# A Configuration Approach for Selecting a Data Warehouse Architecture

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## Abstract

Living in the Information Age, organisations must be able to exploit their data alongside the traditional economic resources of man, machine and money. Accordingly, organisations implement data warehouses to organise and consolidate their data, which creates a decision support system that is "subject oriented", "time variant", "integrated" and "non-volatile". However, the organisation's ability to successfully exploit their data is determined by the degree of strategic alignment. As such, this study poses the question: how can a data warehouse be successfully and demonstrably aligned to an organisation's strategic objectives?

This thesis demonstrates that strategic alignment can be achieved by following a new 'top down' data warehouse implementation framework, the Configuration Approach, which is based upon determining an organisation's target configuration. This was achieved by employing Miles and Snow's Ideal Types to formulate a questionnaire that reveals an organisation's target configuration in terms of its approach to the Entrepreneurial, Administration and Information Systems challenges. Crucially, this thesis also provides the means to choose a data warehouse architecture that is wholly based on the organisation's target configuration.

The Configuration Approach was evaluated using a single case study undergoing a period of strategic transformation where the implementation of a data warehouse was key to its strategic ambitions. The case study illustrated how it is possible to articulate an organisation's strategic configuration, which becomes the key driver for building a warehouse that demonstrably supports the resolution of its Entrepreneurial and Administration challenges. Significantly, the case study also provides a unique opportunity to demonstrate how the target configuration helps organisations to make the right choice of data warehouse architecture to satisfy the Information Systems challenge. In this case, the Configuration Approach provides a basis for challenging the architectural choices made by a consultancy on behalf of the participating organisation. Accordingly, it can be asserted that data warehouses are strategic investments, if implemented using the Configuration Approach.

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# 1 Introduction

Those who have an interest in data warehouses will be aware of the characteristics of a data warehouse provided by the "Father of Data Warehousing" Bill Inmon (2002). A data warehouse is a decision support system that is "subject oriented", "time variant", "integrated" and "non-volatile". This means that a data is structured around subject areas, integrated from disparate source systems, which enables the standardisation of data definitions. Volumes of time stamped data may be held to support historical analysis in a repository that is non operational i.e. data is not entered directly to the warehouse but is subject to extract, transform and load rules to maintain the integrity of the data held in the warehouse. Data warehouses are built to store and manage data for decision support purposes not to facilitate a business process. This is why data warehouses are different from operational transaction processing systems.

The concept of data warehousing is almost twenty years old and has become mainstream, in the sense that numerous organisations have built data warehouses during that time but with varying degrees of success. During the late nineties, it was clear that data warehousing projects were high risk. According to James Bauer, Vice President of Strategic Planning, Chase Manhattan Bank, "the sobering reality is that a very high percentage of data warehousing efforts fail and do not meet the needs of the users and the expectations of senior management" (Skelly, 1997). Indeed, "more than half of data warehousing projects either fall behind schedule or get put on hold" (Stedman, 1998). In addition to this, the Boston Consulting Group reported in 1995 (Rhodes & Mehta, 1995) "According to database technology vendors, installing a basic

customer information capability, including analytical methodology, should cost up to $15 million. Yet some large institutions have spent more than $100 million with questionable results." Data warehousing projects clearly did fail but the failure rate has never been fully understood and the failure rates disputed. Although, it was believed that data warehousing failures were as high as fifty percent (Watson, Goodhue & Wixom, 2002) and if they did fail, it was due to business issues (Sammon & Finnegan, 2000; Trembly, 2001). Conversely, it was Inmon's opinion that warehouse projects are likely to succeed (Inmon, 2003a; Inmon, 2001a). Inmon's confidence perhaps reflected growing practitioner experience and ability to implement the technology to provide workable solutions. However, success is a matter of opinion where technicians may expect to implement a working system on time and within budget and yet businesses may not feel that their warehouse has lived up to the sales hype. The sales hype was one that, in the author's experience, promised competitive advantage by finding commercially viable relationships in an organisation's data.

## 1.1 Data Warehousing Experiences

This project is borne out of a Master's thesis entitled "Best Practice for Implementing a Data Warehouse", which was completed in November, 2000. At that time, the author worked for the newly created Sainsbury's Bank. The Bank is a joint venture between Bank of Scotland (now HBOS) and Sainsbury's supermarket chain, and was created to bring banking products to Sainsbury's large customer base. Bank of Scotland supported the joint venture by providing banking skills and systems, while Sainsbury's provided space in their stores and the marketing knowledge to make the Bank's products attractive and accessible. New customers to the Bank were identified by their sort code and account number and were allocated a Reward Card number, if they did not already have one. The Reward Card was Sainsbury's loyalty shopping card, which stored data for all of a customer's shopping at Sainsbury's stores. This meant that Sainsbury's Bank would have access to a customer's banking and shopping data, which could be used to derive a significant amount of knowledge about their customers. This range of data put the Bank in a rather unique position of having

more than just financial data to profile its customers. As the Bank's operational systems were essentially clones of those used by Bank of Scotland, it was apparent to the Bank's executives that they needed a data warehouse to store both Bank and supermarket sales data for analysis purposes.

The Bank had clear ideas about what it wanted to do with the data i.e. customer profiling, profitability analysis and risk analysis but their data warehouse project proposal had to be sanctioned by Bank of Scotland, as it was they who would provide the systems support to implement the data warehouse. Coincidentally, Bank of Scotland was also investigating the possibility of implementing a data warehouse and it was decided to combine the two projects. Due diligence was exercised and NCR's Teradata platform was chosen as the foundation for both bank's data warehouses. Sainsbury's Bank essentially lost a great deal of control of their warehouse project, as the Sainsbury's Bank element was simply to be a partition of that platform.

The project got underway with NCR providing technical expertise in respect of the data warehouse, while Bank of Scotland staff contributed with their extensive source systems knowledge. Timescales slipped and resentment crept in between NCR and Bank of Scotland, senior members of the project team became noticeably absent from proceedings and the development eventually failed.

During this time, the author researched issues and factors that influenced the successful implementation of data warehouses and proposed the following principles of best practice (Weir, 2000):

- Project must fit with corporate strategy and business objectives
- There must be complete buy-in to the project
- Manage Expectations
- Data Warehouse must be built incrementally
- Build in adaptability
- Project must be managed by both IT and business professionals

- Develop a business / supplier relationship
- Only load data that has been cleaned and is of a quality that is understood by the organisation
- Do not overlook training requirements
- Be politically aware

These principles were presented to the Data Warehouse Steering Committee before its eventual demise and with the help of those involved, it was possible to rationalise the failure of that particular project. Those experiences were published in the author's Master's Thesis and subsequently in the Journal of Data Warehousing (Weir, 2002) now known as the Business Intelligence Journal. Of all the principles of best practice, it was the need to align the data warehouse to corporate strategy and business objectives that was the most prominent in terms of practitioner papers. However, having observed the developments in the industry since the completion of the Masters, it became apparent that the focus of attention had shifted to proving the value of the data warehouse by delivering a suitable return on investment (ROI). In principle, this shift of attention seemed to detach data warehouse developments from strategic alignment with no explanation as to why that should be the case. There were numerous articles that provided advice on how to measure ROI, which seemed rather curious when practitioners had acknowledged that the costs were easy to determine but the benefits were typically difficult to quantify (Sammon & Finnegan, 2000). It was easy to see that conditions within the industry were changing.

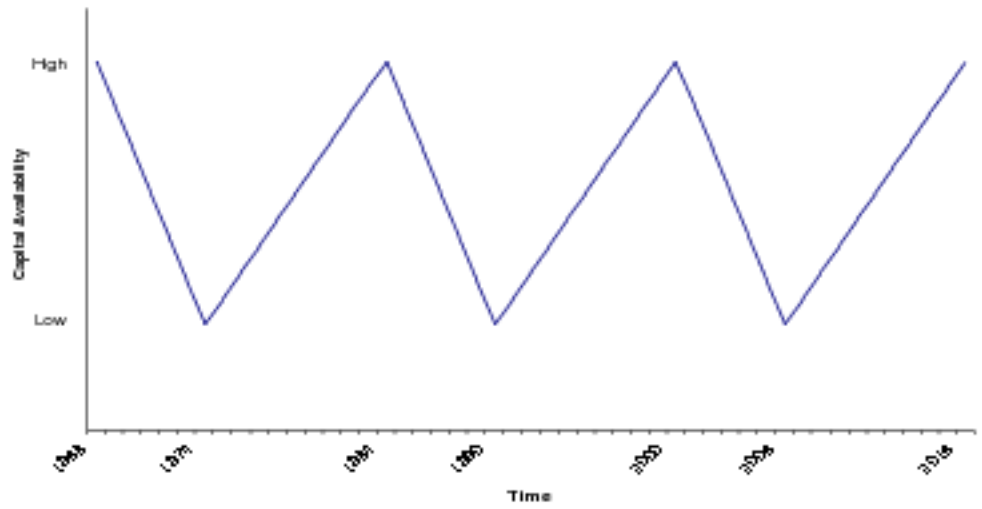
## 1.2 Changing Environment

The focus on ROI started around the beginning of the new millennium when several rather significant events made an impact on global markets. Organisations left the relatively capital rich period of the late nineties and entered an era of more challenging trading conditions and a spate of events that have shaken economies, confidence in financial markets and national security. The following serve as a small example of those events that illustrate an underlying period of instability:

- Dot Com bubble bursts (2000)
- Xerox exposed for falsifying financial statements (2000)
- Terrorist attack on Twin Towers, New York and ensuing war in Afghanistan (2001)
- Enron collapses (2001)
- WorldCom folds (2002)
- Parmalat 'loses' billions of dollars (2003)
- War in Iraq (2004)

Individually, these are dramatic events but collectively, they also appear to have influenced various aspects of business thinking. The bursting of the Dot Com bubble initiated a sustained slide in stock market prices, which clearly affected investor confidence and was compounded by the corporate scandals of Enron and WorldCom, to name but two. The horrific events of 11th September 2001 have almost certainly added to the mix of uncertainty thus raising the profile of 'security'. A legislative reaction to the corporate scandals has been introduced in the form of Sarbanes-Oxley and to a lesser degree Basel II. These directives attempt to limit an organisation's exposure to risk and restore confidence in the integrity of corporate statements. This suggests that risk mitigation and security have been the dominant themes underpinning organisational consciousness.

Graham (2003) made a similar distinction between the two periods pointing out that it was easier to finance telecommunications or technology development initiatives and new ventures prior to 2000. This observation fits very well with the venture capital sixteen year cycle illustrated in Figure 1, which illustrates the availability of venture capital over time and clearly indicates a sharp decline in the availability of venture capital funding from 2000 (Hyland, 2005). Tynan (2004) also suggests that the recent increased reliance on return on investment (ROI) signalled the end of the rather profligate period of the late nineties. ROI, it seems, is a measure of comfort or a risk mitigation exercise that demonstrates to all that every effort has been made to justify the use of scarce resources.




Source: Hyland, 2005

Figure 1. Venture Capital Lifecycle

Data warehousing is no different, as the numerous articles advising how best to calculate ROI (Adelman, 2003; Whittemore, 2003; McKnight, 2002) appear to indicate. However, as Kaplan & Norton (1996, p. 22) explain, ROI is merely one metric that focuses on measuring short term financial results, which could be to the detriment of building long term value. Indeed, a survey by Preslan, Newmark and Hagerty (2004) found that data warehouses had increased the availability of data but had failed to achieve ROI, which appears to indicate that warehouses have failed to meet their commercial potential. But is this really the case?

It seems that despite practitioner advice to align the data warehouse to corporate strategy and business objectives, organisations appear to have reacted to environmental conditions and placed a great deal of emphasis on ROI as a means of justifying investments and measuring success.

The author did not feel that a single financial measure i.e. ROI could adequately account for the impact that a data warehouse can have on an organisation. The First American Corporation case study (see Chapter 2) bears testament to the considerable impact that data warehousing can have on an organisation, where it

would have been futile to calculate the ROI. This is because the data warehouse was built for the long term and integral to the organisation's strategy.

That said, it must be acknowledged that not all data warehouses are built for the same reasons. An organisation may build a data mart to satisfy localised sub unit information needs. An organisation may also build a warehouse that gathers data from business processes that supports decision making in several business units. Alternatively, organisations may implement enterprise wide data warehouses that support decision making with breadth and depth. It seems reasonable to believe that in each of these examples that the reach of the warehouse is proportionate to the strategic emphasis placed on that investment. Indeed, three case studies by Watson, Annino, Wixom, Avery and Rutherford (2001b) indicated that a data warehouse will have a greater impact if it has the backing of executive management and is of strategic importance to the organisation. Expressed another way, a strategically aligned data warehouse will have a more positive organisational impact.

The focus on strategic alignment has diminished in the last few years (Weir, Peng & Kerridge, 2003), which may be having a detrimental effect on the perceived value of data warehousing. In effect, organisations will have aligned their warehouse to greater or lesser degrees. In fact, alignment may be achieved more by accident than design. The focus on ROI has had greater prominence in practitioner literature over the last few years and this, in itself, has meant that strategic alignment has not been promoted as a topic of importance. It is equally true to say that the literature promoting strategic alignment has not been too enlightening in its advice for achieving strategic alignment. The literature states that strategic alignment is required but does not make it clear how this may be achieved. It is a gap in the literature for those organisations that view their data as a strategic asset. If organisations can achieve greater strategic alignment in the early stages of an implementation, that organisation will have a greater chance of realising their expectations.

## 1.3 Research Question

The research question to be addressed in this thesis is: how can a data warehouse be successfully and demonstrably aligned to an organisation's strategic objectives?

Whereas, it is stated that 'business issues' are often the reasons quoted for data warehousing failures, this is an inadequate rationale, as this suggests that it is the customer who is undermining the delivery of their own system. It is therefore important to emphasise that 'business issues' are the reason for implementing a data warehouse and so it is imperative that the warehouse development reflects the business' context and strategic aims.

In general, data warehouse developments are heavily influenced by the industry's leading authorities Bill Inmon and Ralph Kimball. Each has a preferred methodological approach and architecture that has divided opinions regarding whose approach is best, particularly around architectures. This thesis examines the work of Inmon and Kimball and highlights the frailties of each approach in dealing with the issue of strategic alignment. This problem was resolved by seeking out a means of defining organisational strategy, which was modelled to provide a blueprint against which the data warehouse could itself be modelled. This is achieved by drawing on the Configuration School of Strategic Management and in particular, the typologies proposed by Miles and Snow (1978). The Configuration School is founded on the principle that all organisations are uniquely configured. Organisations may operate within the same industry and be bound by the same legal framework but each organisation operating within that industry is structured in a unique way. Miles and Snow found that while organisations are uniquely configured, organisations tend to follow similar patterns of configuration to deal with a given set of trading conditions. Miles and Snow studied those patterns and subsequently published their ideal configurations, namely the Defender, Analyser and Prospector. These ideal types are the basis of our strategic alignment solution i.e. the ideal types are modelled and used to determine the most appropriate data warehousing architectures and methodologies to achieve strategic alignment.

Until now, there has been a lack of advice for those wishing to implement a strategically aligned data warehouse. However, in this thesis, it will be demonstrated that a data warehouse can be aligned to an organisation's strategy by first uncovering the organisation's configuration and using that information to lead key implementation and architectural choices. By revealing an organisation's configuration it is possible to choose an architecture that contributes positively towards its Information Systems challenge and enables the adoption of an appropriate implementation approach that focuses upon the resolution of its entrepreneurial and administration challenges. This thesis will provide practitioners and organisations alike with the means to implement a data warehouse that is demonstrably based upon a strategy led rationale.

### 1.3.1 Remaining Chapters

Chapter 2 examines the question; "what is research?" and explores types of research and methodologies that help researchers to ensure a high degree of integrity in their findings. This chapter concludes with a rationale for the approach taken in the remaining chapters. In Chapter 3, the origins and rationale behind the Configuration School of Strategic Management are presented in order to illustrate how this school of thought can be used to explain the outcomes of three data warehousing case studies. Miles and Snow's typologies are also introduced, as the Ideal Types form the theoretical foundation of our questionnaire, which was used to determine the strategic direction of our case study organisation. Chapter 4 examines the work of Inmon and Kimball by focussing upon their architectural and methodological differences, but this chapter does not simply highlight differences, as it also illustrates that they share common ground when it comes to strategic alignment.

Having established that Inmon and Kimball do not adequately deal with strategic alignment, a solution entitled Configuration Approach is proposed in Chapter 5 by drawing upon and expanding the Triple Driven methodology and rationalising suitable data warehouse architectures for each of the Ideal Types. The usefulness of the Configuration Approach is dependent upon articulating management's view of their organisation's strategy in terms of a Configuration. The solution to this is contained within a questionnaire, which is modelled on the Ideal Types defined by Miles and Snow. Chapter 6 provides an in depth account of the

construction of the questionnaire, which was subsequently completed by senior management in a supply chain organisation implementing a data warehouse. The questionnaire results successfully illustrate that the organisation is in the midst of significant strategic change, the details of which are described in Chapter 7. The key outcome of the questionnaire is a clear view of the organisation's current and target configuration, which provides the platform to outline the organisation's information needs for the purpose of building a demonstrably aligned data warehouse.

The final chapter evaluates the Configuration Approach by comparing the stages of the proposed approach with the experiences of First American Corporation and Menzies Distribution. The First American Corporation case study is perhaps the best example of a successful data warehouse implementation that turned the fortunes of an organisation around. The Configuration Approach provides a comprehensive rationale for that success both in terms of the strategic direction of the organisation and its choice of data warehouse architecture. The Menzies Distribution cases study, on the other hand, illustrates how the Configuration Approach enables an assessment of how well aligned a data warehouse project is to the organisation's target configuration. These findings are validated by drawing upon independent recommendations for the strategic direction of value chain organisations. As a result of this analysis, it can be asserted that an organisation following the Configuration Approach will build a data warehouse that is demonstrably aligned to the organisation's target configuration.

# 2 Methodology

## 2.1 What is Research?

Lang and Heiss (1985, p. 1) state that research is best understood by asking three questions:

a) What is research?

b) Why are research methods used?

c) How are these research methods used?

In essence, research is problem solving using a "systematic and unbiased" approach by "generating verifiable data". Alternatively and according to Bordens and Abbott (2005, p. 4), "the principal method for acquiring knowledge and uncovering causes of behaviour is research. You identify a problem and then systematically set out to collect information about a problem and develop explanations". Lang and Heiss (1985, p. 2) use Dewey's schema for cognition to illustrate the systematic nature of the problem solving process, which became the basis of scientific methods:

1. Indeterminate situation – a puzzling situation
2. Clarification of situation – define the problem
3. Formulation of hypothesis – intelligent guesses or assumptions which attempt to answer the problem
4. Collection, organisation and analysis of data – ongoing through all steps
5. Formulation of possible conclusions

6. Verification, rejection or modification – selected a hypothesis by a test of its consequences in specific situations.

Although, it is acknowledged that while this is a good foundation, many researchers will find different ways to resolve their research question. Indeed, as Blaxter, Hughes and Tight (2001, p. 9) point out; research does not always follow a linear path because research:

- Is cyclical
- Can be entered at almost any point
- Is a never ending process
- Will cause you to reconsider your practice
- Will return you to a different starting place

Bordens and Abbott (2005, p. 13) identify three Methods of Inquiry for gathering information; method of authority, the rational method and the scientific method. Researchers use the method of authority by simply consulting those that are deemed to be an authority on a given subject. This method of inquiry is adopted most often in the early stages of research and is considered flawed for two reasons:

1. The source may not be as authoritative as it was originally thought to be
2. The source may be biased

However, the views expressed by these authorities will help to build some understanding of the issues that need to be considered in the research. The rational method differs from the method of authority by relying on logical reasoning to reach conclusions. This method, as Bordens and Abbott (2005, p. 14) explain, was developed by Descartes and is encapsulated in his statement "I think, therefore I am". But this method too has its flaws, as scientists will tend not to accept deductions as correct until they have empirically tested the underlying logic.

The most robust approach to establishing knowledge is the scientific method where the method of authority and rational methods are combined and enhanced through four steps that has become the basis of finding solutions to scientific problems. The four steps are as follows (Bordens & Abbott, 2005, p. 15):

1. Observing a phenomenon
2. Formulating tentative explanations or statements of cause and effect
3. Further observing or experimenting (or both) to rule out alternative explanations
4. Refining and retesting the explanations

The practical steps that are required to fulfil the scientific method are discussed in Section 2.2.

The benefit of applying scientific research methods is that it guides the problem solving process through stages that are recognised, known to be reliable and explicitly requires that bias be set aside to ensure objectivity (Gray, 2007). As a result, when the research is published, it is possible to review the stages of the process and independently test the results. This is the foundation for advancing knowledge and helps to explain why research methods are used, as opposed to relying on what may seem like a common sense judgement or intuition to rationalise a problem (Lang & Heiss, 1985). Bordens and Abbott (2005, pp. 5-6) emphasise the importance of scientific methods, as they result in explanations, which have the following characteristics:

- Scientific explanations are empirical – an explanation is based upon an observed event that can be validated by third parties.
- Scientific explanations are rational – the explanation cannot defy logic and must be consistent with established facts.
- Scientific explanations are testable – an explanation must be able to be tested through to prove anticipated outcomes.
- Scientific explanations are parsimonious – where it is possible to offer more than one explanation for an event, it the explanation with the least number of assumptions that is preferred.

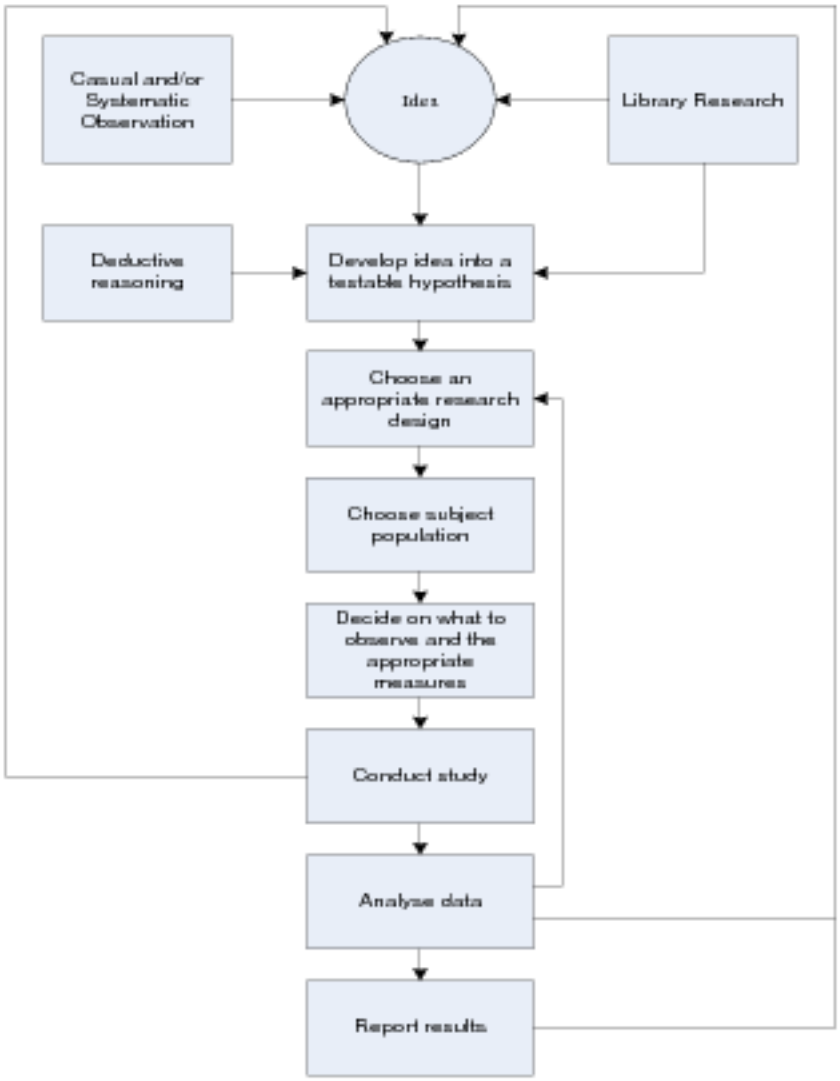
- Scientific explanations are general – explanations that are subject to the existence of a number of preconditions will tend to be rejected.
- Scientific explanations are tentative – scientists will always be prepared to explore faults in a given explanation.
- Scientific explanations are rigorously evaluated – explanations are always subject to scrutiny as a result of changes to principles that support an explanation.

While there are good reasons for employing scientific methods, it must also be accepted that some scientific explanations may be flawed. Bordens and Abbott (2005, p. 10-11) provide two broad but avoidable reasons; researchers wrongly "infer the causes for the observed behaviour" or provide a "pseudoexplanation" i.e. researchers "provide an alternative label for the behavioural event". It is also possible for research to be undermined or disregarded by overlooking ethical protocol or undue influence from project sponsors. In this case, it is the researcher's duty to conduct their research with integrity, an issue that Lang and Heiss term the "Politics of Research" (1985, p. 4).

The question of how research is used could perhaps be summed up by simply looking around at everyday objects and events. For example, governments regularly publish research statistics; drug companies release new drugs to combat disease and mobile phone companies frequently launch products with the latest hardware and software technologies. The point here is that the products of research are all around us. The results are not an end in themselves but represent the latest advance in knowledge.

## 2.2 The Research Process

Researchers who employ the scientific method to conduct their research will follow the steps outlined in Figure 2.




Source: Bordens & Abbott, 2005, p. 21

Figure 2. The Research Process

Each of the Research Process steps is described as follows:

Develop a research idea – the first step is to develop a research idea into a research question that can be tested empirically. Birley and Moreland (1998, p.7) state that "a research question is a way of explaining as sharply and as pithily as possible to yourself exactly what you are going to research and what you wish to find out." A research question that anticipates an outcome is not valid. The research idea may be borne out of observations or prior research. Deductive

reasoning helps to develop a hypothesis by putting the research idea into a form that it is able to be tested.

At this stage, it is perhaps worth stating that the research question for this thesis has already been established in Chapter 1 i.e. how can a data warehouse be successfully and demonstrably aligned to an organisation's strategic objectives? In accordance with a scientific study, the research idea is based upon prior research (Weir, 2000) and observations of market behaviour where the success of a data warehouse was once determined by the degree of alignment to organisational strategy, but has since been superseded by calculating a return on investment. This shift in focus is 'puzzling', as it has been stated that calculating a return on investment for a data warehouse is, at best, difficult (Sammon & Finnegan, 2000).

Choose an appropriate research design – According to Gray (2007, p. 34), research design is "the overall process of using your imagination as well as the strategy and tactics of science to guide the collection and analysis of data." Punch (2005, p. 63), on the other hand, states that research design "situates the researcher in the empirical world, and connects the research questions to data." The determination of a strategy governs the choices made between quantitative, qualitative and mixed method approaches underpinning the research. Bryman (2008, p. 22) describes research strategy as the "general orientation to the conduct" of research, while Punch (2005, p. 63) describes research strategy as "reasoning or the set of ideas by which the study intends to proceed in order to answer the research questions." This is an issue that will be discussed fully in the following section and an explanation will be provided for the strategy adopted for this study.

Choose subject population – The research design will help to guide choices regarding the subject to be studied. This could mean a human population or a single entity, but in either case the subjects must be treated in an ethical manner.

Decide on what to observe and appropriate measures – The next step in the process is to focus on what it is that is being observed and how that study can be measured.

Conduct study – This step is the practical exercise of engaging with the subject(s) who are participating in the study.

Analyse data – Having conducted the study, the researcher will have a set of results (data) to analyse. The researcher may choose to apply different statistical methods during this step, but it is the interpretation that is important.

Report results – Reporting results is important, as it is the point where the whole process is documented and presented for the wider audience to consider.

Finally, Figure 2 illustrates that the process does not end with the final report, as it can be expected that more research ideas will surface as a by-product of the whole process.

## 2.3 Research Methods

As discussed in the previous section, once a research question has been established, it is then necessary to formulate a research strategy. The strategy, as previously stated, governs the choices made between the quantitative, qualitative and mixed methodological approaches underpinning the research. It is essential, therefore, to consider the characteristics of the various research methods. In doing so, it is worth pointing out that there may be a perception that quantitative methods are better than qualitative methods (Berg, 2007) but as the following sections will show, each has its own frailties i.e. one is not better than the other (Dawson, 2007). The purpose of this section is not to contribute to that debate but to consider the characteristics and make rational choices for this study.

### 2.3.1 Quantitative Methods

In general, quantitative methods involve the "use of numbers to describe what exists" (Gray, 2007, p. 42). Bryman's (2008, p. 140) view is that quantitative research "entails the collection of numerical data, as exhibiting a view of the relationship between theory and research as deductive." Davies (2007, p.51) divide quantitative research into two related yet distinct approaches; research based on surveys and experimental research (e.g. research conducted under laboratory conditions). Both approaches require an "understanding of sampling techniques, disciplined data gathering and skilled data interpretation." In terms of

execution, quantitative research is “more linear” than qualitative research (Birley & Moreland, 1998, p. 30).

2.3.1.1 What is Measured

Bryman (2008, pp. 143-154) provides a comprehensive assessment of quantitative research where it is the concepts or the “building blocks of theory” that are measured. Concepts “may provide an explanation of an aspect of the social world, or they may stand for things we want to explain.”

Three reasons are offered for the “preoccupation with measurement in quantitative research”, which may be considered advantages of the quantitative approach:

1. Measurements enable the detection of small differences between elements of a concept.

2. Measurements enable benchmarking where a standard is established and variances from those standards can be measured.

3. Measurements can detect relationships between concepts through the application of correlation analysis.

In measuring a concept, it is necessary to identify “indicators that will stand for the concept”. Measures differ from indicators, as measures are the things that can simply be counted e.g. the number of children in a household. The indicator is a higher level characteristic of the concept. Indicators can be derived from questionnaires, recording behaviours or official statistics, but the researcher needs to give due consideration to the number of indicators required to capture a concept.

The use of multiple indicator measures suggests that there may be a problem with a single indicator. For example, a single indicator could result in incorrectly applying a classification, in which case, the single indicator is too general. It may therefore be more appropriate to use multiple indicators to enable a greater understanding of a concept. Consideration must therefore be given to the fact that the concept is multi-dimensional.

2.3.1.2 Quantitative Data Collection Options

"There is no one best technique for gathering data". A researcher's choice of data gathering method depends on the following (Gray, 2007, p. 43):

- How well formulated your theory is before you begin observation
- The level of social interaction you need or wish to observe
- The type of information you want to know
- The resources you have available for research
- The relative ease of access to individuals, groups or institutions

Gray (2007, p. 44-46) outlines the most common data methods that are available to the researcher, the most appropriate option will be that which fits well with the conditions outlined above.

Social Survey – This is an interviewing technique that focuses on obtaining data as it relates to social phenomena or respondent attitudes. The survey is standardised to ensure that all recipients are asked the same questions, as there may be little, if any, contact with the research subjects. Social surveys usually take the form of a questionnaire where the primary function is to validate an existing theory rather than discover theory.

Content Analysis – This is an approach that does not require the personal involvement of research subjects, as the data is derived from enumeration i.e. "counting the number of times that specific types of communication occur" Gray (2007, p. 44). The author used this technique to determine the "Best Practice for Implementing a Data Warehouse" (Weir, 2000), which is the basis for this thesis. Best practice was determined by analysing the content of academic and practitioner journals to find articles that gave an account of a data warehouse implementation. Those articles provided a list of issues and pitfalls that should be taken into account when building a data warehouse.

