious level by a belief in complete Truth; 'there can only be one Truth and we have it'. People in uncertainty avoiding countries are also more emotional, and motivated by inner uneasy energy. The opposite uncertainty accepting cultures are more tolerant of opinions different from what they are used to; they try to have as few rules as possible, and on the philosophical and religious level they are relativist and allow many currents to flow side by side. People within these cultures are more phlegmatic and contemplative, and not expected by their environment to convey or express emotions.

Long-Term Orientation (LTO) versus short-term orientation can be said to deal with virtue regardless of truth. Values related with Long Term Orientation are thrift and perseverance; values associated with Short Term Orientation are respect for tradition, fulfilling social obligations, and protecting one's 'face'. This fifth dimension was found in a study among students in 23 countries around the world, using a questionnaire designed by Chinese scholars. It is therefore not included in this study as the other four dimensions include more than 80 countries, and thus only provide inputs to less than 20% of the countries in this study.

### **5.2.5. Technological factors**

The internet, advances in computer technology, genetic engineering, and laser technology revolutionizes the ways in which firms operate, and can have a major impact

on business strategy. An innovation may leave a firm's technology obsolete or it can lead to the creation of entirely new industries. Important issues to consider are global technology scanning and technology clusters, the rise of the knowledge based economy, and the spread of the internet.

Technology scanning is defined as the process of identifying technologies in the external environment. Firms may use different methods to learn about new technologies, from attending scientific conferences to pursuing technical partnerships with other technically advanced companies or research centres. These methods of scanning the technology environment would all have qualitative outputs and are therefore not included in this study.

The knowledge based economy is becoming more and more important with the advancement in computer and internet advancements. Unlike physical assets, a key characteristic of the knowledge economy is that knowledge can be transferred and used for different purposes on a global scale. There are great correlations between the spread of the connectivity, computing capability, and the knowledge based economy.

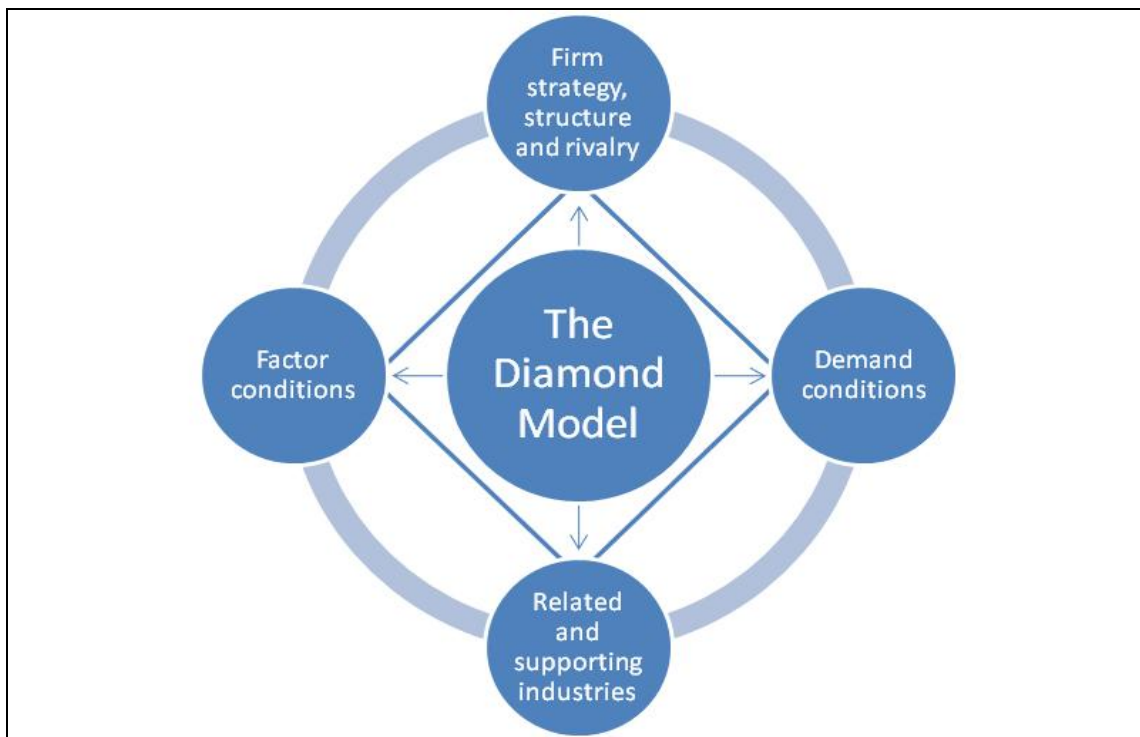
The spread of the internet enabled new types of products and services, operational efficiencies, and better customer services and relationships. Knowledge organisations would therefore be concerned with the amount of users in a country that have cell phones, are connected to the internet, and the number of secure data servers for them to host their services on. The CIA Fact book (CIA, 2007) provides reasonably accurate data on the connectivity of nations, which is used in this study.

#### **5.2.6. The Diamond Model and environmental analysis**

There are intrinsic reasons why some nations are more competitive than others, like a countries' national values, culture, economic structures, institutions, the strength of

local rivalry and challenging local customers. The national home base of a firm plays a key role in shaping that firm's competitive advantage in global markets (Porter, 1990).

Porter (1990) stated that the key to global economic success is innovation in the broadest sense, and developed the Diamond Model, which makes the assumption that the national home base of a firm plays a key role in shaping the firm's competitive advantage in global markets. Four characteristics of the home base help to explain why certain nations are capable of constant innovation in some industries: factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry. This model as depicted in *figure 5.5* (Porter, 1990) can be used to analyse the global competitive success of a national industry.



*Figure 5-5. The Diamond Model.*

The aim of this model is to demonstrate how the wider business environment can have a major impact on competitive success in the international marketplace. Insights from

the local business environment can therefore be applied in international business strategy.

Factor conditions are the countries' position in factors of production like labour, capital, natural resources, specialised skills of the labour force, a scientific base and infrastructure. Basic factors are of little importance in the knowledge based economy because global companies can obtain them through their worldwide operations. Factors can be created and must be highly specialised to an industry's particular needs. Then, the factors would not be widely available to every firm, they are more difficult to imitate and they require sustained investment to create.

These factors for knowledge organisations can be the combination of valuable intellectual property and the way in which it is deployed globally. As knowledge organisations tend to licence out technology, it is important to understand the culture of the recipients of the technology. Culture indexes are subjective, and are therefore used in comparison to that of South Africa as it can't be ranked on its own. A country with similar cultural indexes to that of South Africa would therefore be favoured above a country with a 'good' culture index level that differ greatly from that of South Africa.

Demand conditions of the home market affects how a firm perceive, interpret and respond to customer needs. The character of the demand conditions are more important than the size of the home market, as a firm can compete better globally if domestic buyers are the worlds most sophisticated and demanding buyers for a specific product or service. Local sophisticated buyers push companies to meet higher standards, and urge them to improve, innovate, and to enter more advanced market segments.

Firms can determine what industries they favour depending on their experience, profitability, and factor conditions in specific industries. By segmenting the GDP's of



countries, firms can approach countries by considering industries in those countries as apposed to just considering the GDP per capita. The most appropriate data available for segmenting the GDP of a country is according to three industries: services, industry, and agriculture. This information is given as the percentage that each of these industries contribute towards the GDP. Each of these percentages is multiplied by the GDP per capita to give a comparable measure of accomplishment in various industries of countries.

Related and supporting industries can be good sources of competition, innovation, and even discounts of raw materials if there are too many suppliers. In a global economy, a country does not have to be competitive in all related and supporting industries as a multinational firm with a global strategy can source material, components, or technologies anywhere in the world. A knowledge organisation can also source knowledge in the form of specialists or consultants if needed within the firm.

The case study for this dissertation deals with a service firm delivering a physical asset management service to big asset owners and original equipment manufacturers. The target market would thus be industries with big machines, and subsequently massive consumers of energy. Energy in this case would be the supporting industry, indicating where a need for the service would be required. The amount of energy consumed by every country divided by the population of that country is used as a measure of how big the need in the market would be for a physical asset management service.

Firm strategies and structures differs cross countries and no one country is a best fit for every industry as some managerial structures are more appropriate for some industries than for others. The mode of entry into a foreign market would be a determining factor in the strategies and structures abroad and should therefore be progressed with care. The extent and character of domestic rivalry is an important stimulus to innovation, as

firms facing such tough competition at home often develop the necessary skills enabling them to succeed abroad.

### **5.2.7. Industry environment**

The focus of this study is on the external macro environment within which firms compete in, order to make recommendations as to the countries (markets) that South African knowledge organisations should pursue. Future research should focus on the industries within the selected countries, and then on the companies within these industries by focusing on competitor intelligence. Competitor intelligence is the systematic collection of information about rivals with the purpose of assisting in the development of firm strategies. It is aimed at learning both about the competitors' strengths and weaknesses and about their likely future strategies and initiatives, as well as assessing the strengths and weaknesses of the firm's own resources and capabilities relative to other firms (O'Guin & Ogilvie, 2001). A brief overview of industry analysis and firm analysis follows for more clarity on these topics and completeness of this dissertation.

### **5.2.8. The Five Forces model**

Strategic group analysis is the identification of firms with similar strategies or those competing on similar bases. Firms also conduct market segmentation analysis by identifying similarities and differences between groups of customers who buy and use their goods and services. Strategic group analysis and market segmentation analysis are not enough to provide firms with a thorough understanding of their industry (Mellahi et al., 2005). Managers of firms must understand the underlying economic and technical characteristics of the industry or strategic group in which their firms operate (Porter, 1980, 1985).

Porter (1985) provides a framework that models an industry as being influenced by five forces, known as Porter's Five Forces shown in *figure 5.7*. This model is used to assist firms to better understand the industry context in which they operate by determining the competitive intensity and therefore attractiveness of a market.

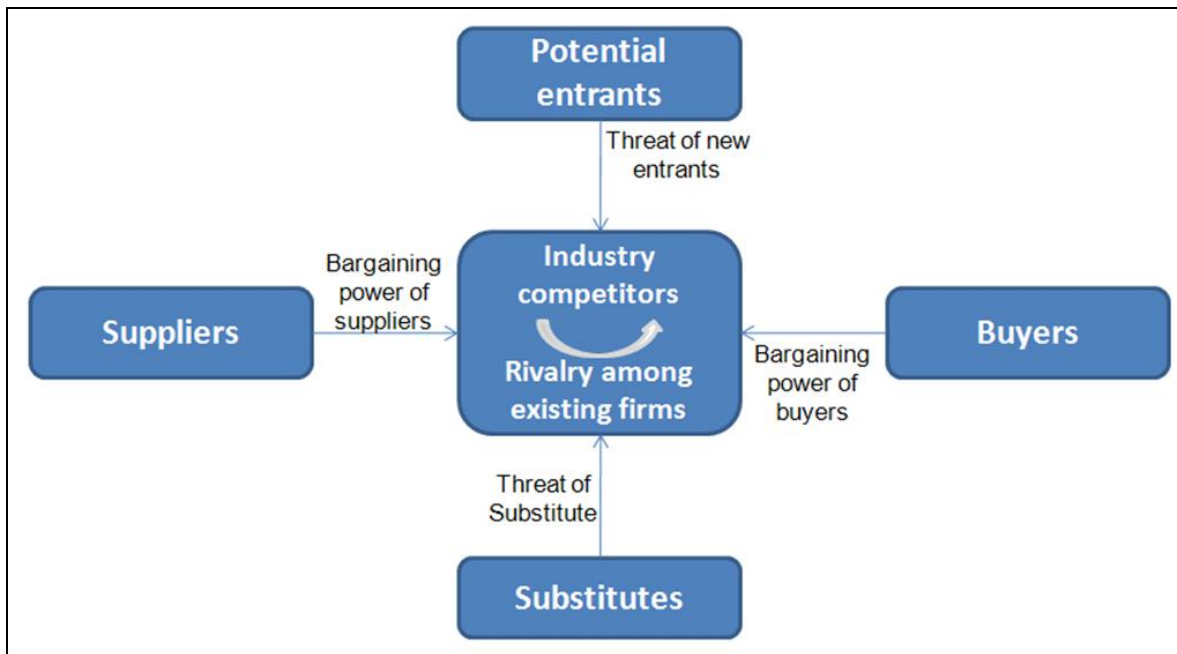


Figure 5-6. Porter's five forces.

Barriers to entry are the obstacles that potential newcomers would encounter when entering the market. Too many barriers to entry makes it less likely for firms to face new competitors, so high barriers to entry ensures higher profits to firms currently in the market. Examples of barriers to entry can be capital requirements and resource investment required to enter a market (or country); the increased economies of scale in the hands of competitors because of internationalization; the product differentiation required in order to win over brand loyal customers from the competition; the initial lack of access to distribution channels; government policies; and expected retaliation of competition who anticipate new entrants into the market.

The bargaining power of buyers and suppliers depends on price and demand, so these two forces can be treated together as they are related to each other. Every firm needs to satisfy buyer needs in order to be profitable, while buyers push firms to sell products at its lowest possible price, with higher quality and higher levels of service, which in turn reduces profitability of the seller. Buyers and suppliers include very different groups. Buyers can include consumers, manufacturers buying components or universities buying equipment. Suppliers include firms providing products and services, but also employees, who supply labour. The bargaining power of buyers and suppliers is determined by several factors which can include the concentration of buyers and suppliers; the cost (or penalty) a buyer would incur when switching between suppliers; buyers switching suppliers because they lack differentiation in their products; shared-supply alliances between many buyers to have more bargaining power; threat of buyers becoming vertically integrated; the availability of price information to the buyer; and the impact of the quality the raw material on the final product.

Threat of substitutes occurs when buyers regard a product or a service as interchangeable. The lack of substitutes in a market would make buyers more likely to accept the price for a product. If there is no lack of substitutes, then buyers will switch to substitutes when the price of the product increases. Substitutes will present a serious threat to the firms' products if the buyer is willing to substitute, if the substitute can perform more or less the same function as the firm's product, and if the buyer switching costs are low.

The intensity of rivalry amongst firms differs between industries. Rivalry can reduce profitability but greatly encourages innovation as firms may be forced to lower their prices, or invest in new research and development just to keep up with competitors. The result of intense rivalry is therefore lower profits, brought about by several factors like the number, size, and diversity of rivals; product differentiation and switching costs protecting sellers; growth rate of the industry; high fixed costs and storage costs; exit

barriers preventing established firms from leaving the market like specialised assets; and the excess of capacity.

### **5.2.9. Internal firm environment**

The internal firm environment is briefly discussed for completeness of this dissertation by referring to firm resources and firm capabilities.

Resources of a firm can include all the assets, capabilities, organizational processes, firm attributes, information, and knowledge. The resources controlled by a firm enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness. A resource audit identifies and classifies the resources controlled by the firm with a stance to supporting the firm's strategies.

Capabilities are complex bundles of skills, collective learning and know-how, exercised through organizational processes that ensure superior coordination of functional activities. Capabilities are about the firm's ability to integrate different tangible and intangible resources in order to provide a valid value offering to the customer in the form of products or services.

## **5.3. Global strategy development**

### **5.3.1. Introduction**

In multinational firms, strategies are initiated at the corporate (headquarter) level and at the subsidiary level. Each of the two levels of strategy has an important and distinct role to play in realizing and sustaining competitive advantage. Although key elements of the multinational firm strategy are formulated at the corporate level, strategies dealing with the implementation of the strategy are usually done at the subsidiary level.

Corporate level strategy deals with the question of what industry or combination of industries to compete in, and the overall game plan of the multinational firm. Subsidiary-level strategy is the game plan of each subsidiary. It is concerned with the question of how a subsidiary would position itself among local and international rivals to achieve its strategic goals.

### **5.3.2. Generic global strategies**

Porter (1985) mentions two basic types of competitive strategy known as 'generic' strategies, because they can be employed in any type of business in any industry. A firm's relative position within an industry is given by its choice of competitive advantage, namely cost leadership or differentiation, and its choice of competitive scope, namely broad target and narrow target. There are four generic strategies that a firm can pursue based on these two distinctions: Cost leadership; differentiation; focused low cost; and focused differentiation.

A cost leadership strategy involves setting out to become the lowest-cost producer relative to the firm's rivals, appealing to price sensitive customers. A subsidiary employing a differentiation strategy seeks to be unique in its industry along some dimensions that are perceived widely as unique and valued by customers, by receiving strong support from the parent and other subsidiaries in terms of sharing technology, process innovation, and product development and marketing. A subsidiary following a focused low-cost strategy selects a narrow, definite, and recognizable segment whose requirement is less costly to satisfy compared to the rest of the market, and tailors its strategy to serve customers in this segment. A subsidiary following a focused differentiation strategy focuses on a niche strategy by concentrating on a narrow customer segment and competes through differentiating features.

Both internal and external factors determine the choice of competitive strategies at the subsidiary level. Externally the choice of the competitive strategy is determined by conditions in the subsidiary's competitive market, such as rivalry intensity and by host country resources and infrastructure. Internally the choice of the subsidiary's competitive strategy is shaped by the role of the subsidiary as set at the corporate level, and by the distinctive resources and capabilities that can be deployed abroad. The greatest determining factor of how a subsidiary would operate and what strategies it should adopt would be determined by ownership of the subsidiary, and this is influenced by the choice of international mode of entry.

## **5.4. Mode of entry into foreign markets**

### **5.4.1. Introduction**

The choice of entry mode into a foreign market has a major impact on the success of a multinational firm's international operations as well as on the subsidiary level strategies. A firm's choice of entry mode depends on the strategic relationship the firm envisages between operations in different countries, and a particular entry decision cannot be viewed in isolation and must be considered in relation to the overall strategic posture of the firm. The vast alternatives of entry modes a multinational firm can choose from usually falls in the following categories: Non-equity contractual modes; an equity based cooperative venture; or a wholly owned subsidiary. A brief overview explaining the different choices of international entry modes follows for completeness of this dissertation.

### **5.4.2. Single venture (wholly owned subsidiary)**

A wholly-owned subsidiary is a company whose stock is entirely owned by a single legal entity. The owner of a wholly-owned subsidiary is known as the holding company or

parent company. Because the parent company owns all of the stock of the wholly-owned subsidiary, the parent company can control all of its decisions and activities. Moreover, under GAAP (General Accepted Accounting Principles or GAAP is the standard framework of guidelines for financial accounting), all of the financial transactions of a wholly-owned subsidiary are consolidated with those of the parent company. Thus, all of the activities of the wholly-owned subsidiary are part of the parent company for both operating and reporting purposes. A wholly-owned subsidiary is therefore a separate entity for legal purposes. Thus, the laws of the state or country in which the wholly-owned subsidiary is incorporated apply to the subsidiary but not the parent company, enabling various possibilities for overcoming legal obstacles.

#### **5.4.3. Joint venturing (equity based cooperative venture)**

A Joint Venture (JV) is an entity formed between two or more parties to undertake economic activity together. The parties agree to create a new entity by both contributing equity (in the form of measurable financial contributions or knowledge as intangible assets), and they then share in the revenues, expenses, and control of the enterprise. The venture can be for one specific project only, or a continuing business relationship like the Sony Ericsson joint venture. This is in contrast to a strategic alliance which involves no equity stake by the participants and is a much less rigid arrangement.

Joint venturing refers to the purpose of the entity and not to a type of entity. Therefore, a joint venture may be a corporation, limited liability company, partnership or other legal structure, depending on a number of considerations such as tax liability. Companies with identical products and services can also join forces to penetrate markets they are unable to consider without investing tremendous resources. Also, due to local regulations, some markets can only be penetrated via joint venturing with a local business. In some cases, large companies can decide to form a joint venture with a smaller business in order to quickly acquire critical intellectual property, technology, or



resources otherwise hard to obtain, even with plenty of cash at their disposal (Orsoni-Vauthey, 2006).

#### **5.4.4. Exporting**

Exporting can take place in many ways. A lot of administrative processes can be avoided if the exporter uses a local agent already established in the country where the products are exported. Commission of the local agent will increase the cost of the product, and a firm can therefore decide to establish a sales office which sells their products. It can also happen that only one transaction takes place without establishing a relationship (arms-length contract).

#### **5.4.5. Counter trade (Non-equity contractual)**

Counter trade is a collective term used for entry modes by which the seller has a contractual obligation to purchase products back from the buyer (Banks, 1983). Two groups of counter trades are distinguished by Buckley and Casson (1990) as the parties involved either avoiding cash payments (barter, clearing arrangement, and switch trading) or enter into contractual obligations laid down in parallel contracts (buy back, counter purchase, and offset).

Barter is the direct exchange of commodities as determined by the parties, without money changing hands. This is the oldest form of trading, as people in ancient times would for example have traded cattle for land and vice versa. A clearing arrangement is a compilation of barters in order to create the possibility of credit. Switch trading enhances the flexibility of arrangements by trading the positions being kept in clearing arrangements.

In a buy back arrangement, tacit technological know-how is transferred to another country for money. The seller of the technology undertakes a parallel agreement for the amount of products, using his technological know-how, he will purchase once it is produced.

#### **5.4.6. Cartel (Non-equity contractual)**

A cartel, as a mode of entry into a country, is subjected to stringent legislation as it causes unfair competition. This temporary form of horizontal cooperation between economically independent participants, deals with agreements made between the parties to change market conditions in their favour.