Experimentation – Davies (2007, p. 32) states that "experiments usually start with a testable hypothesis. In order to see whether the hypothesis is true or false,

the experimental researcher artificially does 'something' to one group of subjects, and does not do it or does something else to a control group". These types of studies are generally carried out in laboratory settings.

#### 2.3.1.3 Reliability and Validity

When building a measurement instrument, the researcher must address the issue of reliability and validity. Punch (2005, p. 95) refers to reliability in terms of consistency over a period of time and "internal consistency". Consistency over time refers to the ability of the instrument to produce consistent results if the measurement instrument was used in similar circumstances but over different time periods. Internal consistency refers to the relationship between concept and indicator, as discussed in section 2.3.1.1. The key issue here is that the indicator must reliably reflect the nature of the concept.

Gray (2007, p. 12) defines validity as "the fit between the concept that a researcher wants to examine and the evidence for that concept". Bryman (2008, p.152) provides more in depth analysis of validity but emphases that "at the very minimum, a researcher who develops a new measure should establish that it has face validity – that is, that the measure apparently reflects the content of the concept in question". This may be achieved by presenting a measurement proposal to someone who is qualified to assess its validity.

While reliability and validity appear distinct, they are related, as "validity presumes reliability". Furthermore, "if your measure is not reliable, it cannot be valid" (Bryman, 2007, p. 153).

#### 2.3.1.4 Disadvantages of Quantitative Research

The criticisms of quantitative research stem from the sole reliance on numbers and values to explain outcomes. As such, the following outline the key criticisms of this approach:

1. Quantitative research fails to account for real world context such that "the principles of the scientific method can and should be applied to all phenomena that are the focus of investigation" (Bryman, 2008, p. 159; Davies, 2007, p. 135).

2. It is also possible for respondents in a survey to interpret questions or statements differently. By ignoring this aspect of quantitative research it is argued that there is an "artificial and spurious sense of precision and accuracy" (Bryman, 2008, p. 159).

3. When examining relationships between variables, no consideration is given to events they underpin that relationship and that the world to which that relationship belongs is static, but it may change.

### 2.3.2 Qualitative Method

Whereas quantitative research is based upon numerical analysis to explain the existence of an event or thing; qualitative research "refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things" (Berg, 2007, p. 3). The data used in qualitative research is defined by Punch (2005, p. 56) as "empirical information about the world, not in the form of numbers" and that "most of the time this means words". Accordingly, qualitative researchers will use "interview transcripts, recordings and notes, observational records, documents and the products and records of material culture and personal experience materials" to seek out answers to research questions. The range of information to draw from is extensive and can be time consuming to rationalise.

#### 2.3.2.1 Qualitative Research Design

Case study - A case study is used when "a 'how' or 'why' question is being asked about a contemporary set of events, over which the investigator has little or no control" (Yin, 2003, p. 9). The aim is to understand a case "in depth, and in its natural setting, recognising its complexity and its context" Punch, 2005, p.142). The benefit of the case study is that it results in "extremely rich, detailed, and in-depth information" that characterises the subject (Berg, 2007, p. 283). In addition, the information gathering process will use "whatever methods seem appropriate" (Punch, 2005, p. 142), but depending on the nature of what is being studied, it is possible for a researcher to use one or more case studies.

Stake (1995, p. 3-4) identified the following types of case study:

Intrinsic case study – This is where the case is of interest "not because by studying it we learn about other cases or about some general problem, but because we need to learn about that particular case".

Instrumental case study – This type of case study provides "insight" into a research question i.e. it is "instrumental to accomplishing something" that is under inquiry.

Collective case study – The use of several case studies helps to learn about the consistency of behaviours among groups of similar case study subjects.

Case studies are considered a valuable research strategy, as the case can be unique resulting in a valuable insight to a given situation. Alternatively, an in depth case study can enable greater understanding of a new problem (Punch, 2005, p. 147). Punch also states that some studies may try to examine a problem in a linear fashion but where a greater understanding is required of a multi-dimensional problem, it is an in depth case study that provides the answers. A case study can also make a valuable contribution to where the researcher employs a combination of research approaches. For example, a survey can be put into context by a supporting case study. However, if the case study is simply descriptive then it will not provide a basis for generalisation. Therefore, it is important to be clear about the role and rationale behind the case study.

Berg's (2007, p. 295) view of case study based research is that the case should "generally provide an understanding about similar individuals, groups, events" i.e. the theory helps to explain what to expect from types of organisations.

While a cases study can provide a great deal of information about the subject, a case study is often not representative of the larger population, so it is not possible to use the findings to generalise. Yin (2003, p. 10) emphasise this point by stating that case studies are "generalisable to theoretical propositions and not to populations or universes". However, the ability to generalise depends on the "context and purpose" of the case in hand Punch (2005, p. 146). Punch also offers the following instances where "generalisation would not be the objective":

- "The case may be so important, interesting, or misunderstood that it deserves study in its own right". In effect, the intrinsic case study.

- There may be a need to account for a case that deviates from normal or expected behaviour. The understanding of the "atypical" leads to a better understanding of the "typical", which represents that Instrumental case study.

The results of case study analysis may be used to generalise in one of two ways. The first is where the researcher uses the case study material to develop new concepts i.e. the more abstract the concept the more that it is possible to generalise. The second way is to develop propositions that "link concepts or factors to a case". This has the effect of reversing the traditional research scenario where the research starts with a proposition or hypothesis. In this case, the ability to generalise will follow from the testing of those propositions in future research.

Ethnography – "Ethnography means describing a culture and understanding a way of life from the point of view of its participants; ethnography is the art and science of describing a group or culture" (Punch, 2005, p. 149). As a research strategy, ethnography can be extremely insightful, as it is possible for participant observers to learn from the people being studied and gather their information as a full participant or by acting as a bystander.

Punch (2005, p. 152) describes six features of the ethnographic approach:

1. "Ethnography starts from the assumption that the shared cultural meanings of the group are crucial to understanding its behaviour". This is central to the focus of understanding the role of culture.

2. The researcher must be "sensitive to the meanings that behaviour, actions, events and contexts have in the eyes of the people involved".

3. The research is conducted in the natural setting of the participants.

4. An ethnographic study will start with a research question but this is likely to be developed as the study unfolds or evolves.

5. Data collection is generally through field work but the data gathering methods tend to be diverse and unrestricted.

6. Data collection can take a long time and the material can be repetitive as the volume of data tends to be extensive.

Grounded theory – The use of the term 'theory' is misleading as Grounded Theory is a research strategy where theory is generated from the ground up (Punch, 2005, p. 154). Under this strategy the research is not bound by the testing of a hypothesis to substantiate a parent theory. This contrasts with the more traditional research approach where theory is verified by testing an associated hypothesis. However, while the researcher may start out without a theory, it can be expected that the researcher will start to formulate a theory and then test it. "It stresses induction as the main tool for theory development, but, in developing the theory, deduction will also be necessary" Punch (2005, p. 158).

A feature of the Grounded Theory strategy is the researcher's approach to data collection and analysis. The researcher will go through cycles of collecting data then analysing it to detect the development of a theory. This cycle will continue until the data confirms a theory. Literature reviews are generally delayed until the data elicits a theoretical direction, which ensures that the data is the key driver of theory building.

Action research – "Action researchers engage in careful, diligent inquiry, not for purposes of discovering new facts or revising accepted laws or theories, but to acquire information having practical application to the solution of specific problems related to their work" (Punch, 2005, p. 160). This means that action research aims to apply the knowledge obtained empirically through inquiry to solve practical problems. This type of research typically leads to the opening up of new areas of inquiry for the action research to start again, which gives the approach a reputation for being cyclical.

#### 2.3.2.2 Qualitative Data Collection Options

Interview – "The interview is one of the main data collection tools in qualitative research. It is a very good way of accessing people's perceptions, meanings, definitions of situations and constructions of reality" (Punch, 2005, p. 168).

Berg (2007, p. 92) identified three types of interview:

1. Standardised interviews are structured and conducted in the order in which the questions are presented, with no deviation of wording. The interviewer will not answer questions and there is no opportunity to add questions, which results in all respondents being treated in exactly the same manner.

2. The semi-structured interviews have more flexibility, as interviews can answer questions to clarify the aim of the question. There is no rigidity with regard to the order in which questions will be asked.

3. Unstructured interviews do not follow a set order of questioning and the questions themselves may vary as the interviewer explores the subject matter. This type of interview is generally used to supplement field observations.

Although not a standardised or structured interview, the self-completion questionnaire is very similar in structure and execution. They share the attributes of having more closed than open questions and are designed in such a way that they are easy to follow. The researcher can encourage completion by limiting the number of questions to ensure that the respondent does not tire of the task (Bryman, 2008).

Bryman also suggests that, in administration terms, the questionnaire is cheaper and quicker to complete, as there is no interviewer and administration overhead in arranging interview slots. In terms of results, the questionnaire will not have any influence from the interviewer, which eliminates the opportunity for bias to feature.

There are, however, disadvantages to using a questionnaire, including lack of interviewer guidance. This means that the interviewer cannot assist with the completion of the questionnaire or ask questions that may help to develop a greater understanding of the subject matter.

Participant/Nonparticipant observation

Bordens and Abbott (2005, p. 210) summarise participant observation succinctly, as they state that observations can be made "using participant observation, in which you act as a functioning member of the group, or using non participant observation, in which you observe as a non member. In addition, you will have to decide whether to conduct your observations overtly or covertly. When done overtly, both participant and nonparticipant observation carry the possibility of subject reactivity; group members who know they are being observed may behave differently than they otherwise would, thus threatening external validity. This problem become more serious with participant observation, in which you interact with your participants". The problems can be avoided by training participant observers not to interfere in the natural order of events or become a "passive" observer. A non participant observer can have no contact at all with the group. However, one of the key issues that must be addressed before engaging in covert observation is to understand and account for the ethical issues.

Documentary data

As Bryman (2008, p. 515) states, "documents cover a very wide range of different kinds of source". These include personal documents, official documents that are in the public domain, official documents produced by organisations, the media and the internet. One of the benefits of sourcing documentary data is that it is produced independently from the study i.e. it is not specifically biased toward or against the study. The quality of that data is measured according to the following criteria (Bryman, 2008, p. 516):

1. Authenticity – is the evidence genuine and of unquestionable origin?

2. Credibility – is the evidence free from error and distortion?

3. Representativeness – is the evidence typical of its kind and, if not, is the extent that it is atypical known?

4. Meaning – is the evidence clear and comprehensible?

2.3.2.3 Disadvantages of Qualitative Research

The disadvantages of qualitative research can be summarised as follows (Bryman, 2008, p. 391-392):

1. Qualitative research is too subjective – the focus of the criticism is that "findings rely too much on the researcher's often unsystematic views about what is significant and important, and also upon the close personal relationship that the researcher frequently strikes up with the people studied".

2. Research is difficult to replicate – this can be attributed to the nature of what is being studied, as there is a holistic element to qualitative research that takes account of the unique nature of a given case and the fact that the events being studied cannot be repeated.

3. Generalisation – the problems associated to generalisation are discussed in section 2.3.2.1, but it should be acknowledged that the difficulty in using qualitative research to generalise is a disadvantage that qualitative researchers need to address.

4. Lack of transparency – this can arise when the researcher is unclear about what steps were undertaking in arriving at a study's conclusions, which contrasts with quantitative research where great care is taken to document sampling procedures.

### 2.3.3 Mixed Method

Bryman (2008, p. 603) states that "the term 'mixed methods research' is used as a simple shorthand to stand for research that integrates quantitative and qualitative research within a single project". Bryman also states that while it may seem that a combination of research methods will yield higher quality research by realising the benefits and avoiding some of the disadvantages of each method, this is not always the case. Five points of caution are offered Bryman (2008, p. 624):

1. Mixed methods research must be competently designed and executed

2. The use of mixed methods must be appropriate to the research question

3. If there are limited research resources then those resources could be spread too thinly when applying mixed methods

4. The researcher may not have the skills to conduct mixed methods research

5. The researcher may have difficulty in interpreting mixed method results

## 2.4 Choice of Methodology

The choice of methodology for this study is driven, in the first instance, by the research question: how can a data warehouse be successfully and demonstrably aligned to an organisation's strategic objectives?

In effect, the question can be split into two further questions:

1. How can organisational strategy be articulated, such that it is possible to demonstrate how a data warehouse can support strategic objectives?

2. With the knowledge that there are different data warehouse architectures to choose from, how can organisational strategy lead the choice of data warehouse architecture?

The answers to these questions depend on a theory led approach where it is necessary to find a means of presenting organisational strategy and articulating the ethos behind the architectural options. As will be explained in the following chapter, Mintzberg, Ahlstrand and Lampel (1998) provide the rationale that has led to the formation of the Configuration School of Strategic Management. The strategic management 'solution' is based upon Miles and Snow's Ideal Types (Miles & Snow, 1978), which is founded upon configuration theory. The influence of other configuration theorists (Miller, 1987; Miller & Whitney, 1999) is also taken into account to develop a means of understanding the holistic nature of strategic management, but it is Miles and Snow's Ideal Types that has had the most influence on this study. This is due to the fact that, according to Doty et al. (1993), it is possible to measure an organisation's configuration and plot that score along a continuum. Consequently, it was necessary to develop a way of measuring configuration, which would provide the means of articulating organisational strategy.

A questionnaire was chosen as the method for measuring organisational configuration for the following reasons:

- The questionnaire could be constructed to reflect the theoretical model
- The questionnaire could be used repetitively
- The responses could be converted to scores enabling measurement of the subjects entrepreneurial, administration and systems configurations
- Participants could complete the questionnaire in their own time
- The questions are consistent for all participants

The research into data warehouse architectures is based upon academic and practitioner papers and studies. The key texts in this field are Building the Data Warehouse and The Data Warehouse Toolkit: expert methods for designing, developing and deploying data warehouses by Inmon (2002) and Kimball, Reeves, Ross and Thornthwaite (1998), respectively, as they are regarded as the industry's leading authorities for the architectures that they propose. A long standing debate exists about whose data warehouse architecture is best, so it was possible to gather information from a small number or articles that contribute to this debate. In particular, Breslin's (2004) provides an industry view of the architectural differences, while Watson and Ariyachandra's (2005) study provides evidence of the architectural choices made by organisations. These texts put the data warehousing choices into context and enable the strategic alignment issue to be highlighted.

A key product of this research is the Configuration Approach to implementing a data warehouse, which facilitates the implementation of a strategically aligned data warehouse. However, the opportunity to test this approach requires the participation of an organisation. The questionnaire could simply be tested on any organisation to obtain a view of their strategic configuration, but the author was presented with a rather unique case study opportunity where the subject was implementing a data warehouse as a strategic investment. The case study presented an opportunity to study an organisation going through a transformation, due to competitive forces, where they regarded the implementation of a data warehouse as key to their future success. The author was contracted to conduct business analysis in the organisation during the

requirements gathering phase of the data warehouse project and in that time, it was possible to collect other documentation and initiate the completion of the questionnaire. As such, the author became a participant observer by nature of the author's employment status.

This describes a mixed methodology approach where a questionnaire is used to gather data to facilitate the measurement of an organisation's configuration and position on the configuration continuum (quantitative analysis). The author's role of participant observer and the collection of official documents are features of qualitative research, together with the content analysis approach to determine the differentiating features of the data warehouse architectures.

As discussed in section 2.3.2.1, the problem commonly associated to the use of a case study is the issue of generalisation. It was stated that a single case study cannot be used to generalise to the larger population but it is possible to generalise to theory. As such, it is expected that the results of the case study will enable generalisation about the use of the questionnaire to determine an organisation's configuration. If the questionnaire can determine the configuration of one organisation, it is suggested that this will be a useful tool for any organisation. The results will also enable the organisation to be plotted on the configuration continuum, but again, the generalisation issue prevents assumptions being made that the continuum represents the entire business population. This is due to the fact that it is not possible to know if all the questions are fully representative of every organisational configuration. What can be asserted is that the continuum reflects the theoretical model and that a case study's configuration can be measured in terms of its distance from the Ideal Types. This illustrates how close an organisation is to the Ideal Type prescribed by Miles and Snow and will be true for any organisation using the questionnaire.

The following chapters provide details of how this mixed methodology approach worked together to answer the research question.

# 3 Organisational Strategy Review

As indicated in the previous chapter, building a data warehouse that is demonstrably aligned to an organisation's strategy firstly requires a deep understanding of organisational strategy. Secondly, strategy must be modelled for the purpose of providing a framework against which the data warehouse can itself be modelled. A model of an organisation's strategy provides us with a firm basis and rationale for taking key data warehouse development decisions. As a result, it can be demonstrated that the warehouse has been built to meet the strategic aims of the organisation.

As will be demonstrated, the Configuration School of Strategic Management provides the ideal platform to realise our aims. In this chapter, the principles of this school of thought are presented and the work of configuration theorists, Miles and Snow, whose typology underpins this thesis, is introduced.

## 3.1 Organisational Configuration

### 3.1.1 Strategic Management Schools

"A Strategy is a pattern or plan that integrates an organisation's major goals, policies and action sequences into a cohesive whole. A well formulated strategy helps to marshal and allocate an organisation's resources into a unique and viable posture based on its relative internal competencies and shortcomings, anticipated changes in the environment and contingent moves by intelligent opponents". Indeed, "strategy itself is not about change, but about continuity" (Mintzberg et al., 2003, p. 9).

In effect, strategic management is concerned with the coordination and management of an organisation's resources in order to realise commercial

prosperity in the face of threats from a competitive environment. The formulation of strategy is the subject of a number of schools of thought including:

#### 3.1.1.1 Design School

This school of thought is based upon the premise that the organisation has to find a degree of fit between the capabilities of the organisation and the opportunities presented by the external environment. Typically, the organisation will determine the degree of fit by analysing the Strengths and Weaknesses of the organisation against the Opportunities and Threats (SWOT) of the external environment. This approach is very much a top down approach where the Chief Executive ultimately determines the organisation's strategy. However, as Mintzberg et al. (1998, pp. 36-42) point out, this school of thought assumes that thinkers are separated from doers and that actions must follow or be sanctioned by the central body of strategists.

#### 3.1.1.2 Planning School

Mintzberg et al. (1998) consider the Planning School to be an extension of the Design School in that strategy formulation requires that the SWOT analysis be deconstructed into checklists, budgets and plans. Planners take centre stage as they formulate objectives to meet strategic aims and evaluate progress primarily via financial analysis or metrics e.g. Return on Investment. The problem with the Planning School was that planning became the raison d'être for the organisation and planning and monitoring became the focus of employees. This approach could not accommodate unplanned opportunities or more volatile trading conditions.

#### 3.1.1.3 Positioning School

The Positioning School came to prominence during the early eighties due to discontent with the design and planning schools of thought. One of the key proponents of the Positioning School is Michael Porter (1980), who asserted that there are a limited number of strategies that ought to be applied to a limited number of identifiable trading conditions. Organisations would analyse their trading conditions and apply one of a range of generic strategies. Among the issues requiring analysis was the need to consider the threat of new entrants to the market, the power of buyers and suppliers and the threat of substitute

products and/or services. An analysis of these factors would enable the organisation to create competitive advantage by applying one of the generic strategies; Cost Leadership, Differentiation or Market Focus. However, as with the earlier schools, planning and design feature highly with all the same frailties. Crucially, the Positioning School infers that there is no alternative to the choices described above.

#### 3.1.1.4 Entrepreneurial School

The Entrepreneurial School moves away from the belief that strategy is a product of analysis, planning or centralised determination by focussing on the flair and vision of a leader. By its nature, the leader's approach, while deliberate, is more fluid or emergent. Proponents of the Entrepreneurial School believe that it is the entrepreneurial characteristics of the leader that can launch a business or take a failing business and turn it around. One feature of the entrepreneurial organisation is that structurally it mirrors the fluidity of the leader's style. The success of the organisation is wholly dependant upon the ongoing success of the leader and does not develop beyond the control of one person.

#### 3.1.1.5 Cognitive School

In the evolving Cognitive School more attention is given to the mind of the strategist and the process of strategy formulation. It is understood that strategists may view the world objectively and decode that view to form strategy. Alternatively, the strategist may develop a more subjective view requiring interpretation, from which strategy is determined. While the school of thought is considered by Mintzberg et al. (1998, pp. 172-173) to be valid, not enough is known about the intricacies of the mind and its ability to manage and accurately assess the impact of the vast array of inputs. Included in this lack of understanding is how the mind can distort information that it receives and the effect on strategic decision making.

#### 3.1.1.6 Learning School

One of the criticisms of the design, planning and positioning schools is that it takes a prescriptive approach and neglects the fact that strategy is also influenced by the learning process. This means that strategy is emergent but a range of possible strategies can be realised so long as there is a means of managing

knowledge. This approach has its own difficulties given that an organisation cannot afford to put too many resources into multiple learning scenarios.

#### 3.1.1.7 Power School

The Power School accounts for the role of power and politics in the determination of strategy, which may be felt both within the organisation and by external bodies. Micro power focuses on the strategy formulated from localised persuasion, politics and bargaining. Macro power sees organisations engage with other organisations by controlling and forming alliances and deals. Power, at this level may extend to government lobbying to influence or shape the way that an industry is regulated. Again, this school of thought has its place but clearly does not account for the influence of other strategic management schools.

#### 3.1.1.8 Cultural School

Under this school, strategy formulation is borne out of the social interactions of the organisation's members. Individuals adopt the organisation's beliefs and principles to the extent that all members contribute to the development of strategy and its continuance. Mintzberg et al. (1998, p. 281) consider this school of thought rather "ethereal" and lacks definition. The favoured position for a culturally driven organisation is to stay on track and remain constant. Change is required to stabilise the organisation and maintain a course rather than alter the culture of the organisation.

#### 3.1.1.9 Environmental School

The premise of the Environmental School is that environmental forces are the "central actor" in the development of an organisation's strategy i.e. the organisation responds to these forces. It is the responsibility of the organisation's leaders to employ and adapt strategies to ensure the organisation's competitive footing or indeed, survival. However, while organisations may well react to environmental forces the problem with this school of thought is that a number of organisations can operate in the same environment but adopt varying but effective strategies.

#### 3.1.1.10 Configuration School

The Configuration School does not seek to wholly differentiate itself from the other schools but argues that organisations may display characteristics from all or

a number of these schools of thought, at any time during its existence. In other words, the Configuration School attempts to reason an organisation's state by considering the contribution from all of the aforementioned schools.

This is illustrated by the four imperatives identified by Miller (1987), which are the key forces that shape the elements behind an organisation's configuration. The environment (including technology), leadership, organisation structure and strategy imperatives are highly resistant to change and found to be central to configurations. Indeed, the imperatives engender relationships between strategy, structure and the environment but it is likely that one imperative will dominate the organisation's configuration and acts as a theme that binds the elements of the configuration together. Change is also a feature of an organisation's existence where incremental change tends to be in support of or driven by the central theme. Organisational transformation, on the other hand, marks a more fundamental shift in an organisation's purpose. A successful transformation requires changes to the organisation's imperatives, which may result in the previously dominant imperative becoming less influential.

### 3.1.2 Configuration Imperatives

In each of the imperatives, summarised from Miller's paper (1987) "Genesis of Configurations", the influence of the various schools of strategic management can be seen:

#### 3.1.2.1 Environmental Imperative

Environmental uncertainty acts as a prompt for organisation's to employ innovative and flexible strategies supported by decentralised, differentiated and integrated structures. The environment is said to cause "strategies and structures". Those organisations attuned to the environmental imperative are likely to have well established and far reaching intelligence systems that help the organisation to scan for opportunities and threats. This environmental awareness enables the organisation to adapt to changing competitive practices. Within the organisation, it is those managers with the greatest knowledge of the environment that will hold power.

The environmental imperative is more likely to impact small organisations in highly competitive environments or medium sized organisations in "turbulent"

markets. Conversely, powerful organisations that have access to significant resources and retain a sizeable market share, while operating in a stable environment will not be influenced greatly by the environmental imperative. This means that organisations finding themselves in increasingly changing environments need to adopt decentralised structures to aid decision making, as the organisation becomes more adaptive and innovative. Organisations moving away from this imperative will tend to have accumulated power through growth, product differentiation, and diversification or have simply acquired sufficient slack resources to allow the organisation to neutralise the effects or influence of the environment.

In this brief summary, the influence of some of the schools of thought becomes apparent. The environmental school is clearly the dominant influence but the need to gather and act upon information gathered is indicative of an organisation that has to employ learning school traits. Power is also a factor for those managers with extensive knowledge of the environment. Significantly, those organisations affected by the environmental imperative are more likely to be small, so the organisation will not have power to shape the trading environment. Power will be exercised internally to ensure that the organisation responds effectively to the threats and opportunities identified. The need for an organisation to differentiate their strategy through products and services is a feature of Miller's appraisal of this imperative. This is one of Porter's generic strategies from the Positioning School of strategic management.

#### 3.1.2.2 Leadership Imperative

Under this imperative, the leader is central to the formulation of strategy, structure and the selection of target markets. The leader's personality will shine through the decisions made with regard to the organisation's operations and direction. The leader's role is so prominent that it shapes the organisation's culture, especially in smaller, highly centralised organisations; a size and structure that lends itself to one person's control. Change will, therefore, be incremental but within the leader's sphere of influence. This is not the domain of the strategic planner or designer, as they will have little control over the leader's decisions.

The Leadership Imperative has close links with the Entrepreneurial and Cognitive schools of thought, as it is the leader's entrepreneurial flair that dictates the organisation's strategy. These decisions reflect the leader's view of the world and no other party has as much control over the organisation's affairs. There is also an element of the Power School because the leader needs to have a great deal of control to have so much influence throughout the organisation. Miller also indicates that the leader's role will determine the culture of the organisation, which can manifest itself through structures and processes.

3.1.2.3 Structural Imperative

Highly structured organisations are favoured in certain organisational cultures. For example, rigid structures prevent quick responses to volatile environmental conditions, which mean that those organisations tend to have predictable behaviours and are slow to change.

Power resides with those who reinforce the rules, procedures and policies of the organisation. Certain generic strategies (as proposed by Porter (1980) for the Positioning School) such as product or market differentiation are rare in highly structured organisations, as those strategies require a greater degree of organisational flexibility and a depth of customer or market knowledge. It is more likely that highly structured organisations will follow a cost leadership strategy, which requires a high degree of organisational efficiency. Organisations that focus on driving out inefficiencies can only do so by managing highly structured processes.

Organisations that are highly structured and successful can do so because they have fewer environmental threats. They will retain power in the market by lobbying governments and negotiating trade agreements, which ultimately protect the organisation's interest and maintains the status quo.

A manager's personal discretion is limited and change is not a common occurrence. The only change that does occur is in response to internal prompts, which are typically aimed at saving money and improving efficiency. Large scale change due to external forces is rare and tends to be revolutionary in its impact on the organisation.

Under this imperative, it can be see that the entrepreneurial and cognitive schools have little influence. The Positioning School features prominently and it is apparent that stable organisations are ideal places for strategic planners, who will be able to implement their plans and monitor performance. Planners, in particular, can focus on factors that affect efficiency and design solutions to strategic problems. The culture in highly structured organisations will be such that managers have little scope to be innovative, unless those innovations are geared towards operational efficiency.

3.1.2.4 Strategic Imperative

In this imperative, Miller states that strategy influences structure. For example, diversification can 'overburden' a functionally structured organisation. A strategy of diversification requires a more divisionalised structure. A strategy of differentiation facilitates greater innovation, which can only thrive where the organisation's systems and controls are more flexible. Added to that, a customer base that demands innovative products will be less cost conscious and those innovations can lead the organisation into new markets.

The cost conscious customer will be less interested in innovation but will require their products to be low cost. Delivery of low cost products is the remit of an organisation pursuing a cost leadership strategy. This type of organisation will endeavour to find efficiencies throughout the organisation resulting in greater formalisation of procedures and processes. Planning departments take control and acquire power within the organisation, as they design the organisation's strategy.

This imperative becomes more likely when there has been a performance review and a decision has been taken to change the strategic direction of the organisation. Change is generally planned and motivated by the results of performance analysis. Movement away from this imperative is often due to the need to become more responsive to environmental changes.

Again, it is possible to see the influence of some strategic management schools i.e. Design, Planning and Positioning schools. Of equal significance is the fact

that strategies that focus on innovation require the adoption of structures that cannot survive under schools like Planning and Positioning.

The imperatives illustrate that an organisation has to adopt a configuration (i.e. the way that it manages strategy, structure and environment) appropriate to the imperative. That configuration will typically be influenced by a number of strategic management schools, but to varying degrees. Miller also observed that a "number of forces restrict organisational variety". This indicates that while the number of possible configurations is innumerable "most alignments are unlikely while relatively few are more common" (Miller, 1999b). Put another way, despite the numerous organisational components, organisations tend to cluster into "coherent patterns" because not all possible configurations are viable.

### 3.1.3 Common Configurations

Viable configurations tend to be represented in conceptually developed Typologies or empirically derived taxonomies (Meyer, Tsui & Hinings, 1993). Miller (1999b) suggests that the limited range of viable configurations is due to the limited number of strategic themes that hold the organisation's constituent parts together.

The use of typologies and taxonomies by configuration theorists has been a matter of debate for some time, as in the view of Doty & Glick (1994), typology and taxonomy are terms that have been used interchangeably, which has led to misunderstanding and inappropriate labelling of classification systems as typologies. As such, typologies have been criticised for their role as mere classification systems and that they tend to take a high level view of organisational form and pay little attention to complexity. However, in their paper, Doty & Glick state that there is a clear difference between typologies and taxonomies. Taxonomy is defined as "classification systems that specify decision rules that categorizes organizations into mutually exclusive and exhaustive sets". Typologies, on the other hand, are conceptually derived ideal organisation types. Doty & Glick extend the definition to state that typologies also possess three criteria of theory i.e. "they have constructs, they predict relationships among the constructs, and these predictions are falsifiable". Accordingly, qualifying typologies include the ideal types offered by Mintzberg and Miles and Snow,

which assumes maximum organisational effectiveness. Mintzberg's typology described five ideal types of organisation: Simple Structure, Machine Bureaucracy, Professional Bureaucracy, Divisionalised Form and Adhocracy, each a unique combination of design and contextual factors (e.g. age, size, technologies, etc). Miles and Snow's typology describes Defenders, Analysers and Prospectors as ideal organisational forms. On the other hand, Porter's ideal type strategies of cost leadership, differentiation and segmentation, are deemed to "maximize competitive advantage".

A study of particular significance to the Configuration School is that which was carried out by Doty et al. (1993). Their study examines the typologies offered by Mintzberg and Miles and Snow for their ability to predict organisational effectiveness. The study's significance may be attributed to two factors; the first is that the study implicitly tests the tenet of equifinality i.e. that organisational effectiveness may be achieved via different methods. Secondly, the study quantitatively modelled the ideal types from the theorists' qualitative descriptions. The ideal types were measured along three constructs: context, structure and strategy. Table 1 outlines the measures obtained within each of the constructs.

Table 1. Construct Measures

| Context | Structure | Strategy |
|---|---|---|
| Environmental turbulence | Decentralisation | Product – Market Development |
| Environmental predictability | Formalisation | Focus on Efficiency |
| Technological routinisation | Specialisation | Scope |
| Technological interdependence | Environmental scanning | Futurity |
| Organisational size | Vertical differentiation | Strategic Clarity |

Doty et al. (1993) were able to model the consistency required among the three constructs for each of the ideal types, which provides a basis for measuring organisational fit. Thus, the closer that an organisation is to an ideal type, the more effective that organisation is.