#### **5.4.7. Licensing agreement (Non-equity contractual)**

A long term contract to transfer the use of specific know-how in exchange for something is referred to as a licensing agreement. The licensee, who owns the specific know-how, generally receives royalty from the licensor, who obtains the know-how. The royalty is based either on the amount of know-how transferred, or on the sales of the output which embodies the know-how transferred.

Cross-licensing is when the right to use a patent is exchanged between parties, making actual payment unnecessary. The knowledge transferred is intellectual property (IP) protected by the law, and has commercial value. In order to make this IP transferable, it should be recorded in a blue print, a drawing, or a formula. IP in its tacit form cannot be transferred in the form of a written contract, and can only be acquired via learning by doing. This way of acquiring knowledge is usually not incorporated in the licensing agreement, except if it forms a minor part of the IP, and complements the knowledge. An example of this would be the training of an operator of the licensee by the licensor on how to use a computer program acquired by the licensee, or how to brew beer of the

brewery licensee. Although a precise process can be described in a formula or a blue print, a gut feel is required for the way to react to unforeseen events and the finishing touch which can only be obtained through experience.

Firms attempt to create a global standard for technological innovations, and licenses are therefore a popular vehicle for the transfer of the newest technology to competitors. Establishing a global standard this way at an early stage of development enables firms to be profitable without the threat of intensive competition. Philips for instance licensed its IP of the production of compact disks and players to several competitors including Sony to avoid a debacle similar to the Video 2000 system of some years ago.

IP that is not classified as know-how can also be transferred via trademark licensing. This kind of licensing permits the use of the names or logos of designers, literary characters, sports teams and movie stars on merchandise such as clothing. The licensor can obtain large revenue with little effort, whereas the licensees can produce a branded product that consumers will recognise immediately. These fees can range between 7% and 12 % of the net sales for merchandising license agreement (Moen and Servais, 2002).

#### **5.4.8. Commercial licensing or Franchising (Non-equity contractual)**

Franchising is when a parent company (the franchisor) grants another independent entity (the franchisee) the right to do business in a specified manner by using the franchisor's brands and business methods (Combs et al., 2004). Franchising is characterised by the simultaneous existence of three features: geographic spreading of sales, product replication and joint ownership by the franchisor and franchisee (Castrogiovanni & Justis, 1998). The typical reasons for the international expansion of franchise systems are financial gain, market potential and saturated domestic markets. Governments generally favour franchises as it does not replace exports or existing jobs

in the country of the franchisor, whereas the recipient country would experience little outflow of foreign exchange and the bulk of the profit generated remains in the country.

The key franchising concern is the need for standardisation, as the brand of the franchisor is associated with products and experiences delivered by the franchisee to clients. The experience of the clients needs to be consistent at every franchise, as it influences the perception of the franchise brand. Centralization as a managerial instrument also makes centralization of information necessary (Kidwell et al., 2007). Franchisors therefore need to design a knowledge repository within which know-how is collected like the documentation and description of processes; otherwise many of the benefits of the transferred know-how are lost. When franchising, KO would license out and transfer technology and know-how, enforce compliance to certain standards and allow the franchisee to use the name and trademarks of the franchisor. Franchisors would typically operate a training academy in order to ensure proper training of franchisees and key staff members like the Spur Training Academy or the Pragma Academy both in Cape Town (Parker and Illetschko, 2007).

To encourage better organised and more successful growth, many companies turn to the master franchising system, wherein foreign partners are selected and awarded the rights to a large territory in which they in turn can subfranchise. The franchisor gains market expertise and an effective screening mechanism for new franchisees as a result, while reducing costly mistakes (Grünhagen and Witte, 2002). Initial fees to the franchisor for entering a country is in the range of \$0.005 to \$0.01 per person in larger and more mature markets, whereas smaller and less mature markets tend to produce fees in the range of \$0.002 to \$0.004 per person. In a master franchise relationship, both royalties and fees are generally a fraction of what they are in a direct franchise relationship, with the licensee generally receiving the greater share of the revenues from both. In the United States of America, franchisors generally receive between 20% and 50% of the franchise fee upon each unit opening, and between 25% and 40% of

royalty revenues. These fees should not be determined based on the country in question, but rather on thorough financial analysis and an understanding of specific support services required (Siebert, 1998).

When considering franchising as a mode of entry, KO would benefit most from a master franchise system to ensure that potential franchisees would have easy access to the required specific support services like a reference site and a training academy. The alternative to a master franchise system would be to appoint a broker in the target country who would invite prospective franchisees to the host country of the franchisor; this subsequently becomes a costly operation in the long run.

#### **5.4.9. Consortium (Non-equity contractual)**

Consortiums are many times confused with joint ventures as it set up only for the duration of a project like a contractual joint venture. The main difference is that no equity participation takes place between the parties of a contractual consortium, and they have the advantage of sharing expenses and risks of a large project.

#### **5.4.10. Strategic alliance**

A strategic alliance is an umbrella term used for many forms of cooperation between the parties involved in agreements. Bell (1996) makes the remark that many definitions exist for a strategic alliance, and that some of them does not include joint ventures as no mention is made of equity participation.

#### **5.4.11. Minority participation (equity based cooperative venture)**

Minority participation is when a small part of the equity of an ongoing firm is sold. This is usually a high tech firm that needs money for research or expansion, which sells a

small part off to a firm who focuses this investment on keeping up with, and eventually acquiring the specific skills and know-how of the target firm (Bell, 1996).

#### **5.4.12. Acquisition (wholly owned subsidiary)**

An acquisition is when all the resources of the target firm are absorbed by the buying firm. This mode of entry can be used to obtain market power by creating an oligopolistic or even a monopolistic market situation

### **5.5. Entry mode decision**

#### **5.5.1. Evaluation of entry modes**

To evaluate the modes of entry, Hill et al. (1990) suggests that three broad groups of variables can influence the entry mode decision: Strategic variables; environmental variables; and transaction-specific variables.

Strategic variables influence the choice of entry mode primarily through the control requirements that they entail. Different strategies require different degrees of control over the operating and strategic decisions of foreign affiliates, and thus different entry modes. Environmental variables influence the entry mode decision primarily through their influence on the appropriate level of resource commitment.

This allows for a particular entry mode decision not to be viewed in isolation. The underlying constructs identified by Hill et al.(1990) that influence the entry mode decision are control, resource commitment and dissemination risk as shown in *table 5.2* (adapted from C. W. L Hill et al. 1990) below. Brand exposure is added as a construct as the influence of brand exposure should also be taken into consideration, especially in

knowledge organisations where the customers do not always perceive the value proposition as a physical product.

Table 5-2. The characteristics of different entry modes.

Entry mode	Constructs			
	Control	Resource commitment	Dissemination risk	Brand exposure
Licensing	Low	Low	High	High/Low
Joint Venturing	Medium	Medium	Medium	Medium
Wholly owned subsidiary	High	High	Low	High

Knowledge organisations tend to leverage their technology assets by licensing out it in exchange for royalties, or other technologies in the case of cross licensing. Licensing as a mode of entry into a foreign country is an easy way to enter a market as it requires low resource commitments from the licensor, but poses a threat of dissemination and lack of control. These obstacles can be overcome with proper legal agreements, and by selecting a country that is a member of the WTO, as all the members of the WTO undersigned the TRIPs agreement.

The brand exposure that a licensor would receive depends on the type of licensing agreement with the licensee. The licensee can be a value added reseller or a sub-licensor (agent) for the licensor, and can provide products under its own brand. Commercial licensing (franchising) is therefore a more attractive mode of entry as the franchisor can enforce the use of its brand and determine how things are supposed to be done.

## **5.5.2. Global strategy levels**

In most firms there are several levels of strategy which can also be described as a strategy hierarchy. The levels of strategy can be described as: Corporate strategy, business strategy and functional strategy.

Corporate strategy refers to the overarching strategy of the diversified firm that looks at the whole gamut of business opportunities. A well devised corporate strategy answers the question of ‘What business should I be in?’.

Business strategy focuses on tactics that is in line with the corporate strategy. It refers to the aggregated operational strategies of a single business firm. In a single business unit of a diversified corporation, it refers to the way in which a firm competes in its chosen arenas. These business units are usually treated as internal profit centres by corporate headquarters and are responsible for their own budget, new product decisions, hiring decisions and price setting.

The lowest level of strategy is the functional or operational strategy, which is very narrow in focus and deals with day-to-day operational activities. It usually operates within a budget determined by the business strategy and is not at liberty to adjust or create that budget. The actions from these strategies are creates direct value as a result of short and medium term plans, and is limited to the domain of a department’s functional responsibility.

## **5.6. Global strategy implementation**

### **5.6.1. Levels of globalisation**

Globalisation usually refers to the increasing degree of connection between various countries and their economies. By another definition, Derryberry (1999) states that



globalisation of the firm involves the efforts of firms to expand their operations into foreign markets. This definition has gained importance with the advent of the internet which gives every firm the potential to achieve global reach in its operations and strategy implementation. Firms generally operate at one of four levels of globalisation. Firms are therefore classified according to the levels at which they operate namely: A multi-domestic firm; an international firm; a transnational firms; and truly global firm.

In a multi-domestic firm the business consists of several independent units that operate in different countries with little communication between them. An international firm maintains a headquarter in one country and operates branches in other countries. At this level the firm is likely to impose its home country bias on the other markets rather than making a true effort to integrate into the global economy. A transnational firm consists of loosely integrated business units in several countries. At this level the firm makes a great effort to address the local needs of operations in each country. A truly global firm views the world as a single market and develops an overall strategy for its various operations around the world. It applies the lessons of each country to ensure its global success, which is very idealistic but not easy to achieve.

## **5.7. Global strategy control**

### **5.7.1. Cybernetics and control**

As described in section 5.1.5 of this chapter, cybernetics is about the availability of information during the implementation of a strategy. It is a key success factor as it provides feedback that can be used to make changes to the strategy if needed. Control is the process of keeping something within prescribed limits, and timely and relevant information (cybernetics) is needed to identify whether the multinational firm should continue with its current strategy or modify it in the light of changed circumstances.

The difficulty in all forms of control is for the right people to have the power to effect change. Sufficient control variables needs to be in place otherwise the controller is given responsibility without power; the two needs to be in balance. The challenge in achieving this balance is particularly acute with the hierarchy involved in the parent-subsidary relationship, where the split of control functions must be such as to balance cost and flexibility. There are three methods of control based on the type of intervention that the parent makes in the activity of the subsidiary. They are: Output based, process based, and input based.

### **5.7.2. Control through input**

Input based control is a form of proactive control, focusing on setting up appropriate conditions for the subsidiary to perform as the parent wishes. This, with control through process will provide means for quality control in out-licensing agreements, especially with franchising agreements. The emphasis is on the knowledge, skills, values and motives of the employees in the subsidiary. Values and motives are intimately bound up with culture, which plays a major role in the wellbeing of the firm. The very important less formal controls can be exercised by individuals themselves and particularly by a group if culture is adequately understood. External specialists can be very useful in helping to inculcate the corporate culture as the culture of the firm will be significant. Another way in which to set the conditions right for a subsidiary is to have an appropriate and well-articulated mission statement for each unit. The vision or strategic intent is a view of a future reality that the firm seeks, whereas the mission statement is a declaration of the broad direction that the firm wishes to follow – a “road map” for employees.

### **5.7.3. Control through process**

Process based control is imperative in firms where quality control is important as with knowledge organisations involved in out-licensing agreements. This way of control focuses on the process that the subsidiary uses to carry out the tasks it has been assigned. The processes can be split into two types: structured processes and unstructured processes (Dermer, 1977). Structured processes are defined as stable, repetitive activities or procedures that can be described as a system, such as clerical or assembly-line tasks. Unstructured processes are novel activities requiring judgement usually associated with the leadership role of managers, once-off projects and many of the activities of knowledge workers.

### **5.7.4. Control through output**

Control through output means that the parent exercises control through comparing the output that the subsidiary has achieved with the objective that has been agreed upon. An objective is a well-defined commitment to achieve whilst a goal is a general statement of intent. The subsidiary should change itself through altering inputs and its processes or through negotiating with its parent for objectives to be changed. Output control will almost always be needed but may not always be the major form of control. It requires appropriate and precise objectives to be devised. This can only occur if the causes can be identified and understood, and if there is a clear understanding of the relationship between cause and effect. A likely case of this is where the subsidiary is carrying out a simple and usually stand-alone task like with the sales and marketing agencies used by exporting firms, and with subsidiaries within a multi-domestic strategy.

## **5.8. The Pragma strategy**

Pragma is in possession of modularised and protected technologies that it intends to outlicence. These out-licensing transactions go hand in hand with training in the transfer of this modularised technology. This presents the opportunity to also sell the time of consultants at the office of the technology client, and to gain more insights on the clients themselves.

Pragma currently has consultants dealing with licensing partners as well as a new business development unit. This business unit will be expanded as soon as business opportunities are identified in countries where Pragma doesn't have a presence yet. The information that these consultant can provide about the clients they deal with would be used in the assessment of whether Pragma should enter a joint venture with their technology partner or not.

To summarise, the strategy for Pragma is therefore to determine who are ideal potential technology clients, to enter into an agreement with them, to enable them with a consultant on site who would transfer the knowledge, and then to investigate the possibility of a joint venture with the technology client.

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## 6. Decision model

*“Good sense is mankind's most equitably divided endowment. The differences of opinions are not due to difference in intelligence, but merely to the fact that we use different approaches and consider different things. For it is not enough to have a good mind: one must use it well.” – René Descartes*

This part of the dissertation introduces the reader to decision making by investigating what variables to take into account in the decision making process, and how to interpret results obtained from the decision model.

They are discussed under the following headings:

- Introduction;
- Attributes;
- The generic systems model;
- Multiple criteria decision analysis;
- Interpretation of results; and
- Pragma as a case study.



## 6.1. Introduction

### 6.1.1. Levels of aggregation

Knowledge organisations (which include consultancies) face unique challenges in the process phases in externally leveraging technology assets. This dissertation deals with the intelligence phase of this process.

The international business system can be represented at various levels of aggregation. Each element identified at a high level of aggregation appears as a system on its own when viewed at a lower level of aggregation. There is a hierarchy of sub-systems within each system as a whole. Different variants of international business can be shown with different levels of aggregation:

- The individual person;
- the firm;
- the industry;
- the global economy (objective measures); and
- the socio-political-ecological system (subjective measures).

Besides the levels of aggregation used to describe a system, an important distinction should be made between short run and long run analysis too. The short run of the international business system is comprised of a fixed number of facilities which have been inherited from the past. By contrast, in the long run of the international business system the number of facilities is variable because new facilities can be created and established facilities may be closed down. It is therefore important in the long run context to distinguish between actual and potential facilities (Hennart, 2003).

An attempt is made to do an external environment scanning of the global economy and the socio-political-ecological system in order to determine the location of potential

licensees and attractive markets. The results would thus serve as a business intelligence system that can be used to assist strategic decision makers in order to extend the footprint of their business. Major firms are struggling with their investment justification procedures because they are either misapplied or the information included in the calculations is insufficient for the multifaceted problems being tackled. Traditional economic analysis simply do not account for the many intangible benefits that can be attained from complex systems. There are many inadequacies of traditional economic analyses methods in evaluating the prospective results of complex systems such as those encountered in macro environmental analysis (like qualitative indicators as culture and quantitative indicators as GDP per capita both needs to be considered in the decision). Multiattribute (multiobjective, multicriterion, multifactor, etc.) decision techniques seem to provide an easily understood yet comprehensive, set of qualitative and quantitative approaches to analyze such systems (Canada et al., 1989). The Brown-Gibson method (Brown et al., 1972) is used in this chapter to combine qualitative and quantitative attributes from the external environment scanning in order to give priority of one country or market over the next.

### **6.1.2. Choice of attributes**

The choice of criteria (attributes) by which to judge the political, economical, social and technological environments of alternative countries are core to this multiple-criteria decision making problem. The most important task is to identify feasible alternatives from where to select alternatives which is the list of countries of the world, and then to rank them according to the outcome of the analysis.

Canada and Sullivan (1989) states that it has been observed that the articulation of attributes for a particular decision can, in some cases, shed enough light on the problem to make the final choice obvious to all involved. Selection of a set of attributes is usually

the result of group consensus and availability of information. It is clearly a subjective process.

### **6.1.3. Properties of criteria**

The criterion used in decision making usually has certain properties: each criterion distinguishes at least two alternatives and in no case should identical values for an attribute apply to all alternatives; each attribute captures a unique dimension or facet of the decision problem (i.e. criteria are independent and nonredundant); all attributes, in a collective sense, are assumed to be sufficient for purpose of selecting the best alternative; and differences in values assigned to each criterion are presumed to be meaningful in distinguishing among feasible alternatives.

### **6.1.4. Selection of a measurement scale**

A large portion of the work associated with multiple criteria decision making lies in identifying feasible alternatives and appropriate attributes. The next task is to develop a measurement scale or descriptors (metrics) that permit various states of each criterion to be represented. A ranking system would thus be the measure by which countries are compared, and provides a prioritised list of alternatives.

All the countries in the world are not worth considering. There are many countries that would automatically be disqualified from the list of candidates like St. Lucia which is an island with a small population (CIA, 2007), or countries with non compliance to intellectual property laws (UNMS, 2007). MacCrimmon (1968) first categorised sequential elimination methods, that are decision rules (some arbitrary) whereby an individual might be able to eliminate one or more alternatives to narrow the choice and even be led to a final decision.

These methods are applicable when one can specify values or outcomes for all criteria's and alternatives. Those values should be scalar or at least ordinal. The method takes two forms: Disjunctive resolution is when an alternative will be retained if it meets the standard for at least one attribute; feasible ranges (satisficing) is a method where an alternative is judged to be feasible only if it meets the standard established for all attributes. The method of feasible ranges (satisficing) will be applied to the PEST framework in order to eliminate countries that do not comply to certain standards that would enable easy trade.

## **6.2. Attributes**

### **6.2.1. Selecting the attributes**

Political (and thus legal) factors to consider would be to assure that intellectual assets are protected and that there is political stability in a country. The indicators for political stability are fluctuating and are not worth considering in this environmental scanning as it aims at taking a longer view than current unstable events. Political risk can later again be evaluated in the decision making process and is not grounds for eliminating a country from the list. A good indicator for the protection of intellectual property would be to only consider countries that undersigned the Patents Cooperation Treaty (PCT) (WIPO, 2007), in which governments agree to comply with international standards of intellectual property protection (WIPO, 2002).

Economic indicators also fluctuate over time and would not be grounds for eliminating a country from the list. Compliance to economic standards would in turn be a good indicator, as the main economic concerns of the firm are to assure that business is legitimate and that money is safe. Countries that are members of the World Bank (WBG, 2008), provide a suitable metric for this.

Social factors are not easy to for customs and cultures. The population of a country (CIA, 2007) would give a projection of how many people are in a country to do business with. A list of all the available information in the CIA Fact book is shown in *Appendix 2*. Countries with a population of less than a predetermined range can be eliminated from the list. This minimum population range depends on the nature and service offering of the consultancy or knowledge organisation.

Technology is spreading rapidly due to the globalisation of nations, and it is possible to import nearly any basic technology required for business to remote locations (like satellite phones and wireless internet). For now, no country would be eliminated from the list due to technological factors. The argument is that countries with insufficient technology would automatically be eliminated from the list due to political, social and economical factors before technological factors would become worth considering.

The author expands the enterprise engineering planes in order to derive meaningful attributes. These attributes are susceptibility, segmentation and competence (see part 3). Many indicators can be taken from the PEST framework and used to determine measurable values of the enterprise engineering planes.

### **6.2.2. Attributes relating to segmentation, susceptibility and competence**

Segmentation deals with how products can be matched with markets. A single indicator has been calculated: The GDP (Gross domestic product) per capita gives an indication of the amount of income, comprised out of various sources, generated by a nation divided by the population of that country (CIA, 2007). The GDP is broken up into its three contributors namely industry, services and agriculture (CIA, 2007). The financial amounts of these three indicators, multiplied by the percentage of how much a firm is interested in each, will give a measure of how big the desired segments are to the firm. Therefore,

$$\text{Segmentation} = \frac{\text{GDP}}{\text{Capita}} \times [I_{\text{actual}} I_{\text{desired}} + S_{\text{actual}} S_{\text{desired}} + A_{\text{actual}} A_{\text{desired}}]$$

where

$I_{\text{actual}}$  is the percentage Industry contributes to the GDP of a country

$I_{\text{desired}}$  is the desired weight the user allocates to Industry

$S_{\text{actual}}$  is the percentage Services contributes to the GDP of a country

$S_{\text{desired}}$  is the desired weight the user allocates to Services

$A_{\text{actual}}$  is the percentage Agriculture contributes to the GDP of a country

$A_{\text{desired}}$  is the desired weight the user allocates to Agriculture

The user is given the option influencing the weight with which each of the industries contributing to the GDP of the countries in order to favour some countries above others. The user can for instance compare the GDP/Capita of countries based only on the contribution of agriculture to their GDP's. It is shown in *figure 6.1* that the input screen indicates services, industry and agriculture are equally contributing to the GDP/Capita.