Crucially, Doty et al.'s (1993) study found considerable support for Miles and Snow's typology as a predictor of organisational effectiveness.

3.1.3.1 Equifinality

Historically, strategic management has been dominated by Contingency research that has focussed upon the issues or concepts that have limited scope i.e. linear relationships between very few variables. Meyer et al. (1993) describe the Contingency approach as reductionist "whereby researchers seek to understand the behaviour of a social entity by separately analyzing its constituent parts". Furthermore, this implies that organisations are comprised of "loosely coupled aggregates". Consequently, where the whole organisation is deemed to be dependent upon and will benefit from the adjustment and tuning of a single component.

Of particular importance is the Contingency theorists' approach to relationships between variables. Contingency theorists do not attempt to account for non linear relationships among an organisation's many components. Contingency theorists focus upon linear relationships only. This is particularly relevant to the concept of equifinality, whereby organisations can reach the same end from different routes (Grezov & Drazin, 1997). This is one fundamental difference between the contingency and configuration theorists.

Allied to this, the Configuration school is a holistic approach where "the parts of a social entity take their meaning from the whole and cannot be understood in isolation." i.e. order emerges from the interaction of the organisation's constituent parts. Organisations pass through periods of equilibrium and disequilibrium but occasionally experience transformation that fundamentally changes the organisation's configuration. Accordingly, Configuration theorists prefer to study organisations over a period of time to take account of the impact of time. Configuration theorists fully accept the concept of equifinality, as Miles and Snow's (1978) illustrate how organisational effectiveness may be achieved via three ideal types, the Defender, Analyser and Prospector. The profiles of Miles and Snow's ideal types are contained in Appendix 1.

### 3.1.4 Configuration as a Process

Mintzberg et al.'s (1998, p. 302) view of the Configuration School is that it has two distinct aspects:

1. the organisation's state and surrounding context (configuration)
2. the strategy making process (transformation)

"The Configuration School describes the relative stability of strategy within given states, interrupted by occasional and rather dramatic leaps to new ones."

Accordingly, the form that an organisation takes depends upon the resources available to the organisation and the many influences, internal and external that affects the organisation's constitution. These forces help mould the organisation into a unique configuration, which may be more or less effective than other organisations in the same market place that are subject to the same or similar forces. This organisational state will evolve over time and move through different 'states', 'periods' and organisational 'life cycles'. In 1971 McGill University initiated research to historically map the strategies of a range of organisations over a 30 to 50 year period. The results showed that organisations pass through distinct and identifiable stages:

- Stage of development (hiring people, establishing systems, firming up strategic positions)
- Stage of stability (fine-tuning the strategies and structure in place)
- Stage of adaptation (marginal changes in structures and strategic positions)
- Stage of struggle (groping for a new sense of direction)
- Stage of revolution (rapid transformation of many characteristics concurrently)

For much of the time, change is incremental and centred upon reinforcing the prevalent theme or imperative. However, the Configuration School adopts the

view that an organisation's existence is punctuated by 'quantum' change i.e. many constituent parts change at once. This is contrary to the views of the incremental change theories of the learning school. Mintzberg et al. (1998, pp. 314-315) rationalise this conflict of views by concluding that strategists learn incrementally and then when the opportunity arises, accelerate change in a 'revolutionary' fashion.

Mintzberg's change cube (see Figure 3) presents the various dimensions of change within an organisation i.e. formal and informal, conceptual or concrete and strategic or organisational.


Source: Mintzberg et al., 1998, p. 326

Figure 3. Change Cube

The key feature of the change cube is that product and people changes have less organisational impact than program and system changes, which has less impact than position and structure changes. Vision and Culture changes are high impact and are likely to enforce organisational transformation because all of the factors below vision and culture will have to change too. This degree of organisational change is considered to be 'quantum'. The challenge is maintaining continuity of the organisation's operation during the period of change.

How an organisation changes is reflected in the work of Beer, Eisenstat and Spector (1990) and Kotter (1996), who respectively believe that change occurs either bottom up or top down.

Beer et al. (1990) argued that change 'usually started at the periphery of the organisation in a few plants and divisions far from headquarters' and were led by 'general managers of these units', not by CEO's or corporate staff. CEO's create 'a market for change' but others within the organisation dictate the subjects and pace of change.

Accordingly, there are Six Steps to Effective Change (Beer et al., 1990):

1. Mobilise commitment to change through joint diagnosis of business problems. By helping people develop a shared diagnosis of what is wrong in an organisation and what can and must be improved, a general manager of a unit mobilises the initial commitment that is necessary to begin the change process.

2. Develop a shared vision of how to organise and manage for competitiveness. Once a core group of people is committed to a particular analysis of the problem, the general manager can lead employees toward a task aligned vision of the organisation that defines new roles and responsibilities.

3. Foster consensus of the new vision, competence to enact it and cohesion to move it along.

4. Spread revitalisation to all departments without pushing it from the top.

5. Institutionalise revitalisation through formal policies, systems, and structures. The new approach has to become entrenched.

6. Monitor and adjust strategies in response to problems in the revitalisation process. The purpose of change is to create a learning organisation capable of adapting to a changing competitive environment. Some might say that this is the general managers responsibility but monitoring the process needs to be shared.

Kotter's (1996) alternative is a top down approach where leaders are required to initiate and head up the organisation's change efforts. As such, there are Eight Steps to Transforming Your Corporation:

- Establish a sense of urgency
- Create the guiding coalition
- Develop a vision and strategy
- Communicate the change vision
- Empower employees for broad-based action
- Generate short term wins
- Consolidate gains and produce more changes
- Reinforce new approaches in culture

The question is: which of these approaches is most effective and in what circumstances? Mintzberg et al. (1998) do not provide answers to these questions but intuitively, it could be surmised that a top down change program would be more effective in an organisation heavily influenced by the design school of strategic management. The learning school would perhaps, be more receptive to change from the bottom up. As will be seen later in this section, configuration and change approaches are relevant in data warehouse implementations.

Mintzberg et al. (1998, pp. 305-306) summarised the premises of the Configuration School as follows:

1. Most of the time, an organisation can be described in terms of some kind of stable configuration of its characteristics: for a distinguishable period of time, it adopts a particular form of structure matched to a particular type of context which causes it to engage in particular behaviours that give rise to a particular set of strategies.

2. These periods of stability are interrupted occasionally by some process of transformation – a quantum leap into another configuration.

3. These successive states of configuration and periods of transformation may order themselves over time to patterned sequences, for example describing life cycles of organisations.

4. The key to strategic management, therefore, is to sustain stability or at least adaptable strategic change most of the time, but periodically to

recognise the need for transformation and be able to manage that disruptive process without destroying the organisation.

Accordingly, the process of strategy making can be one of conceptual design or formal planning, systematic analysing or leadership visioning, co-operative learning or competitive politicking, focusing on individual cognition, collective socialisation, or simple response to the forces of the environment; but each must be found at its own time and in its own context. In other words, the school of thought on strategy formulation themselves represent particular configurations.

The resulting strategies take the form of plans or patterns, positions or perspectives, or else ploys, but again, each for its own time and matched to its own situation.

### 3.1.5 Configuration of Organisational Elements

Miller and Whitney (1999a) provide some insight into how configurations are formed. They describe configurations as 'constellations of organisational elements that are pulled together in a unifying theme'. There are two such constellations; the first is the 'core' which is comprised of the organisation's 'mission, 'means' and 'market'. The second constellation 'supports the systems, processes and structures that support the core'. Competitive advantage, it is argued, is driven from the synergetic relationship between the two constellations. The creation of configuration is where an organisation makes choices about what it does, how it will pursue those decisions and making sure that the organisation's activities 'reinforce' each other.

There are many reasons for configuring or reconfiguring an organisation whether it is the identification of a gap in the market for a new product, the creation of an innovative product or adoption of new technology. Significantly, some configurations are borne out of crisis, which 'causes a theme to surface and forces the pieces of a company to adjust to one another'.

The core of the configuration has three elements: the mission, means and market.

The Mission

An organisation's mission presents the organisation's ambitions, objectives and standards. It enables the organisation to communicate with its workforce giving them guidance of the values and direction for their ongoing efforts.

The Means

'Means constitute the very basis of an organisation's identity, both to its employees and its customers. Means – technologies, procedures, programs, and unusual talents or resources – shape the tasks and interactions of everyone in the organisation'.

The Market

An organisation's configuration will be judged by the market in which it operates. If the market does not respond to products or services offered by an organisation then that configuration could be regarded as worthless. Organisations need to understand their customers and market to the degree that it can offer products or services of true value.

Embedding a successful configuration requires a considerable amount of support activities. These activities need to be coordinated if they are to support and help develop the core of the configuration. Miller and Whitney (1999a) suggest that support comprises of six key parts: 'attitudes, influence, resources, motives, attention and effort'.

| Directing Attitudes: Rituals and Ceremonies |
|---|
| The goals and priorities of top managers will have little effect unless they shape the values and attitudes of most other members of the organisation. This is often accomplished using the elusive phenomenon called organisational culture. Culture must create a sense of common purpose that inspires targeted effort toward the corporate mission. And that comes from the actual work environment rather than from the company pronouncements. |
| Directing Influence: The Power and Reporting Structure |
| Organisation structure specifies how responsibility and authority are to be distributed. In well configured organisations, it is used to give those with the most important tasks the discretion and influence to perform them. Structure also signals which units and individuals - and hence which priorities and tasks – are especially critical. |
| Directing Resources: Strategic Plans and Budgets |
| Configurations must be operationalised by plans and programs that break down strategic priorities into sub objectives and sub tasks. Central activities feature most directly in strategic plans, while more peripheral concerns are given less prominence. |
| Directing Attention: Information Systems |
| Effective configuration demands that managers pay special attention to particular kinds of information. Information systems, whether formal or informal, need to be designed to direct managers' attention to the trends, facts and issues most central to their missions, means and markets. |
| Directing Motivates: Recruitment, Training, Promotion and Compensation |
| Configurations are best sustained when people enthusiastically direct their efforts toward a common purpose. This is achieved in part by strategic human resource management. On the one hand, recruitment policies must address the compatibility of new people with the organisation; they must seek out individuals with skills especially important to the core theme who complement one another. |
| Directing Effort: Administrative Routines |
| Routines serve as primary tools for directing human effort and ensuring compatibility in the activities of different departments and decision makers. There are routines for almost everything – from purchasing supplies to training or hiring. Managers should strive to shape routines in a great many areas around the core means and mission. But because most organisations must address ever-changing internal and market needs, routines must be continually re-examined for relevance, currency and dangerous side effects. |

Finally, Miller and Whitney categorise the competitive advantages of effective configuration:

Clarity of Direction

The benefits of having a clearly defined mission that has been distributed and understood throughout the organisation is that collectively, everyone moves in

the same purposeful direction. People within the organisation are unified in their efforts, which reduce the amount of time spent on trivial and unimportant matters.

Smooth Collaboration

'When employees share common values and have a thorough understanding of core priorities, they are able to work together toward common objectives. Petty disputes are rare, and organisational politics takes a back seat to accomplishing an overriding goal'.

Solid Commitment

Configurations are strengthened by interdepartmental cooperation in the pursuit of 'common values'. The organisation benefits from this commitment through increased collective effectiveness.

Effective organisations commit resources to prioritise projects and do not try to spread resources too thinly over an array of projects. There is clarity of purpose and focus to overcome challenges and achieve objectives. This reduces the risk of being undermined by competitors.

Core Competency

'Configured companies, because they distinguish sharply between the thematic and the peripheral activities, are able to focus their resources to develop powerful and unique competencies. It is neither feasible nor productive for firms to become jacks-of-all-trades. Instead, managers must prioritise activities and allocate resources of what their companies do especially well'.

Market Superiority

Well configured organisations have an advantage over badly configured organisations that will lack business focus and the commitment of their personnel. Well configured organisations enjoy internal strength and closer relationships with customers, which is a sign of good configuration.

Enduring Originality

'Business scholars have argued that the primary sources of long term profitability are talents or resources that competitors cannot imitate. Abilities or resources that are easily copied soon lose their value. But the core competencies, competitive advantages, and synergies that inhere in a tight configuration are very hard to imitate. In part, this is because configurations creatively combine many elements – mutually enforcing means, cohesive teams, complex administrative structures, and elaborate systems'.

## 3.2 Configuration and Data Warehousing

### 3.2.1 Case Studies

In the following section, the case studies of First American Corporation (FAC), the Inland Revenue Service (IRS) and a manufacturing company from the articles by Cooper, Watson, Wixom and Goodhue (2000) and Watson et al. (2001b) are considered. The degree of fit with the Configuration School principles and the elements of change / transformation are considered. In reference to strategic management research, Miller and Whitney (1999a) claim that 'previous work has tended to look at only parts of an organisation, with little concern for the central themes and relationships that prioritise and orchestrate the parts'. Accordingly, an attempt has been made to examine the impact of the data warehouse across the organisation's component parts.

There are, however, limitations to this exercise as the authors of the articles only provide a limited amount of information about the nature and trading conditions of the organisations. These articles do not examine the impact of warehousing to the company as a whole, as may be required under the Configuration School. For example, the strategy adopted by the IRS is discussed but do not know the overall context for this strategy.

| | | Satisfies configuration principle? |
|---|---|---|
| Organisation<br>FAC | Core: A clear MISSION and set of priorities and goals that are shared by many managers.<br>As with each of the case studies, it is not known what the mission statement was at the time of the study. However, it is known that FAC discounted a number of possible strategies such as becoming a low cost provider or focusing on product differentiation since they did not feel that they were in a position to realistically compete with their competitors. FAC decided to concentrate on competing on service and to do this, the company knew that it had to become 'intimate' with the customer in order to develop long standing and profitable relationships.<br><br>The strategy that was developed became known as 'Tailored Client Solutions', which had four components:<br><br>Client Information – know the client better than anyone<br><br>Flexible Product Line – provide what the client needs<br><br>Consistent Service – help the client achieve goals<br><br>Distribution Management – offer the client preferred channels<br><br>Each of these components centred upon the customer. | Yes |

| | | |
|---|---|---|
| | While a mission statement is not provided, it is clear that the priorities were known and that the theme centred upon customer intimacy. | |
| IRS | Compliance 2000 was a new vision, which was conceived by a group of IRS executives between 1986 and 1987. The idea was that the IRS would use the data available to it via data warehousing and employ market segmentation methods to identify non compliant groups of taxpayers. This would help the IRS combat these irregularities by adopting methods to 'change the behaviour' of these groups without performing an audit. The new vision was 'institutionalised' in 1989 by the establishment of the Compliance 2000 Office, which was created to provide support and direction to the various IRS districts.<br><br>In this case, it is not clear if the new vision was part of the whole IRS mission. Whilst there was support for the ideas, there is no indication that the IRS had made a significant change in approach to dealing with non compliant cases. In fact, it appears more likely that Compliance 2000 was being administered in the manner of a project or research i.e. the IRS was learning from the experience. The authors advise that it was down to 'key players in the National Office of Research' (NOR) to sell the concepts to the various districts. The NOR typically, only had enough time at the half yearly IRS executive conference to summarise their work until 1997 when they were given a full day to review their projects. This would suggest that Compliance 2000 did not form part of the IRS mission. | No |
| Manufacturing | During the early 1990's, business units had identified the need for integrated data to support various business | |

| | | |
|---|---|---|
| Co. | initiatives. The manufacturing company's first attempt at building a data repository failed and it was left to the IT department to champion a second effort based on the data warehousing technology available to it at that time. Unfortunately, the IT executive who had promoted the data warehouse development left soon after starting the project. This left the IT department as owners of the data warehouse and had to market the warehouse as the various development stages unfolded. | No |
| | A number of business units have incorporated data warehousing in their own strategies and despite business gains resulting from warehousing initiatives, the executives did not incorporate the potential of data warehousing in their strategic plans.<br><br>It is clear that warehousing is not part of the company's mission. | |
| | | Satisfies configuration principle? |
| Organisation FAC | Core: Focusing attention, activities, and resources on the primary MEANS for attaining these goals.<br>With customer intimacy as the organisation's theme FAC utilised data warehousing technology to; redesign products, amend its distribution channels, change processes to ensure consistent service levels, and develop detailed customer analysis. | |
| | The accomplishments of FAC fit very well with Miller and Whitney's assertions that means 'help define work', 'create unique products or services', 'reflect a central theme'. Indeed 'means must also incorporate methods of learning and improving'. It would appear that the ongoing development of the warehouse and | Yes |

| | | |
|---|---|---|
| | continued learning associated with the customer data analysis, contributes to this principle concisely. | |
| IRS | The incremental build of the data warehouse allowed the staff within the newly created District Offices of Research Analysis (DORA) to learn and develop their skills. However, the executives backing the initiative did not have control over the selection of staff for the analyst positions. This resulted in staff of varying degrees of skill and attitude. The executives did, however, manage to secure the mechanism for allocating budget, which ensured adequate funding. | In part |
| | The incremental approach to the build closely resembles the steps being taken to have the warehousing initiative wholly incorporated as IRS policy. The theme in this situation appears to be one of cost reduction through technological advances but not across the whole of the IRS. This would be achieved by proving the research and learning as opposed to a full-scale attempt at phasing out audits. | |
| Manufacturing Co. | In the manufacturing company, it was up to the individual business units to manage the warehouse for their own strategic benefits. Examples were given to demonstrate that the technology had provided tangible benefits and had changed some localised practices. For example, suppliers had been given access to data that allowed them to monitor the performance of the parts sold to the manufacturing company. The cost benefit was a clearer understanding of warranty liability. In general, the number of users was increasing and skills were being developed to help users get the most from the technology. | In part |
| | Despite the positive signs, these successes do not appear to have been centred upon a corporate theme. This means that the changes appear to be fragmented and seen as incremental improvements. In short, Miller & | |

Whitney describe this situation as a lack of 'harmony'.

| | | Satisfies configuration principle? |
|---|---|---|
| Organisation | Core: A viable target MARKET that values the outputs the means creates. | |
| FAC | In 1990, FAC had lost $60million and was operating under letters of agreement with banking regulators. By 1998, FAC had posted profits of $211 million, which is attributed to the means described above.<br><br>There is no doubt that the market has responded to the products and services offered by FAC. | Yes |
| IRS | The IRS 'market' is the taxpayer in the USA. This is obviously different to an organisation that has to compete in a competitive market. It can be stated that, there have been examples of market segmentation efforts that have delivered good results in terms of taxes recovered. There is no doubt that there is a market for this work but the problem is that of co-ordinating a country wide effort. | Yes |
| Manufacturing Co. | Data warehouse users cited two tangible benefits from the introduction of warehousing, the first is a better fault detection in the production process. This means that there will be a reduction in the number of service callouts saving a considerable amount of money per month. The second example was one of monitoring the sale of goods in retail outlets. The information extracted from the warehouse enabled the stores to better manage their floor planning policy, which has a direct effect on sales.<br><br>Whilst the benefits may be tangible, the 'market' for the data warehousing initiatives appears to be vague. | No |

That is to say, there is no discernible theme as the above examples represent separate quality and sales initiatives. The actual market is unclear from the information given.

As previously stated, the core needs a comprehensive support structure to allow the configuration to become established. Miller and Whitney identified six areas that require attention in order for this 'bedding in' process to occur.

| Organisation | Directing Attitudes: Rituals and Ceremonies | Satisfies support principle? |
|---|---|---|
| FAC | It took two years from conception to communicating FAC's customer focus strategy to its workforce. Watson et al. (2001b) states that 'FAC concurrently developed the component parts of the strategy with each part providing significant financial impact. Once those component parts had been successfully implemented, the full TCS strategy was formally announced. Using meetings and FAC's newsletter, the TCS strategy was communicated to everyone in the company'. | Yes |
| IRS | In order to increase the rate of tax payment, the IRS developed a scoring tool that could predict who was more likely to pay. Senior management viewed this capability as a 'key strategic possibility', which would enable the IRS to move away from the labour intensive audit methods of recovering taxes. A group of IRS executives presented their vision under the banner of Compliance 2000. The term 'key strategic possibility' does not give the impression of strong conviction but the technology was released incrementally and offices set up to implement | In part |

| | | |
|---|---|---|
| | the vision.<br><br>The article does not indicate that there was a 'revolutionary' shift in the IRS' approach to dealing with non compliance. It is, therefore, impossible to determine if there was a change in the IRS' values or culture but it is possible to speculate that sufficient gains had been made to change the way staff approached non compliance in many if not all IRS offices across the country. | |
| Manufacturing Co. | Far from being part of the company's fabric, IT managers had to regularly educate managers and new business leaders about the purpose and value of the data warehouse. The warehouse was regarded as a facility only that was used by a number of business units as warehousing did not feature in the company's strategy. The warehousing effort could not be said to be changing the cultural thinking of the organisation, although at application level, the warehouse was becoming a standard business facility. | No |
| Organisation FAC | Directing influence: The Power and Reporting Structure<br>FAC took significant steps to prevent the company from complete collapse by bringing in new senior management tasked with turning the organisation around. These executives changed the bank from a product to a customer focused bank. FAC made a conscious decision that the organisation would be managed in a new way. | Satisfies support principle? |

| | | |
|---|---|---|
| | An example of this was the appointment of the Director of Marketing who restructured his team to address the new challenges. This was important as the bank considered this area of the organisation to be crucial to the development of customer focused strategies. | Yes |
| IRS | The executives promoting market segmentation established District Offices of Research and Analysis (DORA's), that gave those responsible for conducting the analysis a structured environment to work in. This enabled analysts to focus their attention on the research projects and a platform from which they could champion the concept. | |
| | Again, the article does not indicate any shift in power or changes to the corporate reporting structure. However, it is safe to assume that the DORA's formed part of a new reporting structure. | In part |
| Manufacturing Co. | While the data warehousing 'vision is strong at application level', it is clear that there is no senior management direction for the incorporation of warehousing on a company wide scale. This indicates that operational areas are using their discretion to use the data available to them for business purposes. Whilst management are aware of these activities no details are given that would indicate changes to the power base or reporting structures. | No |

| Organisation | Directing Resources: Strategic Plans and Budgets | Satisfies support principle? |
|---|---|---|
| FAC | While no budgetary information is available, FAC took greater control over costs and any development work in support of the new strategy had to have a positive financial impact on the organisation. It is expected that FAC were acutely aware of their financial position and adjusted their financial controls accordingly. As previously stated, FAC had planned their strategy and defined how they would achieve their goals. All reconfiguration work had the customer at the centre, closely allied to measuring and understanding financial returns. | Yes |
| IRS | The work of the DORA's was directly linked to the strategic objective of classifying groups of customers for the purposes of managing non compliance. A strong advocate of the warehousing initiative was the Assistant Commissioner, Research and Statistics of Income. This member of the executive strengthened the research work by persuading the Chief Operations Officer to pass the Budget Planning Office under his control. This ensured appropriate funding for the DORA's.<br><br>This fits well with Miller and Whitney's view that 'to be effective, such plans must be linked to capital and operating budgets that allocate funds'. | Yes |

| | | |
|---|---|---|
| Manufacturing Co. | It is clear by now that this data warehouse project was split into two parts; those who did and those who did not value the data warehouse. Those who valued the warehouse incorporated the warehouse into their plans, while the executives chose not to involve warehousing in the strategic plan.<br><br>Whilst not all business functions utilised the warehouse, those that did encouraged others within the same work group to access and use the data. One manager trained engineers to use the warehouse applications and would not approve the engineers work until it had been validated by data from the warehouse. Business units that had an interest in the warehouse had expressed a requirement to increase the development of the warehouse but at that time they felt that the future of the warehouse was unclear. This means that business unit plans for the warehouse were being underlined by the lack of executive backing. | In part |

| Organisation | Directing Attention: Information Systems | Satisfies support principle? |
|---|---|---|
| FAC | The data warehouse was crucial to the attainment of FAC's strategy. The data from the warehouse was used to design products, distribution channels and measure profitability. | Yes |
| IRS | The whole project is based upon the possibilities that data warehousing technology brings to enhance research capabilities. The technology is a core element in the IRS' strategic ambition for understanding taxpayer behaviour. | Yes |
| Manufacturing | By using data to manage the floor planning in retail outlets, this is an example of using information systems to | |

| | | |
|---|---|---|
| Co. | satisfy a business need. The problem again, is that it is not possible to know if this contributed to the organisation's strategic objectives.<br><br>It is known that business units incorporated warehousing into their business plans and it is therefore interpreted that the technology was being used to achieve their objectives albeit at the business unit level. The technology clearly was not being used to direct managers in their pursuit of higher level strategies and objectives. | In part |

| Organisation | Directing Motivates: Recruitment, Training, Promotion and Compensation | Satisfies support principle? |
|---|---|---|
| FAC | FAC recruited people not only with the right skills but also at the right time to drive the strategy forward. For example, new senior management were brought in to direct operations, NCR was engaged to deliver the warehouse and transfer skills to existing IT professionals while staff were assessed to establish competencies. Financial rewards had to be restructured to ensure that staff activities were in line with the organisation's objectives. | Yes |
| IRS | When the DORA's were established, the executives anticipated that people with appropriate statistical analysis skills would staff these offices. Unfortunately, those who had lost jobs from within the IRS were given first pick of the jobs, which meant that the staff skills and enthusiasm varied. The executives did change the remuneration package and incentive schemes in order to keep the initiative moving forward. | Yes |

Despite the lack of control over the appointment of some members of staff, steps were taken to improve the potential for success, including providing appropriate training.

| | | |
|---|---|---|
| Manufacturing Co. | There is no evidence of any changes to the personnel policies to back up the organisations investment in warehousing technology. | No |
| | | Satisfies support principle? |
| Organisation | Directing Effort: Administrative Routines | |
| FAC | Work routines had to be changed to ensure that staff could adopt customer focused activities. The data from the warehouse also helped the organisation assess the type of skills and number of staff required for particular branches. This allowed the bank to tailor its presence according to local customer needs. | Yes |
| IRS | There are no signs of administrative processes changing in other areas of the IRS but the DORA's themselves were in the fortunate position of establishing the required administrative systems and processes. | Yes |
| Manufacturing Co. | The manufacturing company did state that some business processes had changed. The evidence of this was the changes made to allow suppliers access to the information on parts sold. This meant that the supplier did not have to wait on the manufacturing advising them of the necessary information. In that sense, at least one part of that process had changed. | Yes |

### 3.2.2 Case Study Configuration Summary

It is worth reiterating that the articles used for this mapping exercise were not written to specifically answer a number of configuration issues. Wherever possible, specific examples were used to demonstrate the match with the configuration theory element. If no examples were available, a degree of interpretation was used to assess the fit with the mapping in question. In the case of FAC, there was considerably more information available to assess strategic fit from the article by Cooper et al. (2000).

The results of the mapping illustrate that there is a good degree of alignment between Miller and Whitney's configuration theory and the experiences at FAC. It is also apparent and that the data warehouse successfully contributed to a clearly defined business strategy. FAC matched up to all factors of the configuration theory.

The IRS analysis shows signs of having configured the warehouse to help satisfy the requirements of a taxpayer segmentation strategy only. However, it is not known how this strategy contributes or complements the strategic plans of the entire IRS. The configuration is limited to the realisation of a specific strategy by adopting data warehousing technology supported by a network of DORAs.

The manufacturing company would appear to show few signs of complementing the organisation's configuration. From a strategic point of view, the organisation did not view the data warehouse as a strategic investment, despite the wishes of staff at the operational levels. The data warehousing effort is a facility utilised and managed by a select number of people within the organisation.

### 3.2.3 Case Study Transformations

The second part of the configuration theory is that organisations must pass through a transformation phase in order to implement the changes proposed by the new configuration. According to Mintzberg et al. (1998), the change experienced by organisations tends to be dramatic as they move from one strategy to another. There may be small changes applied to operations on a day-to-day basis but the changes associated to the adoption of new strategies tend to be 'revolutionary'. Miller and Whitney also state that change may be based upon the development of a new and innovative product or technological advancement. Significantly for FAC, such dramatic changes may be borne out of crisis.

FAC illustrate this point well as they had just posted losses of $60 million and badly needed to find a strategy that would make the company viable and competitive. Cooper et al. (2000) explains the transformation process using Kotter's change model:

| Establish a sense of urgency | |
|---|---|
| FAC | There is no doubting the urgency here; the company was facing extinction. |
| IRS | Watson et al. (2001b) consider that there was a sense of urgency but not shared by all executives. |
| Manufacturing Company | The sense of urgency was not significant due to the eventual lack of senior management support. |
| Create the guiding coalition | |
| FAC | FAC had guidance from the CEO and was supported by a newly appointed senior management team. |
| IRS | The Chief Operations Officer, Assistant Commissioner for Research and Statistics and key personnel from the National Office for research guided the IRS' project. |
| Manufacturing Company | The key champion of the data warehouse left the company soon after initiating the project. This unexpectedly left the mantle with representatives from the IT department. In other words, there was no guiding coalition. |
| Develop a vision and strategy | |
| FAC | FAC rallied around their Total Customer Satisfaction vision. |
| IRS | The IRS delivered their vision via Customer 2000. |
| Manufacturing Company | Any vision for the data warehouse lay with IT department or within individual business unit strategies. |
| Communicate the change vision | |
| FAC | FAC communicated their vision via conferences, meetings and company newspapers. However, they only communicated the policy when they had confidence in its viability. |
| IRS | Communication of the vision was performed by representatives from the DORA's in addition to the conference material delivered by the executives. |
| Manufacturing Company | There was no vision to communicate to the organisation. |

| Empower employees for broad-based action | |
|---|---|
| FAC | A new management team had clearly defined objectives to act upon. |
| IRS | The IRS team appears to have had the means to act but there are few examples of significant changes to the organisation as a whole. |
| Manufacturing Company | Again, there was no vision to fulfil. |
| Generate short term wins | |
| FAC | There were a number of short term wins at FAC. The bank had planned the rollout of their strategy and any gains also had tangible financial payback. |
| IRS | The short term wins appear to have been more closely aligned to the incremental build of the warehouse, such was the dependency on the data warehouse. |
| Manufacturing Company | The manufacturing company had undoubtedly had a number of successes using the warehouse but the gains were localised and not part of a greater plan. |
| Consolidate gains and produce more changes | |
| FAC | The strategy had been pursued for 8 years and success had not dissipated. Although, changes may have been made along the way, the theme remained the same. |
| IRS | At the time of writing, Watson et al. (2001b) could not assess the IRS for this section. |
| Manufacturing Company | The users of the data warehouse wanted to continue to expand the facility but due to a lack of strategic support, the future of the warehouse was unclear. |
| Reinforce new approaches in culture | |
| FAC | Data warehousing is a core piece of technology that enables business strategies. |
| IRS | The IRS is much further behind FAC in terms of changing the organisation approach to data warehousing. Institutionalising these approaches had yet to be achieved. |
| Manufacturing Company | No transformation effort was attempted. |

Source: Devised from Kotter (1996)

Despite the obvious frailties of the manufacturing company's approach to data warehousing, Watson et al. (2001b) do point out that all companies were successful but in varying degrees. This is rationalised by mapping the companies change efforts with Kotter's model. However, Mintzberg states that Kotter's model represents a top down approach to change (Mintzberg et al., 1998, p. 336), which satisfactorily explains the experiences of FAC and the IRS. Each of these cases had executive management to drive their project forward. The manufacturing company, on the other hand, was using the data warehouse at the operational levels of the organisation and also having some success. In fact, there were 1700 people who had access to the system while 400 to 600 actually used the warehouse applications each month generating up to 40,000 queries. The users were also able to articulate the reasons for having the warehouse and produce tangible benefits that have been attributed to the warehouse. So, while Watson et al. (2001b) have attempted to explain the reason for limited success by using Kotter's change model, this does not wholly explain why they have had success despite the complete lack of top management direction.