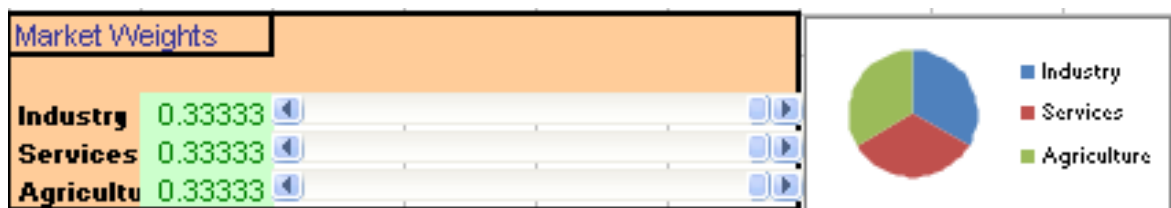


Figure 6-1. User inputs for the weights contributing to the GDP/Capita.

Germany as an example (CIA, 2007):

$$\begin{aligned} \text{Segmentation} &= (31,900) * (0.3 * 0.3333 + 0.691 * 0.3333 + 0.01 * 0.3333) \\ &= 10643.97 \end{aligned}$$

Susceptibility deals with how well technology will be adopted by a specific market. It also reflects the degree to which a firm will blend into the country, its policies and people, and if there is a need for specific technologies in that country (or market). The firm in the case study deals with physical asset management (PAM) and would therefore be welcomed into a market that uses a lot of energy (translating to a greater need for physical asset maintenance needs in the market). Energy consumption is therefore used as an indicator of the amount of physical assets in a country, and is indicated as the amount of KWh consumed (CIA, 2007 and WBG, 2006).

It is possible to determine how well a firm will fit in with the people of a country by comparing the host country's Corruption Perceptions Index (CPI) with that of the target country. The CPI is given as a number between 1 and 10, with 10 being least corrupt as shown in *figure 6.2* below (Transparency International, 2007).

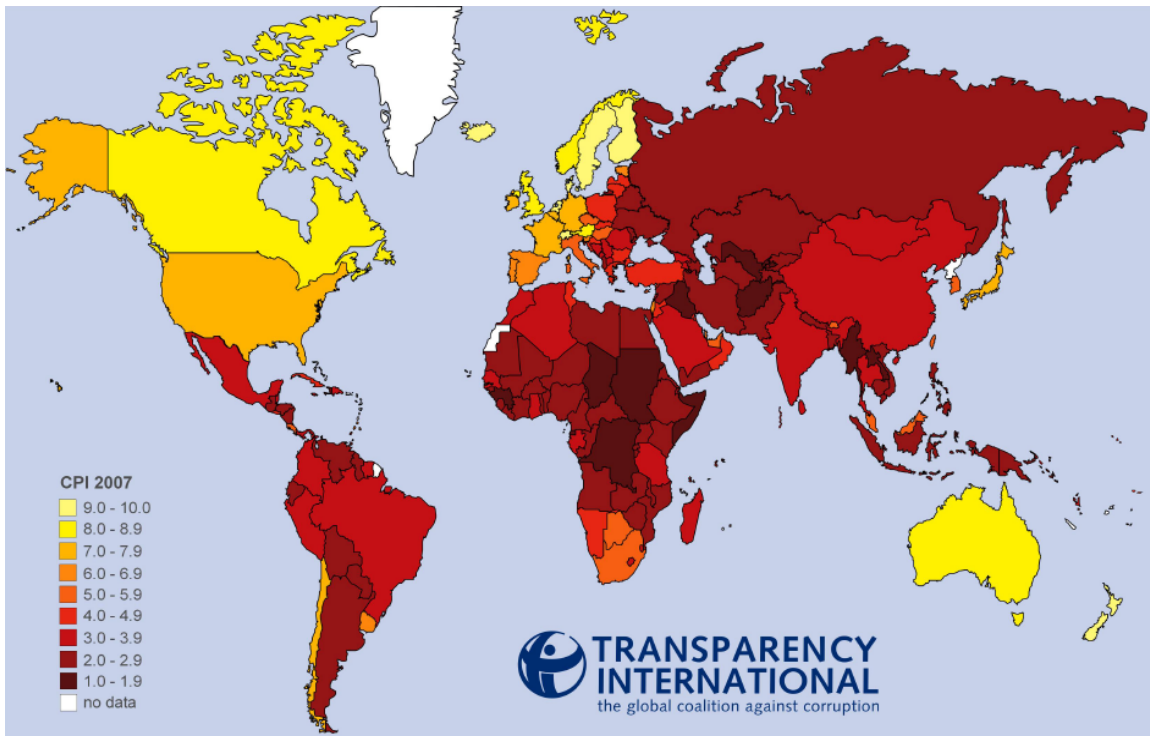


Figure 6-2. Map of the Corruption Perceptions Index of 2007.

Economic measures can also be used in order to determine if susceptibility is high in a country. The exports minus the imports into a country will give an indication of whether the country is producing more products than it is consuming. These values are all relative to the country in which it is measured; this indicator is divided by the GDP of the target country in order to compare countries with each other on the same bases. This indicator then gives a number between -1 and 1 indicating how much a county produces in relation to its income, which is a good indication of where maintenance and physical asset management services will be favoured. A positive number indicates that a country produces more than it consumes, whereas a negative number would indicate that a country imports more than it can export. To keep this number positive, 1 is added to the final answer which causes the number to be between 0 and 2.

Susceptibility is also dependent on the interaction between people, and therefore their cultures. Hofstede (ITIM, 2003) managed to measure culture and defined cultural dimensions. These dimensions are the Power Distance Index (PDI), the Individuality Index (IDV), the Masculinity Index (MAS) and the Uncertainty Avoidance Index (UID) as discussed in chapter 5.

The cultural indexes of South Africa are compared to that of the rest of the world, and countries with similar cultural scores are favoured over countries with different scores. The user can specify which of the four indexes are more important and give preference to one index to be taken more into account than the next. The answer to this calculation is a number between 0 and 1, where 1 indicates that the culture of the compared country is exactly like that of South Africa.

Therefore,

$$\text{Culture} = 1 - \sum_{i=UID, MAS, IND, PDI} \text{ABS}(i_{\text{South Africa}} - i_{\text{target country}}) \times i_{\text{desired}}$$



where

$i$  are the various cultural indexes

$i_{\text{South Africa}}$  is the culture index  $i$  of South Africa

$i_{\text{Target Country}}$  is the culture index  $i$  of the target country

$i_{\text{Desired}}$  is the desired weight the user allocates to index  $i$

The user is given the option influencing the weight of how each of the cultural indexes contributes to the total culture metric. The user can therefore give a higher weight to the UAI in order to give preference to cultures feeling comfortable in unstructured situations. It is shown in *figure 6.3* that PDI, UAI, IDV, and MAS are equally contributing to the Culture metric.

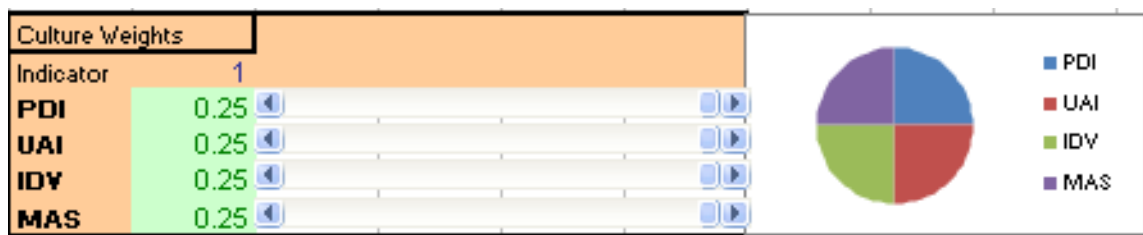


Figure 6-3. User inputs for the weights contributing to the culture score

Germany as an example (ITIM, 2003):

$$\begin{aligned} \text{Culture} &= 1 - (\text{Abs}(0.35 - 0.49) + \text{Abs}(0.67 - 0.65) + \text{Abs}(0.66 - 0.63) + \text{Abs}(0.65 - 0.49)) * 0.25 \\ &= 0.9125 \end{aligned}$$

This means that Germany is 91.25% like South Africa in terms of the measured culture.

The most basic ICT measures that would indicate a high level of susceptibility would be the amount of mobile telephones and internet hosts in relation to the rest of the world.

The reasoning behind this is that a knowledge organisation would need an ICT infrastructure with which to deploy their technology, and without internet or mobile phones their product will not be accepted as expected.

Susceptibility is then calculated using all the above mentioned indicators as shown below:

$$\text{Susceptibility} = \left( \frac{\text{GDP} + \text{Exports} - \text{Imports}}{\text{GDP}} \right) \times \text{corruption index} \times \text{culture index} \times \text{ICT measures} \times \text{Ena}$$

Germany as an example (Transparency International, 2007, CIA, 2007):

$$\begin{aligned} \text{Susceptibility} &= \left( \frac{(1.131 \times 10^{12} - 9.34 \times 10^{11})}{2.88 \times 10^{12}} + 1 \right) * 0.78 * 0.9125 * \\ &\quad (0.08749 * 0.03172) * 0.042518 \\ &= 1.068522 * 0.78 * 0.9125 * 0.00371989982 * 0.042518 \\ &= 0.00012028598139962265689646 \end{aligned}$$

Competence is calculated by multiplying measures of resources with measures of capabilities. It is argued that because competence indicates how well a firm can translate a technology into a product, that the capabilities would make the translation possible, and that the amount of resources determines the scalability of the translation. An example would be that an ICT company might possess certain know-how. If they have more money to buy equipment (resources) then they will be better at delivering products containing their technologies, and if they purchase more know-how (capabilities) then they will have better technologies in their products. The most basic measure of resources in a country is that of the GDP index (UNDP, 2007), and of capability would be the human development index (HDI) as well as the education index (UNDP, 2007).

$$\text{Competence} = \text{GDP index} \times \text{HDI} \times \text{Education index}$$

Germany as an example (UNDP, 2007):

$$\begin{aligned}\text{Competence} &= 0.89472 * 0.932 * 0.96 \\ &= 0.8410368\end{aligned}$$

A high measure of competence therefore means that there are healthy and educated people in a country that supports the infrastructure for them to be employed in an environment where they can transform technologies into products.

### **6.2.3. Discussion of variables**

The traditional view of economists and marketers in determining the location of lucrative markets are to use the elements of the PEST framework separate from each other, and then to base decisions on some weight of the four PEST outcomes to get a single score or outcome. This different approach, using segmentation, susceptibility and competence, can be validated by ensuring that enough metrics are represented by each of those representing PEST sections. It is shown in *Table 6.1* that sufficient variables relating to the PEST framework have been used in order to rank countries.

Table 6-1. The selection of variables compared to PEST and Segmentation, Susceptibility and Competence.

	Segmentation	Susceptibility		Competence		Satisficing criteria
		Firm/Industry Specific	Culture	Resources	Capability	
Political			Corruption index			IP Protection agreements
Economical	GDP/Capita for 3 segments	(E-I)/GDP		GDP index		Members of World Bank
Social			Cultural index		HDI Education index	Population large enough
Technology		ICT measures				
Other	User inputs A	Energy use	User inputs B			

Countries are ranked from best to worst using the rank function in Excel in order to compare countries. Appendix 3 shows a screen shot from Excel of how the variables are used to calculate a weighted evaluation. It should be noted that the *ICT measure* is an indicator comprised out of 3 other metrics, and that *technology* metrics are incorporated sufficiently into the model.

#### 6.2.4. Relating enterprise engineering to productivity management

By representing the enterprise engineering framework on the Cartesian axes, the author managed to define the planes of the solution space as Segmentation, Susceptibility, and Competence. Productivity management (as discussed in the next section) is a function of efficiency and effectiveness. Segmentation would be an indication of how a product is matched with a market. Good segmentation would result in doing the right thing, relating to effectiveness which would directly influence output. Susceptibility would be an indication of the diffusion of innovation of a certain technology in a market, relating to efficiency. Competence is an indicator of how well a product or service can be delivered by sufficiently supporting the required technology during technology deployment, relating to efficiency and doing the right things. Competence and Susceptibility has to do with people, and how they react with technology. Actions of

humans therefore influence efficiency. Setting the right targets deals with markets and segmentation and therefore influences effectiveness.

These concepts are graphically illustrated in the *Table 6.2* below.

*Table 6-2. Relations between elements of productivity management and the planes of the solution space.*

	<b>Effectiveness</b>	<b>Efficiency</b>
Segmentation	x	
Susceptibility		x
Competence		x

Zoltners et al. (2006) investigated the allocation of sales force resources during the various business life cycles, and found that good territorial alignment is a frequently overlooked productivity tool. Territorial alignment entails the assignment of accounts, prospects, or geographies to sales people. Organisations can allocate resources best if they measure how responsive different products and markets are to sales efforts. In order to apply a generic decision model to a specific client (KO in this dissertation) the current model should be able to make based recommendations upon certain user inputs which would base the answers on the input instead of giving the same answers to everyone. It is for this reason that the user can control inputs that would influence both the outcomes of efficiency and effectiveness as shown in *figure 6.1* and *figure 6.3* earlier.

## 6.3. The generic systems model

### 6.3.1. Introduction

Some of the principles of the technology deployment process can be analysed through studying the generic systems model proposed by Sink (1986) as shown in *figure 6.4* that follows.

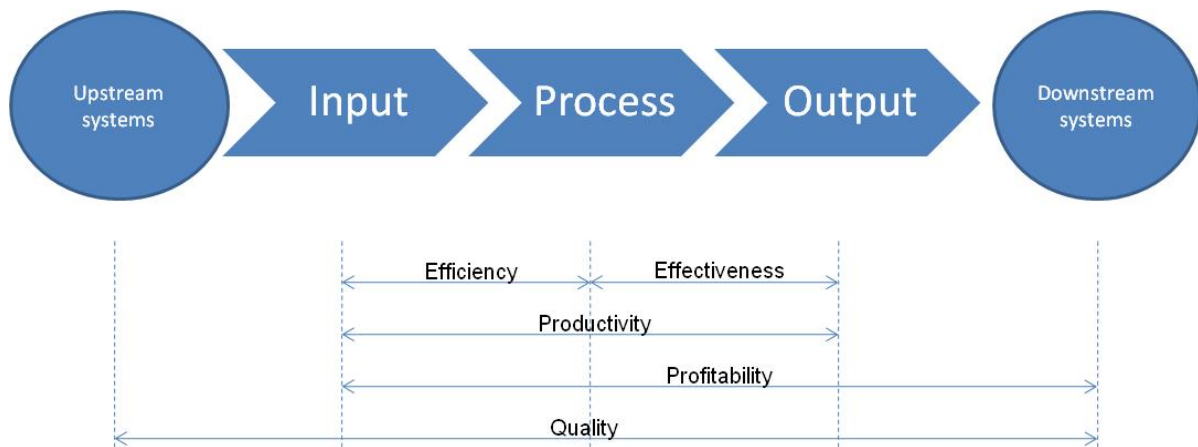


Figure 6-4. The generic systems model.

The generic systems model encourages the generation of improved or optimal combinations of output and throughput in relation to input with respect to these systems. The ideal of optimising the system places the focus effectiveness, efficiency, productivity, profitability and quality, an approach termed by Sink (1986) as productivity management.

The strategic focus of productivity management would be on effectiveness, which is when one is doing the right things in order to attain a goal. The operational focus of productivity management would be on efficiency, which is when one is doing things right while perusing a goal. Better effectiveness would thus mean that goals are better attained, translating into more throughput by the system. Better efficiency on the other

hand means that whatever action is taken is taken in the best way, translating into savings by not unnecessarily converting a resource.

Productivity is defined as the relationship between the amount of output produced and quantities of input dedicated to a system. A productive system can be described as a system that produces sufficient output while not wasting resources. One can then conclude that productivity must be mathematically related to efficiency and effectiveness. Revenues generated from the output in relation to the cost of resources in the input and process phases would be an indication of the profitability.

Profitability is defined as the relationship between the revenues generated from the output and the costs of inputs and processing. Quality can be defined as the combination of the factors of conformance to technical requirements, fit for purpose, conformance to financial and resource specifications and accordance to scheduling (Sink, 1986). Moll (1998) defines quality management as a process applied to five major components of a system namely selection or management of upstream systems, management of incoming quality, managing of process quality, managing of outgoing quality and interaction with customer needs and expectations.

It can now be mathematically stated that:

$$\text{Effectiveness} = \frac{\text{Throughput}_{\text{actual}}}{\text{Throughput}_{\text{expected}}}$$

$$\text{Efficiency} = \frac{\text{Resources converted}_{\text{expected}}}{\text{Resources converted}_{\text{actual}}}$$

$$\text{Productivity} = \frac{\text{Throughput}}{\text{Input}}$$

where,

$$Productivity_{expected} = \frac{Throughput_{expected}}{Resources\ converted_{expected}}$$

$$Productivity_{actual} = \frac{Output_{actual}}{Resources\ Converted_{actual}}$$

$$Profitability = Revenue - Expenses$$

$$Quality = \frac{return\ of\ subsystem_{actual}}{return\ of\ subsystem_{expected}}$$

This forms a theoretical base for productivity management, and the rest of this study will focus on the study of efficiency and effectiveness.

### 6.3.2. The application of productivity measures

In the application of the generic efficiency and effectiveness theory to the enterprise model it is proposed that the following identities are defined:

$$Effectiveness = f(GDP/Capita; Agriculture; Industry; Services)$$

$$Efficiency = g(UCT; Corruption; Culture; Imports; Exports; GDP; HDI; Education)$$

Effectiveness is about doing the right things and therefore only takes economic factors into account, giving a measure of how much financial potential a country has. If a firm would for instance only profit from agricultural firms then this measure would indicate what country has the highest agricultural GDP per capita. Thus, this would be the *right* country for agricultural activities.



Efficiency is about doing things right and therefore takes political, economical, social and technological factors into account. These measures would determine how easy it would be for a firm to deploy their value proposition in a new market. Thus, this would indicate the level to which the country will facilitate expansion from South African firms. These firms can not only take economic factors into account as a country can have a very high GDP per capita due to oil production and yet be extremely politically unstable, inhibiting expansion. A high efficiency measure would therefore indicate how easy it would be to set up an office with local employees and to deal with the governments and people of the target country. A country with very high energy consumption would for instance indicate that there are many physical assets powered by electricity (likely to be in factories) that would require a maintenance management service. It would then be easier to open an office or outsource maintenance management technology in this country than in another country.

The relation between these variables and PEST (for knowledge organisations) is shown in *table 6.3* below. Note that the variables might differ for firms in other industries using this model.

*Table 6-3. The variables used to calculate measures of efficiency and effectiveness.*

	Effectiveness	Efficiency				Satisfying criteria
	Segmentation	Susceptibility		Competence		
		Firm/Industry Specific	Culture	Resources	Capability	
<b>Political</b>			Corruption index			IP Protection agreements
<b>Economical</b>	GDP/Capita for 3 segments	(E-I)/GDP		GDP index		Members of World Bank
<b>Social</b>			Cultural index		HDI Education index	Population large enough
<b>Technology</b>		ICT measures				
<b>Other</b>	User inputs A	Energy use	User inputs B			

Hence, measures of efficiency and effectiveness are calculated in this study. Effectiveness is measured according to the ranking of the outcomes of segmentation. Efficiency is measured as the rank of a country based on the product of susceptibility and competence. The top 10 rankings of the latter as well as the HDI, GDP and energy consumption are shown in *table 6.4* that follows.

*Table 6-4. The top 10 ranked countries according to various measures.*

Rank	HDI	GDP (nominal)	Energy consumption	Efficiency	Effectiveness
1	Norway	USA	China	<b>Japan</b>	<b>Luxembourg</b>
2	Iceland	Japan	Japan	<b>China</b>	<b>UAE</b>
3	Australia	Germany	Russia	<b>Germany</b>	<b>Norway</b>
4	Ireland	China	Germany	<b>France</b>	<b>Ireland</b>
5	Sweden	UK	Canada	<b>UK</b>	<b>USA</b>
6	Canada	France	India	<b>Brazil</b>	<b>Iceland</b>
7	Japan	Italy	France	<b>Italy</b>	<b>Hong Kong</b>
8	USA	Spain	Brazil	<b>Canada</b>	<b>Denmark</b>
9	Switzerland	Canada	Korea	<b>Australia</b>	<b>Canada</b>
10	Netherlands	Brazil	UK	<b>Russia</b>	<b>Austria</b>

There are many ways by that can be used to compare countries, and the problem arises that there are too many factors to consider in the process of selecting a country. The two attributes that best describe measures relevant to this study are efficiency and effectiveness. These two attributes needs to be combined into a weighted outcome in order to indicate a decision that takes all the factors into account.

## **6.4. Multiple criteria decision analysis**

### **6.4.1. Introduction**

Multiple criteria decision analysis (MCDA) is the general field of study that includes decision making in the presence of at least two conflicting objectives and/or the decision analysis processes involving two or more attributes (Teclé and Duckstein, 1994). The selected MCDA technique typically needs to (De Montis et al., 2000):

- Deal with complex situations; consider different scales and aspects; social/technical issues and types of data;
- involve more than one decision maker; and
- inform stakeholders in order to increase their knowledge and change their opinion and behaviour (problem structuring, tool for learning, transparency).

### **6.4.2. The Brown-Gibson model**

Many numerical formula methods for assigning weights exist that are easy to use but generally less defensible than direct assignment of weights based on performance comparisons among criteria. A variation on the weighted evaluation procedure is the Brown-Gibson model. The Brown-Gibson model was first used for solving a Multiplant Location Problem (Brown and Gibson, 1972), where different objective and subjective factors were considered to evaluate optimum placement of production facilities. The decision needed to take at least the following into consideration: the location of suppliers, the price of facilities, the location of the wholesalers of the finished products, transportation cost, and the weight of raw material and finished products.

The model transforms objective (usually economic) measurement scales for alternatives under consideration into a score between zero and one so that the sum of the (objective) scores totals one. For subjective attributes normal ratings are then

transformed into numerical scores, and the relative importance of the attributes are weighted so that the scores of each attribute over all alternatives and the weighted (subjective) scores over all attributes each sum to one. Next, weights assigned to the objective and the subjective scores (which also sum to one) permit the analyst to determine the relative desirability of each alternative. Expressed in equation form, the combined measure [weighted evaluation (WE)] for each alternative k can be expressed as:

$$WE_k = (\alpha)(OM_k) + (1-\alpha)(SM_k)$$

where

$OM_k$  is the objective measure for alternative k

$SM_k$  is the subjective measure for alternative k

$\alpha$  is the relative importance weighting for  $OM_k$  between 0 and 1

Effectiveness is used as an objective measure as it deals with economic measures, while efficiency is used as a subjective measure.  $\alpha$  can now be adjusted between 0 and 1 in order for the weighted evaluation to take both the objective and subjective measure into consideration.

As an example, Germany is compared to Ireland by calculating a weighted evaluation for both by applying the Brown-Gibson model:

$$WE_{DEV} = (\alpha)(Effectiveness_{DEV}) + (1-\alpha)(Efficiency_{DEV})$$

$$WE_{IRE} = (\alpha)(Effectiveness_{IRE}) + (1-\alpha)(Efficiency_{IRE})$$

A break-even point is shown when  $\alpha$  is selected between 0.8 and 0.9, meaning Ireland would only be a better choice if effectiveness plays a role of more than 80% in the

decision process. It should be noted that the horizontal axis represents the 11 different values that is used for  $\alpha$ , and that the rank of the outcome of the weighted evaluation is plotted and not the linear values of the weighted evaluation.

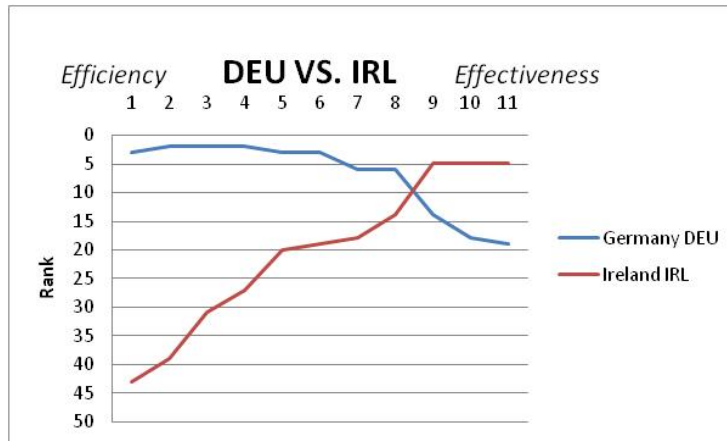


Figure 6-5. Outcomes with  $\alpha$  adjusted for Germany and Ireland.

It is useful to depict the effects of differing weights on the weighted evaluation as shown in *figure 6.5* above. The Brown-Gibson model is an enhanced weighted evaluation procedure that makes decision makers more aware of important criteria that therefore yields a more realistic decision model. Other advantages include its ease of use and being understandable like graphical results showing overall dominance and break-even points among alternatives. Another noteworthy item is that the use of this procedure does not remove subjectivity from the evaluation process; it merely attempts to recognise and quantify the subjectivity. As a result the subjective factors should be ranked carefully.

The computation of the objective factor weights can pose a problem if the decision maker is not aware that this model is only sensitive to multiplicative differences in the objective measure (cost). Two alternatives costing R10,000 and R12,000 would yield the same objective factor measure as two alternatives costing R100,000 and R120,000 , even though the cost differentials are R2,000 and R20,000 respectively.. Decision

makers need to be aware of this and take it into account when making their final decision.

### **6.4.3. Sensitivity analysis**

Sensitivity analysis (SA) is the study of how the variation in the output of a mathematical model can be apportioned both quantitatively and qualitatively to different sources of variation in the input of the model. In SA one tries to identify what source of uncertainty weights more on the study's conclusions, therefore looking at the effect of varying the inputs of a mathematical model on the output of the model itself.

With SA information is obtained from the system with a minimum of numerical experiments. The objective (effectiveness) and subjective (efficiency) measures of 182 countries are calculated, and a weighted evaluation is calculated for each country by changing the value of  $\alpha$  between 0 and 1 with increments of 0.1, giving 11 WE outcomes for each country. These outcomes are ranked and the rank orders are plotted and a line graph is shown in *figure 6.10* with changes of  $\alpha$  on the x-axis and the ranks of the countries on the y-axis.

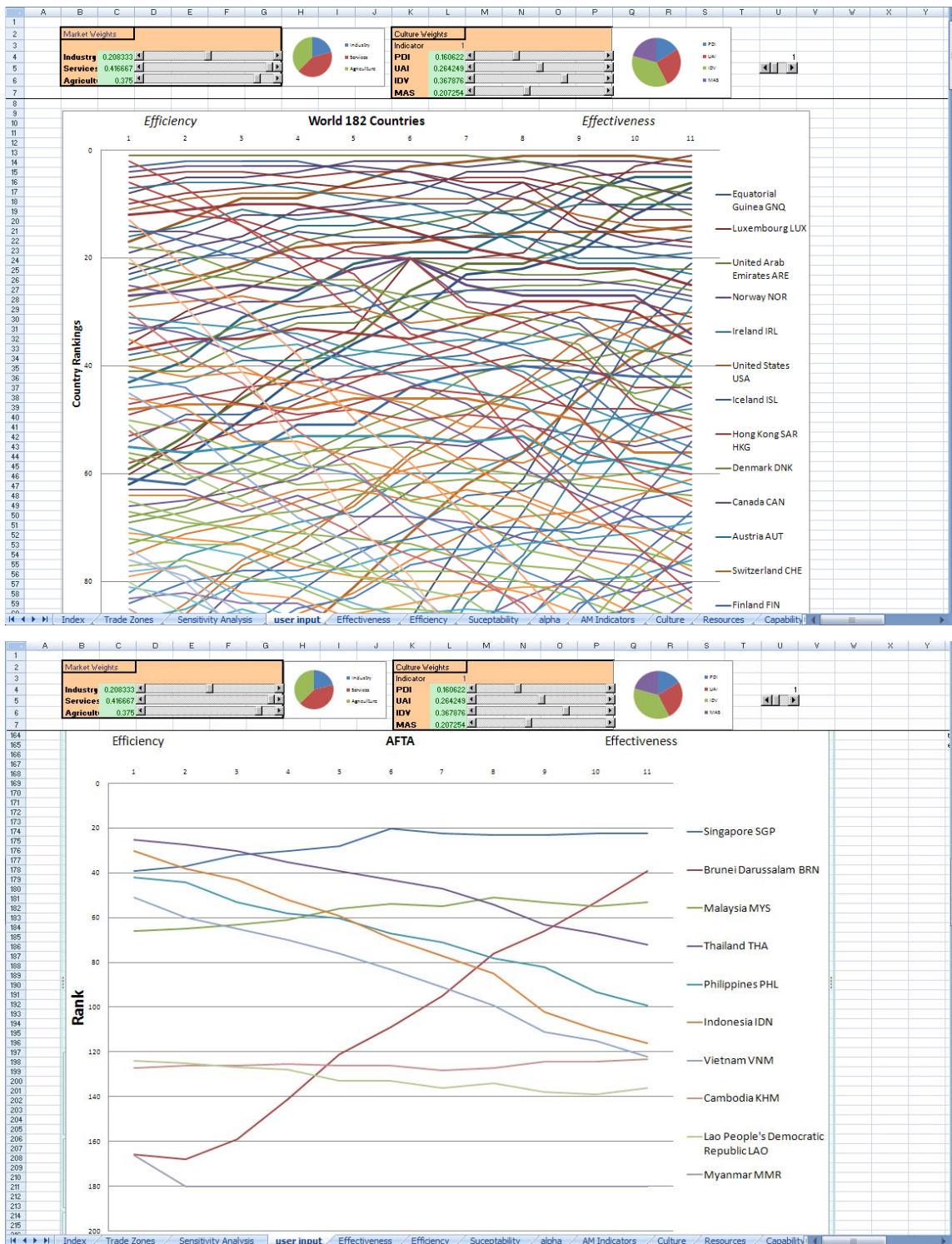


Figure 6-6. Output from the SA showing the ranks of 182 countries over the changing values of  $\alpha$ , and a second output of 10 countries from the above sample.

Note that this figure is only a screen shot intended to show that sufficient output is produced with SA, and not for deducting answers.

## **6.5. Results and the interpretation thereof**

### **6.5.1. Trade blocs in the interpretation of results**

The international business system can be represented at various levels of aggregation. As mentioned in *paragraph 6.1.1*, each element identified at a high level of aggregation appears as a system on its own when viewed at a lower level of aggregation. There is a hierarchy of sub-systems within each system as a whole, and viewing all the countries at once is too complex. A higher level for evaluation is required as the countries as a subsystem shows too much detail. When grouping countries according to the continents they are on, one can compare 7 regional divisions of the world. This is not good enough, and members of various trade blocs proves to have more similarities than occupants of continents, as trade blocs are political and geographical groupings where continents alone are only geographical groupings.

A trade block is a large free trade area formed by one or more tax, tariff or trade agreement. The most famous trade block is the European Union (EU) that even includes a more democratic and participative system. Varieties exist among trade blocs that include free trade areas, customs unions, single markets and economic and monetary unions. A figure of the most active trade blocs are shown in *figure 6.7* that follows.



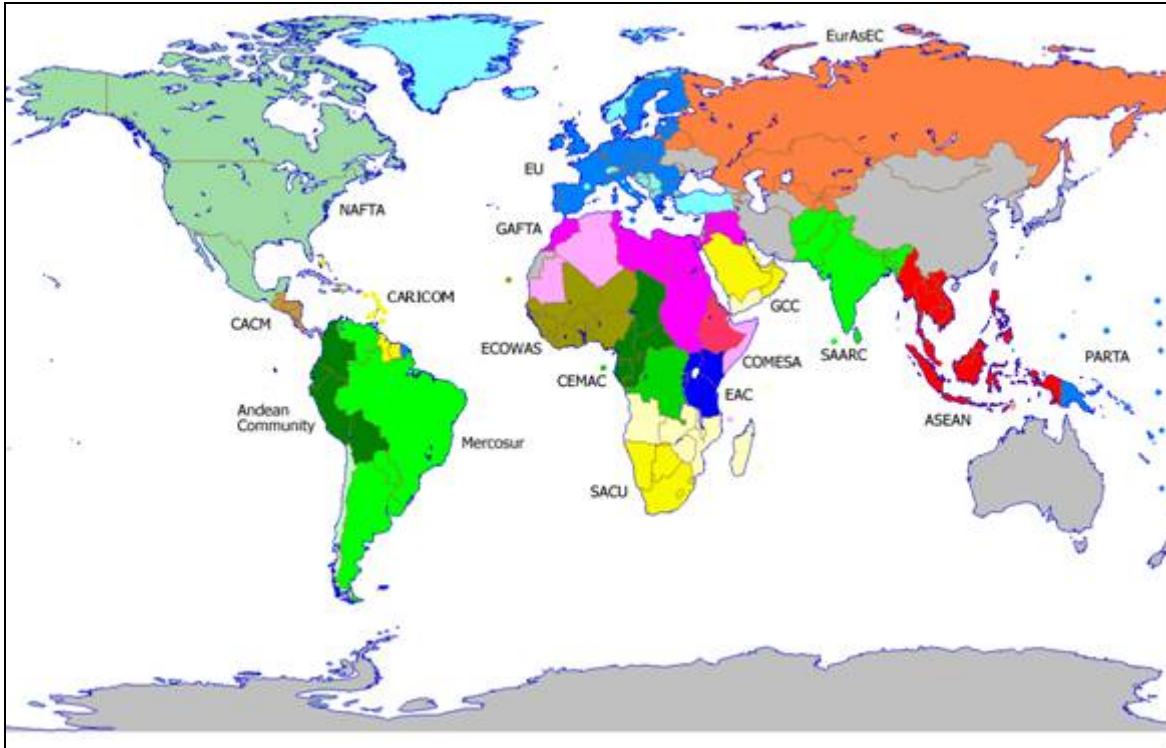


Figure 6-7. The world as divided by the most active trade blocs.

Various trade blocs are therefore used in this study in order to divide the world into sub systems to a workable level. The trade blocs used is shown in *table 6.5* below.

Table 6-5. The trade blocs and its members used in this study.

Trade Bloc	Members
ACC	Egypt; Arab Rep. of Iraq; Jordan; Yemen
AMU	Algeria; Libya; Mauritania; Morocco; Tunisia
Andean Group	Bolivia; Ecuador; Venezuela; Colombia
AFTA	Singapore; Brunei Darussalam; Malaysia; Thailand; Philippines; Indonesia; Vietnam; Cambodia; Lao People's Democratic Republic; Myanmar
APEC	Japan; China; Canada; Australia; Russia; United States of America; Mexico; Hong Kong SAR; Singapore; Taiwan; New Zealand; Brunei Darussalam; Chile; Malaysia; Thailand; Peru; Korea; Philippines; Indonesia; Vietnam; Papua New Guinea
LAIA	Brazil; Mexico; Argentina; Chile; Uruguay; Colombia; Venezuela; Peru; Paraguay; Ecuador; Cuba; Bolivia
CACM	El Salvador; Guatemala; Nicaragua; Honduras
SAARC	India; Sri Lanka; Maldives; Pakistan; Bangladesh; Nepal; Bhutan
SACU	South Africa; Botswana; Namibia; Swaziland; Lesotho
ASEAN	Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Singapore; Thailand; Philippines; Vietnam
CARICOM	Antigua and Barbuda; Barbados; Belize; Dominica; Grenada; Guyana; Jamaica; St. Lucia; St. Kitts and Nevis; St. Vincent and the Grenadines; Suriname; Bahamas, The; Trinidad and Tobago
EU	Germany; France; United Kingdom; Italy; Luxembourg; Netherlands; Spain; Sweden; Ireland; Denmark; Belgium; Austria; Finland; Poland; Greece; Slovenia; Czech Republic; Malta; Estonia; Portugal; Hungary; Slovak Republic; Latvia; Lithuania; Cyprus
ECOWAS	Cape Verde; Mauritania; Ghana; Gambia, The; Guinea; Senegal; Togo; Burkina Faso; Nigeria; Mali; Benin; Niger; Sierra Leone; Guinea-Bissau; Liberia
EFTA	Norway; Iceland; Switzerland
GCC	Bahrain; Kuwait; Oman; Qatar; Saudi Arabia; United Arab Emirates
Japan and Tigers	Hong Kong SAR; Japan; Malaysia; Singapore; Korea; Taiwan; Thailand
Mercosur	Argentina; Brazil; Chile; Paraguay; Uruguay
NAFTA	Canada; Mexico; United States
SADCC	Angola; Botswana; Congo, Democratic Republic of; Lesotho; Malawi; Mauritius; Mozambique; Namibia; Seychelles; South Africa; Swaziland; Tanzania; Zambia; Zimbabwe
SADC	Angola; Botswana; Congo, Democratic Republic of; Lesotho; Madagascar; Malawi; Mauritius; Mozambique; Namibia; Seychelles; South Africa; Swaziland; Tanzania; Zambia; Zimbabwe
SICA	Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua
Traid	Japan; Germany; France; United Kingdom; Italy; Canada; Spain; Netherlands; Ireland; Portugal; Poland; Finland; Lithuania; Sweden; Greece; Luxembourg; Austria; Slovak Republic; Czech Republic; United States; Estonia; Denmark; Hungary; Latvia; Malta; Slovenia; Belgium; Cyprus

It is possible that a country belongs to more than one block. To avoid overlapping for this classification such countries are only included in the most active bloc in question, or the nearest if the other member countries are on other continents. Activity of each block can be measured according to real practical achievements (and not only declarations that are not followed by action of its members), recent activities such as meetings or new agreements, and ambitious plans for future integration with a tighter time scale for achieving it.

Averages of the WE of all the member countries of the 22 trade blocs are calculated and trade zones are compared according to the WE outcome as shown in *figure 6.8*.

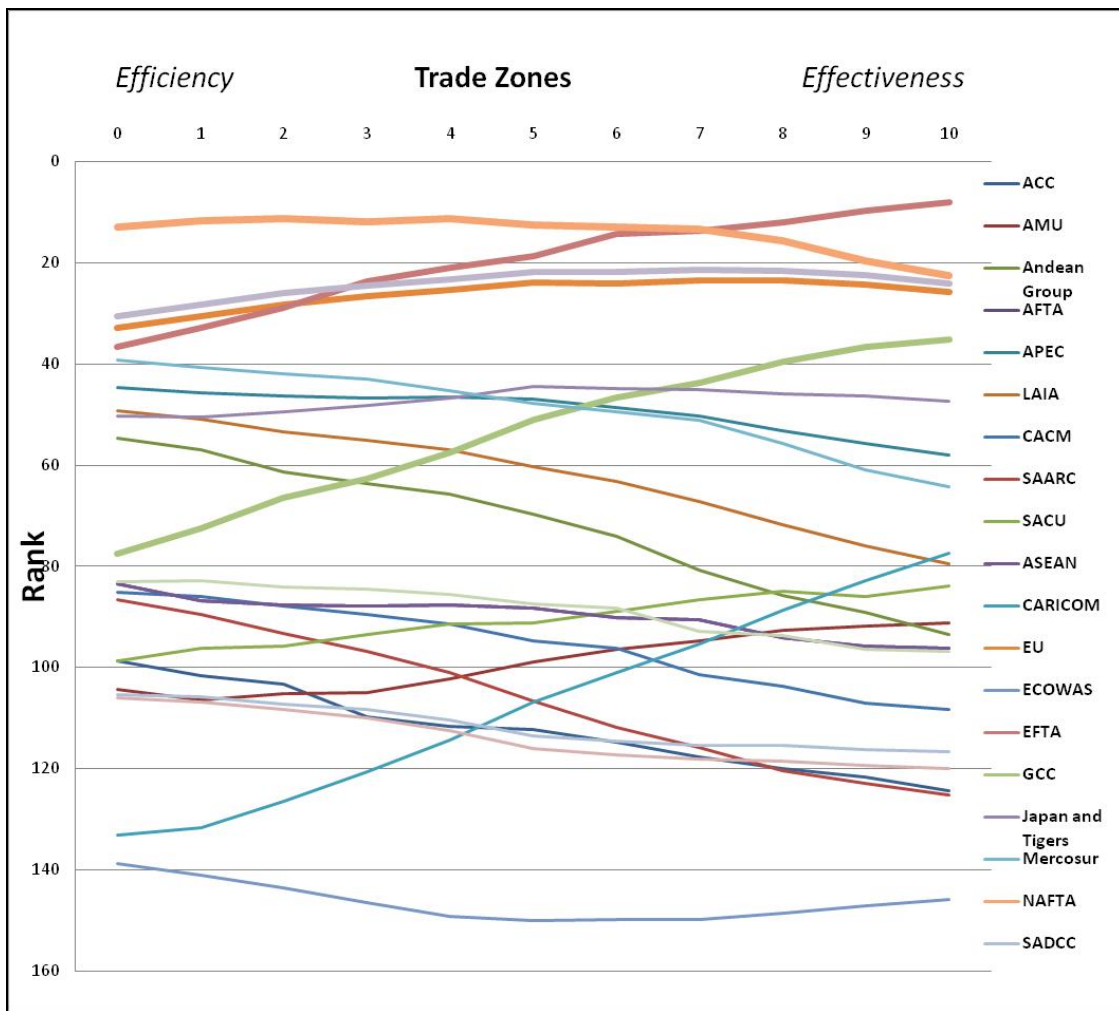


Figure 6-8. The selected trade blocs are compared.

The graph can now be interpreted, and EFTA (The European Free Trade Association) and NAFTA (The North American Free Trade Association) are the top two lines crossing at around  $\alpha=0.63$ . This means that a firm would prefer NAFTA based on efficiency, but should consider EFTA whenever efficiency influences less than 40% of the decision. Countries can become more efficient in their operations due to organisational learning as discussed in *Part 3* represented by the sigmoid curve in *figure 3.3*.

The efficiency of internal communication is a major factor in the overall cost of decision making, and hence a major determinant of the performance of the firm. The entrepreneurial qualities of the firms' key decision makers govern its ability to synthesize information successfully. This in turn affects the overall quality of decisions (e.g. the frequency with which potential mistakes are avoided) and so determines overall performance (Buckley et al., 2003).