This section attempts to map the manufacturing company's situation against the bottom up model by Beer et al. (1990) to try to explain the growth of the warehousing activities.

| |
|---|
| Mobilise commitment to change through joint diagnosis of business problems. By helping people develop a shared diagnosis of what is wrong in an organisation and what can and must be improved, a general manager of a unit mobilises the initial **commitment that is necessary to begin the change process…** |
| Collectively, a number of business units had identified a need to create a single repository of data to support their various business needs. This resulted in the company's first attempt at building a warehouse, which failed. Despite the setback, the IT department continued to look for a potential solution and subsequently adopted data warehousing within IT's strategic plan. A senior IT executive did push the warehousing project forward but left the company soon afterwards leaving the project in the hands of the warehousing team. This team has continued to develop and support the data warehouse and actively encourages business units to interact with the warehouse.<br>Initially, the need for change was identified by the business units and not at the higher levels of the organisation. Perhaps the failure of the first project diluted the drive for change. |

| |
|---|
| Develop a shared vision of how to organise and manage for competitiveness. Once a core group of people is committed to a particular analysis of the problem, the general manager can lead employees toward a task aligned vision of the **organisation that defines new roles and responsibilities…** |
| The problem here is that the business units appear to act solely for the purposes of satisfying the needs of their own business unit. There is no evidence to suggest that the business is prepared to take ownership of the warehouse. It is not possible, therefore, to state that there was a shared vision. |
| Foster consensus of the new vision, competence to enact it and cohesion to move it along. |
| Again, there is no high level vision to take forward. The vision rests with each business units requirement for the warehouse although this does require the continued support of the IS department and their commitment towards the potential for the data warehouse technology. Allied to this, there are business units who have incorporated the warehouse applications within their daily routines. More significantly, those using the warehouse want to see continued development of the warehouse despite the lack of senior management commitment.<br>The vision for the warehouse at application level is strong. |
| Spread revitalisation to all departments without pushing it from the top. |
| Those business units that have used the warehouse have seen tangible benefits. The warehouse applications have been incorporated within daily routines and have changed some practices. An example of this would be giving warehouse access to parts suppliers in order to monitor quality standards. This has saved effort in determining share of warranty costs. Revitalisation though, has not extended to all departments. |
| Institutionalise revitalisation through formal policies, systems, and structures. The new approach has to become entrenched. |
| While it has been stated that some business process have changed, there is also little proof of significant change for the organisation as a whole. The instances of change remain at the operational areas. For example, decision making has improved for example, decisions about floor plans in their retail outlets are based upon data from the warehouse. There is also an instance of one manager refusing to approve work until it has been validated by information extracted from the warehouse. |
| Monitor and adjust strategies in response to problems in the revitalisation process. The purpose of change is to create a learning organisation capable of adapting to a |

| |
|---|
| changing competitive environment. Some might say that this is the general managers responsibility but monitoring the process needs to be shared. |
| There is no doubt that this organisation is adapting to the possibilities afforded by the warehouse but this seems to apply to some business units and not others. Watson et al. (2001b) states that there are many examples of tangible benefits since the introduction of the warehouse and at the application level, there is a willingness to continue improving the warehouse capabilities. |

Source: Devised from Beer et al. (1990)

Whilst a degree of fit may be demonstrated with the bottom up approach to change, this does not fully explain the reason for the degree of data warehousing success enjoyed by the manufacturing company.

There appear to be a number of change barriers facing the organisation:

- The business has not taken ownership of the warehouse, which breaks one of the rules of best practice i.e. Project must be managed by both business and IT professionals. To take this one step further, the warehouse initiative must be business driven (Weir, 2000).

- Unless the business takes full ownership of the warehouse, there cannot be a unified vision for the warehouse.

- An example was given where some business units have not fully communicated the benefits of warehousing. Business units have not reported the full extent of cost savings in order to preserve their budgets. This will stem the flow of learning up the organisation thus preventing senior management commitment to the data warehousing effort.

This perhaps illustrates the need for all change conditions to be met if a bottom up approach is to be successful. This also indicates that successful change initiatives are rather fragile and that change cannot be a haphazard event but needs management to ensure success.

## 3.3 Summary

In this chapter, a summary of the various schools of strategic management has been illustrated via the strategic imperatives and how the Configuration School draws on these schools of thought. From this it can seen that the component parts of an

organisation are configured to consistently and effectively manage the elements or forces affecting strategy, structure and environment.

Significantly, despite the limitless number of possible configurations, the strategic imperatives limit the number of viable configurations. As a simple example, an organisation operating in a volatile environment will need to be agile in its response to environmental opportunities and be innovative to capture a segment of the market. That organisation cannot employ a cost leadership strategy, as there is not enough time to refine systems and processes to drive out inefficiencies, as they will lose their ability to be responsive to the market. Accordingly, typologies such as those offered by Minztberg, Miles and Snow and Porter, provide a holistic means of distinguishing how organisations can achieve maximum organisational effectiveness or competitive advantage. That said, Doty et al. (1993) provide us with clear evidence that it is Miles and Snow's ideal types that are the determinants of maximum organisational effectiveness. This is also important for the concept of equifinality, as the study also confirms that organisational effectiveness may be achieved by following different paths. This is a concept that distinguishes configuration studies from contingency studies.

Change is also a significant feature for the Configuration School. Incremental change is constant in order to reinforce the organisation's theme e.g. cost leadership, innovation or quality. Organisations move in and out of equilibrium, as they adjust to opportunities and / or threats. Periodically, however, an organisation undergoes a configuration transformation. This is typically found when industries are subject to deregulation. For example, the Royal Mail operated a monopoly but deregulation will open up the market to competition. This has meant that the Royal Mail has had to transform its structure and services to accommodate the changing operating environment.

In section 3.2, three case studies were mapped to Miller and Whitney's configuration framework. There are clearly limitations to this exercise because the case studies were not written for the purpose of configuration analysis. Despite this, the FAC case study mapped well to Miller and Whitney's framework while Cooper et al. (2000) have already stated that FAC managed their change program according to Kotter's change model.

The key point that can be taken from this section is that configuration analysis is an appropriate method of assessing a data warehouse implementation. The data warehouse

has to fit with either an organisation's current configuration or that which the organisation is striving to achieve. Additionally, Miles and Snow's typology has been empirically tested, as discussed in Section 3.1.3, and was found to be predictor of organisational effectiveness. It is for this reason that the configuration analysis model is based upon the typology prescribed by Miles and Snow. The rationale behind the configuration model is that if it is possible to measure an organisation's configuration now and where its wants to be in the future, against the range of ideal types; it will be known how to build a data warehouse that is fit for the purpose of supporting an organisation's information needs. Configuration of the data warehouse may be considered both in terms of what information and architecture required to meet the organisation's strategic ambitions.

A full description of Miles and Snow's typology and its relevance to data warehousing is contained in Chapter 4. However, it is only possible to illustrate the relevance of the Ideal Types having first considered the data warehouse implementation practices (i.e. architecture and methodology choices) prescribed by the industry's leading authorities Bill Inmon and Ralph Kimball, which is contained in Chapter 3.

# 4 Inmon versus Kimball

This chapter describes the data warehousing solutions proposed by the industry's leading authorities, Bill Inmon and Ralph Kimball; whose solutions are both widely used and respected but have split the views of the data warehousing community with regard to whose solution is best. Whereas the Configuration School, described in Chapter 2, provides us with a means of understanding the organisational strategy, Inmon and Kimball provide us with technology options that will help us to balance out the strategic alignment equation. If strategic alignment is to be achieved, it is necessary to understand the implementation options proposed by Inmon and Kimball to ensure that the most appropriate choices are made for the business.

In order to understand the data warehousing build and implementation options, two key texts are examined (Kimball et al., 1998; Inmon, 2002), which provide details of each approach to building a data warehouse. A comparative analysis follows, based upon a comprehensive summary published by Breslin (2004). This analysis clearly focuses on their differentiating characteristics, which is the basis of choice. In particular, the different architectures and methodological approaches are examined. However, the common ground between Inmon and Kimball through their treatment of strategic alignment is also highlighted.

## 4.1 Inmon – Hub and Spoke

### 4.1.1 Architecture Overview

Inmon's approach to building a data warehouse is based upon traditional relational database development techniques. This means that the data warehouse is founded upon the same concepts as the operational or transaction systems that provide data to the warehouse.

The data warehouse sits at the centre of the architected environment (Figure 4) where it receives data from the operational systems via the Extract, Transform and Load (ETL) process. The ETL process is essential, as data is copied from the source systems, transformations are applied to the data according to predefined rules before being loaded to the data warehouse. This process can be highly complex, as data domiciled in disparate operational systems will be defined and formatted differently. It is the function of the ETL processes to standardise the data before being loaded to the warehouse. There are numerous ETL tools in the market, which have to be configured to converse with a range of systems and coded to apply the business transformation rules. In applying these rules, the ETL tools also have a role to play in applying data quality standards. For example, a data field that makes a loan applicant less than eighteen years old may not be loaded to the warehouse and flagged as an exception.

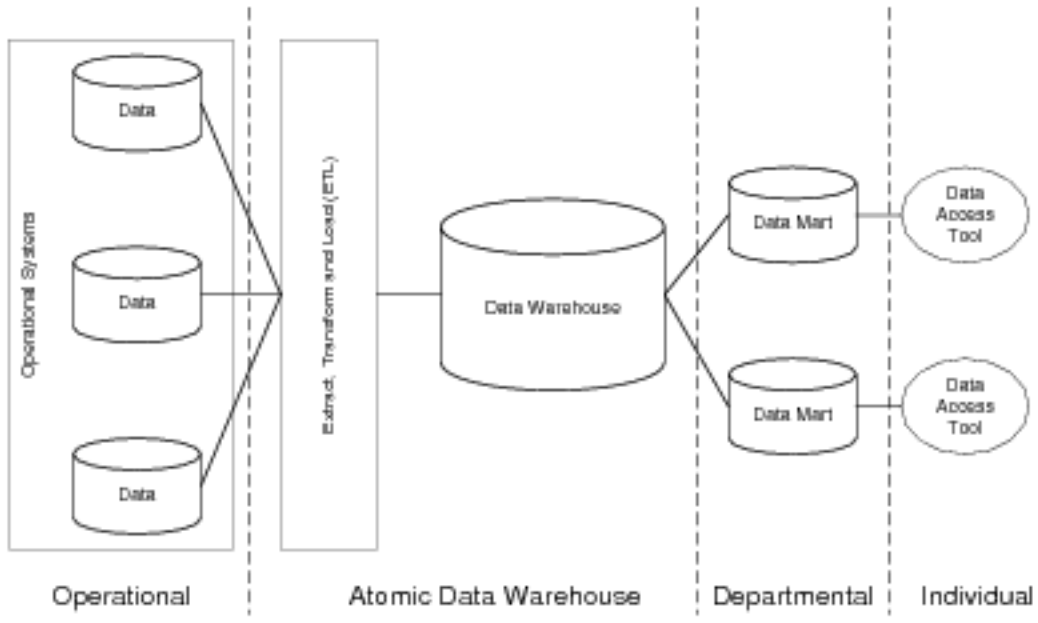



Figure 4. Hub and Spoke Architecture

The warehouse itself will be based upon a normalised relational data structure, which ensures efficient data storage, as there is little data duplication. The warehouse stores atomic level data i.e. data in its most granular form and data that has been summarised according to the needs of the information users. The data marts, on the other hand, are structured around the dimensional modelling technique (see Section 4.2.2 Dimensional Data Model), which facilitates greater data access response times than those achievable form the relational data structure. The data marts receive consistent data from the warehouse and are designed to meet the data / information needs of a department or

function within the organisation. Individual information users will access the data using reporting or data analysis applications layered over the data mart, of which there are many to choose from. Individuals can access data from the warehouse itself, but this tends to require more specialised tools and skills.

### 4.1.2 Three Level Data Model

The data warehouse is the product of Inmon's three level data modelling approach. In common with operational database design techniques, Inmon proposes the use of Entity Relationship Diagrams (ERD), as the first modelling level (high level), to identify the characteristics, attributes and relationships among entities in a given subject area. The data warehouse is built by subject area, which means that the enterprise wide warehouse represents the sum of all subject areas.

The second modelling level (mid level) is the establishment of Data Item Sets (DIS), which are specifically based upon the preceding ERDs. There are four basic constructs for the mid level model (Inmon, 2002, pp. 95-96):

1. A primary data grouping, which can exist only once for each subject area and contains attributes and keys for each major subject area.

2. A secondary data grouping holds data attributes that may exist multiple times for a major subject area.

3. A connector, signifying the relationships of data between major subject areas, which emulates the relationship identified at ERD level.

4. "Type of" data identifies whether a data grouping is supertype or subtype. Data groupings flowing to the right are subtypes of the preceding data group.

The final level of the modelling exercise is the construction of the physical or low level model. This is an extension of the mid level model to "include any physical characteristics". Once complete, the model closely resembles the structure of the physical database but this can only be done once the granularity and partitioning have been taken into account. Of particular importance are the changes to the key structure to add the element of time. Consideration of physical characteristics is required to ensure that the design optimises capabilities of the input / output devices. This can be achieved by denormalizing tables to enable rapid adapt retrieval, which is a technique specifically

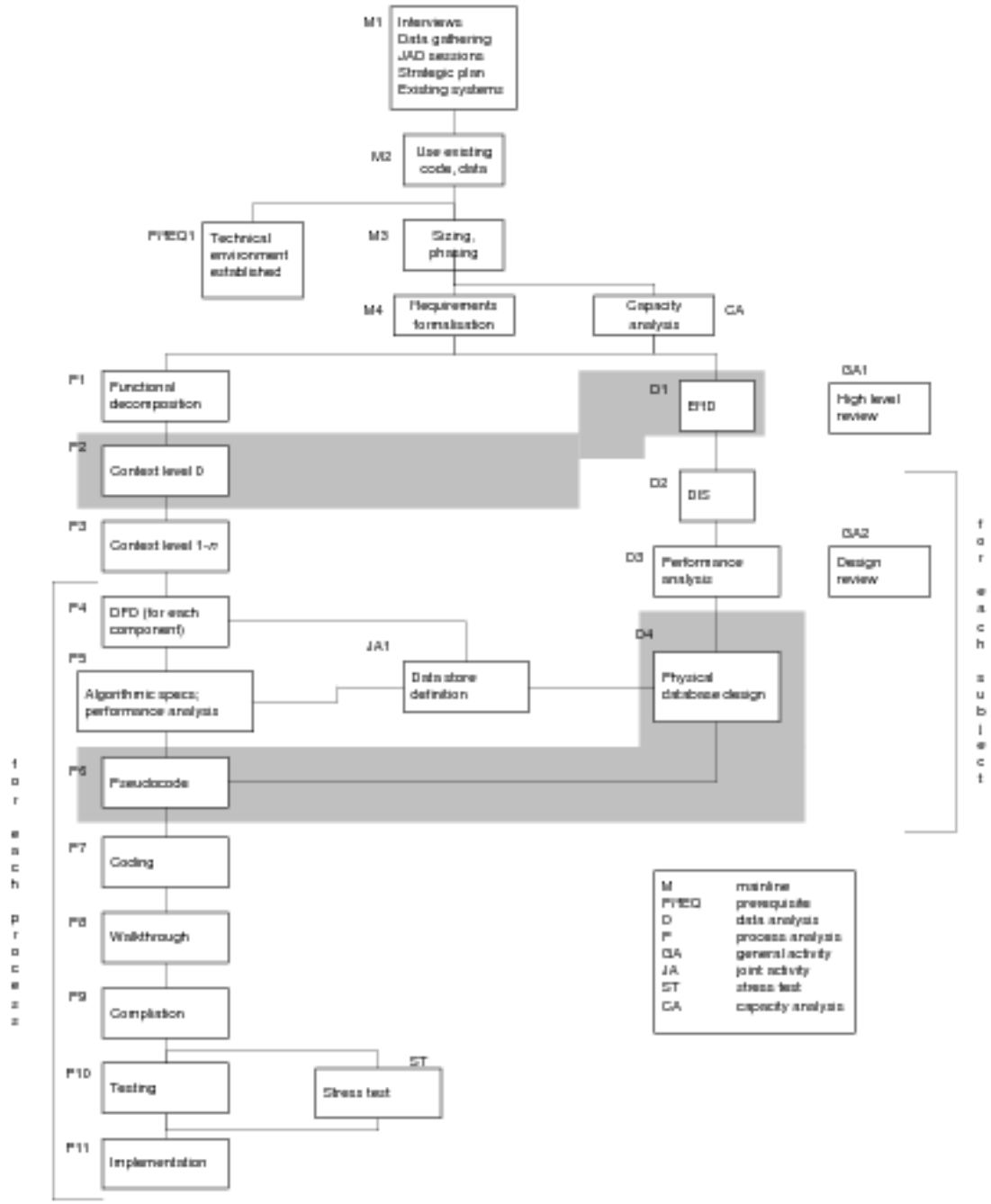
afforded to data warehouses, which are not subject to the same data storage restrictions as operational systems.

### 4.1.3 Development Methodology

It is with some reluctance that Inmon acknowledges the merits of documenting a methodological approach since the "classic systems development life cycle does not work in the world of the DSS Analyst" (Inmon, 2002, p. 285).

The data driven or spiral methodology is presented in three parts (Inmon, 2002, pp. 343–384). The first is METH1 (Figure 5), which deals with traditional operational systems developments; METH2 (Figure 6) is the only part that governs the data warehouse development while METH 3 (Figure 7) is a heuristic or learning approach for data warehouse usage.

As Figure 5 illustrates, METH1 is a rather grand representation of the traditional waterfall development lifecycle. This can be broken down into a more simple flow from Requirements Analysis > Design (including data modelling) > Development or Build > Test (including systems and performance testing) > Implementation. The benefit of Figure 5 is that it highlights dependencies between the various activities of the project. From Inmon's perspective, the purpose of METH1 is to show that the waterfall development methodology is appropriate to operational systems developments only and is more complex than METH2. Inmon's rationale is that the waterfall methodology is not appropriate for data warehouse developments, while Kimball et al. (1998) propose the waterfall methodology.




Source: Inmon, 2002, p. 356

Figure 5. Developing operational Systems - METH 1

According to Inmon, one of the most significant features of a data driven methodology is that the process is dependent upon and expands preceding efforts. Processes and code are, in effect, recycled in order to avoid "reinventing the wheel" (Inmon, 2002, p. 292), while developing the range of the data warehouse.

In essence, the business will receive the first iteration of the data warehouse having submitted no detailed business requirements. Inmon (2002 p.19) explains that it is the

decision support analyst referred to as the Explorer, who is adept at analysing their organisation's data to investigate hunches or pursue their intuition, that will use their insight to analyse the data and produce requirements to refine the data model. Each time that data is delivered, the Explorer will repeat the process. It is this process that is at the heart of the 'evolutionary not revolutionary' concept that Inmon subscribes to (Inmon, 2002, p. 41).

Figure 6 illustrates the data warehouse development approach labelled METH2. DSS1 is the first activity following the commitment to build the warehouse. This demonstrates that the data model is at the heart of the development, as the model has to be defined to identify all major subject areas and define boundaries for the development. Note that the connectors between the DSS stages are not fully explained by Inmon but are left to the interpretation of the reader.

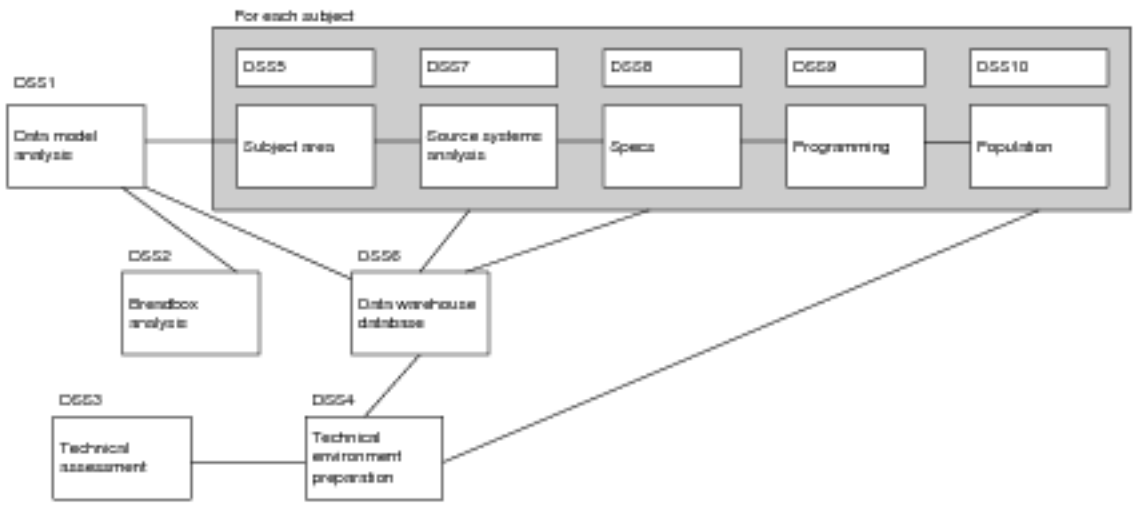
Almost all other tasks are dependent upon DSS1, except DSS3 and DSS4. DSS2 or the "Breadbox Analysis" is an unfamiliar term but relates to the effort required to estimate the eventual size of the database. The analysis must attempt to give due consideration to the levels of data granularity.

DSS3 is the Technical Assessment, which is concerned with the delivery of a system capable of managing large amounts of data that is accessible, flexible enough to interact with a variety of technologies and can accommodate the characteristics of a data warehouse data model. Once this is complete the Technical Environment can be prepared (DSS4), which focuses upon the configuration activities, such as network links and storage.

The Subject Area analysis (DSS5) is an exercise to ascertain the data to be populated in the warehouse, which may be a subset of a particular subject area. The subject area should be large enough to provide the business with a meaningful dataset for analysis. When complete the data can then be sourced from the operational system(s) during the Source Systems Analysis phase (DSS7).

DSS6 is dependent upon the outputs of DSS1, DSS5 and DSS7, which enables the physical data warehouse design. At this point, specifications can be completed (DSS8), including the program specifications for the ETL process. In accordance with other systems development projects, the specifications are delivered for coding and unit testing (DSS9).

Finally, when the technical environment is ready and the coding tested, the data warehouse is populated (DSS9).



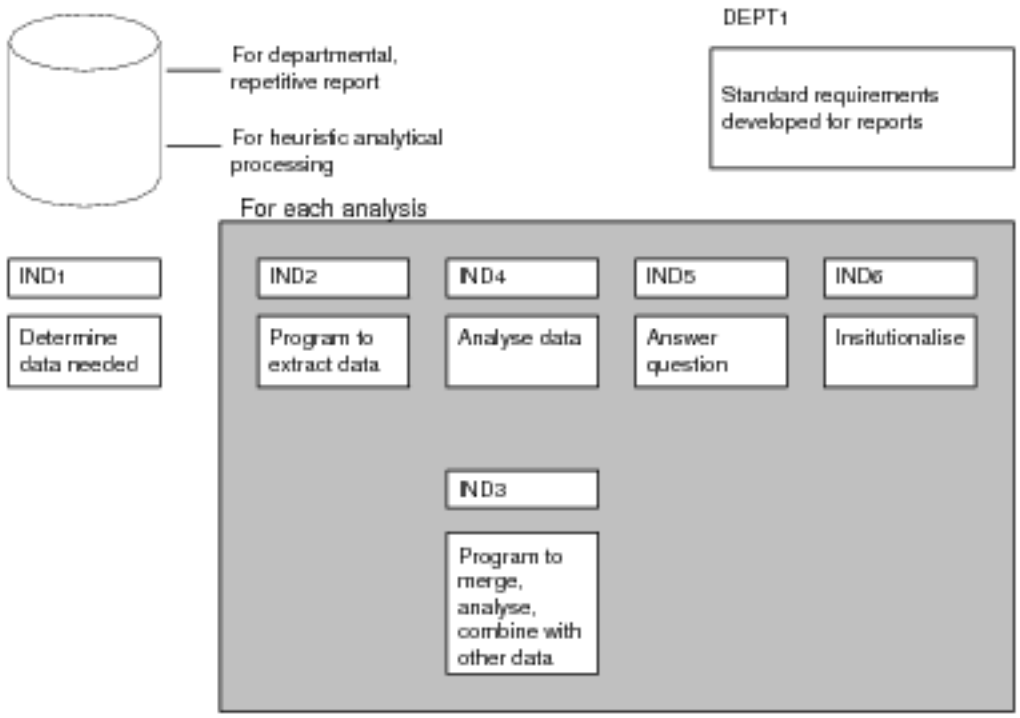

Source: Inmon, 2002, p. 365

Figure 6. Data Warehouse Development – METH 2

The final stage of the data driven methodology is the usage of the data warehouse for the purpose of carrying out further analysis; this is presented in METH3 (Figure 7). This is the heuristic or learning phase, characterised by the lack of requirements at the beginning of the next development phase. This means that the requirements are borne out of the learning gained from the usage of the system. Requirements will unfold and be accommodated iteratively.

DEPT1 refers to the development of regular standard reports, which are produced by following the METH1 systems development cycle i.e. as a requirement driven waterfall process.

IND1 refers to the process where data is identified for the purposes of building reports. This will require the development of a program to access and extract the data (IND2). Once the data is selected it is then prepared for analysis, which could include merging the data with other data (IND3). The question that can then be asked is "Do the results obtained meet the needs of the analyst?" If not, the development cycle starts again to determine the data needed to augment their information needs (IND4). Once the correct or complete dataset has been delivered, the business will have satisfied their information needs (IND5). A decision then has to be taken whether or not to create the report on a regular basis. If so, the report becomes institutionalised (IND6).




Source: Inmon, 2002, p. 366

Figure 7. Heuristic Processing – METH3

### 4.1.4 Inmon's Development Ethos

#### 4.1.4.1 Evolutionary not Revolutionary

Inmon's evolutionary approach can be easily substantiated in terms of design and development approach.

Inmon's relational design integrates data from operational systems that span the entire organisation. This is derived from existing relational database design methods that were originally introduced to construct database structures that efficiently manage operational systems' data storage. Inmon draws upon these relational design techniques to integrate data from operational systems but builds an infrastructure that makes the data more freely available (Breslin, 2004). As a result, the data warehouse becomes a logical extension and complimentary to an organisation's IS portfolio.

The data model itself evolves iteratively and may be completely reworked to ensure that the DSS Analysts expectations are met (Inmon, 1999a). This means that the data model is constantly changing to reflect the needs of the Explorer on behalf of the organisation. This approach is in sharp contrast to Inmon's assertion that a requirements driven methodology is an indicator of a 'big bang' approach, which is revolutionary in nature.

Research by Jarvenpaa and Stoddart (1998) has concluded that, in the business process re-engineering field, successful implementations are based upon a period of revolutionary design followed by evolutionary implementation. Enthusiasm and momentum are built up during the revolutionary phase but the application of the design is much more effective if applied in a considered and evolutionary manner. The problem associated to an evolutionary implementation is momentum i.e. an organisation may sit back on the task and lose sight of the organisation's objectives. On the other hand, a revolutionary approach is disruptive for those involved and therefore a high risk strategy but if an organisation finds itself in crisis, a revolutionary implementation approach may be the right approach. However, neither Inmon nor the practitioners contributing to the principles of best practice would sanction a 'big bang' data warehouse implementation.

The concept of evolutionary development suggests that a data warehouse has simple and unsophisticated origins, which take the form of a corporate data model. Its development into an integrated data repository servicing the information needs of an entire organisation cannot be achieved in one requirements driven effort. Additionally, it appears to be the responsibility of the Explorer(s) to constantly review and refine the data model to support an organisation's search for greater 'business intelligence'.

#### 4.1.4.2 Top Down versus Bottom Up

Inmon also subscribes to the top down development approach. It was previously indicated that the top down concept manifests itself in terms of a design that starts at the highest level, the corporate data model (Inmon, 2002, p.89). Subsequent data models will become more detailed until it expresses the business in a more granular form. The impact of taking a top down enterprise wide view is that the data warehouse design will integrate data from disparate systems, ensuring that the warehouse becomes a single, cross functional and unambiguous source of information.

This differs from the data mart approach, which is designed around business processes for a department within an organisation. The data warehouse is comprised of a series of data marts that expands to meet organisational needs. The expansion of the data mart network could lead to large scale inconsistencies in data definition but the application of Kimball's conformed dimensional modelling techniques have been designed to address this issue (Kimball et al., 1998).

Inmon, however, is adamant that the bottom up data mart approach does not constitute an enterprise data warehouse, which is based upon his belief that the data mart approach will undermine the centralised integrated data design principle (Inmon, 2003a). So, what is the importance of having integrated data?

There appear to be several reasons (Ortiz, Lario & Ros, 1999):

- The business needs to share enterprise information
- Functions within the business are working together
- There is a need to understand the impact of decisions on the entire organisation
- There is a need to align the enterprise with the organisations strategy

The inference here is that Inmon's top down approach is best suited to a strategic initiative where the organisation has identified a need to deliver an enterprise data warehouse that supports broader integration effort. However, successful change initiatives do not appear to be the result of exclusively following either a top down or a bottom up approach. It is the application of a combination of both (Gould, 1998).

Whether intentional or not, Inmon does appear to combine a top down design approach with bottom up application. This is expressed in the iterative nature of the data warehouse development where the Data Warehouse Architect fine tunes that data model and provides more data according to the needs of the DSS Analyst. The DSS Analyst (Explorer) is in a mode of learning, adaptation and change "is the natural order" (Gould, 1998).

## 4.2 Kimball – Bus Architecture

In this section, consideration is given to the data warehouse architecture prescribed by Kimball et al. (1998).

### 4.2.1 Architecture Overview

The architecture proposed by Kimball is illustrated in Figure 8, which differs from that proposed by Inmon (Figure 4) by the fact that the data marts are not dependent upon the central data warehouse. Each of the data marts is joined by conformed dimensions, which is a differentiating feature facilitated by the Bus architecture.

As with Inmon's architecture, the ETL layer is required to standardise data from the source operational systems before being loaded to the dependant data marts.