Firms would over time favour countries with a high measure of effectiveness, which would only be relevant after entrance into the 'market' has been attained. A firm should therefore first establish a presence within a trade block, and then expand within that trade bloc to the preferred countries. Entrance into a trade block would be easiest into countries with high rankings of efficiency after which (because the organisation becomes more efficient) countries with high rankings of effectiveness should be pursued.

### **6.5.2. Interpretation of results**

It is shown in *figure 6.5* that there is a break even point of the WE between efficiency and effectiveness when Germany and Ireland are compared. It is also shown in *figure 6.6* that it does not make sense to compare all the countries of the world at once. Germany and Ireland belong to the same trade bloc, the European Union (EU), as shown in *table 6.5* earlier.

It is shown in figure 6.9 how countries of the EU are performing relative to one another. Germany and Ireland are depicted using dashed lines.

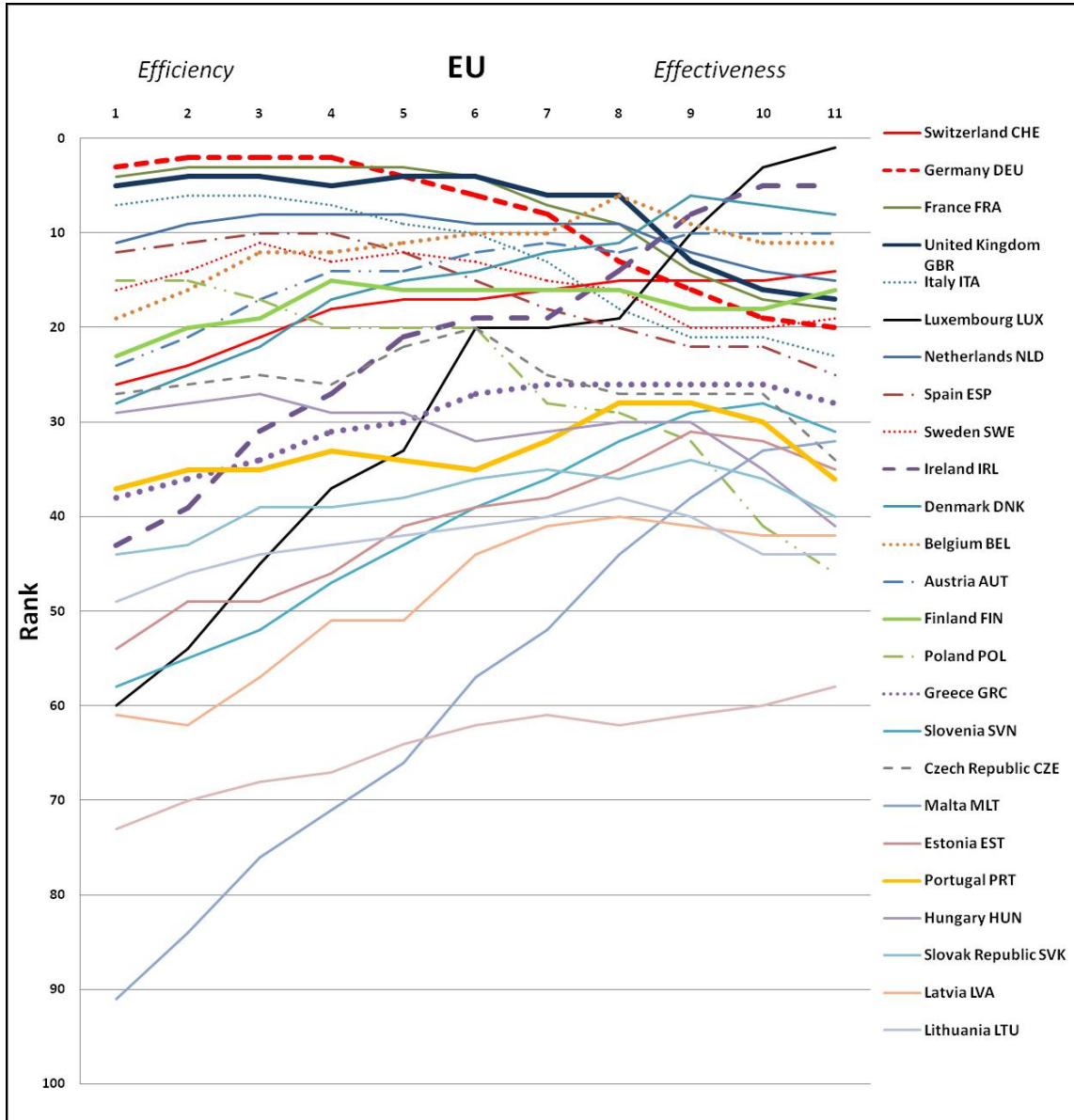


Figure 6-9. The countries from the EU are compared.

Again, a weighted evaluation is calculated for each country by changing the value of  $\alpha$  between 0 and 1 with increments of 0.1, giving 11 WE outcomes for each country. These

outcomes are ranked and the rank orders are plotted and a line graph shows changes of  $\alpha$  on the x-axis and the ranks of the countries on the y-axis.

Other countries are now included in the comparison, and various observations can be made. Germany has the highest ranking when only efficiency is taken into account. The blue line below Germany is that of the United Kingdom (UK), that follows a similar trend as that of Germany. This means that according to the graph, that the business environment would be similar in those countries.

The goal of firms is to maximise profit, and countries with high measures of effectiveness should therefore be pursued. Luxemburg is just above Ireland on the effectiveness side of the graph. A strategy for a knowledge organisation to extend its footprint in the EU can then be to first open up offices in Germany or the UK, and then to open the next office in Ireland and/or Luxemburg.

Cyprus is on the bottom left side of the graph, with a very low ranking of efficiency. A valid question then can be: What if someone who works in the expanding knowledge organisation knows someone or has family in Cyprus?

This model is merely there to be used as a decision support tool, and does not take human social networks into account. This model would make recommendations on where prospective clients might be, but an already established connection is much more worth than the speculation of a possible connection.

### **6.5.3. User inputs into the system**

It is shown in figure 6.10 that, to get into NAFTA, one should first go to Canada or Mexico, and then to the USA. This answer can't be the same for all the industries, and the model can take preferences for industries into account as shown in figure 6.1 earlier. The model is adjusted three times. In figure 6.11 the results are shown for the

instance when industry is set to 100%, agriculture to zero and services to zero. In figure 6.12 the results are shown for the instance when services are set to 100%, agriculture to zero and industry to zero. In figure 6.13 the results are shown for the instance when agriculture is set to 100%, industry to zero and services to zero.

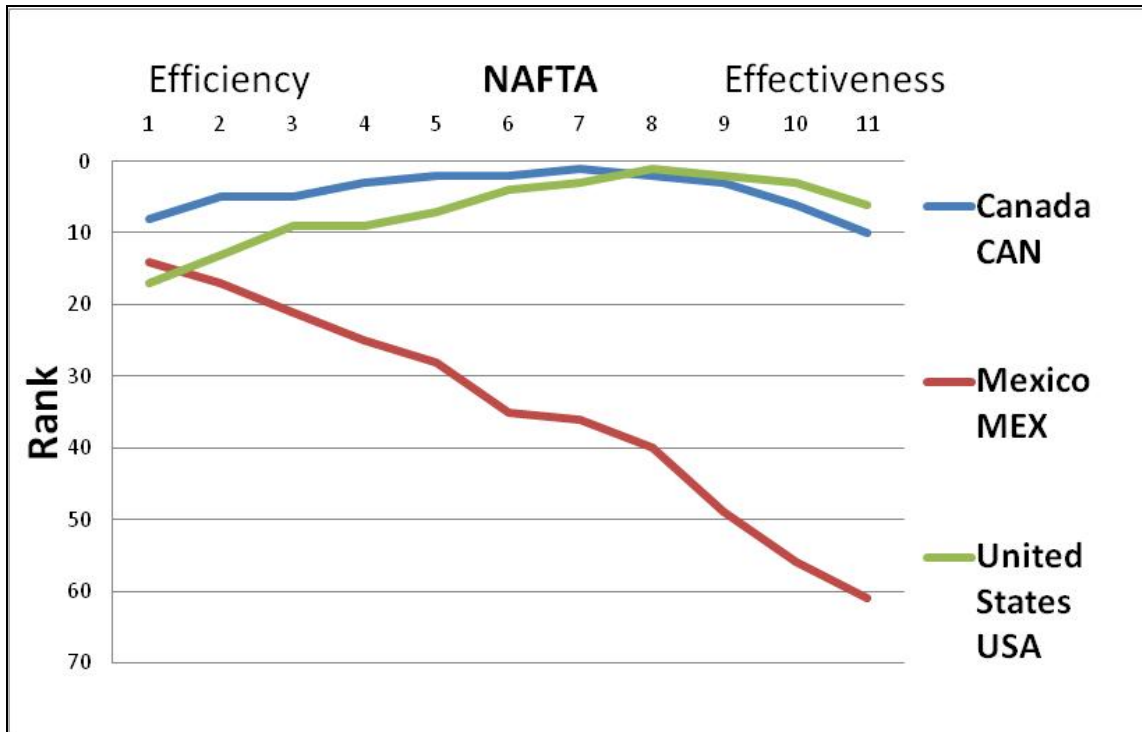


Figure 6-10. The countries from NAFTA are compared.

This way of changing the various inputs to the model is also a way of sensitivity analysis, and short interpretations of the results are given below each figure that follows.

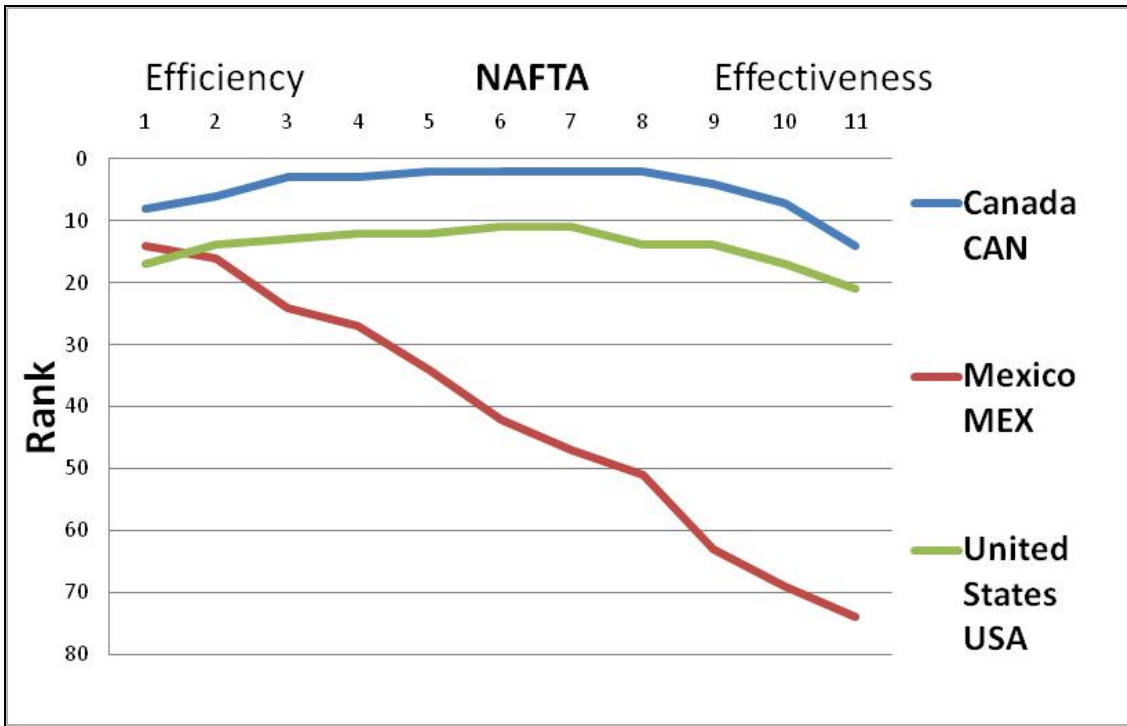


Figure 6-11. The countries from NAFTA, industry as the only contributor to the GDP.

Knowledge organisations with a value proposition to firms who are not in the agricultural or services industry should definitely go to Canada, and can then expand to Mexico and the USA.



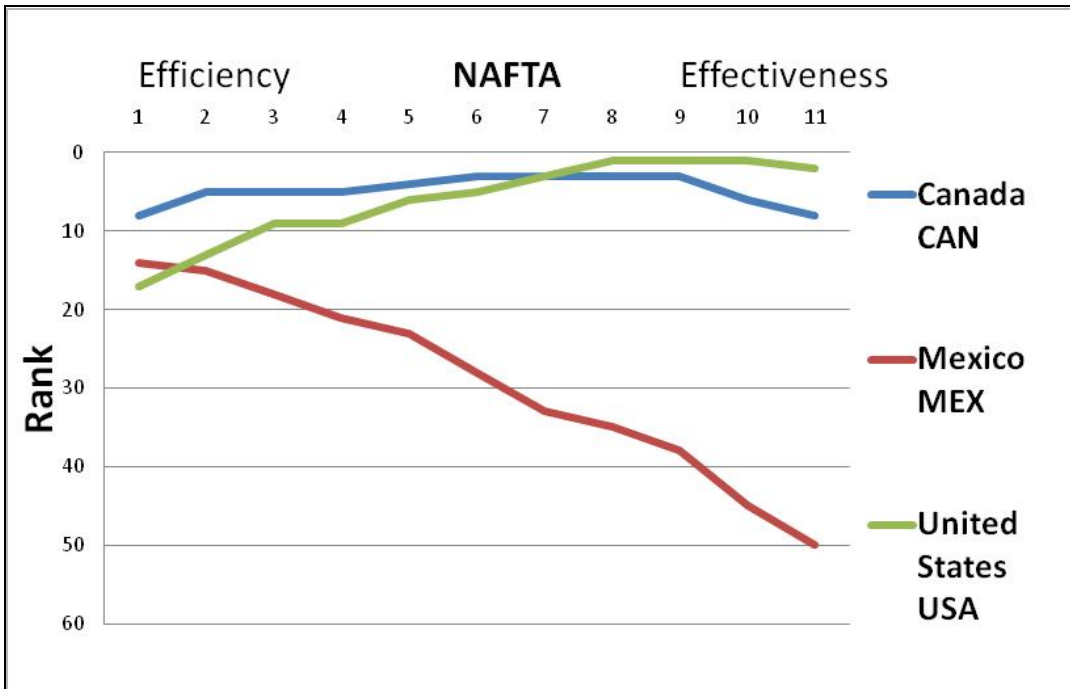


Figure 6-12. The countries from NAFTA, services as the only contributor to the GDP.

Knowledge organisations with a value proposition to firms who only operating in the services industry, should go to Canada and then seriously consider expanding to the USA.

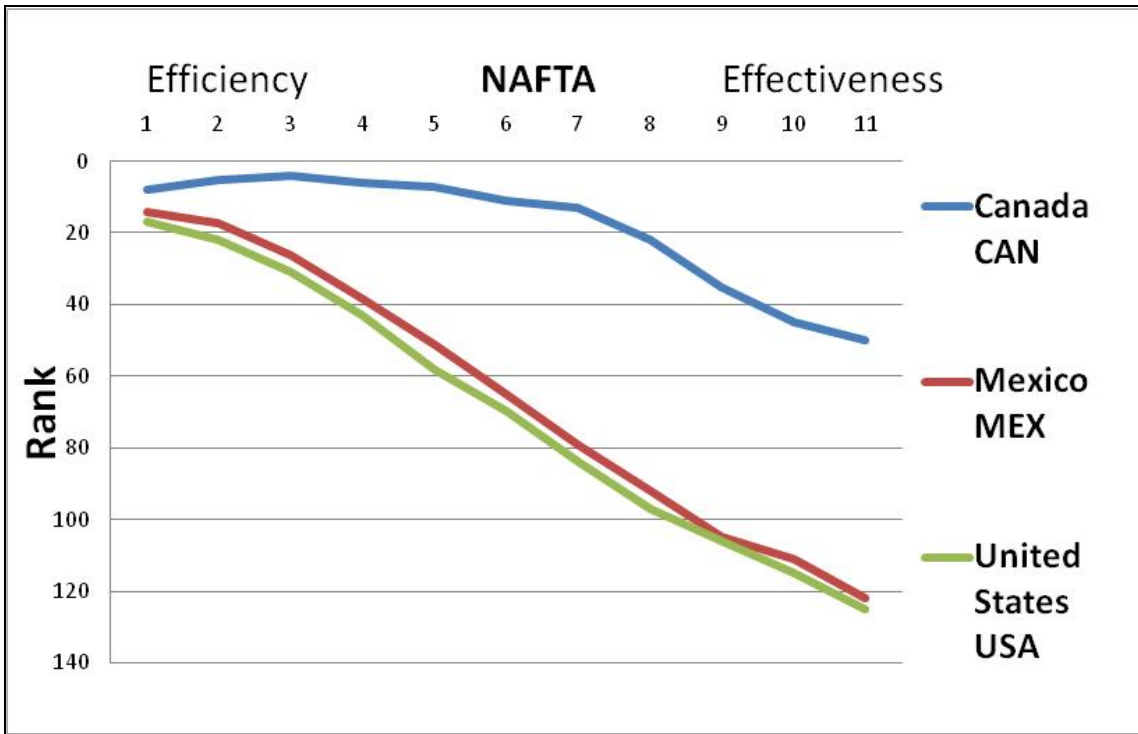


Figure 6-13. The countries from NAFTA, agriculture as the only contributor to the GDP.

Knowledge organisations with a value proposition to firms, who only operate in the agricultural industry, should go to Canada. Mexico and then the USA can then be considered, but there are no break even points for this instance.

The same can be done for the cultural indexes as shown in figure 6.3, where the user can adjust preference to certain cultural traits. This does change some of the outcomes, but not as drastically as the effectiveness inputs shown above.

## **6.6. Pragma as a case study**

### **6.6.1. The current state of Pragma**

The presence (licensing partners or offices) of Pragma in South Africa, Ireland, Brazil, and Saudi Arabia will be used as a starting point for translating the results. NAFTA will not be covered in this section as paragraph 6.5.3 provided a sufficient overview.

### **6.6.2. Trade blocs to consider and some results**

The following trade zones are discussed in this section, and graphs of the results are shown in appendix 1: EU; Latin American Integration Association (LAIA); Cooperation Council for the Arab States of the Gulf (GCC); and the Southern African Development Community (SADC).

The results are interpreted by first considering where Pragma has a presence in the trade blocs. For the GCC, is in Saudi Arabia. The ranking on the left side of the graphs in appendix 1, indicating levels of efficiency, is then used to indicate where Pragma should expand to in the short term. For the GCC, it is the United Arab Emirates. The user inputs for effectiveness is changed in the same way as in the previous section for these four trade zones, and the interpretation of the results are shown in table 6.6 that follows.

These changed inputs would only influence the right hand side of the graph, as it only influences the effectiveness. It is for this reason that only one recommendation is given for the short term and three for the long term. For the GCC, Qatar, Kuwait and Bahrain should be considered long term prospects if the industry sector is favoured. Qatar scored lower in the ranks when only the services sector is considered, and Bahrain and Kuwait should be considered next. Oman seems to be the only prospect worthwhile if only agriculture is considered.

Table 6-6. Interpretation of results for some trade blocs.

Trade bloc	Effectiveness preference	Current presence	Short term prospects	Long term prospects
EU	Industry sector	Ireland	Germany France UK Italy	Finland Austria Denmark
	Services sector			Denmark Luxembourg Belgium
	Agricultural sector			Cyprus Portugal Spain
LAIA	Industry sector	Brazil	Brazil	Chile Uruguay Colombia
	Services sector			Uruguay Chile Colombia
	Agricultural sector			Colombia Paraguay Uruguay
SADC	Industry sector	South Africa	Zimbabwe Mozambique	Botswana Mauritius Angola
	Services sector			Mauritius Seychelles Botswana
	Agricultural sector			Namibia Mauritius Swaziland
GCC	Industry sector	Saudi Arabia	UAE	Qatar Kuwait Bahrain
	Services sector			Bahrain Kuwait
	Agricultural sector			Oman

The other trade blocs can be interpreted in the same way to give results as long and short term prospects. This model therefore provides a starting point for Pragma in extending their footprint in the market.

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## 7. Conclusion

*“Science has not yet mastered prophecy. We predict too much for the next year and yet far too little for the next ten” – Neil Armstrong*

This part of the dissertation concludes this study by giving an overview of the unique challenges in establishing an extended footprint in a service and consulting business.

They are discussed under the following headings:

- Introduction;
- Global strategy management; and
- Applicability of the research.

### 7.1. Introduction

#### 7.1.1. Overview

KO's have specific features that needs to be catered for as well as unique business models. Intellectual assets are frequently created and can be leveraged through licensing agreements. An in depth study of knowledge was conducted, and consultancies as KO were investigated. Consulting firms develop technology for specific market applications to assist them in solving industry specific problems. These technologies are easily modularised and packaged and can be transferred as assets to licensees. Franchising as a method of out-licensing is proposed as a mode of entry into foreign markets. South African consultancies following the process phases in externally leveraging technology assets can benefit from the developed model during the intelligence phase of their out-licensing endeavours.



Modes of entry into foreign markets have been investigated, showing ways in which KO's can externally leverage intellectual assets through value networks in the form of licensing agreements.

The industrial engineering approach to systems provides a suitable mindset for understanding the complexity of global strategy problems. Proposed global strategies are based on combinations of geographic areas that become more desirable over time. One of the purposes of the intelligence phase in the process phases in externally leveraging technology assets is to provide the decision makers in KOs with the necessary information for selecting possible technology clients. This study intends to assist these decision makers by recommending favourable trade blocs, countries and industries within which to extend their footprint in the market.

The problem with such a macro environmental analysis is the overload of information on countries and markets. EE provides a base for understanding how this information can be translated into the useful measures of susceptibility, competence, and segmentation. These measures relate to efficiency and effectiveness, and are used as the objective and subjective variables in determining a weighted evaluation as an outcome. The Brown-Gibson model (1972) is a feasible approach to solving global strategy problems, and countries are ranked according to the outcomes from this model.

The variables included in the decision model are a result of consultation sessions with Pragma, where they identified measures for competence, susceptibility and readiness. These measures have been used to calculate efficiency and effectiveness, and a ranking system of the weighted evaluation outcomes provides suitable graphs to assist decision makers within Pragma. This study therefore expanded the EE model for KO (specifically consultancies) using analytical decision making methods (specifically MCDA) in determining global strategy with a focus on the external environmental analysis.

## **7.2. Global strategy management**

### **7.2.1. Approaches to global strategy management**

Moll (1998) proposes three approaches in the application of the business engineering process. These approaches can be applied in the same way to the generic systems model or the global strategy management process. The approaches are the analytical approach, the visionary approach and the organic approach.

The analytical approach focuses mainly on analysis in the earlier phases of a process and base decisions on the thorough understanding of the most significant issues at hand. The visionary approach in contrast would focus on design of the system, strategy or process in order to spend as much effort on the future as opposed to things that are bound to change in any event. The organic approach is that of not viewing analysis and design independently, but rather on organic growth that would speed up the process but with less direction.

### **7.2.2. Some contributions of the developed model**

Any one of these three approaches can be used when externally leveraging technology assets by means of a non-equity licensing agreement. Any approach would take the shape of a system made up of processes, and the generic systems model provides a foundation for understanding this.

Similarities exist between the model developed and the three approaches in the application of the business engineering process. The ranking of countries on the efficiency side of the solution graphs can be used in the analytical approach, as this indicates what the short term focus of a firm should be (opening up more offices to gain

entry into markets). The ranking of countries on the effectiveness side of the solution graphs can be used in the visionary approach, as it indicated what the long term focus of the firm should be (entering the most profitable markets).

Ultimately, the solution graphs should be interpreted as the organic road maps of a firm, making decision makers aware of how countries and geographic markets will become more or less favourable over time. This information is useful as it makes the decision makers of a firm aware of linkages and dynamics that can occur between the long and short term focus of the firm.

### **7.2.3. Future research**

By using this model, KO's can be assisted in selecting trade blocs, countries and industries within which their technology assets can be deployed. However useful it may be, this model does not take the licensee firms or technology and individuals within those firms into account. It is therefore proposed that the focus of future research should be on analysing firms within the selected industries, countries and trade zones in order to further assist KO's in the intelligence phase of the process phases in externally leveraging their technology assets.

### **7.3. Applicability of the research**

The dissertation has shown how a model can be developed to solve the global location problem for a selected KO through case study research. However, this approach can be generalised to various other applications by changing the variables used to calculate competence, susceptibility and readiness.

It was shown how an Industrial engineering approach, including some existing theory, can be modified to provide answers to the initial research question. By doing so, the

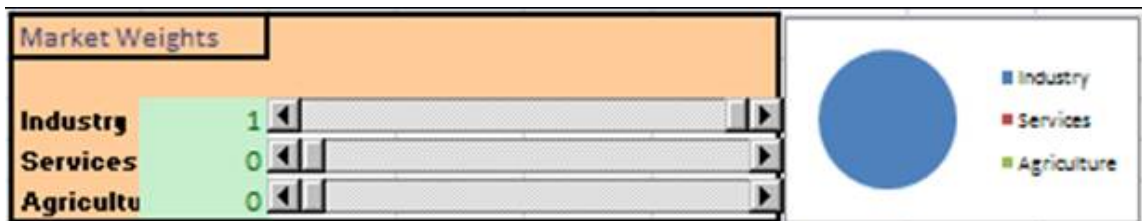
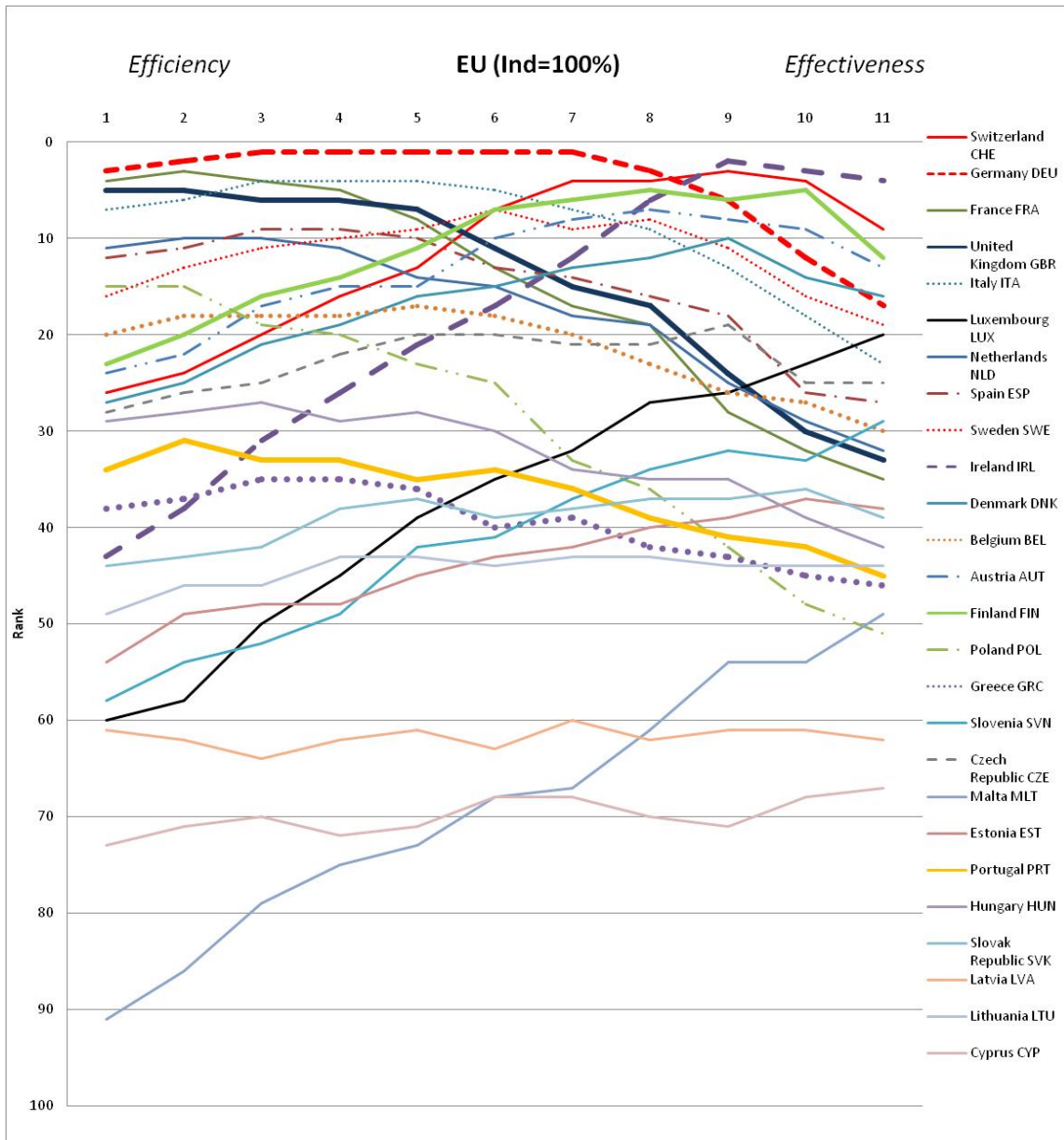
student had the opportunity to master his understanding of the discipline in the selected fields.

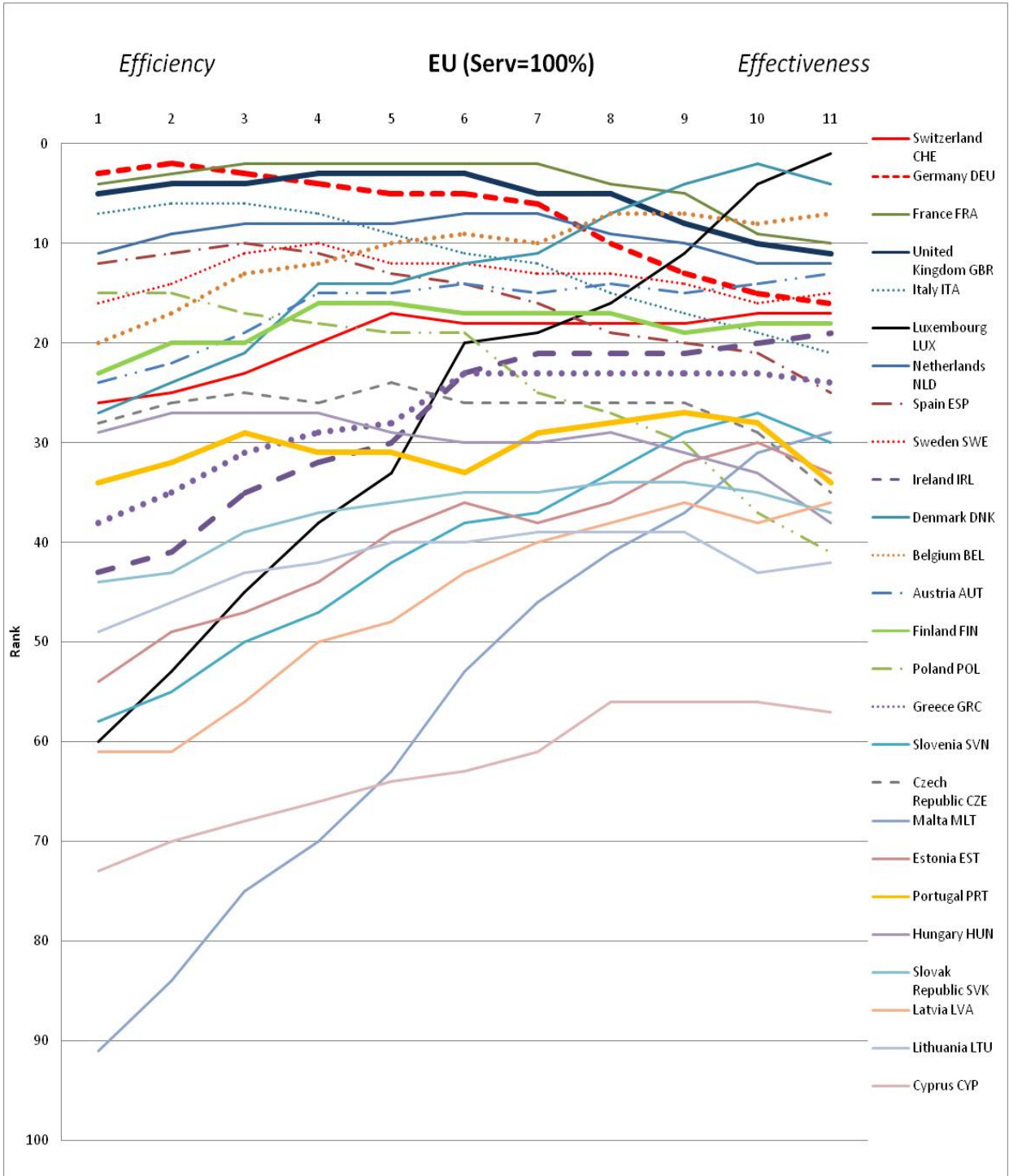
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# 8. Appendix 1

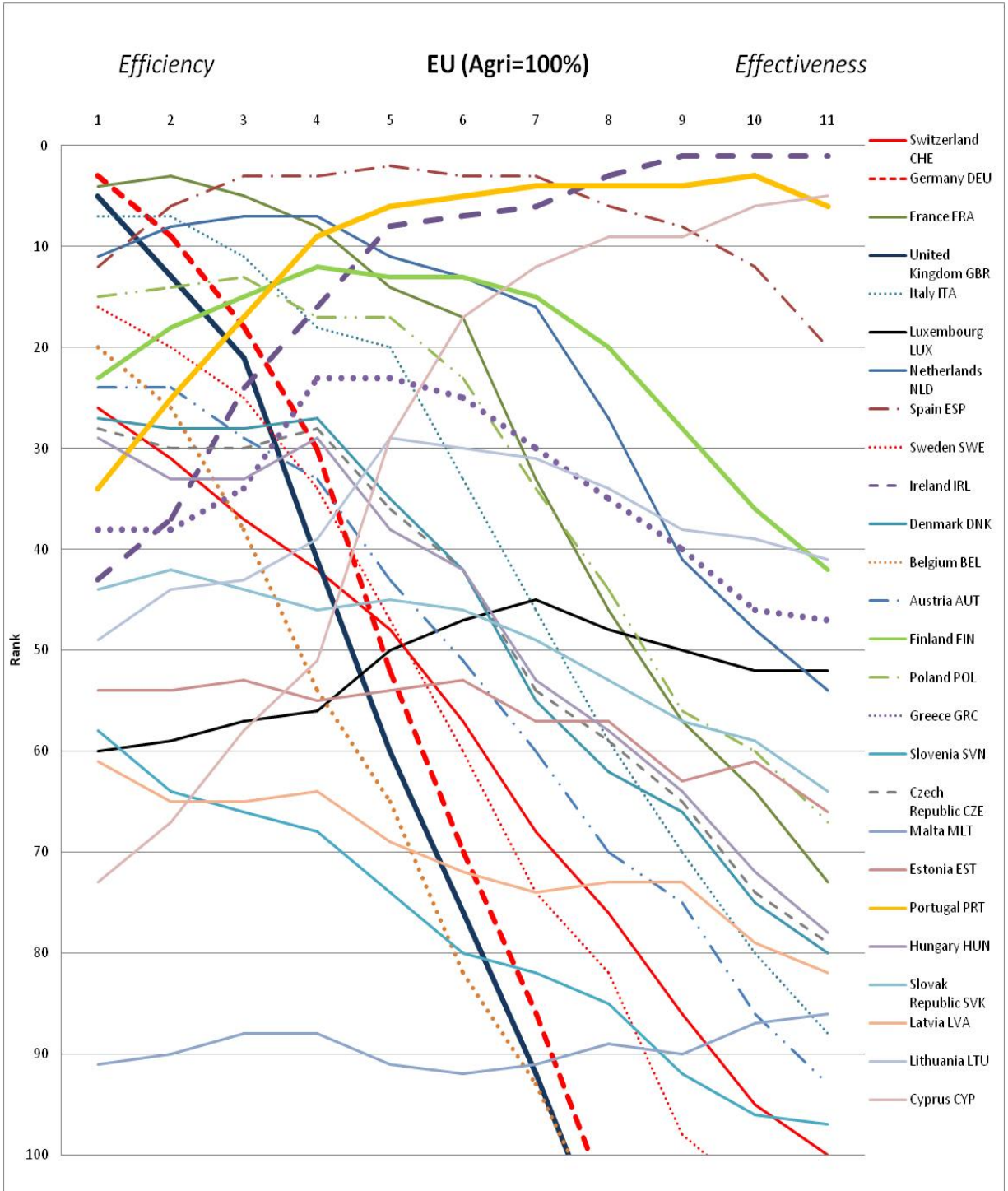




**Market Weights**

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Services	1	<input type="text"/>
Agriculture	0	<input type="text"/>

Legend: Industry (blue square), Services (red square), Agriculture (green square)



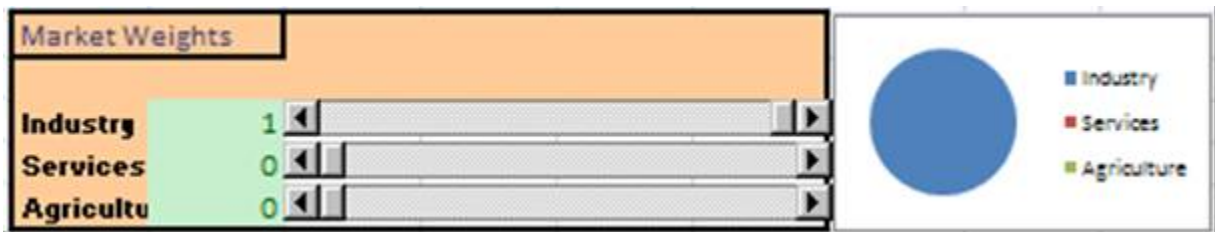
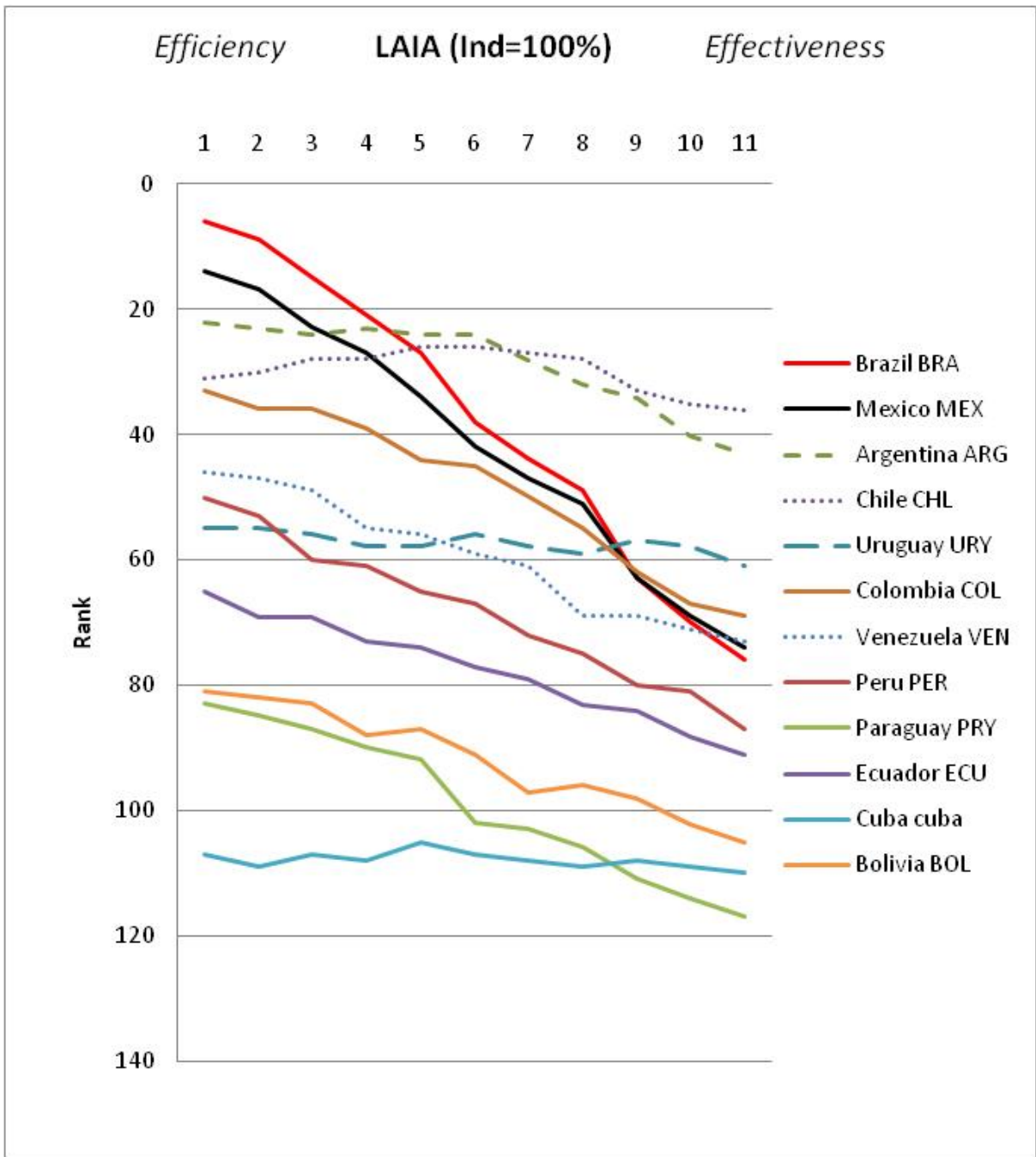
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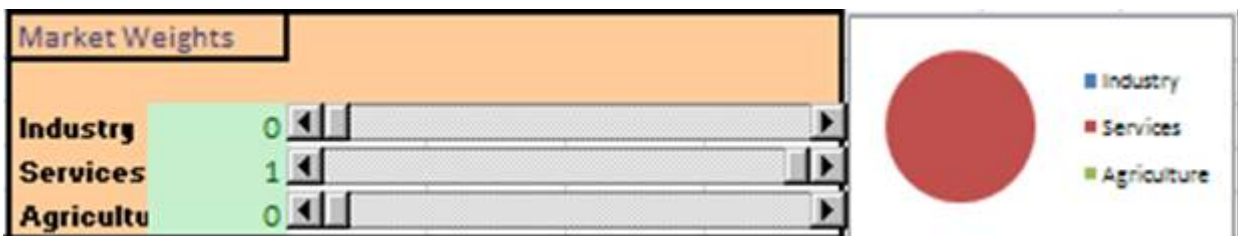
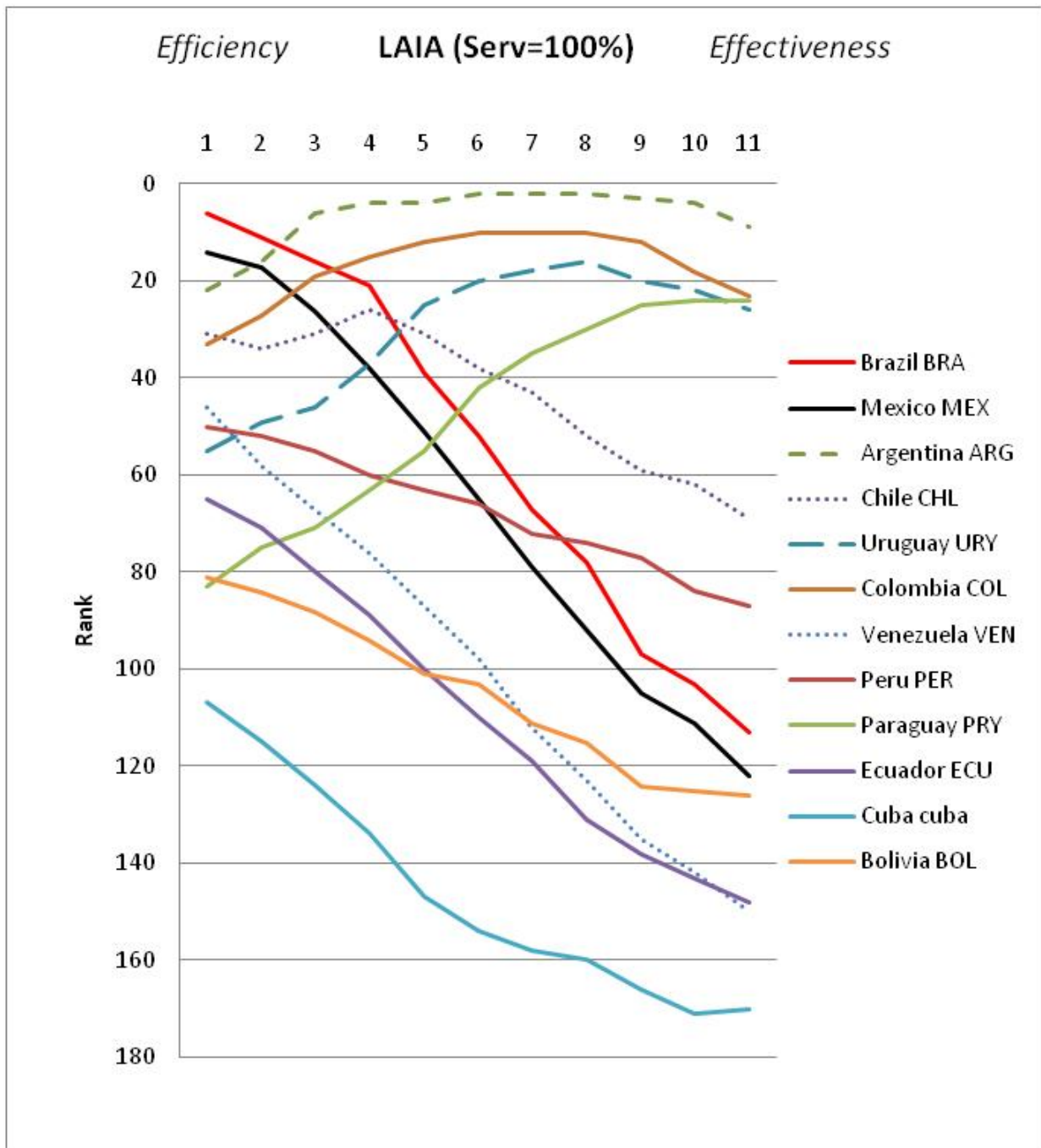
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Services	0	◀	▶
Agricultu	1	◀	▶