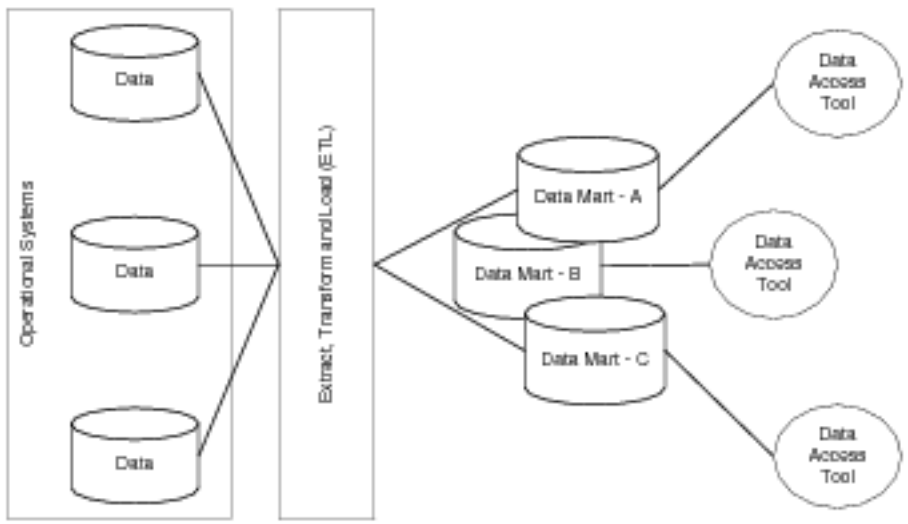
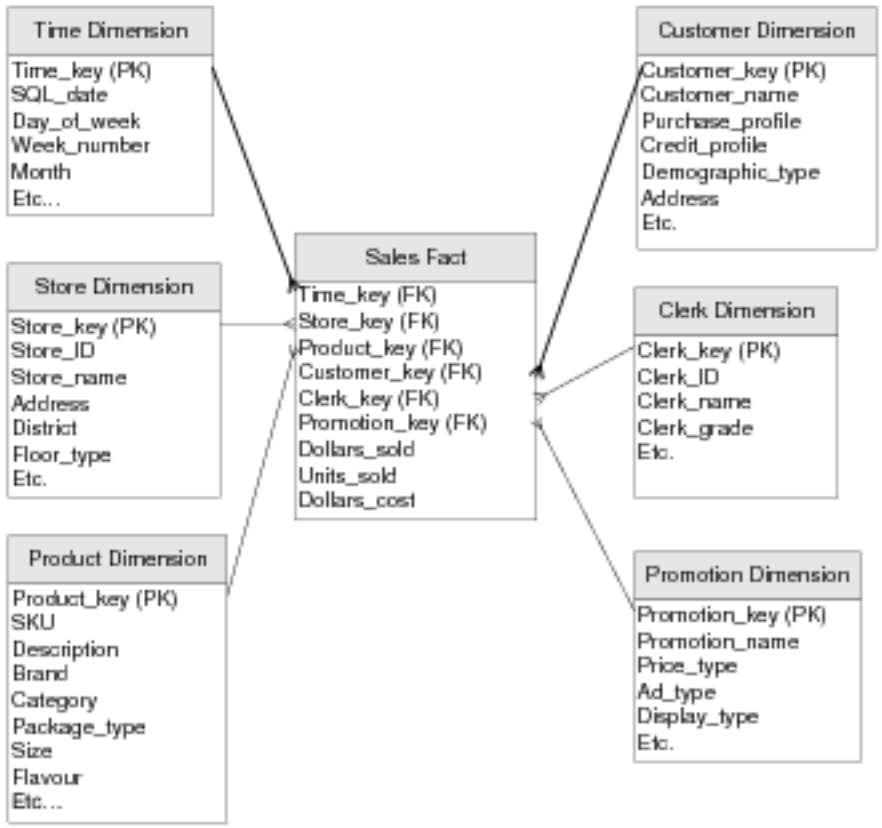



Figure 8. Bus Architecture

Each of the data marts is borne out of a business process, which is why Kimball et al.'s (1998) approach is considered to be developed from the bottom up.

### 4.2.2 Dimensional Data Model

The dimensional model differs greatly to the relational model employed by Inmon. Central to this modelling technique are facts (metrics) and dimensions (attributes), which are typically depicted in a star schema where the facts are at the centre surrounded by dimensions see (Figure 9).




Source: Kimball et al., 1998, p.145

Figure 9. Dimensional Model (Star Schema)

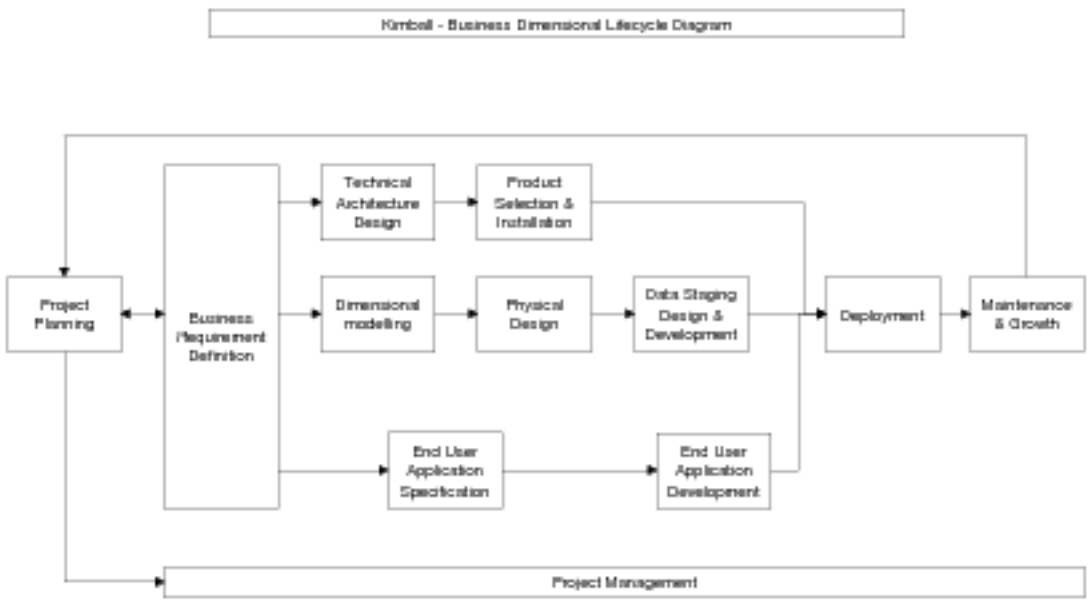
Typically, the fact table will contain millions of rows of data with few columns, which contrasts with dimension tables, which have fewer rows but many more columns. Those columns contain the subjects many attributes, which are highly denormalised to facilitate superior data retrieval performance.

According to Corral, Schuff and St. Louis (2006), this simplified data structure is considered to be easy to construct and interpret. Data marts are based upon business processes and are quicker to design and build, which also make them cheaper to deploy. However, a proliferation of independent data marts will undoubtedly result in many different interpretations of the source data. This is resolved by applying the principle of conformed dimension, which requires that "keys, column names, attribute definitions, and attribute values are consistent across business processes" (Breslin, 2004). The data warehouse therefore emerges from the collection of data marts that have conformed dimensions as the foundation.

### 4.2.3 Development Methodology

The Data Warehouse Lifecycle Toolkit is structured around Kimball's lifecycle model as illustrated in Figure 10. This model is a "sequence of high level tasks required for

effective data warehouse design, development and deployment" (Kimball et al., 1998, p.33).




Source: Kimball et al., 1998, p.33

Figure 10. Business Dimensional Lifecycle

The project starts by considering the Project Planning and Project Management tasks, which are primarily designed to provide clarity to both the overall objectives of the development and the management framework to fulfil the project's aims. Project Planning includes a readiness assessment exercise, project scoping and advice for obtaining project funding.

There are five business readiness factors that ought to have been satisfactorily assessed before moving onto the detailed analysis phase (Kimball et al., 1998, pp. 43–49). These factors include:

1. Strong Business Management Sponsor(s)

A strong business sponsor is considered to be the most critical of the five readiness factors and fits well with the concept of management buy-in. A successful candidate will be a leader with vision, conviction, influence and politically astute.

2. Compelling Business Motivation

A compelling business motivation has three aspects; the data warehouse is recognised as the technological solution to a set of business requirements, the organisation has a "sense of urgency" fuelled by the business motivation and the data warehouse's alignment with strategic ambitions.

3. Information Systems / Business Partnership

A positive working relationship between the business and IS can only be achieved if there is shared responsibility for the development as "neither group is likely to achieve success if they try to build a data warehouse on their own."

4. Current Analytical Culture

There should exist, within the organisation, a desire for data in order to satisfy the business' information demands. It is implied that the organisation already values data as a business asset and that the data warehouse is regarded as a means of releasing data to meet increasing business demands.

5. Feasibility

An assessment will be carried out to determine the state of the data to be extracted from the operational systems and made available in the warehouse. If the data quality is found to be poor then it will be necessary to question the viability of the data warehouse or alternatively, reassess the project timetable to allow for the time required to address those quality issues.

The scoping exercise requires business and IS collaboration in order to obtain consensus and to ensure that the data delivered to the organisation is both meaningful and manageable. During this phase, the success criteria should also be agreed. This will help the project team to focus on the expected benefits, which should, as far as possible, be quantifiable. The benefits will be offset against the associated costs to form a cost / benefit analysis.

Following on from the Project Planning tasks, it essential to identify the project team members and develop a management plan, which assigns individuals to roles and tasks to timescales. Dependencies between the tasks must also be mapped to ensure that tasks are completed in the right order.

The Business Requirements Definition underpins the whole project, as the requirements specification reflects the end-user's information needs and facilitates the organisation of the data and the frequency with which it is updated. Accordingly, Kimball provides guidelines for the elicitation of requirements from business representatives of varying levels of seniority (Kimball et al., 1998, pp. 95-136).

Three parallel streams of work flow from the requirements gathering process. The first of these is the Technical Architecture Design, which is followed by the Product Selection and Installation phase.

Kimball provides a very comprehensive account of the technical considerations for supporting the ETL process in terms of issues such as databases, servers and utilities. In particular, Kimball addresses the subject of metadata i.e. data about data. In this regard, Kimball discusses the technical considerations for supporting 'back room' and 'front room' metadata (Kimball et al., 1998, pp. 335-410). Back room metadata is process related and guides the ETL processes, while the front room metadata is a facility that helps the end user to interpret and find definitions for data.

The Technical Architecture Design coverage in Kimball's book is extensive and in depth but a complete summary of this is beyond the scope of this project.

Once the technical design is complete, the Product Selection phase can start. The major evaluation areas include:

Hardware platforms, which typically include servers / platforms for the staging area, data marts and application servers.

DBMS platform.

Data staging tool i.e. ETL tool

Data access tools i.e. data analysis and reporting applications

Kimball recommends that a matrix be created to compare the vendor's product against the required functionality, which can be used to assess the value of the various products. It is also recommended that the vendors be researched and market research carried out to determine the market views of the products (Kimball et al., 1998, pp. 516-517).

The second work stream to flow from the business requirements is the Dimensional Modelling phase, which is described in Section 3.2. Once complete, the Physical Design stage can be addressed, which is concerned with the creation of database tables and deals with issues such as indexing and sizing.

The Data Staging Design and Development phase is dependent upon the data modelling and physical design stages, as the data mapping planning needs to account for the source of the data and its destination. The planning process includes defining the transformation rules, all of which needs to be built and tested.

The third work stream determines the End User Application Specifications. These are the business requirements that focus on what the end users want the reporting tools to deliver, which feed directly into the End User Application Development phase. The production of the end user application reflects the need to plan for and produce a reporting application, which is essentially, the businesses information portal.

The Deployment Phase is the final stage of the warehouse implementation process where all the effort from the preceding phases comes together for business use. It is another phase that requires planning to make live the technology, data and reporting applications. Kimball is especially mindful of the need to deliver training at the right time and to ensure that the end users have the necessary support structure to reinforce their training.

Maintenance and Growth is the acknowledgement that the data warehouse development does not end with the implementation of the system. The business will typically see opportunities to expand the capabilities of the warehouse, which ought to be managed under a governance structure. Consequently, the next phase of the warehouse development will start again at the Project Planning phase.

It can clearly be seen from Figure 10 that Kimball's approach is requirements driven comprised of three linear parallel processes under the control of Project Management.

## 4.3 Architectures in Practice

In a comprehensive study conducted by Watson and Ariyachandra (2005), four hundred and fifty four respondents provided details about the data warehouse architecture selected by their organisation. The study set out to answer two questions:

1. What factors lead companies to select a particular architecture?

2. How successful are the various architectures?

### 4.3.1 Types of Architecture

The authors identified five core architectures (Watson & Ariyachandra, 2005, pp. 11-13):

1. Independent data marts – generally developed by individual organisational units, which operate in isolation. Organisations with a number of data marts will find data definitions across the data marts inconsistent and lacking in conformity.

2. Data mart bus architecture with linked dimensional data marts – this architecture is rooted in specific business processes but the use of conformed dimensions and facts enables the incremental integration of additional data marts to form an organisation wide view of the organisation. Data is modelled dimensionally in a star schema.

3. Hub and spoke architectures – the aim of this architecture is to iteratively develop, subject by subject, an enterprise wide view of data where atomic level data is maintained in the warehouse in 3$^{rd}$ normal form i.e. the hub. The vast majority of users will access the data from dependant dimensionally modelled data marts (spokes).

4. Centralised data warehouse – this architecture is similar to the hub and spoke architecture but has no dependant data marts.

5. Federated – the federated architecture draws upon existing decision support structures where the "data is either logically of physically integrated using shared keys, global metadata, distributed queries, and other methods".

While there are five different architectures there are only two fundamentally different approaches i.e. Inmon's hub and spoke architecture of which the centralised warehouse is a derivation and Kimball's data mart bus architecture, which is an advance on the more simple independent data mart. The federated architecture is an amalgam of existing structures whatever they may be. The influence of Inmon (2002) and Kimball et al. (1998) in the field of data warehousing is clearly, extremely significant. The questions that Watson and Ariyachandra (2005) raise in their study touch on the debate that exists within the industry, whose architecture is best?

Of the five architectures, it was found that the hub and spoke architecture was the most popular, as it had been implemented in 39% of the organisations in the study. This was followed by the bus architecture at 27%, while the centralised data warehouse and independent data marts were found in 17% and 13% of the organisations respectively. Only 4% of the organisations in the study had implemented a federated architecture. Additionally, it was also found that the match between actual and reference architectures was very close, especially the bus, hub and spoke and centralised architectures.

It was observed that the organisations with the highest average gross revenue had implemented a federated architecture, which led the authors to surmise that organisations growing through merger and acquisition are likely to look to the federated architecture to draw on data from disparate decision support systems. It was also found that larger organisations with higher revenues tended to implement hub and spoke architectures, as they are less likely to be affected by the higher costs associated to the implementation and maintenance of a warehouse and will embark on a more 'mature data warehousing initiative'.

The data warehouse's organisational reach or domain ranges from departmental sub unit to enterprise wide. The breakdown of a warehouse's domain was found to be as follows:

- Several business units - 38%
- Enterprise wide - 35%
- Single business unit – 15%
- Functional area unit – 10%
- Sub unit – 2%

Organisations implementing a data warehouse enterprise wide tend to opt for the centralised or hub and spoke architecture, while the bus architecture is more common when the warehouse is intended for several business units. However, regardless of the domain, it was found that the hub and spoke architecture was the architecture chosen where the anticipated data volumes are high.

Significantly, one third of companies were found to have switched their architecture. Of those that switched, 44% moved to the hub and spoke architecture from independent data marts (32%), bus architecture (29%), or a centralised data warehouse. Approximately 25% of organisations moved to the bus architecture from independent data marts (40%), hub and spoke (30%), or centralised warehouses (22%). Few organisations switched to any of the other architectures.

What this study has done is illustrate that the hub and spoke and bus architectures are the core architectures in data warehousing. This reflects the influence of the industry's leading authorities, Bill Inmon and Ralph Kimball.

### 4.3.2 Selection Influences

The study found that there are eleven factors that influence the decision to select a particular architecture, all of which were found to have significant influence (Watson & Ariyachandra, 2005, pp. 15-17):

1. Information interdependence between organisational units refers to the need for information that crosses a number of organisational functions. For example, management accounting may require data from operations, marketing and human resources in addition to financial data.

2. Upper management's information needs may be best served by choosing an architecture that allows them to drill down to low levels, if they so choose.

3. The urgency of need for a data warehouse may force an organisation to choose an architecture that is known to be quick to implement. This could be perceived to be a tactical solution to a business problem.

4. The nature of end user tasks is a factor in the choice of architecture because organisations build data warehouses for different reasons. For example, an organisation may not see the need to conduct in depth data analysis and are happy to simply produce management information as efficiently as possible.

5. Constraints on resources could limit the choices of architecture, as some architectures cost more to build and maintain than others.

6. The strategic view of the data warehouse prior to implementation is important when making a choice of architecture. A data warehouse implemented as a tactical solution to an isolated business problem will not have organisation wide support and could be re-architected at a later date to accommodate the needs of other business areas.

7. Expert influence will have some bearing on the eventual solution, as experts may prefer to implement architectures that they know they can do.

8. Compatibility with existing systems will make it easier to fit the data warehouse within current structures.

9. The perceived ability of the in-house IT staff is important, as new concepts have to be fully understood and successfully applied.

10. Source of sponsorship is influential, as they may opt for a solution that fits with the functional needs of a select number of areas within the organisation.

11. Technical issues may affect the choice of architecture in order to control issues such as query performance, data storage and number of users.

The authors analysed the results of the study to determine why particular architectures were selected. To do this, they dropped the data on federated data from the analysis and combined the hub and spoke and centralised architecture data into one category, due the similarities between them.

Independent Data Marts Versus the Others

An independent data mart is more likely to be selected if resources are limited, the perceived skills of the IT staff are low and the warehouse is not part of a strategic solution i.e. limited domain.

Bus Architecture Versus the Others

The key factors influencing the choice of a bus architecture are a high need to share data or information between departments, the project has sponsorship at high levels, the organisation needs a quick solution but with limited resources.

Hub and Spoke / Centralised Versus the Others

This architecture tends to be selected where the data warehouse is considered to be an integral part of a strategic solution, there is a high need for data to be made freely available between business units and the organisation has confidence in the skills of their IT staff to deliver the solution.

Bus Architecture Versus Hub and Spoke / Centralised

While the need for information to be made freely available between business units is important in the choice of either of these architectures, it is the bus architecture that will tend to be chosen. Similarly, if the data warehouse is required quickly the bus architecture has proved popular. However, as a strategic solution, it is the hub and spoke / centralised architecture that is the more likely choice.

While all eleven factors were found to be important when deciding on an architecture, it is clear that the most important factors were:

- Information interdependence between organisational units
- The strategic view of the warehouse prior to implementation
- Upper management's information needs

It was noted from the results that the bus architecture will be favoured where the organisation has fewer constraints on resources, the view of the data warehouse is less strategic and less concerns regarding the compatibility with existing systems. The centralised warehouse fairs better than the hub and spoke architecture where the organisation needs to implement a strategic solution quickly, has fewer resources, is conscious of technical issues but has confidence in the IT staff to successfully deliver the solution.

Success metrics included (Watson & Ariyachandra, 2005, pp. 18-20):

- Information quality – this includes information accuracy, completeness and consistency. Information quality was found to be lower in the independent data mart and federated architectures and of a higher quality in the remaining architectures. In terms of completeness, the hub and spoke / centralised architectures scored well but in general, the accuracy and consistency of the data was good.
- System quality – quality is measured by system flexibility, scalability and integration. The system quality results follow a similar pattern to the information quality results. The average scores for the hub and spoke / centralised and bus architectures are similar with the bus architecture having an edge over the others in terms of flexibility. In general, the scores for system quality are higher than the information quality scores.
- Individual impacts – measured by the speed and ease with which individuals can access data to answer questions and explore business issues and improve the decision making process. The bus architecture scored particularly well in terms of individual impacts but the margin of difference is small. Again, the individual data mart and federated architectures do not rate as well as the others.

- Organisational impacts – this relates to the ability of the warehouse to meet business requirements and support strategic objectives. An organisation may assess impact by measuring return on investment, observe improved communications between business units and realise improvements in business processes. The organisational impact results are consistent to the extent that the hub and spoke / centralised and bus architectures provide better results than the others. The margin of difference between the hub and spoke and bus architectures is again, small.

- Development time – this may include the time required to implement subject areas, supporting business processes or an assessment of the entire warehouse development timescales. The results so far, indicate that if an organisation requires a quick solution, it is reasonable to select the individual data mart, bus or centralised architectures. The hub and spoke and federated architectures take longer to implement. The difference between the centralised architecture is the dependant data marts, which would appear to account for the additional time to implement.

- Development cost – these may be considered in terms of project budget, incremental development charges and ongoing maintenance costs. It is no surprise to find that the hub and spoke and federated architectures cost more to build, as they take longer to implement.

## 4.4 Inmon versus Kimball

### 4.4.1 Comparative Analysis

Breslin (2004) observed that the most obvious similarities between Inmon and Kimball are their dependency on the ETL layer and their use of time stamped data, which "is arguably the most important defining characteristic of data warehouse data". Time is a valuable dimension in data warehousing, as it enables the comparison of data over time to determine trends. Kimball's date dimension is defined to ensure that the business user can select specific dates, a range of dates, specific days and reporting periods (e.g. statutory financial accounting periods). The date dimension forms part of the conformed dimensional model and is therefore available and consistent across the data marts. Inmon's approach may store date data in normalised tables, which can be accessed to calculate date ranges, specific days and reporting periods. Clearly, Breslin highlights the

similarity of their focus on time as a significant feature of the warehouse but it also illustrates the different approaches to the same issue.

With regard to the ETL layer, Inmon and Kimball's approaches are similarly dependent upon the function of the ETL process to extract data from source and apply rules to load the warehouse or data mart with data that is standardised and subsequently, of value to the organisation.

While there appears to be few similarities, Breslin considers that the differences are "deep and many". These differences are summarised in Table 2, which is based upon Breslin's (2004) comparison and the results of Watson and Ariyachandra's architectures study (2005).

Table 2. Summarised Differences

| | Inmon | Kimball |
|---|---|---|
| Methodology & Architecture | | |
| Overall approach | Top-down | Bottom-up |
| Architectural structure | Enterprise wide (atomic) data warehouse "feeds" departmental databases | Data marts model a single business process; enterprise consistency achieved through data bus and conformed dimensions |
| Complexity of the method | Quite complex | Fairly simple |
| Comparison with established development methodologies | Derived from the spiral methodology | Four-step process; a departure from RDBMS methods |
| Discussion of physical design | Fairly thorough | Fairly light |
| Scalability | Growing scope and changing requirements are critical | Need to adapt to highly volatile needs within a limited scope |
| Application | Strategic solution | Tactical solution |
| Information interdependence | Supported | Supported |
| Deployment cost | Higher start-up costs, with lower subsequent project development costs | Lower start-up costs, with each subsequent project costing about the same |
| Time to deploy | Longer start-up time | Quick start-up time |
| Development skills required | Larger team(s) of specialists | Small teams of generalists |
| Persistency of data | High rate of change from source systems | Source systems are relatively stable |
| Data modelling | | |
| Data orientation | Subject or data-driven | Process oriented |
| Tools | Traditional (ERDs, DISs) | Dimensional modelling |
| End-user accessibility | Low | High |
| Philosophy | | |
| Primary audience | IT professionals | End users |
| Place in the organisation | Corporate wide facility | Growth subject to departmental demand |
| Objective | Deliver a sound technical solution based on proven database methods and technologies | Deliver a solution that makes it easy for end users to directly query the data and still get reasonable response times |

Breslin's comparative analysis is supported by the findings of Watson and Ariyachandra's study (2005).

#### 4.4.1.1 Commentary

Breslin's analysis states that the primary audience for Inmon's solution are IT professionals, which is a curious notion. This suggests that the warehouse is designed and built as a technical exercise primarily for the use of IT and not the business. It is more appropriate to state that Inmon's data warehouse is designed and maintained by IT professionals due to the underlying technical complexity. Any organisation investing in a data warehouse will expect that the data is used commercially by business users.

Watson and Ariyachandra's study (2005) also highlighted that the warehouse needs to support information interdependence i.e. sharing of information across organisational functions. Both Inmon and Kimball's solution provides that support, which is another similarity between the two approaches. However, Kimball's solution was found to be the solution of choice in this regard, which is curious when Inmon is adamant that the top down approach is very focussed upon the delivery of integrated data.

Despite these observations, Table 2 highlights fundamental differences between the data warehousing solutions prescribed by the industry's leading authorities. It can be seen that Inmon's approach is focussed upon delivering a technically robust strategic solution, which can be easily updated to accommodate changes to source systems through traditional systems design techniques. This approach requires greater financial resources, highly skilled technicians and more time to deploy, but it is a solution for longevity. Kimball's dimensional modelling and bottom up approach provides quick solutions, which supports the organisation's tactical information requirements. It is borne out of business processes, requires fewer highly skilled technicians and financial resources to implement. This indicates why Kimball's solution is considered to be a support for parts of an organisation in isolation i.e. parochial. Organisational coverage is the product of demand from the bottom up, inferring that executive management has little or no part to play in defining the deliverables or role of the warehouse.

### 4.4.2 Inmon and Kimball's Contribution to Strategic Alignment

In this analysis of Inmon and Kimball's approaches, a slightly different perspective is presented by assessing their contribution to the principle of strategic alignment.

#### 4.4.2.1 Alignment via Business Requirements

Kimball et al. agree that strategic motivation is something that has to be captured in the high level business requirements (Kimball et al., 1998, p. 50). As such, it is recommended that representatives from all levels of the organisation be interviewed as

part of the requirements gathering process. This ensures that the development is built according to a defined business context. Indeed, it is stated that there must be a "compelling business motivation" driving a "sense of urgency" (Kimball et al., 1998, p. 44).

Kimball et al. (1998) appear to recommend that strategic business needs be contained within the confines of more detailed business requirement documentation. This assumes that the integrity of strategic requirements can be maintained and become more detailed as the full extent of the requirements unfold through the various levels of the organisation. However, where an organisation considers a data warehouse development as a facilitator of strategic change, it may not be possible to fully define information requirements in a short period of time. This is an issue that Inmon highlights, as he believes that it is not possible for information users to articulate their requirements without first seeing the data (Inmon, 2002, p. 41; Inmon, 1999d). The problem with the requirements driven approach is that personnel at the operational level of the organisation may not be fully conversant with strategic requirements. Consequently, the business requirements are likely to reflect and reinforce existing operational practices. Ultimately, there is an element of trust that the requirements reflect the strategic aims of the organisation, as there is no mechanism for illustrating that this objective will be met.

Unlike Kimball et al. (1998), Inmon does not make a direct reference to corporate strategy or business objectives. Inmon's contribution to this principle of best practices is restricted to inference from the principle of top down data model development and the statement that the data model "represents the information needs of the corporation. Keep in mind that it represents what the corporation needs, not necessarily what it currently has. In addition, it is built with no consideration of technology" (Inmon, 2002, p. 278).

Inmon appears to be stating that the data model is a representation of the organisation's future information needs and that its development is wholly influenced by the business. It should also be borne in mind that the data model development starts by representing a higher level corporate wide view and becomes more detailed with the participation of lower levels of the organisation. It is therefore realistic to assume that an enterprise wide development that requires input from various functional areas cannot be carried out without being sanctioned at executive level. However, this in itself does not ensure the delivery of a strategically aligned warehouse. As with the business requirements

approach, the data model is subject to influence from parties who, again, may not fully appreciate the strategic application of the warehouse.

Each of the approaches so far, is clearly different in engaging strategic influence but there is no indication of a means of illustrating or demonstrating strategic alignment.

4.4.2.2 Alignment via Management Buy-in

Inmon makes no reference to management buy-in, which perhaps reflects Inmon's focus on the construction of the warehouse and not the enablement of its development.

Kimball et al. (1998) on the other hand, regard management buy-in or sponsorship as a fundamental requirement for a successful project. So much so that Kimball et al. (1998) suggest a pre project exercise to assess business readiness. A positive assessment of the five readiness factors will help to increase the likelihood of project success (Kimball et al., 1998, pp. 43-53). Table 3 indicates the weighting that Kimball et al. give to the business sponsor. It is apparent that this role is a fundamental to the project's success.

Table 3. Influence of Readiness Factors

| Readiness Factor | Weighting |
|---|---|
| Strong Business Sponsor | 60% |
| Compelling Business Motivation | 15% |
| Feasibility | 15% |
| IS / Business Partnership | 5% |
| Current Analytical Culture | 5% |

Source: Kimball et al., 1998, p. 46

Clearly, there is a significant amount of emphasis placed on this role for all the reasons stated above but unlike Inmon, Kimball et al. (1998) appear to rely heavily on management or executive participation. The business sponsor is regarded as an enabler of the development i.e. this is the person who is influential and close to the projects finances. Such a heavy reliance on the role of the business sponsor infers that it is this person who will have the strategic vision for the warehouse.

4.4.2.3 Alignment via End User Buy-in

As Table 3 indicates, Kimball et al. place more emphasis on the role of management buy-in, while Inmon places the end user or Decision Support (DSS) Analyst at the heart of the development.

Kimball et al. are aware of the need to have end user participation but this appears to be managed within a good communications strategy, where the end user receives periodic

reminders of the iterative nature of data warehouse developments. Good communications are also a means of making sure that end users know what is required of them and when (Kimball et al., 1998, p. 89), but Kimball et al. do not expand upon the participative nature of the end user's role.

According to Inmon, there are four types of DSS Analyst: Tourist, Farmer, Explorer and Data Miner. The Tourist merely browses and does not analyse the data. Their information requirements are unclear. In contrast, the Farmer knows what information they require and are active warehouse users. Explorers operate in a 'mode of discovery' (Inmon, 2002, p. 19). They work on hunches and intuition, which helps them to develop different views of the organisation (Inmon, 1999b). The Data Miner operates in conjunction with the Explorer, as this role investigates an Explorer's hypotheses by undertaking statistical analysis to validate the hypothesis or otherwise (Inmon, 1999c).

Of the four types of DSS Analyst, Inmon states that it is the Explorer who is best suited to developing the data warehouse data model through iterative development phases (Inmon, 2003b). The Explorer accepts each data warehouse release and develops requirements that help the Explorer investigate and search for relationships within the data (Inmon, 1999d). However, while the Explorer is best suited to direct the development of the warehouse, it is the Farmer who participates in the development of the dependant data marts; as it is the Farmer who knows what their information requirements are (Inmon, 1999e).

#### 4.4.2.4 Commentary

Inmon's emphasis on end user participation and influence differentiates him from Kimball et al.'s approach (1998). Kimball et al. express the need for end user participation through the documentation of business requirements. This is a much more formal and structured approach to that described by Inmon and is more appropriate for gathering the Farmer's requirements. The relationship between the Explorer and data modeller has a more fluid feel, as Inmon encourages the Explorer to take a 'hands on' approach and if necessary, request a redesign of the data model to suit business needs. The redesign of a data model, whether in part or wholly, should be considered as a mark of refinement not failure (Inmon, 1999a).

The key point here from a strategic alignment perspective, is that Inmon leaves the direction of the data warehouse development to the wishes of the Explorer. This suggests that organisational strategy may be influenced by the findings of the Explorer.

### 4.4.3 Strategic Alignment Summary

The preceding sections summarise a rather tentative contribution to the issue of strategic alignment. There is an assumption that alignment will be delivered through the vision of the business sponsor or via the findings of the data analyst searching for commercially viable relationships in the data. Alternatively, alignment may be documented in the business requirements, which assumes that this can be articulated by business users down to the level of capturing data at a granular level.

It can be asserted that both Inmon and Kimball fail to adequately address the issue of strategic alignment. This is attributable to the fact that both Inmon and Kimball are focussed on providing a technical solution and not a business solution.