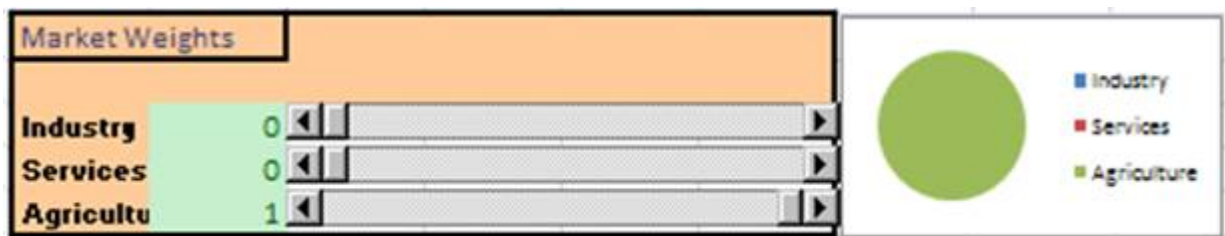
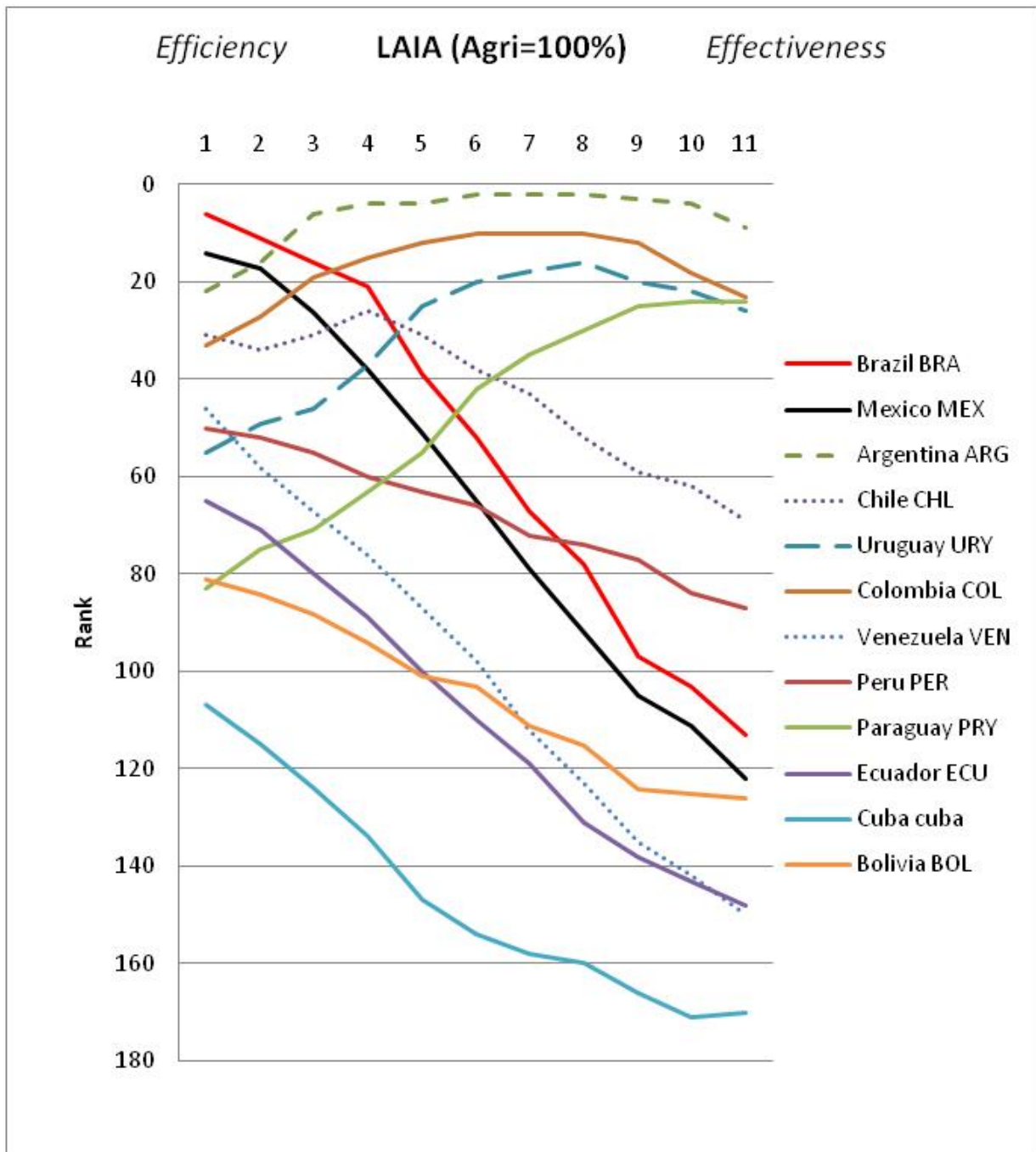
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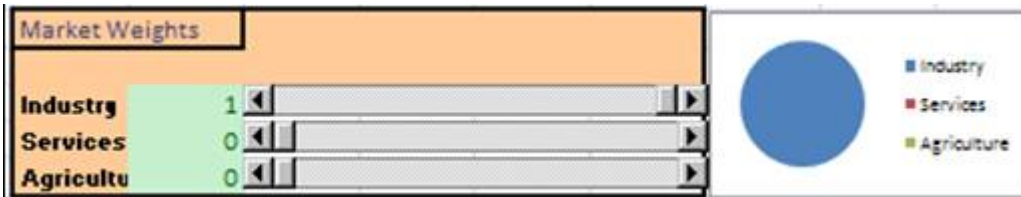
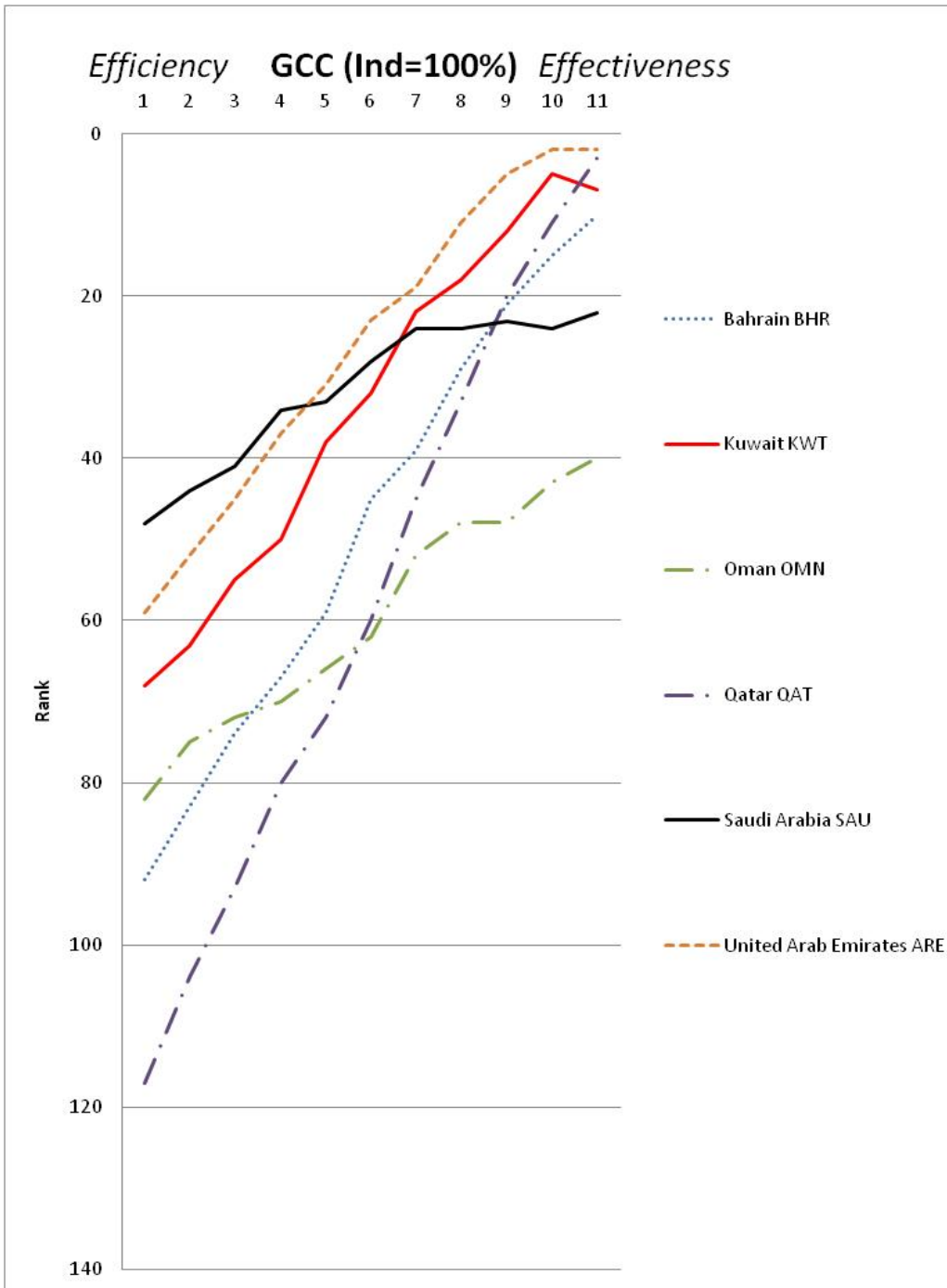
- Industry (Blue)
- Services (Red)
- Agriculture (Green)

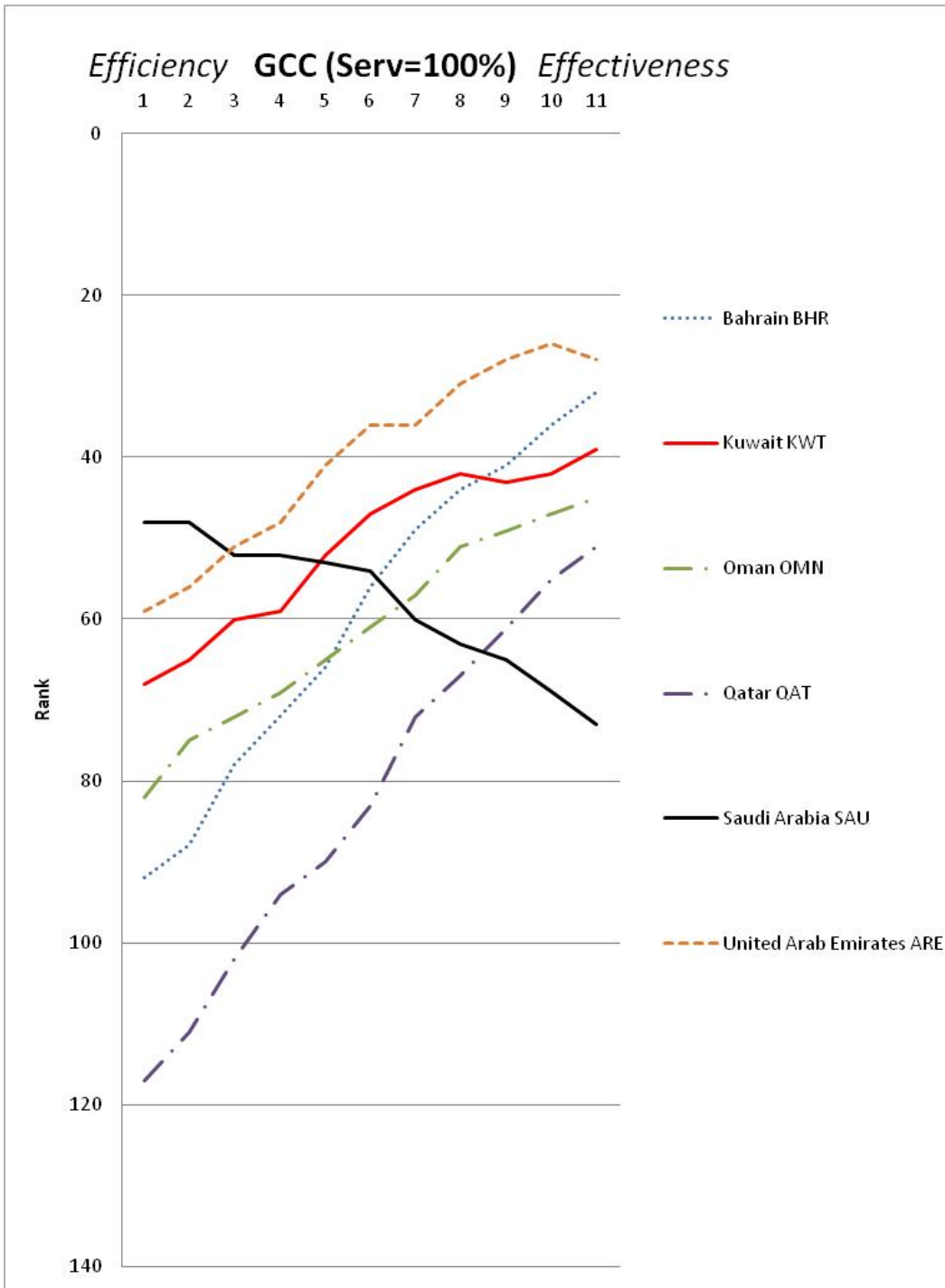








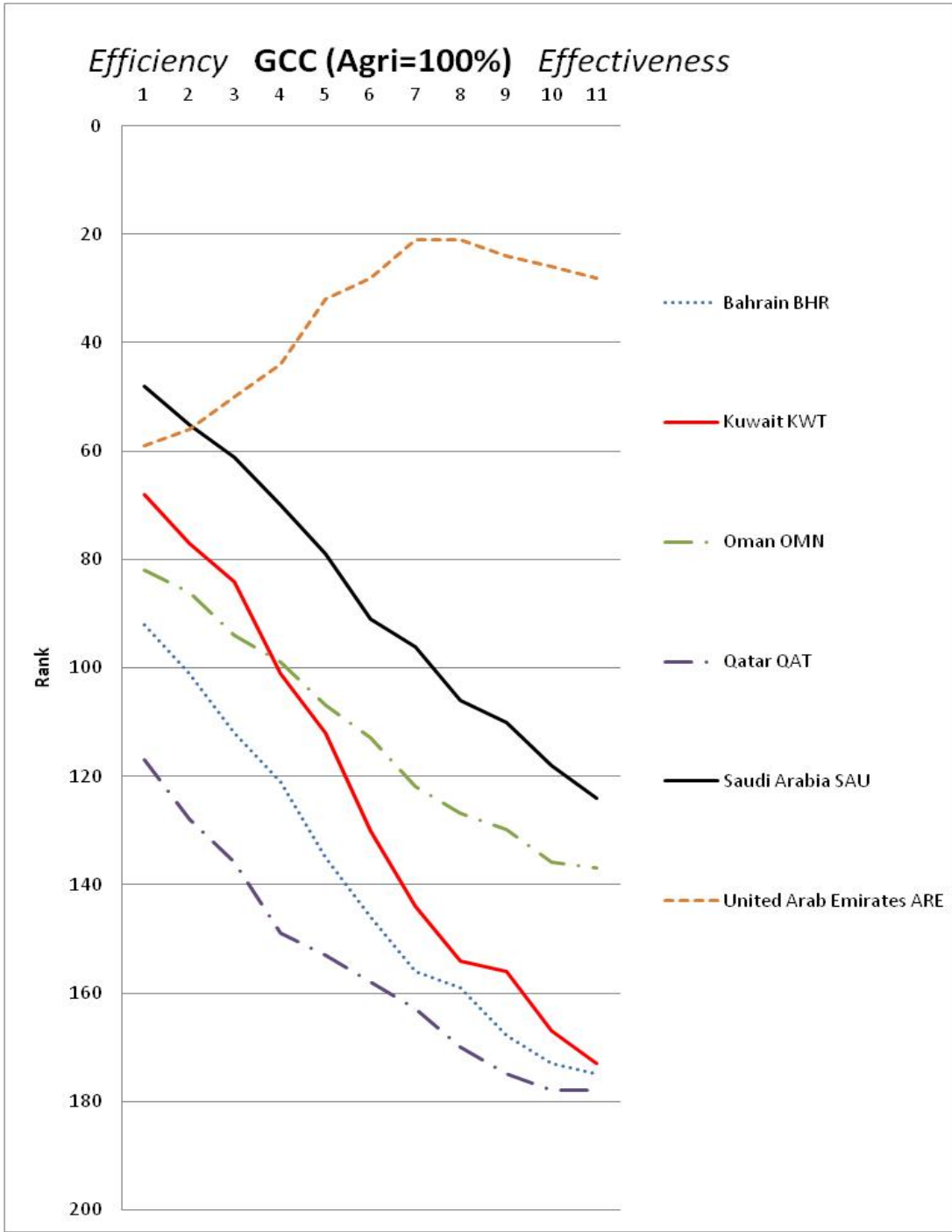




**Market Weights**

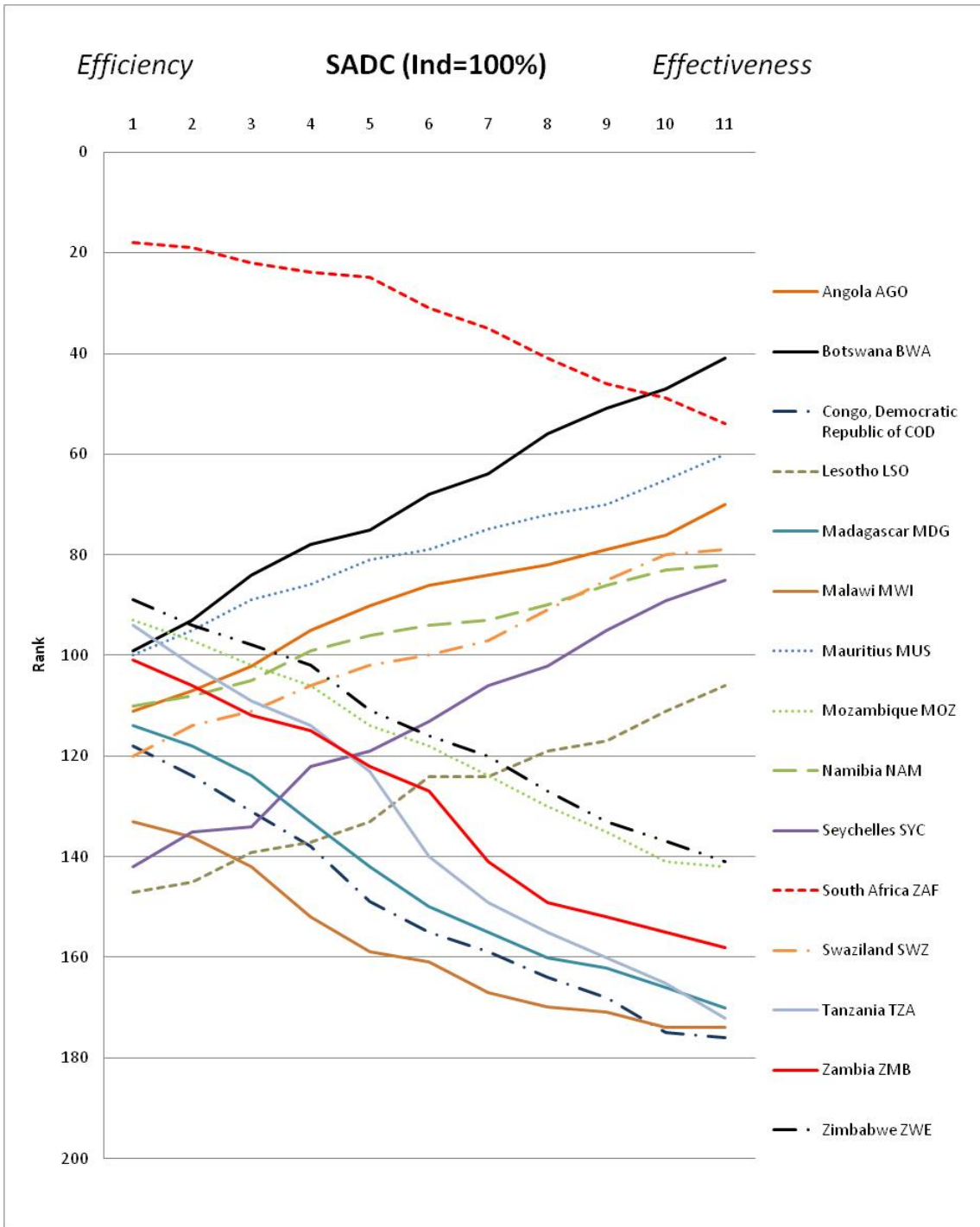
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<b>Services</b>	1	<input type="text"/>	▶
<b>Agriculture</b>	0	<input type="text"/>	▶

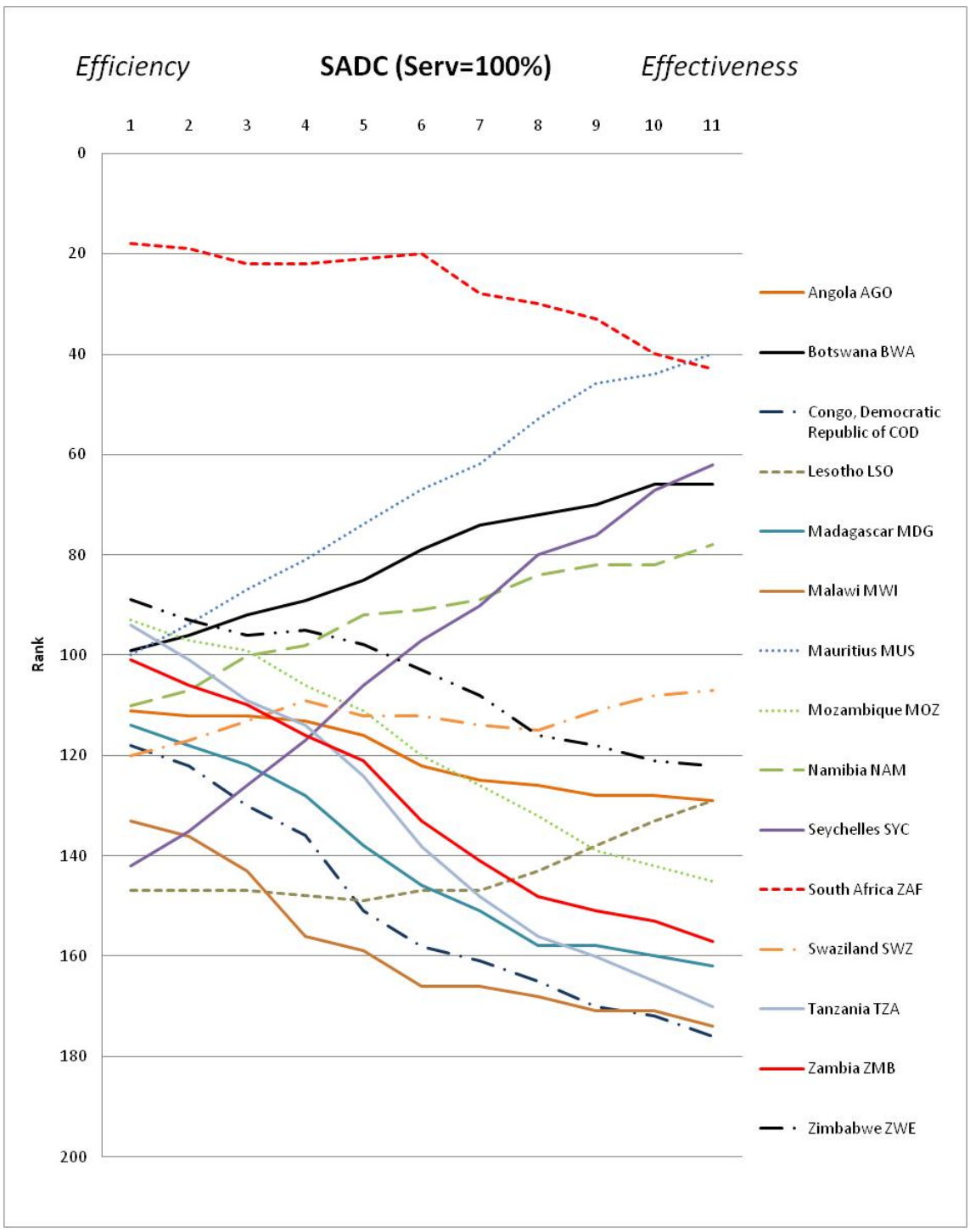
- Industry
- Services
- Agriculture



**Market Weights**

<b>Industry</b>	0	<input type="text"/>	▶
<b>Services</b>	0	<input type="text"/>	▶
<b>Agriculture</b>	1	<input type="text"/>	▶



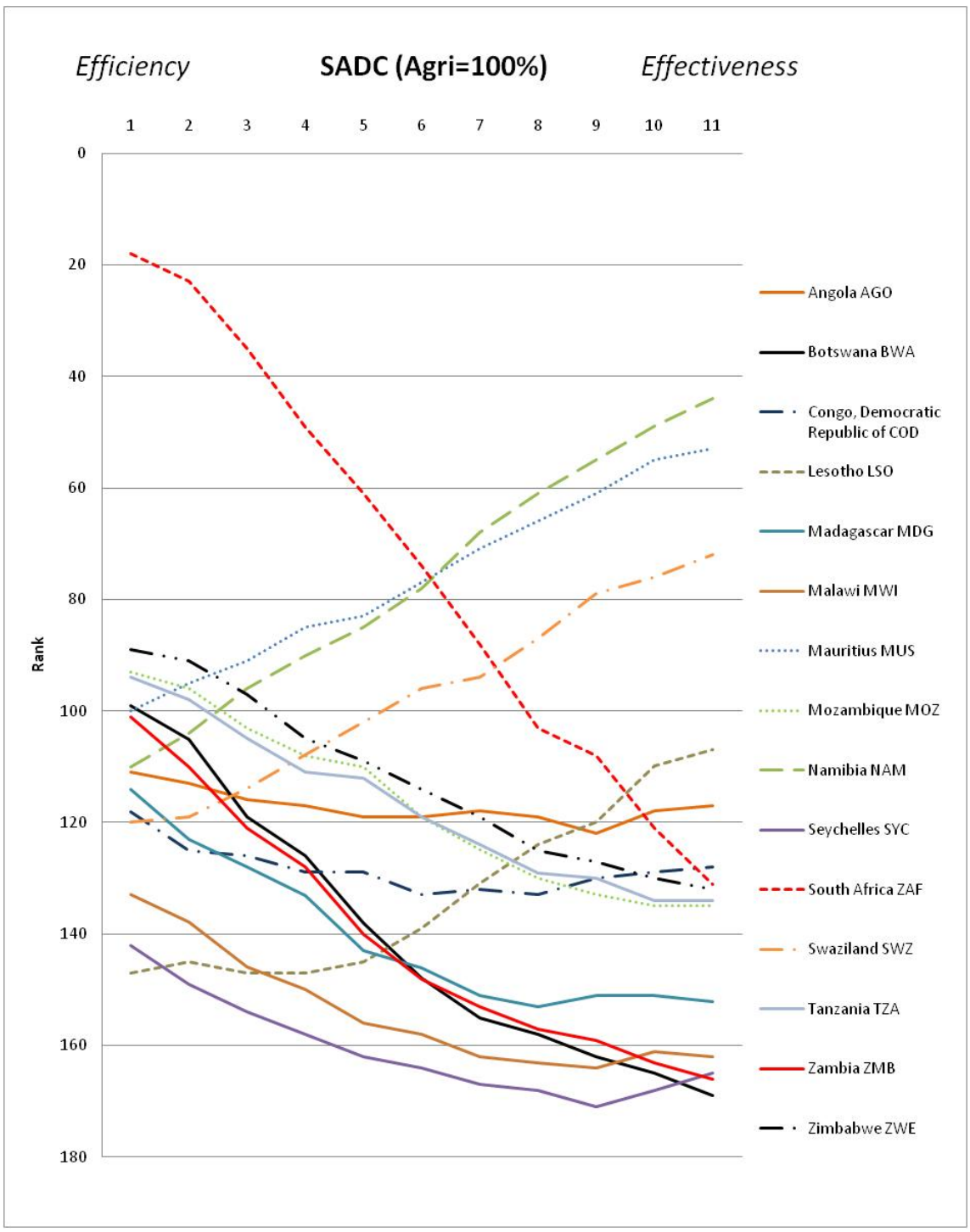


**Market Weights**

Industry	0	<input type="text"/>
Services	1	<input type="text"/>
Agriculture	0	<input type="text"/>

Legend: Industry (blue square), Services (red square), Agriculture (green square)





**Market Weights**

Industry	0	◀	▣	▶
Services	0	◀	▣	▶
Agriculture	1	◀	▣	▶

■ Industry  
■ Services  
■ Agriculture

## 9. Appendix 2

These are the **Categories**, Fields, and *subfields* of information generally recorded for each country. Links are to the Notes and Definitions about each entry.

<b>Introduction</b>
<b><u>Background</u></b>
<b>Geography</b>
<b><u>Location</u></b>
<b><u>Geographic coordinates</u></b>
<b><u>Map references</u></b>
<b><u>Area</u></b>
<i>total</i>
<i>land</i>
<i>water</i>
<b><u>Area - comparative</u></b>
<b><u>Land boundaries</u></b>
<i>total</i>
<i>border countries</i>
<b><u>Coastline</u></b>
<b><u>Maritime claims</u></b>
<i>territorial sea</i>
<i>contiguous zone</i>
<i>exclusive economic zone</i>
<i>continental shelf</i>
<i>exclusive fishing zone</i>

<b><u>Climate</u></b>
<b><u>Terrain</u></b>
<b><u>Elevation extremes</u></b>
<i>lowest point</i>
<i>highest point</i>
<b><u>Natural resources</u></b>
<b><u>Land use</u></b>
<i>arable land</i>
<i>permanent crops</i>
<i>other</i>
<b><u>Irrigated land</u></b>
<b><u>Natural hazards</u></b>
<b><u>Environment - current issues</u></b>
<b><u>Environment - international agreements</u></b>
<i>party to</i>
<i>signed, but not ratified</i>
<b><u>Geography - note</u></b>
<b>People</b>
<b><u>Population</u></b>
<b><u>Age structure</u></b>
<i>0-14 years</i>
<i>15-64 years</i>
<i>65 years and over</i>
<b><u>Median Age</u></b>

<i>total</i>
<i>male</i>
<i>female</i>
<b><u>Population growth rate</u></b>
<b><u>Birth rate</u></b>
<b><u>Death rate</u></b>
<b><u>Net migration rate</u></b>
<b><u>Sex ratio</u></b>
<i>at birth</i>
<i>under 15 years</i>
<i>15-64 years</i>
<i>65 years and over</i>
<i>total population</i>
<b><u>Infant mortality rate</u></b>
<i>total</i>
<i>male</i>
<i>female</i>
<b><u>Life expectancy at birth</u></b>
<i>total population</i>
<i>male</i>
<i>female</i>
<b><u>Total fertility rate</u></b>
<b><u>HIV/AIDS - adult prevalence rate</u></b>
<b><u>HIV/AIDS - people living with HIV/AIDS</u></b>
<b><u>HIV/AIDS - deaths</u></b>

<b><u>Major infectious diseases</u></b>
<i>degree of risk</i>
<i>food or waterborne diseases</i>
<i>vectorborne diseases</i>
<i>water contact diseases</i>
<i>aerosolized dust or soil contact disease</i>
<i>respiratory disease</i>
<i>animal contact disease</i>
<b><u>Nationality</u></b>
<i>noun</i>
<i>adjective</i>
<b><u>Ethnic groups</u></b>
<b><u>Religions</u></b>
<b><u>Languages</u></b>
<b><u>Literacy</u></b>
<i>definition</i>
<i>total population</i>
<i>male</i>
<i>female</i>
<b><u>People - note</u></b>
<b>Government</b>
<b><u>Country name</u></b>
<i>conventional long form</i>

<i>conventional short form</i>
<i>local long form</i>
<i>local short form</i>
<i>former</i>
<i>abbreviation</i>
<b><u>Dependency status</u></b>
<b><u>Government type</u></b>
<b><u>Capital</u></b>
<i>name</i>
<i>geographic coordinates</i>
<i>time difference</i>
<i>daylight saving time</i>
<b><u>Administrative divisions</u></b>
<b><u>Dependent areas</u></b>
<b><u>Independence</u></b>
<b><u>National holiday</u></b>
<b><u>Constitution</u></b>
<b><u>Legal system</u></b>
<b><u>Suffrage</u></b>
<b><u>Executive branch</u></b>
<i>chief of state</i>
<i>head of government</i>
<i>cabinet</i>
<i>elections</i>

<i>election results</i>
<b><u>Legislative branch</u></b>
<i>elections</i>
<i>election results</i>
<b><u>Judicial branch</u></b>
<b><u>Political parties and leaders</u></b>
<b><u>Political pressure groups and leaders</u></b>
<b><u>International organization participation</u></b>
<b><u>Diplomatic representation in the US</u></b>
<i>chief of mission</i>
<i>chancery</i>
<i>telephone</i>
<i>FAX</i>
<i>consulate(s) general</i>
<i>consulate(s)</i>
<b><u>Diplomatic representation from the US</u></b>
<i>chief of mission</i>
<i>embassy</i>
<i>mailing address</i>
<i>telephone</i>
<i>FAX</i>
<i>consulate(s) general</i>
<i>consulate(s)</i>
<i>branch office(s)</i>
<b><u>Flag description</u></b>
<b><u>Government - note</u></b>

Economy
<b><u>Economy - overview</u></b>
<b><u>GDP (purchasing power parity)</u></b>
<b><u>GDP (official exchange rate)</u></b>
<b><u>GDP - real growth rate</u></b>
<b><u>GDP - per capita</u></b>
<b><u>GDP - composition by sector</u></b>
<i>agriculture</i>
<i>industry</i>
<i>services</i>
<b><u>Labor force</u></b>
<b><u>Labor force - by occupation</u></b>
<b><u>Unemployment rate</u></b>
<b><u>Population below poverty line</u></b>
<b><u>Household income or consumption by percentage share</u></b>
<i>lowest 10%</i>
<i>highest 10%</i>
<b><u>Distribution of family income - Gini index</u></b>
<b><u>Inflation rate (consumer prices)</u></b>
<b><u>Investment (gross fixed)</u></b>
<b><u>Budget</u></b>
<i>revenues</i>
<i>expenditures</i>



**Public debt**

**Agriculture - products**

**Industries**

**Industrial production growth rate**

**Electricity - production**

**Electricity - consumption**

**Electricity - exports**

**Electricity - imports**

**Oil - production**

**Oil - consumption**

**Oil - exports**

**Oil - imports**

**Oil - proved reserves**

**Natural Gas - production**

**Natural Gas - consumption**

**Natural Gas - exports**

**Natural Gas - imports**

**Natural Gas - proved reserves**

**Current account balance**

**Exports**

**Exports - commodities**

**Exports - partners**

<b><u>Imports</u></b>
<b><u>Imports - commodities</u></b>
<b><u>Imports - partners</u></b>
<b><u>Reserves of foreign exchange and gold</u></b>
<b><u>Debt - external</u></b>
<b><u>Economic aid - donor</u></b>
<b><u>Economic aid - recipient</u></b>
<b><u>Currency (code)</u></b>
<b><u>Exchange rates</u></b>
<b><u>Fiscal year</u></b>
<b>Communications</b>
<b><u>Telephones - main lines in use</u></b>
<b><u>Telephones - mobile cellular</u></b>
<b><u>Telephone system</u></b>
<i>general assessment</i>
<i>domestic</i>
<i>international</i>
<b><u>Radio broadcast stations</u></b>
<b><u>Television broadcast stations</u></b>
<b><u>Internet country code</u></b>
<b><u>Internet hosts</u></b>
<b><u>Internet users</u></b>

<b><u>Communications - note</u></b>
<b>Transportation</b>
<b><u>Airports</u></b>
<b><u>Airports - with paved runways</u></b>
<i>total</i>
<i>over 3,047 m</i>
<i>2,438 to 3,047 m</i>
<i>1,524 to 2,437 m</i>
<i>914 to 1,523 m</i>
<i>under 914 m</i>
<b><u>Airports - with unpaved runways</u></b>
<i>total</i>
<i>over 3,047 m</i>
<i>2,438 to 3,047 m</i>
<i>1,524 to 2,437 m</i>
<i>914 to 1,523 m</i>
<i>under 914 m</i>
<b><u>Heliports</u></b>
<b><u>Pipelines</u></b>
<b><u>Railways</u></b>
<i>total</i>
<i>broad gauge</i>
<i>standard gauge</i>
<i>narrow gauge</i>
<i>dual gauge</i>
<b><u>Roadways</u></b>

<i>total</i>
<i>paved</i>
<i>unpaved</i>
<b><u>Waterways</u></b>
<b><u>Merchant marine</u></b>
<i>total</i>
<i>ships by type</i>
<i>foreign-owned</i>
<i>registered in other countries</i>
<b><u>Ports and terminals</u></b>
<b><u>Transportation - note</u></b>
<b>Military</b>
<b><u>Military branches</u></b>
<b><u>Military service age and obligation</u></b>
<b><u>Manpower available for military service</u></b>
<i>males age 15-49</i>
<i>females age 15-49</i>
<b><u>Manpower fit for military service</u></b>
<i>males age 15-49</i>
<i>females age 15-49</i>
<b><u>Manpower reaching military age annually</u></b>
<i>males</i>
<i>females</i>
<b><u>Military expenditures - percent of GDP</u></b>
<b><u>Military - note</u></b>

Transnational Issues
<b><u>Disputes - international</u></b>
<b><u>Refugees and internally displaced persons</u></b>
<i>refugees</i>
<i>IDPs</i>
<b><u>Trafficking in persons</u></b>
<i>current situation</i>
<i>tier rating</i>
<b><u>Illicit drugs</u></b>

This page was last updated on 13 July, 2007

# 10. Appendix 3