In considering the lack of guidance for achieving strategic alignment and the composition of Inmon and Kimball's project teams in Table 4; it can seen that Inmon and Kimball are technology oriented. While Kimball et al. are very specific about the roles they also provide a list of tasks to be carried out by each of the roles (see Appendix 2). Inmon, on the other hand, does not. A direct comparison cannot be made between roles but what can be stated is that omissions on Inmon's team list indicate that Inmon's methodology does not account for development issues that Kimball's does. Examples include: the Data Warehouse Educator, which represents training issues; the Data Steward and Quality Assurance Analyst are important roles for the application of data quality measures; The Data Staging Programmer appears to be a role that could be identified with Extract, Transfer and Load (ETL) issues.

It is also worth noting that there is no Project Manager in Inmon's project team list, although it could be assumed that this is governed under the Management role. The point is that a lack of clarity regarding Inmon's list of roles makes it very unclear for the reader to decide if the project is properly managed.

Table 4. Project Teams

| Inmon's Project Team Members | Kimball's Project Team Members |
|---|---|
| Data Architect | Business Sponsor |
| Database Administrator | IS Sponsor |
| Programming | Project Manager |
| DSS Analysts | Business Project Lead |
| End Users | Business Systems Analyst |
| Operations | Business End Users |
| Systems Programming | Data Modeller |
| Auditing | DBA |
| Management | Data Staging Systems Engineer |
| | End User Application Developers |
| | Data Warehouse Educator |
| | Technical / Security Architect |
| | Technical Support Specialists |
| | Data Staging Programmer |
| | Data Steward |
| | Data Warehouse Quality Assurance Analyst |

Only a limited amount of analysis can be done on Inmon's project team structure but Kimball provides the means to determine the contribution of each project team participant. Role contribution is derived from data supplied by Kimball et al. (1998), which is contained in Appendix 2. The array of symbols presented in Appendix 2 was found to be difficult to examine and required a simpler representation. This was achieved by converting the symbols to numbers Figure 11, summing up the values for that role and calculating the contribution of as a percentage of the maximum possible contribution value.

| | | |
|---|---|---|
| Primary Responsibility for the Task = | ● | 5 |
| Involved in the Task = | ❍ | 4 |
| Provides Input to the Task = | • | 3 |
| Informed Task Results = | ❒ | 2 |
| Optional Involvement in the Task = | ◦ | 1 |
| No Involvement = | | 0 |

Source: Kimball et al., 1998, p.737

Figure 11. Kimball's Responsibility Key Conversion

The results are graphically presented (Figure 12), from which the following observations are made:

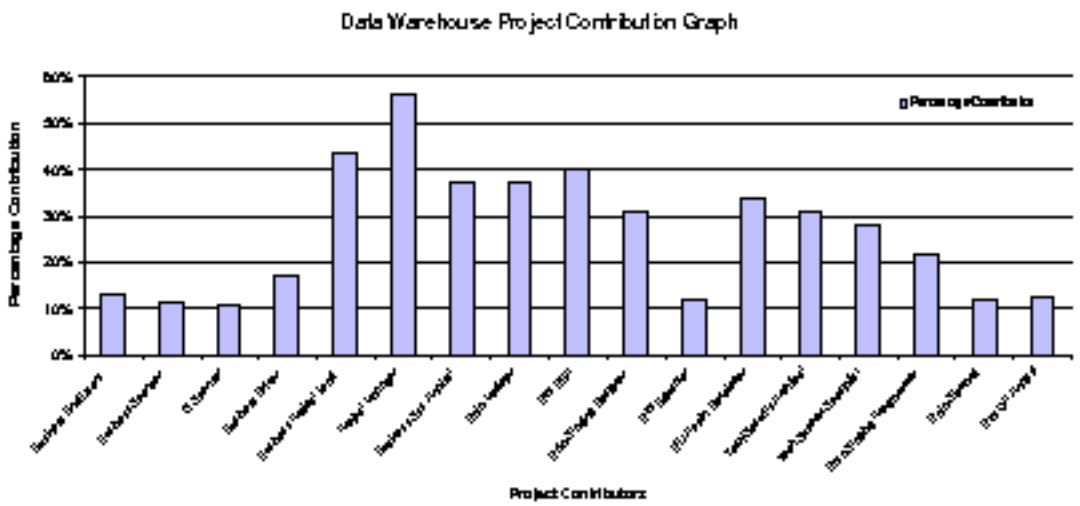



Figure 12. Project Contribution Graph

- Only four of the seventeen roles listed in Table 4 are exclusively from the business i.e. Business End Users, Business Sponsor, Business Driver and Business Project Lead.
- Bearing in mind the fundamental need for a Business Sponsor, this role contributes a little over 10% to the development of the data warehouse.
- The highest contributors to the projects development are the Project Manager and Business Project Lead.
- The Business Project Lead is regarded as a part time role but has a percentage contribution (>40%).
- The business is largely represented by people in senior positions. The most junior business representatives are end users who do not make a significant contribution.
- The End User Application Developer contributes over 30% while the End User contributes just over 10%.

Figure 12 illustrates that the business representation and contribution is not as high as may have been expected. In particular, the role of the Business Sponsor appears to be more symbolic or distant than the 60% influence rating in the business readiness

assessment suggests. The Business Project Lead contributes significantly more than any other business representative, which seems a particularly heavy burden for a part-time position. This raises a number of questions about the actual value placed upon the role of Business Project Lead and the amount of influence that the business could expect to gain. This clearly indicates that Kimball et al. prescribe a technically led data warehouse project, which is in contrast to the belief that Kimball et al. are closer to the business needs than Inmon (Gallas, 1999; Breslin, 2004).

The lack of strategic alignment is confirmed by considering the issues raised against Henderson and Venkatraman's Strategic Alignment Model (1999). Henderson and Venkatraman believe that an organisation's inability to realise the benefits of IS investments lie in the degree of alignment between business and IS strategies, which includes the strategy formation and implementation processes. In effect, the effectiveness of an organisation is enhanced by the degree of fit between the IS function and the rest of the organisation (Pollalis, 2003; Bergeron et al., 2004).

The concept of strategic alignment has two component parts: strategic fit and functional integration. Strategic fit addresses the need for any strategy (business or IS) to take account of external and internal domains. The external domain is the market in which the organisation operates. The organisation's position in the IS market is subject to three sets of choices:

1. Information technology scope - the range of technologies that support current and future business strategies.

2. Systemic competencies - those attributes of IT strategy that could positively contribute to the creation of new business strategies or better support of existing strategy. This is analogous to the concept of business distinctive competencies (e.g. price product promotion).

3. IT Governance - selection and use of mechanisms (e.g. joint ventures, R&D) for obtaining the required IT competencies.

The internal IS domain focuses on administrative structures and the specific rationale for the design and redesign of critical business processes. The internal IS domain must address at least 3 components:

1. IS architecture - choices that define the portfolio of applications, the configuration of hardware, software and communications.

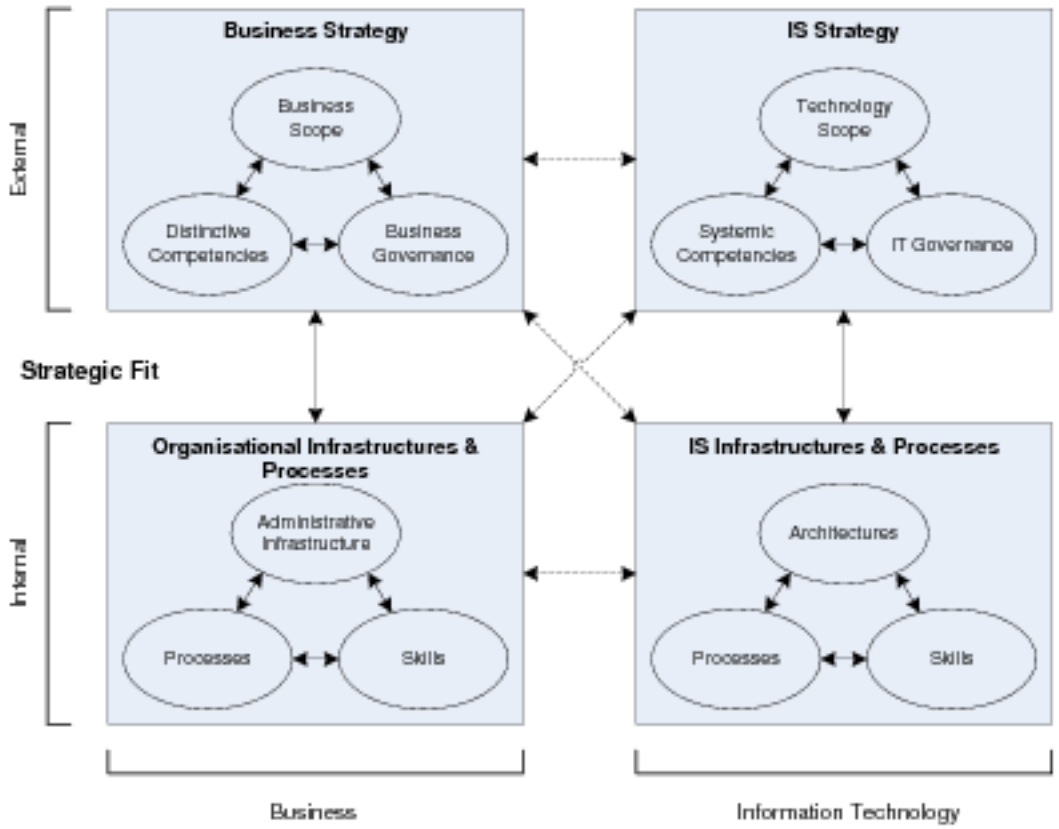
2. IS processes - choices that define the work processes central to the operations of the IS infrastructure such as systems development, maintenance and monitoring.

3. IS skills - choices pertaining to the acquisition, training and development of knowledge and capabilities.

Henderson and Venkatraman (1999, p. 474) state that the differentiation between the two domains has to be made clear, as their research indicates that the inadequate fit between external and internal IS domains is a major reason for failure to derive benefits from IS investments. Traditionally, managers think of IS in terms of the internal domain components, while it is imperative that firms also pay attention to the three external components of IT strategy.

The second strategic alignment component is functional integration, which considers how choices made in the IT domain impact those made in the business domain and vice versa. Typically, research has focussed upon the need to integrate internal IS and business infrastructure as a result of changes to business strategy.

Figure 13 illustrates the multivariate relationships between the business and IS, both strategically and functionally, that have to be managed effectively if the organisation is to maximise the potential of its investments in IS.

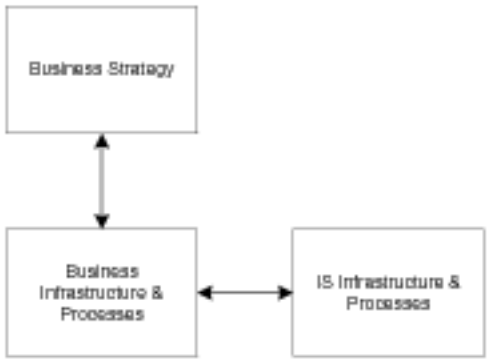



Source: Henderson & Venkatraman, 1999, p. 476

Figure 13. Strategic Alignment Model

Most studies have tended to examine the fit between IS and Business strategy than business and IS functional integration (Bergeron et al., 2004). Yet, the Strategic Alignment Model clearly indicates that there are relationships across all four domains, illustrating Henderson and Venkatraman's claim that IS and therefore organisational effectiveness is the result of balanced management across all four domains.

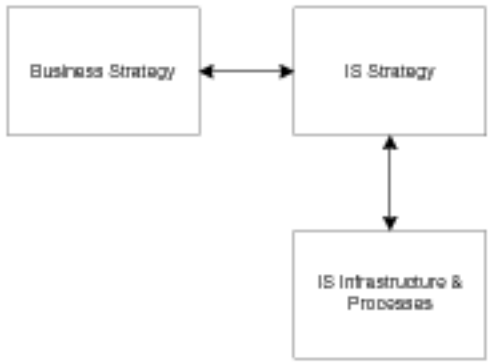
Henderson and Venkatraman (1999, p. 477) identify four alignment perspectives based upon the relationships expressed in Figure 13. The first of these is Strategy Execution (Figure 14) where business strategy is the driver and perhaps represents a more traditional perception of systems development. In this case, the business strategy is cascaded down to the business' operational area who are then able to articulate IS requirements to the IS functional area.




Source: Henderson & Venkatraman, 1999, p. 477

Figure 14. Strategy Execution

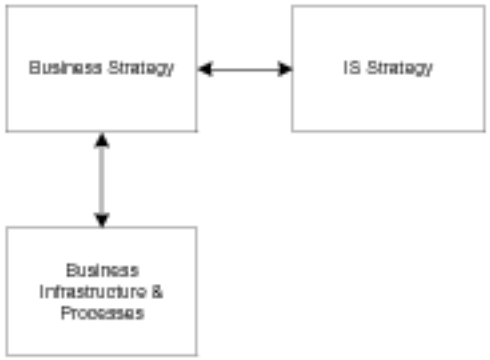
The Technology Transformation (Figure 15) perspective aims to ensure that the organisation adopts or builds a suitable IS infrastructure to support business strategy. In this perspective, the business strategy requires the support of an IS strategy that can be articulated to and realised by the IS functional.




Source: Henderson & Venkatraman, 1999, p. 478

Figure 15. Technology Transformation

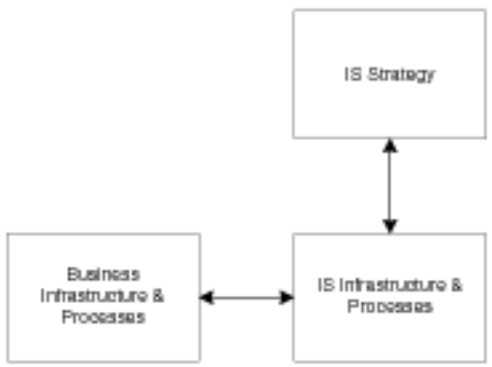
The third perspective is Competitive Potential (Figure 16), which requires a business visionary to adopt and realise the strategic vision of their IS counterparts. IS identify the potential of technologies to shape the product / service range and / or the way the organisation operates and propose a range of potential strategic solutions. This means that IS strategy flows through business strategy resulting in new products and services administered and executed by the business' functional areas.




Source: Henderson & Venkatraman, 1999, p. 479

Figure 16. Competitive Potential

The aim of the final perspective, Service Level (Figure 17), is to deliver an IS infrastructure that is resourceful and responsive enough to deliver an exceptional standard of service to the business' operational areas. The role of IS executive is to develop and execute an IS strategy that manifests itself in an IS infrastructure focussed on business infrastructure service delivery.




Source: Henderson & Venkatraman, 1999, p. 479

Figure 17. Service Level

It should be noted that all alignment perspectives originate at the strategic or executive level of the organisation indicating that strategic alignment is driven from the top down. Each of the perspectives also concentrate on the effects on three of the four domains but it should be borne in mind that organisational effectiveness is based upon the multivariate relationships across all four domains.

Henderson and Venkatraman observed that Strategy Execution is the traditional IS alignment perspective. If there is dissatisfaction with an IS investment, it is likely that the benefits of realising one of the other alignment perspectives has not been taken into

account. By considering all alignment perspectives, an organisation allows IS to enlarge its potential contribution.

### 4.4.4 Commentary

Kimball et al. (1998) state that strategic business requirements must be captured and that these direct the overall project. There is also a significant emphasis on the role of the executive sponsor but that role appears to have very little visibility throughout the project. Below the executive management level, business users provide more detailed business requirements and a Business Project Lead is appointed to work alongside the Project Manager from the technical side. There is substantial technical representation on the data warehouse project team (Figure 12) with the business user's contribution largely limited to the development of on-line analytical processing (OLAP) interrogation tools. This indicates that the requirements driven approach falls into the Strategy Execution perspective, as displayed in Figure 18. However, the connecting lines between business strategy and operational levels are broken to illustrate the incomplete relationship between these levels.

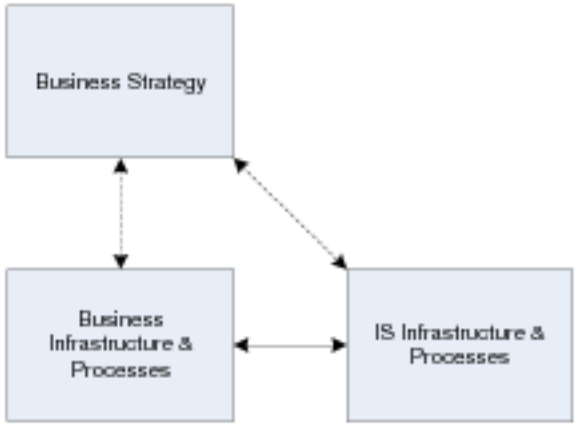



Figure 18. Kimball's Strategic Alignment Perspective

Inmon, on the other hand, makes no reference to business strategy or management and executive buy-in. The only clear relationship is that which exists between the data modeller and the Explorer. Inmon does state that a data warehouse development is an opportunity to tidy up an organisation's existing complex IS infrastructure and suggests a way of approaching this subject with senior IS people (Inmon, 2002, p. 287). This rather tentative link is acknowledged in Figure19.

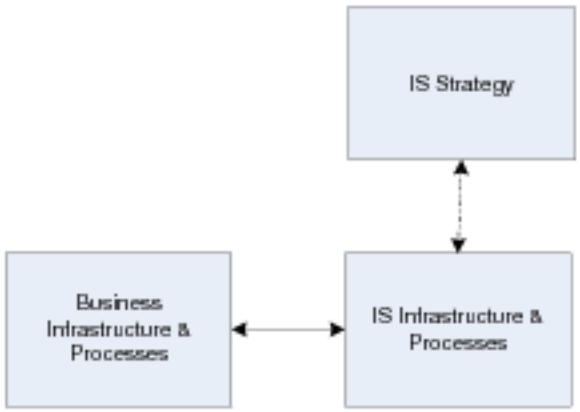



Figure 19. Inmon's Strategic Alignment Perspective

While a link to the strategic levels is acknowledged, the strength of that link is poor, which indicates that there is a distinct gap between the need for strategic alignment and practical steps to promote alignment. It is stated that Inmon's approach is a strategic solution but no evidence was found in Inmon's methodology to take account of the organisation's strategy. Figure 19 simply indicates the strength of relationship between the Explorer and Data Modeller / Architect at the operational levels.

## 4.5 Inmon versus Kimball Summary

In this chapter, a comprehensive analysis is presented of the differences between data warehousing's leading authorities in terms of architecture, data modelling and implementation methodology / approach. The analysis provides an understanding of the choices that have to be made when implementing a successful data warehouse.

It is stated that Inmon's architecture is strategic due to the fact that the hub and spoke architecture is enterprise wide and is developed in an evolutionary way i.e. it is an emergent system in that it is built using traditional systems development / modelling techniques and fits well within the organisation's systems estate. Kimball regards his architecture as being driven by strategic ambitions but because it is a bottom up development that complements business processes the market, at least, regard the dimensional modelling approach as tactical.

Over the years, data warehouse practitioners and academics have confirmed that the data warehouse must be strategically aligned if it is to maximise its organisational impact (Weir, 2003). This is confirmed by Henderson and Venkatraman (1999, p. 472) who state that an organisation's inability to realise the benefits of IS investments lie in the degree of alignment between the business and IS strategies, which includes the

strategy formation and implementation processes. Consequently, a review was carried out of the implementation processes prescribed by Inmon and Kimball using the principles of best practice and the Strategic Alignment Model. It was found that the issue of alignment is a matter of trust that the business users will be able to articulate the strategic information requirements or that the Explorer's hunches and intuition will determine strategic direction. Each of these approaches lay considerable responsibility on the shoulders of users at the wrong end of the organisational hierarchy, as Henderson and Venkatraman (1999) also state that strategic alignment originates at the top of the organisation via the business or IT strategies.

Inmon and Kimball provide choices and alternatives but it is apparent that organisations occasionally make the wrong choice, including architecture (Watson & Ariyachandra, 2005). The question that is left to answer is: how do we ensure that the choices made are strategically aligned? This study draws on organisational configuration to provide that guidance.

The focus on organisational configuration provides a rationale for treating each organisation as a new case by understanding how it operates and the business direction that it is taking. If it is accepted that data warehouse implementation programmes are not meeting business expectations (Preslan et al., 2004), it could be asserted that this is due to the employment of inappropriate architectures and development methodologies for the subject organisation. The configuration approach provides an opportunity for the implementation approach to become truly business led, not by people alone but through the concept of organisational fit.

However it ought to be acknowledged that there are organisations that are satisfied with the impact that their data warehouse has made on the business. Again, this may be explained by examining the organisation's configuration. For example, organisations operating in stable environments that are structurally driven will have fewer competitive pressures to contend with. It is quite feasible therefore, that the data warehouse simply reinforces current processes by delivering information in a more efficient and user friendly manner. In that case, the data warehouse is simply emulating what is already there and is not considered to be a facilitator of organisational transformation.

These questions can only be answered by taking a closer look at the organisational context in which a data warehouse operates. The Configuration School of Strategic

Management tells us that all organisations are uniquely configured and so it is necessary to understand those configurations if the right data warehouse implementation choices are to be made. The debate that exists regarding whose approach is best (i.e. Inmon or Kimball) is testament to the need to better understand what is appropriate and in what circumstances. In the following chapter, a solution to this problem is proposed based upon Miles and Snow's Ideal Types.

# 5 A Configuration Approach

In Chapter 2 the Configuration School of Strategic Management was introduced, which states that all organisations are uniquely configured but have a tendency to adopt similar forms, where they compete in a similar trading environment. Miller referred to these common configurations as Archetypes (Miller, 1990), but it is Miles and Snow's (1978) typology of Defenders, Analysers and Prospectors that have been found to be predictors of organisational effectiveness (Doty et al., 1993). As stated in Chapter 2, it is for this reason that Miles and Snow's typology is used to underpin the organisational strategy element of this study.

In this chapter, it is proposed that Miles and Snow's typology can guide the choice of data warehouse architecture and the methodological approach to achieve greater strategic alignment. In chapter 3, the differences between Inmon and Kimball were presented and a study was highlighted where it was found that organisations choose an architecture for a variety of reasons. For example, an organisation may simply be led by a consultant's preference. It has also been found that some organisations will change the architecture at some point through the development (Watson & Ariyachandra, 2005), but a reason for this change of heart has not been offered. In this thesis, it is asserted that the choice of architecture should complement the organisation's current or target configuration. It is also proposed that the methodological approach used will have a bearing on the organisation's ability to achieve strategic alignment i.e. the approach should be driven by the strategic aims of the organisation and will be influenced by the choice of architecture.

In the following sections Miles and Snow's typology is described in more detail. From there it is proposed that there is a data warehouse architecture that would appear to have the highest degree of fit. This is followed by an analysis of the most appropriate methodological approach to building a data warehouse.

## 5.1 Miles and Snow

Organisational Strategy, Structure, and Process was first published in 1978 by R.E. Miles and C. C. Snow (1978). The book was based upon research work during the 1970s that led the authors to conclude that in strategic management terms, an organisation's characteristics facilitate classification into organisational type. While there may be any number of possible configurations, Miles and Snow proposed three ideal types of organisation, which they referred to as Defender, Analyser and Prospector. A fourth type of organisation, the Reactor, was also identified but this is an organisation that is failing and consequently, far from ideal.

Miles and Snow state that the effectiveness of an organisation depends on the way that it manages the entrepreneurial, information systems and administration challenges. The entrepreneurial challenge accounts for the way in which an organisation engages with its chosen market. For example, a highly stable and predictable market will require a different management approach to a volatile market. The information systems challenge deals with the appropriate use of technology in delivering a service to customers and the organisation itself. The administration challenge explores the adoption of appropriate organisational structures and administrative methods. While each of these challenges can be examined in isolation, it is imperative that they are managed consistently and are mutually supportive. Another strategic management theorist in this area, Miller and Witney (1999a), emphasized this point by stating that there must be a "unifying theme" to keep the organisation's configuration consistent and purposeful. Therefore, it is not a question of profitability but organisational effectiveness that is being examined.

Miles and Snow's theory fits into the configuration school of strategic management, which states that all organisations are configured uniquely. For example, all UK retail banks operate in the same market, within the same legal framework and they provide very similar products but each organisation has a unique configuration. It is possible to copy products and policies but the infrastructure, systems and people used to deliver those products and services cannot be copied. Put another way, configuration is a holistic approach that appreciates the multivariate relationships among organisational components that define the whole.

Miles and Snow's ideal types have been widely used to support organisational and strategic management research. However, the tendency amongst researchers is to use the ideal types simply as organisational classifications without enough consideration for

the strength of relationship to the ideal Defender, Analyser or Prospector. So, two organisations may be classified as an Analyser but which is the most effective? Research carried out in 1993 (Doty et al., 1993) concluded that the organisation that can be shown to be closest to Miles and Snow's ideal profile will be a more effective organisation. Details of Miles and Snow's ideal profiles can be found in Appendix 1. This research also indicated that it is appropriate to portray the ideal types (Defender, Analyser and Prospector) as lying on a continuum with the Defender and Prospector at opposite ends of the spectrum.

### 5.1.1 Defender

#### 5.1.1.1 Entrepreneurial Challenge

Defenders produce high quality but standard products to a stable, narrow market place at competitive prices. The stability of their environment means that they do not engage in interests in the broader environment and are content to pursue current interests with minimal product and market development.

In essence, the deeper that a Defender can penetrate the market, the stronger and more immoveable it becomes. Its product range will be subject to change but any changes applied will not be radical. This level of stability also facilitates another of the Defender's drivers, excellent customer service. Market penetration is also the basis of growth.

This means that the central theme that drives a Defender is value for money via the delivery of high quality products and customer services at prices that competitors cannot match. Indeed, this creates a barrier to entry for would be competitors.

#### 5.1.1.2 Information Systems Challenge

The focus, in terms of information systems, is on efficiency, which enables competitive pricing. Accordingly, Defenders are more likely to operate with one core, highly tuned technology to deliver products and services as efficiently as possible. Cost and productivity are issues of particular importance to the Defender, as these need to be tightly controlled to drive the pursuit of greater efficiency.

As part of the drive for control, Defenders tend towards vertical integration i.e. acquire and subsume suppliers and delivery channels to ensure that the whole process is as efficient and cost effective as possible.

The drive for efficiency also means that core technologies are subject to continuous improvement programmes and while cost containment is a strong feature of the Defender, these organisations will invest in technology to improve performance and productivity. However, Defenders will not necessarily rush out to employ cutting edge technologies, as they need to ensure that the technologies "remain familiar and predictable for lengthy periods of time" (Miles & Snow, 1978).

5.1.1.3 Administration Challenge

Administratively, the Defender exercises strict centralised control in order to keep costs down and performance high. This means that decision making is also centralised with 'long looped' communication channels i.e. problems identified at the bottom of the organisation will be reported at the top of the organisation. Structurally the organisation is characteristically hierarchical and managed functionally. Promotion tends to be from within, as those at senior and executive levels need to understand that organisation's operations and ethos. The "dominant coalition" i.e. the organisation's controlling executives, will be dominated by Finance and Production / Operations. Those controlling the organisation will not scan the environment for threats to the trading conditions. In contrast, they will be more concerned with the threats to efficiency that emanate internally.

Planning is an intensive and detailed exercise, which occurs before any action is taken. These plans form the basis of targets against which performance is measured. Organisational and market stability allows for plans to be based upon past performance but the rewards for meeting targets will favour Production and Finance departments.

The functional structure is one that helps to contain roles and narrows the scope of an individual's responsibilities. This helps the organisation to formalise roles and exercise extensive division of labour.

In ideal conditions, the Defender is strong and immovable. However, the rigid structures employed by Defenders make them vulnerable to significant environmental changes such as deregulation. This rigidity means that they are slow to react to change and less competitive in faster moving markets. The Royal Mail is an example of an organisation having to reconfigure from its monopoly to meet the challenge from competitors, who have entered the market.

5.1.1.4 Choosing an Architecture

Miller (1987) found in his study of organisational configuration that the relationship between strategy, structure and environment was bound by a central theme. The Defender's theme is efficiency, as cost effectiveness is behind the organisation's drive to deliver high quality products and services at the right price for the consumer. The Defender is able to focus on efficiency because it does not have to continually respond to environmental forces. The organisation's structure is arranged functionally and employee's roles are the product of high levels of division of labour. Tasks are broken down to a level where the employee can fulfil the role with high degrees of productivity and efficiency, which can be easily monitored and enables a greater degree of control.

The ideal Defender will operate with one core technology, which is highly tuned to deliver an efficient and effective service. This indicates that the systems employed by the organisation will be highly supportive of organisational processes. As these processes are highly defined, it is reasonable to expect that the Bus Architecture would be the most appropriate data warehouse architecture for the Defender i.e. borne out of business processes. It is expected that the data marts could be rapidly deployed to support departmental decision making. The simplified data modelling structure makes it easy for end users to understand and access the data. It is also possible to deploy data marts to many departments quickly and via conformed dimensional modelling, the organisation will have an enterprise wide data warehouse, should it wish to do so.

Clearly, the Bus Architecture is a workable solution but does this have the best fit? In order to answer this question, it is necessary to account for the whole profile of the Defender.

As efficiency is the underlying theme for the Defender, Miles and Snow describe the Defender as applying centralised control with long looped decision structures. The systems themselves are highly efficient but what is of particular relevance is that while the Defender will invest in new technologies, they do have to be "familiar and predictable". The efficiency of existing systems is, in part, due to the underlying data structure of the operational systems. Traditionally, operating system's data structures are normalised as far as possible but certainly aiming for 3$^{rd}$ Normal Form (Imhoff, Galemmo & Geiger, 2003). This means that there are no repeating groups of data and so, the data is stored efficiently. It is also easy to add new data sources to a normalised structure. Inmon states that existing data models should be the basis of a data warehouse

development. This avoids 'reinventing the wheel' but the data warehouse development team will have to build the warehouse subject area by subject area in an incremental build process. This approach is characteristic of the top down evolutionary approach, which fits with the Defender's need for predictability, as the relational model is a logical extension of the operational system models. The dimensional modelling approach is a departure from the normalisation technique and conceptually more radical, as it does not have the efficiency feature due to the existence of repeating groups.

One of the benefits of the Bus Architecture is that it delivers data to the end user, which promotes decision making at that lower levels of the organisation. This is not an attractive feature for the Defender, as there is high division of labour and decisions are taken by senior managers in the organisation. This means that problems or issues raised at the lowest levels of the organisation are fed up the hierarchical chain to senior management for resolution. This infers that there is no need for data or information to be spread widely across the organisation. If there is a need for lower level roles to have access to data, the derived information will have a narrow scope.

In defining the most appropriate architecture for a Defender, it is also necessary to anticipate the business use for that data. It is known that Defenders spend little time, if any, gathering information from their trading environment. Consequently a Defender's data warehouse will not support environmental scanning activities. There are, however, three data / information intensive areas of importance to the Defender: growth, planning and control.

The Defender's growth comes from its ability to penetrate its market and intensify the relationship that it has with its customers. At the same time, the Defender's product and service range is stable but subject to incremental changes over a period of time. It is reasonable, therefore, to suggest that a data warehouse would prove to be valuable in understanding the depth of its relationship with its customers. For example, this may result in information concerning the customer's needs, buying habits and lifecycle. Marketing is not a significant functional activity for the Defender but activities to generate sales is a business priority. It is therefore, reasonable to expect that information to help secure sales would be an appreciated commodity.

Planning is an intensive activity, which is based upon previous years' performances. Cleary, the data warehouse is geared towards storing and delivering historical data,

which can be analysed to isolate performance drivers. Any data that adds informative value and speed to the planning process would improve planning accuracy and make the process more efficient.

The data warehouse can also be used to improve control mechanisms, which is an issue that falls into the domain of the guiding coalition formed by Finance and Production. In general terms, Production will be concerned with issues of efficiency as they relate to performance and the underlying infrastructures. Anything that hinders the performance of business operations is a matter that has to be reported to senior levels and acted upon as soon as possible. Achieving performance targets will be of paramount importance. This can be achieved by developing performance reports or dashboards, which report or display performance metrics, at a glance.

Finance, on the other hand, will be concerned with what the financial and management accounts reveal. Financial accounts are bound by regulatory controls, but the information required to generate financial statements can be sourced from a data warehouse. Moreover, the management accounts amount to an accounting analysis of an organisation's operations. Management accounts examine performance drivers and their effect on the organisation's financial wellbeing. Management accountants will typically examine metrics such as financial contribution per employee or capacity utilisation. The data required to generate these metrics requires data from a number or all functional areas. For example, to measure the effectiveness of a cost centre such as Human Resources requires data about that function to be made available. This gives the organisation good cause to populate an enterprise wide data warehouse with data from many, if not all, functional areas to support the delivery of control metrics. The warehouse also has the advantage of being able to aggregate data to the level required by the organisation. While it could be anticipated that control would focus upon the organisation's operations, efficiency measures can be applied organisation wide; especially for an organisation whose underlying theme is efficiency. This in itself would make the enterprise wide option attractive, as it serves as a central repository of data that can be used to analyse organisation wide activities. The Defender controls operations centrally, which suggests that the centralised data warehouse would offer the highest degree of fit for the Defender.

In Chapter 3, Section 4.3, the factors that influence the choice of architecture are summarised, as defined by Watson and Ariyachandra (2005). It could be argued that it

is possible to arrive at the same conclusion using that method but the difference between the configuration rationale and the other method is the business justification. The holistic profile of the Defender drives the architectural conclusion, as opposed to a series of loosely defined statements where no one factor determines the choice and collectively it is possible to draw conflicting conclusions. The Defender is an ideal profile i.e. in the right context, the closer an organisation is to that profile the more effective it is. Our choice of architecture is based upon helping an organisation move closer to that ideal. It is a decision not based upon hunch but clarity about how the warehouse compliments the existing systems infrastructure and what the information requirements are.

### 5.1.2 Prospector

#### 5.1.2.1 Entrepreneurial Challenge

The Prospector lies at the opposite end of the continuum to the Defender and as the name suggests, these organisations are innovative and apt to disregard market boundaries. Therefore, the domain in which they operate is broad and continually developing.

The Prospector is always looking for commercial opportunities, which they can exploit. Consequently, they rigorously scan and monitor the environment for events and trading conditions deemed conducive to a commercial venture.

This level of attention to innovation and opportunity means that the Prospector is a creator of change within an industry, as they are adept at pioneering products and services. The ability to quickly bring new products and services to market is a strong feature of a market leading organisation, which is also a means of achieving market growth. Growth under these conditions occurs in bursts and is hard to maintain.

The challenges associated to this approach are that innovation is expensive, as constant change never allows the organisation to find and implement efficient practices. The Prospector is, therefore, vulnerable to over extending its resources in the pursuit of innovation in the hope that consumers will pay a premium for those products and services. Profitability is therefore, less predictable under these circumstances. The Prospector has to endeavour to innovate while holding on to a loyal customer base.

5.1.2.2 Information Systems Challenge

Change is an integral part of the Prospector's being, which means that they operate with multiple, flexible but underdeveloped technologies. The knowledge held by people in terms of environment and technologies is vital as the organisation moves into new and diverse markets. The dependency on market knowledge means that Prospectors need sophisticated surveillance systems to ensure up to date knowledge.

In accordance with the need to innovate and develop solutions quickly, Prospectors will take a prototyping approach to systems development. This allows the organisation to explore the possibilities of a technology and / or system.

The Prospector's technology estate will enable change and flexibility but the technologies / systems will not be configured to deliver efficiency. There is, therefore, a low level of mechanisation.

5.1.2.3 Administration Challenge

Structurally, Prospectors decentralise control and decision making in order to be more responsive to their markets. Marketing and Research and Development (R&D) experts will hold most control in how the organisation is run. The Prospector's guiding coalition is large and transitory, which reflects the ever changing nature of the Prospector. While there may be promotion from within it is equally likely that skills will be sourced externally, which also ensures that new ideas and practices are introduced to the organisation.

Planning is not an intensive or detailed activity, which is attributable to the focus on problem solving. Prospectors will not undertake extensive planning before acting, as this is lost time and does not aid the drive to research and develop.

The need for market agility results in decentralisation, which gives business units more autonomy to deal with issues as they arise. As a result, business units are empowered to make decisions locally, which only require short looped decision structures. Employee's roles are also less well defined, giving them broader scope within their role.

An agile and flexible organisation is not easy to control, which means that the control mechanisms are difficult to coordinate due to their complexity. Ultimately, performance will be measured against that of competitors'.

Virgin is perhaps a good example of a Prospector, as they know no boundaries given their presence in the mobile phones, banking, cosmetics, music and airline industries. Space flight is understandably their most innovative venture, so far.

5.1.2.4 Choosing an Architecture

The dominant themes underpinning the Prospector's profile is innovation and agility. The Prospector operates in volatile markets and needs to be responsive to market opportunities, which is why it has significant environmental scanning capabilities.

Structurally, the Prospector operates a divisionalised structure which requires that decision making be decentralised and delegated to lower levels in the organisation. Miles and Snow have stated that Prospectors are product driven, which would suggest that the process driven Bus Architecture is inappropriate but this would be too simplistic an assessment. For the reasons outlined in the remainder of this section, it is asserted that it is the Bus Architecture that is most appropriate.

Due to market volatility and ever expanding market domain, the need for speed is essential. Decision making authority is more prevalent in lower positions within the organisation because the organisation needs to be responsive. This helps the organisation to spot and react to market opportunities and readily manage customer's issues, which is important when the organisation has to work at satisfying a core customer base in a highly competitive market.

The Bus Architecture is the most appropriate choice because it is quick to deploy. This means that data from new systems, albeit underdeveloped, can be fed into the warehouse quickly and provide support to localised needs. The dimensional modelling technique allows for the proliferation of data marts but to ensure the integrity of the data across all data marts, the data modelling process must adhere to the principles of conformed dimensional modelling. This technique makes sure that data is consistently defined across all data marts e.g. sales could be defined as the sum of cash sales and credit sales, so sales in one division will be defined the same way in another division. This means that the data marts can support divisional needs, while conformed dimensions make it easier to coordinate information from or about the divisions in what tends to be a complex control network.

A centralised architecture would not be appropriate because the warehouse would have to be domiciled outside of the division's logical boundaries and be maintained by a

central function. Alternatively, there would be technology staff from each division trying to apply changes as quickly as possible to support the business areas. This would prove to be an onerous task for those enforcing governance procedures e.g. whose change has the highest priority?

Another benefit of the Dimensional Modelling approach is that it has been found to be more intuitive for users to work with. This has helped end users to become more adept at conducting business analysis from the data made available to them. Therefore, fewer data specialists are required to extract and package data in a format the user wants. These specialists are generally required for accessing a centralised data warehouse due to the complexity of the relational data model. By making it easier to interrogate the database, the dimensional model provides the end user with quick access to support the short looped decision structure. This means that the decision support system supports those who are empowered to take decisions at lower levels of the organisation, which is in contrast to the more highly controlled Defender organisations. Consequently, the dimensional modelling approach can have broader appeal, which encourages dependency on the system.

As the guiding coalition is comprised of Marketing and Research and Development personnel, it is likely that staff from these areas will have a significant interest in the content of the warehouse and its ability to support their business activities. In order to support environmental scanning activities, it would be anticipated that external data sources (e.g. market profile data) would be fed into the warehouse. In any case, data warehouses are often used to support marketing activities through mailing campaigns and customer profiling, for example. Research and Development activities are also supported by data warehouses, as it is known that warehouses are used to support clinical research. It is the user's role that is of interest here, as it was Inmon who identified Explorers as people who ask questions of the data in order to find commercially viable relationships. It is suggested that the Explorer's role is akin to Research and Development because the Explorer pursues ideas and hunches with no guarantee of a return for the Explorer's efforts. This is the type of role that would be expected in a Prospector, as it strives to deliver innovative products and services. Therefore, a Prospector who sees data as a commercial asset to be exploited will be prepared to give Explorers the opportunity to seek out commercial opportunities.

When considering the typical planning process in a Prospector, it is known that the procedure is to act, evaluate and then plan. This means that the Prospector will act on hunches and ideas to test the market before planning expansion. This is not a centralised function, as the Prospector's central governing body will expect each division to pursue its own goals. The performance of each division is measured against that of competitors.

In summary, it is asserted that the Bus Architecture provides a Prospector with an architecture that expands from the bottom up via a proliferation of business focussed data marts. Prospectors can build data marts quickly and at a relatively low cost, which suits the Prospector's need for agility. The Prospector's rather disparate organisation structure makes it difficult to monitor and control each division's activities but the application of conformed dimensions means that the data warehouse can help the organisation's central controlling body to draw information for the purposes of monitoring performance. The Prospector is also the ideal type of organisation for Inmon's Explorer, who is allowed the opportunity to research the data for the purposes of finding opportunities to innovate, which is the underlying theme of the Prospector.

Kimball's architecture is commonly considered to be a tactical solution but for the reasons offered in this section, the Bus Architecture may be considered to be a strategic solution. It is strategic because it is wholly supportive of the Prospector profile. Innovative organisations should use this architecture to help drive it towards greater effectiveness as a Prospector.

### 5.1.3 Analyser

#### 5.1.3.1 Entrepreneurial Challenge

The Analyser holds a position to the centre of the continuum, as they pursue new markets while serving their more stable market domain. The challenge for the Analyser is to find the right balance that allows the organisation to compete effectively in both stable and volatile markets.

This means that the Analyser has to operate in a domain where growth comes from steady market penetration through the development of its products in an effort to maintain their attractiveness and appeal in its pursuit of a balanced market domain.

Typically, the Analyser will follow the market to minimise its research and development efforts. This means that the Analyser has to have good environmental scanning mechanisms to ensure that it can anticipate changes. The ability to quickly

apply changes to its products and services means that the Analyser supporting infrastructure has to be both efficient and agile to ensure low organisational impact.

5.1.3.2 Information Systems Challenge

The information systems challenge is to manage a dual technological core i.e. a stable and flexible component to support the stable and changing elements of the business. Finding this balances means that the systems will never achieve the highest levels of efficiency or effectiveness.

5.1.3.3 Administration Challenge

The Analyser will embrace a matrix structure that accommodates both functional and product focussed thinking and decision making. This engenders increased complexity among coordination mechanisms and could prove difficult to manage. Marketing and Applied Research personnel are likely to lead Analysers but the influence of Production staff will also be felt.

In terms of planning, the Analyser will undergo intensive planning for the stable elements of their business but will be prepared to test the unknown elements of the market before setting out plans. The control mechanisms are moderately centralised but the control mechanisms are very complex and expensive to operate.

The performance appraisal systems reflect the organisation's underlying drive for efficiency and effectiveness with marketing being the most highly rewarded.

Balancing the conflicting demands of operating in stable and volatile markets is a significant undertaking that makes the pursuit of efficiency and effectiveness more elusive. One organisation that appears to hold the Analyser position well is Tesco, who have built upon a core low cost, convenience ethos. Tesco profits from a loyal customer base and continually innovates by bringing new products (e.g. electrical goods) and services (e.g. banking) to its market.

5.1.3.4 Choosing an Architecture

So far, it has been suggested that the most appropriate architectures for the Defender and Prospector are the Centralised Architecture and Bus Architecture respectively. The Defender and Prospector lie at opposite end of the continuum and as would be expected, pursue very different strategies. The architectures are complimentary to those ideal types because they themselves are very different propositions. The ideal Analyser finds equilibrium between the Defender and Prospector and so, it is logical that the Hub and

Spoke Architecture would be the most appropriate architecture for the Analyser, as the Hub and Spoke is an amalgam of architectures.

Balance is the key to becoming an ideal Analyser, as it strives to grow the stable elements of its market while pursuing market opportunities. The Analyser needs to be stable yet flexible and tends to be a follower of the latest innovations, which limits the risks linked to innovation. Efficiency is an important issue for the Analyser but its systems cannot reach the same level of tuning to that found in the Defender, as there is a need to retain some flexibility. The Hub and Spoke architecture has a centralised data warehouse (hub) built according to relational modelling techniques to provide efficiency and dependent data marts (spokes) that can be developed quickly to support the more dynamic elements of the business. New data feeds can be accommodated relatively quickly in the centralised model, which again helps to support flexibility.

As the Analyser is only moderately centralised, the data marts provide a means for many business interests to be accommodated from one centralised source. The centralised warehouse enables high levels of data integration, which the data marts can draw upon to reflect the needs of a variety of business interests. This is particularly true for Analysers who employ a matrix structure, which is comprised of employees with many different complementary skills e.g. marketing, finance, product development, legal, etc.

In addition, employees enjoy the benefits of accessing data from data marts where the data is structured using the Star Schema, which as has been previously highlighted, is easy to use. The central warehouse can be accessed but this tends to be the domain of specialist data analysts. This illustrates that there are different users of the warehouse and that it takes varying levels of technical expertise to access data. It is, however, accessible for all the user types identified by Inmon (i.e. Explorers, Data Miners, Farmers and Tourists).

It is reasonable to expect that Analysers may encourage Explorers to find relationships in the data that can be exploited, but the Analyser is not at the forefront of Research and Development, which would also suggest that the Explorer may not be a significant role. Despite this, an organisation that is becoming increasingly data driven can create a data mart for this type of exploration activity. The Farmer too can state their requirements and have them delivered via the appropriate data mart(s). The Tourist is merely a

browser of data, so there will be plenty of data to satisfy the Tourist. The point here is that the Hub and Spoke architecture has a core data warehouse built to support high levels of data integration efficiently but the spokes provide the flexibility required to support stable and flexible elements of the business. Business users at all levels of the organisation can be accommodated using data from a consistent source. Additionally, the matrix structure is comprised of cross functional skills, which indicates that the needs of the matrix unit are best satisfied by the taking an enterprise wide approach to building the warehouse in order to capture cross functional data. The centralised / hub and spoke warehouse is the recognised solution for an enterprise wide data warehouse.

## 5.2 Data Warehouse Methodologies

In Chapter 3, both Inmon's and Kimball's preferred development approaches were highlighted i.e. data driven and requirements driven respectively. Inmon, in particular, focuses on the data driven approach because he believes that the requirements driven approach is a 'big bang' approach that cannot succeed. In contrast, Kimball takes a requirement driven approach because the end users are best placed to articulate their information needs. However, what also has to be considered is the fact that Inmon and Kimball have different aims for their warehousing solution. Inmon's warehouse is generally held to be an enterprise wide solution, while Kimball's is a warehouse borne out of business processes.

As will be seen in the remainder of this chapter, both Kimball and Inmon perhaps lack flexibility in the preferences that they prescribe.

### 5.2.1 Comparing Methodologies

Using a case study, List, Bruckner, Machaczek and Schiefer (2002) compared the goal driven, data driven and user (requirements) driven methodologies. The goal driven approach requires that the aims of the organisation are accounted for when determining the information needs of the organisation. The data driven approach, as previously stated, does not rely on a great deal of business input, as the development starts with the purpose of reengineering existing operational system schemas into a data warehouse schema. The requirements or user driven approach relies on the business user to articulate their information needs.

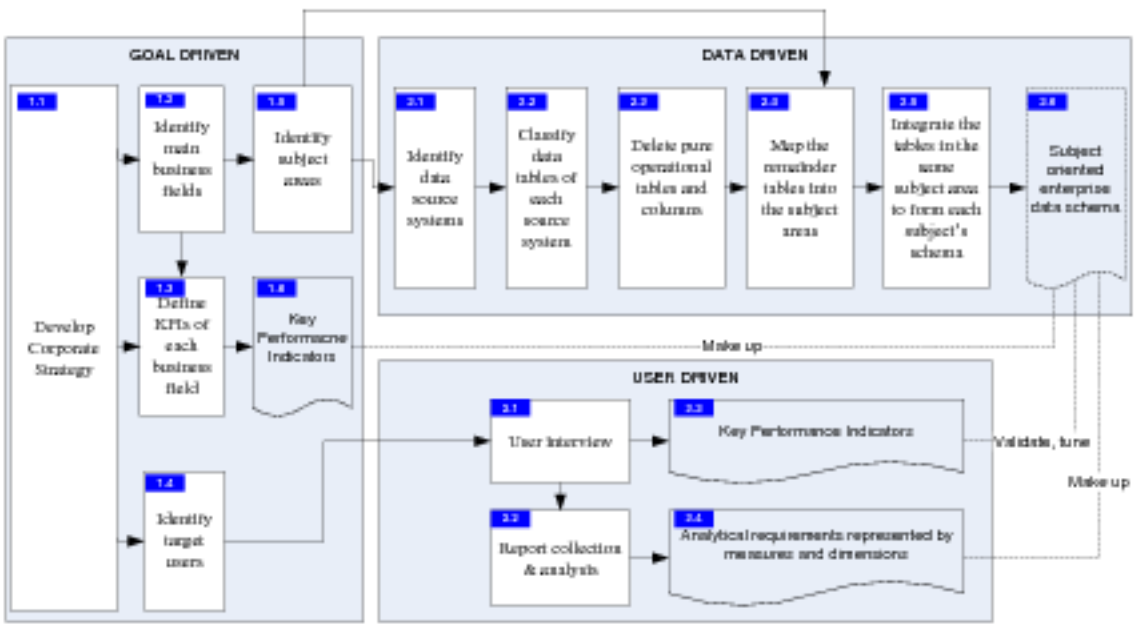
In their conclusions, List et al. (2002) determined that the goal driven and data driven approaches were mutually supportive and proposed a solution that was rooted in the strategic aims of the organisation. List et al.'s (2002) proposal, while high profile, is a

costly approach involving senior management in articulating their information requirements to measure performance. From there, the data driven approach helped to focus on sourcing data from the organisation's many systems. The goal driven approach gives the data driven stage a more business focussed objective, which it otherwise lacks under the data driven approach. End users are rarely involved in this approach but will feature if there are operational details to be resolved. The study also found that the measures and dimensions that evolved out of this process were well balanced with a high degree of granularity i.e. financial / non-financial and qualitative / quantitative aspects were all represented. This means that this approach produced a long term solution that met the strategic, tactical and operational needs of the organisation. In terms of the requirement driven approach, List et al.'s (2002) view was summed up as follows:

"A monopolisation of the user-driven development methodology is risky and must be avoided, as it generates performance information that reflects the organisational level of the people involved. Therefore, selected measures, dimensions, the level of granularity and the targeting level of the organisational hierarchy are very unstable. The methodology has a bottom up tendency, because most employees do not see the organisation from a broad angle, theirs is a narrow minded, egocentric point of view."

Clearly, this is a very forthright recommendation to avoid a user driven approach. However, this is difficult to reconcile with the knowledge that the executives are themselves users who have articulated requirements. Their requirements start at the strategic level and the data driven approach ensures that the data required to support those requirements is made available through the tactical and operational levels, ensuring drill down capabilities. The 'goal' in the goal driven approach is the articulation of the strategic aims of the organisation, which is the base for formulating information requirements. List et al. (2002) essentially state that information users at the operational level of the organisational hierarchy cannot articulate strategic information requirements but information users at the strategic levels can articulate those requirements. This being the case, the user driven or requirements driven approach, per se, (albeit executive information users) is not a worthless exercise but if the data warehouse is to accommodate the organisation's strategy then it is essential to consult from the top down. Their study also indicates that neither Inmon nor Kimball's approach alone will deliver a strategically aligned warehouse.

Guo, Tang, Tong and Yang (2006) draw on List et al.'s (2002) study but prescribe a more balanced methodology. Guo et al.'s (2006) triple driven methodology is illustrated in Figure 20, which requires that all three approaches be used to draw on the strengths and eliminate the weaknesses of each approach individually. Crucially, Guo et al.'s (2006) aim is to ensure that the methodology delivers a data warehouse that adheres to the principle of best practice that the 'project must fit with corporate strategy and business objectives' (Weir et al., 2003).




Source: Guo et al., 2006, p. 61

Figure 20. Triple Driven Methodology

As Figure 20 illustrates, this methodology requires that the Goal Driven phase precedes both the data driven and user driven phases, which occur in parallel. Guo et al. (2006) state that the Goal Driven stage produces both business requirements analysis and conceptual schema. The Data Driven stage is more technically oriented producing detailed data analysis and logical data models. The User Driven phase deals with business requirements too but at a level closer to business processes and serves to validate the logical data model.

The stages of the triple driven methodology are summarised as follows (refer to Figure 20):

1.1 (Goal Driven phase) Develop Corporate Strategy – this requires that the organisation's strategy be articulated and expressed in measures that will help the organisation achieve its goals. While List et al. (2002) found that this was an expensive exercise, Guo et al. (2006) acknowledge that it is difficult to coordinate senior management to articulate the organisation's corporate strategy and is by its nature political. A possible solution to this is to examine the organisation's published strategic aims and try to manage what will be "fragmentary" meetings with the organisation's senior management.

1.2 (Goal Driven phase) Identify Main Business Fields – The aim of this stage is to identify business initiatives that the data warehouse can support. These initiatives will be central to the organisation's strategy.

1.3 (Goal Driven phase) Define Key Performance Indicators (KPIs) of Each Business Field – The KPIs are metrics translated from the business initiatives that the data warehouse will be supporting. The rationale is that if the organisation can monitor and influence the KPIs then the business will realise that business initiative.

1.4 (Goal Driven phase) Identify Target Users – This stage simply focuses on finding those individuals who will use the data warehouse and are capable of contributing to the User Driven stage.

1.5 (Goal Driven phase) Identify Subject Areas – This step is required to define the type of information required by identifying the subjects that the data warehouse will hold data about. By identifying the subject areas it is possible to "semantically" map data tables to those subject areas.

1.6 (Goal Driven phase) Key Performance Indicators – Guo et al. (2006) consider this to be the key deliverable from the Goal Driven phase, as the KPIs will be broken down in the logical data model produced in the Data Driven phase.

2.1 (Data Driven Phase) Identify Data Source Systems – The purpose of this stage is to identify potential source systems that will eventually feed data into the warehouse.

2.2 (Data Driven Phase) Classify Data Tables of Each Source System – Having classified data source tables by subject area, Guo et al. (2006) recommend classifying the data tables by the following types:

Transaction Tables – Record customer transaction with the organisation.

Component Tables – Typically identify the "who", "what", "where", "how" and "why" of a business event.

Report Tables – Hold transaction data at a summarised level to help build reports.

Classification Tables – Code tables that are dependent upon data held in the component table.

Control Tables – Typically define user roles and rights along with system parameters.

2.3 (Data Driven Phase) Delete Pure Operational Tables and Columns – These tables are deleted, as they serve no purpose in populating the data warehouse.

2.4 (Data Driven Phase) Map the Remaining Tables into the Subject Areas – The difference between this step and 2.2 is that a table may appear in one or more subjects, as the table may act as a link table among subjects.

2.5 (Data Driven Phase) Integrate the Tables in the Same Subject Area to Form Each Subject's Schema – The aim here is to integrate tables from different source systems to reflect one subject area.

2.6 (Data Driven Phase) Subject Oriented Enterprise Data Schema – This is the key deliverable from the Data Driven methodology, which is a schema "composed of multiple integrated schemas of each subject formed in step 2.5".

3.1 (User Driven Phase) User Interview – Meet with the users identified in step 1.4 to elicit business requirements.

3.2 (User Driven Phase) Reports Collection and Analysis – Collect reports from various departments to build drive out the extent of the business user's information needs.

3.3 (User Driven Phase) Business Questions – This is a business requirement prioritisation phase where the user can highlight the hot topics affecting the business.

3.4 (User Driven Phase) – Analytical Requirements Represented by Measures and Dimensions – The information gathered from users and reports is analysed and the

measures and dimension identified, which are used to validate the logical schema produced from the Data Driven phase.

The final step in the triple driven methodology is to combine the results of the goal, data and user driven methodologies to produce a complete, subject oriented logical data model.

Guo et al. (2006) cite four advantages of the triple driven approach:

1. This approach takes account of the organisation's strategic aims and delivers a data model built for the future.

2. The involvement of the business users helps to ensure user acceptance of the warehouse.

3. The outcome is that the warehouse is flexible enough to support a wide range of business analysis needs.

4. The design captures all specifications.

The publications by List et al. (2002) and Guo et al. (2006) are important because they highlight the fact that neither the Data Driven nor the User Driven approach will deliver a strategically aligned data warehouse. This means that both Inmon and Kimball's prescribed methodology may produce a data warehouse but it is unlikely to be strategically aligned unless there is, at least, a Goal Driven phase to articulate the strategic aims that the warehouse is expected to support. This is required to provide the greatest amount of business benefit for the long term.

However, List et al. (2002) and Guo et al. (2006) have found that the Goal Driven phase is costly and difficult to manage. This is due to the cost of occupying high level managers in workshops or meetings to articulate their organisation's strategy, which can be a politically charged affair. Indeed, that's if it is at all possible to gather senior management in one room. Guo et al. (2006) concede that data warehouse professionals may have to rely on reading published material on, for example, the corporate web site and arranging meetings where possible. This is not a particularly robust way of delving into the organisation's strategic goals, which are so important to the long term data warehouse solution.

It is also felt that both papers fail to deal with the problem of which data warehouse architecture to select. As an analogy, List et al. (2002) and Guo et al. (2006) provide a rationale for how to build a car and what should be in it with the exception of the engine. Some guidance should be given regarding what engine to select.

### 5.2.2 A Configuration Approach

Miles and Snow's Ideal Types are configured around the way that they manage the entrepreneurial, information systems and administration challenges. Each of the Ideal Types has a particular perspective that allows us to anticipate the key issues affecting an organisation depending on the configuration that it is aligned to or trying to move towards. It is therefore possible to anticipate the context for the warehouse and who the key decision makers will be and this helps determine the priorities for the data warehouse. In this section, a more comprehensive methodology is proposed for the implementation of a strategically aligned data warehouse that addresses a number of the difficulties experienced by List et al. (2002) and Guo et al. (2006).

The Configuration Approach is a comprehensive framework for implementing a data warehouse, influenced primarily by the Triple Driven Methodology (Guo et al., 2006), which is illustrated in Figure 20 and Kimball et al.'s (1998) Business Dimensional Lifecycle. Guo et al.'s (2006) Goal Driven element is replaced by a Configuration Analysis phase (see Section 5.2.2.1), as the Goal Driven phase is unable to demonstrably deliver strategic alignment. The Configuration Analysis phase is a new approach that clearly articulates an organisation's strategic objectives that need to be supported by the data warehouse. The transformation of those objectives into a strategically aligned data warehouse is dependent upon executing both the Requirements Driven Development and Data Driven Development phases, which are wholly based upon Guo et al.'s (2006) Data Driven and User Driven elements. This is in acknowledgement of the need to find a balanced approach instead of pursuing either the data driven approach, as prescribed by Inmon (see Section 4.1.3) or Kimball's requirements driven approach (see Section 4.2.3). Inmon and Kimball do not acknowledge the existence of alternative approaches but this study accepts that, practically, both approaches must be mutually supportive.

The Configuration Approach is unique in that the choice of data warehouse architecture is based upon the Configuration Analysis phase. Having made the architectural choice, the data warehouse project must then design and implement the appropriate hardware

and software. The practical steps required to carry out these tasks are derived from Kimball et al.'s methodology (see Figure 10) but are adapted to meet the needs of the Configuration Approach. Guo et al. (2006) fail to rationalise the choice of data warehouse architecture, and in so doing, fail to acknowledge that the architecture is a strategic investment. The Configuration Approach addresses this issue but appreciates a number of practical implementation steps offered by Kimball et al. (1998). The final stage of the proposed approach is the Governance phase, which emphasises the need to build incrementally but under the stewardship of a governance framework. Again, no other methodology includes governance in the development framework but it is essential to control the data warehouse's development. The Configuration Approach is described, in full, in the remaining sections of this chapter.

#### 5.2.2.1 Configuration Analysis

The Configuration Approach to implementing a data warehouse is illustrated in Figure 21. The first stage of nine is Configuration Analysis and the role of this stage is to ensure that the warehouse is developed according to the needs of the target configuration and helps measure progress of the drive towards full strategic alignment. Consequently, Configuration Analysis is not a one off event but a means of both establishing and monitoring an organisation's configuration throughout the lifelong development of the warehouse. As Figure 21 indicates, the objective of this stage is to define the target configuration for the organisation. The establishment of the configuration provides the list of Strategic Issues that the organisation will need information about if it is to manage the organisation effectively towards the target configuration. The data warehouse can only be considered to be fully aligned when it can be demonstrated that the warehouse provides information and analysis across all of the given Strategic Issues. Realising the goal of strategic alignment will take time, as data warehouses must be built incrementally (Weir et al., 2003). This means that strategic alignment will require tenacity and clarity of thought / direction.

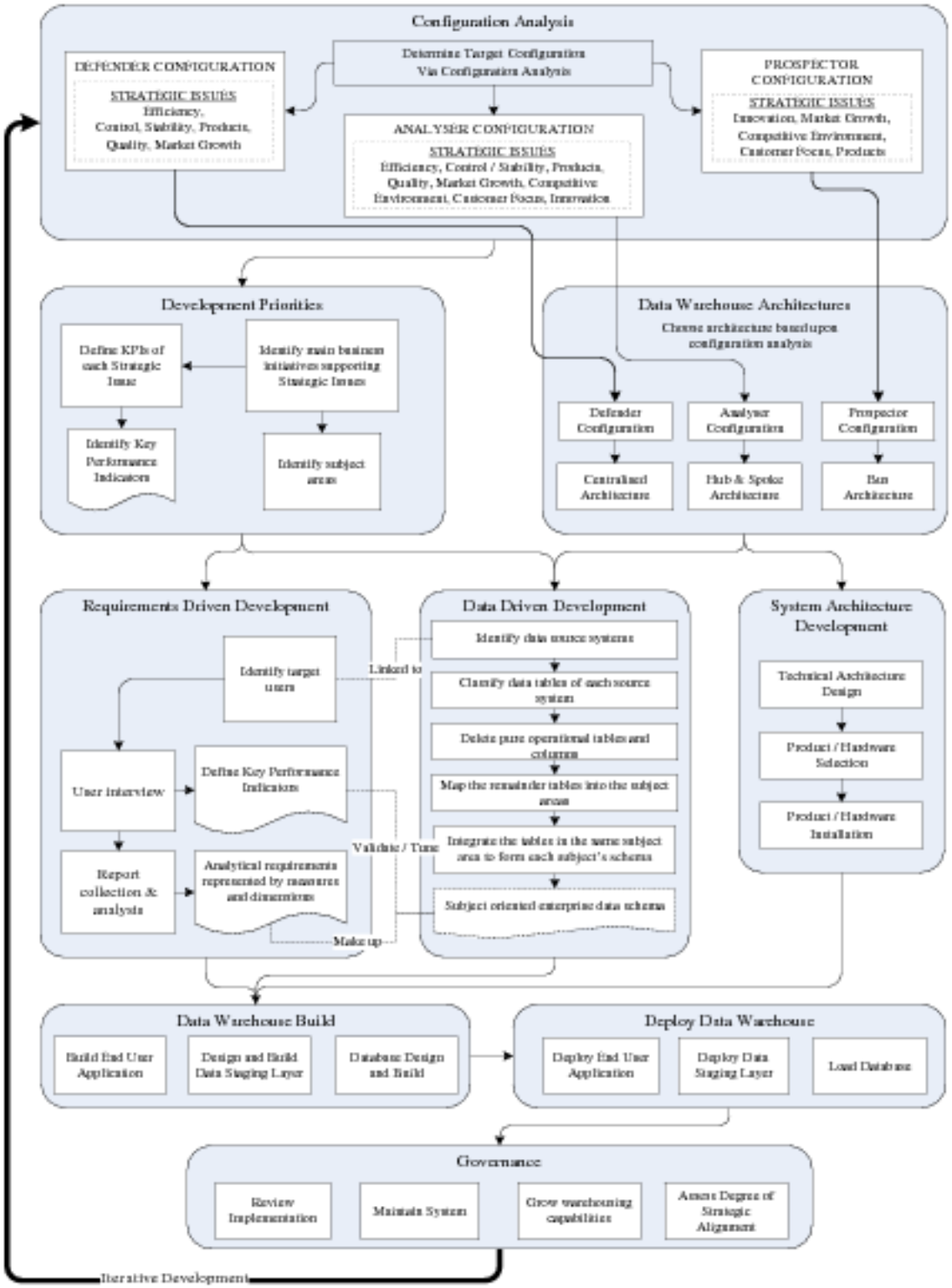



Figure 21. Configuration Approach

This is a key difference between the Configuration Analysis stage and the Goal Driven stage of the Triple Driven Methodology, as the Goal Driven stage is very much reliant upon what executives of an organisation are prepared to impart about the organisation's

strategy. This, as List et al. (2002) and Guo et al. (2006) have conceded, is a difficult, expensive and political task. The Configuration Analysis is different in that we know that the organisation will be pursuing an organisational type; the question is what configuration and how far away is that organisation from its target, and consequently what strategic issues does the organisation need information about to manage them effectively? Chapters 5 and 6 deal with these questions comprehensively and in a manner that addresses the difficulties experienced by List et al. (2002) and Guo et al. (2006) i.e. how to establish a common view on organisational strategy and evade the political machinations that influence that process.

The Strategic Issues have been broken down into sub issues in Table 5. This is not an exhaustive list and should be reviewed and revised to reflect the industry in which the organisation operates. The choice of Sub Issue is influenced by topics raised in configuration papers published by Doty et al. (1993) and Miller (1987). Each of the Ideal Types will manage these issues to a greater or lesser degree.

Table 5. Strategic Issues / Sub Issues

| Strategic Issue | Sub Issue | | | | | |
|---|---|---|---|---|---|---|
| Efficiency | Human Resources | Finance | Process | Productivity | Inventory Management | IT Management |
| Control / Stability | Risk | Compliance | Planning | Procurement | | |
| Products | Product Features | Service Features | Delivery Channels | Product Lifecycle | | |
| Quality | Complaints | Production Faults | Service Levels | | | |
| Market Growth | New Product Sales | New Customer Acquisition | New Markets Penetration | Existing Product Sales | Existing Market Penetration | Customer Retention |
| Customer Focus | Customer Profile | Customer Relationship Management | Customer Promotions | | | |
| Competitive Environment | Competitors Products | Competitor Pricing | Potential Markets | | | |
| Innovation | Research & Development | DataMining | | | | |

In the Triple Driven Approach Guo et al. (2006) state that it is necessary to Identify the Main Business Fields (Figure 20, Stage 1.2), as it is these initiatives that will be supported. Guo et al. (2006) provide examples of 'business fields': Customer Relationship Management (CRM), Risk Management (RM), Asset Liabilities

Management (ALM) and Finance & Performance Management (FPM). Each of these 'fields' or initiatives has its roots in a business function i.e. CRM – Marketing, RM – Risk Management / Compliance, ALM and FPM – Finance. However, it is not clear what is to be achieved from each of these initiatives; how do these initiatives complement each other? How do they make the organisation more effective? By identifying the business field, it should be possible to understand how that field / initiative will help address the strategic issues faced by an organisation. If it addresses one or more issues this is only one step, as each organisation type has to face a number of strategic issues in its management of the entrepreneurial, information systems and administration challenges. As it stands, Guo et al.'s (2006) approach is more focussed upon how the data warehouse will support the business initiative and while it is agreed that this is necessary, it is also necessary to critically assess the various initiative's contribution to the management of the Strategic Issues. The 'goal' in the Configuration Approach is to align the data warehouse with the organisation's target configuration and not with any one business initiative. Accordingly, under the Configuration Approach, any consideration that is given to business initiatives is an assessment under Development Priorities.

#### 5.2.2.2 Development Priorities

Having established a target configuration and the governing set of Strategic Issues, the business representatives and data warehouse implementation management team must identify the supporting business activities and initiatives. In the previous section it was highlighted that Guo et al. (2006) had found that their case study organisation had initiated their CRM, RM and ALM initiatives. Table 1 helps to classify these initiatives into the Customer Focus and Control / Stability categories. From this, it is possible to analyse and elicit the data / information needs required to support those business initiatives and will drive the warehouse development. It should be acknowledged that a data warehouse development is an iterative process, which means that not all business initiatives can be accommodated and so it is the responsibility of the data warehouse management team to prioritise the deliverables through the incremental development process. Whatever decisions are taken about the development priorities, it will be possible to ascertain which of the strategic issues are being addressed.

The elicitation of data requirements can commence by defining the Key Performance Indicators (KPI) and/or identifying the subject areas that comprise the aforementioned business initiatives. Guo et al. (2006) prescribe defining the KPIs from the business

initiatives currently being undertaken by the subject organisation. However, where an organisation needs to change strategic direction, it is imperative that the KPIs remain supportive of the relevant Strategic Issues. It should be borne in mind that the KPIs are designed to monitor and act upon events that affect the pursuit of the business initiatives. The only requirement at this stage is to describe the KPIs in broad terms, as the full details will be documented during the Requirements Driven Development. At the same time, some effort should also be given to identifying the subjects that the data warehouse will hold data about. It may be that the subjects can be identified having ascertained the pertinent KPIs.

The identification of KPIs and relevant subjects at a higher level essentially amounts to a break down and analysis of the relevant Strategic Issues and provides a view of what the data warehouse will deliver. It is also an opportunity to prioritise what will be delivered and when. To this end, it is important that business and IT managers are included in this assessment and that this stage ends with agreement on the deliverables.

#### 5.2.2.3 Data Warehouse Architectures

While the Development Priorities are being agreed, the system architects must consider the architectural options in view of the results of the Configuration Analysis. As we have previously stated, the Centralised Architecture is appropriate for the Defender, the Hub and Spoke Architecture is supportive of the Analyser configuration while the Bus Architecture fits well with the Prospector configuration. In any event, the architects must be sure that the skills are available to deliver the technical platform and investigate the hardware and software solutions.

By this stage of the data warehouse development, there will be a clear view of what the development priorities are and the platform required to support that solution. The next phase is more detailed.

#### 5.2.2.4 System Architecture Development

It follows that having made the architectural choice, a more in depth design stage is required to put the infrastructure into place that will deliver a robust technical platform. In essence, the architects need to consider the database sizing and performance issues together with matters of integration with other systems within the systems estate. It follows then that the appropriate products may be selected, purchased and installed according to the timescales dictated by the project.

5.2.2.5 Requirements Driven Development

In parallel with the architectural development, the Requirements Driven Development will be underway extending the efforts made to prioritise the deliverables. As the requirements stem from the needs of the business users, it is necessary to first identify those who will be able to expand and define the aforementioned KPIs, as they will help the Business Analysts deliver a detailed requirements specification, including report designs and logical data model. It should be noted that this stage requires the active participation of business users in the definition and review of requirements.

Miles and Snow's typology also helps us to fulfil the task to Identify Target Users. Clearly, it is not possible to identify individuals but those individuals are likely to be sourced from the departments of the guiding coalition or dominant business functions. This means that for organisations aligned to or pursuing a Defender configuration, the guiding coalition will be comprised of Production / Operations and Finance, while the remaining organisational functions have a less influential role. The Prospectors guiding coalition is very different to that of the Defender, as Marketing and Research & Development make up the core of the guiding coalition. Typically, the Analyser has to find the balanced approach but it is Marketing that holds the balance of power along with Applied Research but Operations will have some presence. What can be seen from the guiding coalitions is that those with most power will dominate the information requirements of that type of organisation and the data warehouse will be built, in the first instance, in a way that satisfies the guiding coalition. As a result, it is possible to anticipate that the users to be included in the development will primarily come from the same functions as the dominant coalition. This does not exclude the information needs of other departments but the data warehouse will be developed according to the needs of the most powerful functions within the organisation.

5.2.2.6 Data Driven Development

The Data Driven stage compliments the Requirements Driven Development by investigating the systems that the business users operate to elicit the data that can deliver the KPIs and data identified in the Requirements Specification. However, it is equally important that the Data Driven Development focuses upon eliciting the range of data lying within the subject areas identified in the Development Priorities stage. Clearly, the right source systems need to be identified before classifying the data tables from each source system according to the subject areas. As Guo et al. (2006) indicated the next step is to remove purely operational tables to reveal the important data

elements. The penultimate step is to integrate the tables from the source systems, subject area by subject area in an effort to build the subject oriented enterprise data schema. As Figure 21 indicates, the schema must support the information requirements produced through the Requirements Driven Development.

#### 5.2.2.7 Data Warehouse Build

Figure 21 clearly shows that The Requirements Driven Development, Data Driven Development and Systems Architecture Development culminate with the Data Warehouse Build. The reports and KPIs specified in the Requirements Driven stage will be the subject of the end user application development, which includes static reports and dashboards with drill down functionality. The data staging layer requires the appropriate hardware and software be implemented in order to support the Extract, Transform and Load (ETL) application. At the centre of this build work is the database schema that will store the data.

#### 5.2.2.8 Deploy Data Warehouse

In accordance with any systems development, the systems must be tested prior to implementing in the production environment. Each of the build steps will be replicated at the time of implementation and marks the end of that particular development.

#### 5.2.2.9 Governance

The objective of Governance is to ensure that the data warehouse is managed and developed effectively. This means that a management team will be established to make decisions about the ongoing development prioritisation, planning, communication and resource demands. The governance team are also responsible for ensuring that the data warehouse is developed in line with the organisation's strategic objectives. Kight (2005) summed up the role of the governance team as follows:

- Ensure that data warehouse projects align with the long term vision and key business objectives of the enterprise
- Set principles and policies that govern data warehouse use in the entire enterprise
- Ensure an enterprise wide business perspective in formulating and supporting data warehouse technical initiatives
- Ensure that the right projects are done at the right time

- Monitor and evaluate project deliverables
- Communicate regularly with stakeholders
- Ensure that corporate data standards are followed, ensure data integrity and quality, and facilitate resolution of cross functional business data ownership
- Be data warehouse 'champions'; remind decision makers and end users of the long term benefits
- Ensure adherence to the organisation's guiding principles
- Manage business and IT expectations

While a number of these points are management tasks, the objectives of the governance team are captured within the governance stage in Figure 21. The arrow from Governance back to Configuration Analysis is a reminder that data warehouse developments are iterative and that alignment to the organisation's strategic objectives is an ongoing task along with the other responsibilities of the governance team.

### 5.2.3 Summary

The Configuration Approach is driven by the need to understand an organisation's strategic position in greater depth before developing the data warehouse. The Goal Driven approach acknowledges the need to align the data warehouse with strategic objectives but does not attempt to define the range of issues that an organisation has to address in its day-to-day activities. Miles and Snow's typology provides us with descriptions of configurations that were found to be the most common configurations and remain valid since their publication in 1978. The key Strategic Issues have been identified that affect each of the organisational types' ability to achieve greater effectiveness and have asserted that the data warehouse should be built to deliver data / information that will support the decision making behind the management of those issues. By following this approach, alignment is not left to chance, as the strategic issues that are being addressed can be identified as well as those that are not. Alignment is not the satisfaction of one or two strategic issues but the range of issues that affect the organisation's configuration. Best Practice determines that the warehouse must be built incrementally, which means that the supply of data across all strategic issues will take time, but what has been defined is the roadmap / development strategy for each of the organisational types.

In addition, it can be seen from the Configuration Approach that Inmon and Kimball's preferred approaches to building a data warehouse will not deliver a strategically aligned warehouse. The data driven and user (requirements) driven approaches clearly have their place in the Configuration Approach but each cannot exist on their own without some loss of development focus, as it is the combination of all three approaches that provides a comprehensive development methodology.

The next step in this thesis is to put the configuration principle into practice. The following chapter describes the functionality of a questionnaire that was developed to fulfil the Configuration Analysis i.e. align an organisation to an ideal organisational type.

# 6 Configuration Questionnaire

In the previous chapter, it was stated that an organisation's configuration should be accounted for before choosing a data warehouse architecture. The architecture chosen must be compatible with the organisation's information systems infrastructure and their strategic aims i.e. there is strategic fit. The data warehouse architecture is the means of supporting the organisation's data / information needs and so, it essential that the right infrastructure is put in place to manage the data. As has been indicated in the previous chapters, organisations make wrong architectural choices but no explanation is given for this. An attempt to resolve this problem has been made by first determining the configuration of the organisation in order to understand what the organisation needs.

In this chapter, the rationale behind the construction of a questionnaire is presented where the objective is to pose a manageable set of questions that can collectively provide us with a configuration profile of an organisation.

## 6.1 Foundations of the Questionnaire

The questionnaire is principally based upon Miles and Snow's ideal types, which were described in the previous chapter. Miles and Snow provide rich descriptions of organisations labelled as Defender (D), Analyser (A) and Prospector (P), which lie on a D A P continuum. The reason that D, A and P are ideal organisational forms is because they are configured to manage their Entrepreneurial, Information Systems and Administration challenges consistently. Put another way, the characteristics of the ideal types complement each other to form a synergy that gives them strength. As a result, the questionnaire is split into questions relating the Entrepreneurial, Information Systems and Administration challenges.

The following sections outline the rationale behind the Entrepreneurial, Information Systems and Administration challenges, while the detailed characteristics are contained in Appendix 3 – Profile Analysis.

### 6.1.1 Entrepreneurial Challenge

Each organisation has to take full account of environmental forces that shape the way the organisation interacts with it but ultimately, it is the organisation that chooses the market to which it will bring goods and services (Miles & Snow, 1978, pp. 5–9). Organisations are said to 'enact their environment' (Miller & Whitney, 1999a). The Entrepreneurial Challenge refers to the choices that an organisation faces to make sure that it successfully satisfies the needs of its chosen market. These choices are affected by a wide variety of environmental factors, each of which uniquely affects an organisation's responses. It is the responsibility of executive management to align the organisation to the environment to achieve the best return for its investment in its chosen market (Miles & Snow, 1978, pp. 18-19).

The entrepreneurial choices are categorised as follows:

Entrepreneurial challenge and solution – summarises the problems that an organisation faces while engaged with stable and/or volatile markets and the typical solution for each ideal type.

Domain establishment and surveillance – refers to the key characteristics of the product / market domain and the degree to which an organisation will scan the market for opportunities and threats.

Growth – outlines the growth expectations in relation to market stability.

Costs and benefits of the entrepreneurial solution. This section highlights the problems associated to a particular strategy and the vulnerability of the Defender, Analyser and Prospector.

### 6.1.2 Information Systems Challenge

The solution to the Information Systems Challenge is the delivery of a system that supports decisions made to resolve the Entrepreneurial Challenge. This means developing a system or systems that enable the delivery of products or services to the

chosen market. However, systems do not simply support the delivery of products or services, as they are also required to support information delivery and communications.

As the organisation develops and grows, those systems will need to continue to support the organisation's needs. Therefore, those responsible for the ongoing management of the Information Systems Challenge need to be mindful of the continuous support required to resolve both the Entrepreneurial and Administration Challenges (Miles & Snow, 1978, p. 22).

### 6.1.3 Administration Challenge

Each organisation has to implement an operating model that defines processes and other administrative activities that are required to keep the organisation stable and functioning effectively.

Miles and Snow state that the ideal situation is where management can implement an administration solution that fully supports existing business activities without becoming so engrained that it prevents the organisation from readily adapting to future organisational needs (Miles & Snow, 1978, p. 23).

The administrative choices are categorised as follows:

- Administrative challenges and solutions – outlines the key characteristics of the Administration Challenge.
- Dominant coalition and managerial succession – identifies the power structure in each of the ideal types and their approach to filling those roles.
- Planning – the degree of and time spent planning provides a good measure of how quickly an organisation has to respond to its market.
- Structure – Structural rigidity characterises an organisation's attitudes towards its target market. For example, flexible organisations are quick to respond and closer to customers that those organisations with bureaucratic and inflexible structures.
- Control – the degree of control exercised provides some insight into the amount of responsibility delegated to employees at lower levels of the organisation.
- Coordination and conflict resolution – this is an area that reveals how decisions are made and by whom. For example, in Defenders, senior management are very much aware of activities and problems at lower levels of the organisation and are the key decision takers.

- Costs and benefits of the administrative solution – typically, it is the Defender that is most cost conscious, as this drives profitability.

## 6.2 Defining the Questions

The approach to defining questions for the questionnaire is illustrated by Appendix 3 – Profile Analysis, which contains the detailed characteristics of the ideal types, constructs from Doty et al.'s study (1993) and Miller and Whitney's (1999a) strategic imperatives. Appendix 3 is split into five sections i.e. Sections A – E; in Section A, the characteristics of each of the ideal type profiles is detailed, having been sourced solely from Miles and Snow's text (1978). Miles and Snow's structured approach has been followed, so Section A of Appendix 3 contains the characteristics of each of the ideal types categorised under Entrepreneurial Challenge, Information Systems Challenge and Administration Challenge and then sub categorised under the categories outlined in Section 6.1.

Section B simply considers the characteristics and enters a means of measuring those characteristics along a continuum like scale. For example, the Defender competes on price and quality while the Prospector cannot generate the levels of efficiency required to compete on price. From this, a method of measuring efficiency (high focus on efficiency – low efficiency focus) and cost consciousness (high focus on costs – lower cost focus) is proposed along a scale that reflects the focus of the ideal types.

Having started to identify characteristics that can be measured, due cognisance is given to the work conducted by Doty et al. (1993). In their study, Doty et al. developed a measurement method, which was used to validate Miles and Snow's ideal types as a means of measuring effective organisations. Their paper highlights the issues that their model covered but not the lower level detail e.g. questions or metrics. In Section C of Appendix 3, Doty et al.'s list the issues is identified, which act as a check to ensure that the same issues are covered, at least.

In Chapter 2, Section 1.1.2, the strategic imperatives identified by the configuration theorist Miller (1999b) were introduced and summarised. Section D highlights the key characteristics of the Environmental, Organisational Structure, Leadership and Strategic imperatives and are reminded that relationships exist between these constructs. In effect, this is used as a control to ensure that the questions posed provide sufficient coverage to gauge organisational configuration. The results of this analysis are a list of subject areas

in Section E that are used to categorise questions. As Section E illustrates, the characteristics have been reduced to a group of subject areas that focus on issues that help us to determine an organisation's configuration and facilitates our objective to keep the questionnaire manageable.

The final step was to use the subject area headings in Section E to develop a list of questions that would reveal an organisation's approach and attitudes to a particular subject. For example, under the Planning subject area, the question is asked:

Which of the following best describes this organisation's planning process?

In this case there are three possible answers:

Response A - Plan > Act > Evaluate

Response B - Plan > Act > Evaluate & Evaluate > Act > Plan

Response C - Evaluate > Act > Plan (e.g. prototyping)

Each of the responses represents the typical action of an ideal type i.e. Response A = Defender, Response B = Analyser and Response C = Prospector.

In Appendix 4 – Questionnaire, all eighty seven questions are detailed together with the range of possible answers.

## 6.3 Questionnaire Structure

The questionnaire was constructed in Microsoft Excel 2003 using VBA to code the functionality, which is detailed in a functional specification in Appendix 5 – Functional Specification.

In summary, the questionnaire fulfils the following tasks:

1. Automatically takes the respondent to the welcome page, where the respondent can either 'enter' the questionnaire or simply exit and close the workbook.

2. If the respondent enters the questionnaire for the first time, he / she is taken to page one for the first question.

3. There are nineteen pages of questions and the respondent can opt to save and exit the workbook at any time. The respondent may also exit without saving, which will clear all responses.

4. When the respondent clicks the 'Next' command button, a function stores the 'A' – 'G' response and looks up a numerical value for that response. The numerical values are contained in a decision table, so if the respondent answers A and C, there is a corresponding numerical score associated to AC.

5. The next page of questions cannot be displayed until all questions in the current page are complete. An error message lets the respondent know which question has been omitted.

6. When the last question has been answered, the respondent clicks the 'Next' button and enters the closing page. A message is displayed "Thank You for Completing the Questionnaire" and the respondent is invited to enter their name and department. Their name is not compulsory but their department is. It is useful to know the respondent's functional perspective.

7. Finally, the respondent is invited to send the completed workbook to my Napier e-mail account, which is detailed on the final page.

8. A completed workbook will have stored and saved all responses and their associated numerical values.

9. If a respondent exits and saves the questionnaire before it is complete, he / she may open the questionnaire again to complete it. When the questionnaire is re-opened, the respondent will always be brought back to the welcome screen and when the respondent clicks 'Enter', a message appears stating that they can restore the saved values i.e. start where they left it or start at the beginning. If the respondent starts at the beginning, all stored values are erased.

10. If the respondent opts to start where they left off, a function is called to restore the values and displays the correct page.

11. The questionnaire has been completed for the ideal Defender, Analyser and Prospector together with maximum and minimum values. These responses and scores are contained in the workbook beside the columns where the respondent's

scores will be stored. The storage of these values enables a comparison of respondent's values with the ideal profiles.

12. The minimum and maximum scores make it possible to place the Defender, Analyser and Prospector along the minimum to maximum continuum. When the respondent enters the final page of the questionnaire, a function is called that takes the respondent's score and finds its location on the continuum.

13. The total score is also subdivided into scores for the Entrepreneurial, Information Systems and Administration challenges. So, the total score for the ideal organisations and the respondent's organisations may be compared as per point 12.

The objective of the questionnaire is to reveal an organisation's configuration along the D-A-P continuum. This requires the construction of a continuum but the decision was made to construct three continua representing the Entrepreneurial, Information Systems and Administration Challenges. The reason for opting for three continua instead of one is that it is more difficult to interpret the influences of the Entrepreneurial, Information Systems and Administration Challenges in one continuum. If three continua are produced, this ensures that the user can see the scores individually.

To produce the continua, it was necessary to be able to plot the minimum and maximum points in the continua and the produce scores for each of the ideal types. The minimum score is derived by selecting answer A only for all questions and the maximum score is calculated by selecting all possible answers. The scores for the ideal types were produced by completing the questionnaire according to the characteristics of the Defender, Analyser and Prospector. Altogether, these scores allow for the continua to be constructed.

In order to aid the interpretation of the subject organisation's position on each of the continua, the continua are subdivided into seventeen sections (see Appendix 4 – Configuration Continua Examples). Table 6 contains the label for each section in the Entrepreneurial continuum with a corresponding rationale in the adjacent column.

Table 6. Entrepreneurial Segments

| Segment Label | Rationale |
|---|---|
| Reactor | Scores are moving away from recognised organisational profiles |
| Poor Entrepreneurial Score | Defensive but very introvert |
| Conservative Entrepreneurial Score | Defensive score but moving towards a more introvert profile |
| Operating in Niche Market | Score is close to ideal profile |
| Signs of Venturing | Scores show signs opening up to new markets |
| Defensive D/A | Occupies middle ground between Defender and Analyser but still has Defender characteristics |
| Analytical D/A | Occupies middle ground between Defender and Analyser but moving towards Analyser characteristics |
| Good Balance but Cautious | Good Analyser profile but needs more balance |
| Good Presence in Core and New Markets | Close to the ideal Analyser profile |
| Signs of Prospecting | A shade more innovative than the ideal Analyser |
| Analytical A/P | Occupies middle ground between Analyser and Prospector but still has Analyser characteristics |
| Prospecting A/P | Occupies middle ground between Analyser and Prospector but moving towards Prospector characteristics |
| Cautious Prospector | Good Prospector profile but slightly more cautious than the ideal Prospector |
| Expected Market Leader | Close to the ideal Prospector profile |
| Ambitious Prospector | Operates in slightly riskier markets |
| Failing Prospector | Operates in very volatile markets |
| Reactor | Profile not appropriate for an effective Prospector |

The same exercise is repeated for the Information Systems Continuum labels (see Appendix 4) in Table 7 and the Administration Continuum labels (see Appendix 4) in Table 8.

Table 7. Information Systems Segments

| Segment Label | Rationale |
|---|---|
| Reactor | Scores are moving away from recognised organisational profiles |
| Poor Information Systems Score | Very inflexible |
| Conservative Information Systems Score | Efficient but very restricted flexibility |
| Efficient Systems | Efficient but supportive of Defender's needs |
| Signs of Venturing | Scores show signs of flexibility |
| Defensive D/A | Occupies middle ground between Defender and Analyser but more aligned to Defender's needs |
| Analytical D/A | Occupies middle ground between Defender and Analyser but moving towards Analyser's needs |
| Good Balance but Cautious | Good Analyser balance but weighted slightly towards efficiency |
| Good Mix of Systems Efficiency & Flexibility | The ideal Analyser balance |
| Signs of Prospecting | A shade more innovative than the ideal Analyser |
| Analytical A/P | Occupies middle ground between Analyser and Prospector but still has Analyser characteristics |
| Prospecting A/P | Occupies middle ground between Analyser and Prospector but moving towards Prospector characteristics |
| Cautious Prospector | Good Prospector systems flexibility but slightly more cautious than the ideal Prospector |
| Fluid Systems Infrastructure | The ideal Prospector infrastructure |
| Underdeveloped Systems | Systems too flexible |
| Failing Prospector | Volatile systems |
| Reactor | Profile not appropriate for an effective Prospector |

Table 8. Administration Segments

| Segment Label | Rationale |
|---|---|
| Reactor | Scores are moving away from recognised organisational profiles |
| Poor Administration Score | Very inflexible |
| Conservative Administration Score | Effective but very restricted flexibility |
| Fully Supports Defensive Infrastructure | Effective and balanced administrative balance |
| Signs of Venturing | Scores show signs of flexibility |
| Defensive D/A | Occupies middle ground between Defender and Analyser but more aligned to Defender's needs |
| Analytical D/A | Occupies middle ground between Defender and Analyser but moving towards Analyser's needs |
| Good Admin Balance but Cautious | Good Analyser balance but weighted slightly towards efficiency |
| Good Mix of Administration Flexibility | The ideal Analyser balance |
| Signs of Prospecting | A shade more innovative than the ideal Analyser |
| Analytical A/P | Occupies middle ground between Analyser and Prospector but still has Analyser characteristics |
| Prospecting A/P | Occupies middle ground between Analyser and Prospector but moving towards Prospector characteristics |
| Cautious Prospector | Good administrative flexibility but slightly more cautious than the ideal Prospector |
| Fully Supports Prospecting Infrastructure | The ideal Prospector infrastructure |
| Ambitious Prospector | Administrative infrastructure too changeable |
| Failing Prospector | Unreliable organisational infrastructure |
| Reactor | Profile not appropriate for an effective Prospector |

The segments in the continua also serve to illustrate how consistent the scores are between the Entrepreneurial, Information Systems and Administration challenges. This is an important issue, as the organisation draws strength from the consistency between the scores. The functional specification details how the scores were normalised, which made it possible to compare the scores in the continua. The added benefit of this approach is that consistent normalised scores across the three continua enable us to assert that there is a strong relationship between the data sets. The strength of the relationships is essential when determining the effectiveness of the configuration.

When considering the characteristics of Miles and Snow's organisational types, the focus of attention was given to the ideal types. Miles and Snow identified a fourth organisational type, the Reactor but they do not provide a detailed description of this organisational form. It seems that a Reactor can have many representations. It may be suggested that weak relationships between the Entrepreneurial, Information Systems and Administration data sets may be one way of identifying a Reactor. However, it is not possible to state the point at which a less effective configuration becomes a Reactor. In Table 6 to Table 8, the term Reactor is used to denote a score at the extreme ends of the continua. This term is used because it indicates that the score reflects a situation where the scores are moving away from any of the ideal profiles. This potentially represents another way of identifying Reactor behaviour.

The questionnaire described in this chapter was completed by the case study organisation, the results of which are described in full in Chapter 6.

# 7 Case Study

The author was contracted to work for Menzies Distribution for a four month period throughout the analysis phase of a data warehousing project. It was during this time that the organisation agreed to participate in the study by completing the author's questionnaire. In the following section, some background information is provided, which is readily available from the organisation's website and the author's observations during the time of employment. This information provides some context to the results of the questionnaire, which are presented later in this chapter.

## 7.1 Organisational Profile

Menzies Distribution has operated a long established and successful supply chain business. Until recently, the organisation was the market leader but has since lost that position to one of its two major competitors and while there are a number of smaller organisations that provide similar services, these are confined to particular segments of the market.

### 7.1.1 The Organisation in 2006

The core business is to receive goods from suppliers then allocate and distribute those goods to numerous retail outlets accordingly. As would be expected with any supply chain business, it is essential that the process is efficient and that the supply and re-supply of goods is both accurate and timely. These goods are distributed on a sale or return basis, which means that the retailer is given credit for any unsold items.

Therefore, it is the responsibility of the organisation to collect and account for unsold items on the supplier's behalf and dispose of the unsold goods. This is a service for which there is little or no means of recovering costs. It is therefore, in the interests of the supply chain organisation to allocate the goods to the retail outlet as accurately as possible, in order to minimise the return of unsold goods and maximise throughput.

The organisation has a central base with a number of rather autonomous branches spread across the UK and into Ireland. Those branches state that they provide a service that accommodates local needs, which has perhaps contributed to the continued autonomy of the branch network. The branch, while centred on the supply chain function, is supported by a management and administration function, which is in turn, supported by the functions domiciled at Head Office. The Head Office functions includes the Executive, IT, Finance, Marketing and Operations Management. Those branches operate continuously throughout the year, except Christmas Day, providing a time critical service to both the supplier of goods and the retail outlet.

There are two customers that have to be served, the supplier of goods and the retailer. At present, the supplier is the more powerful of the two, as the supplier dictates how many items will be distributed to the retail outlet. It is also the supplier who awards the distribution contracts to the supply chain organisations, which means that the retail outlet has to receive the goods from the supplier's choice of supply chain organisation. The power therefore lies with the organisation allocating the contracts. Despite this, the retail outlet must receive a high level of service, as it is essential to the supplier that the goods are distributed according to specific delivery instructions.

It was observed that the organisation is cost conscious and recent appointments in key managerial positions e.g. IT Director and CEO had signalled a period of change for the organisation. Two signs of change include the development of a goods allocation system that allows greater centralisation of this operational function. This is driven by both the need to provide a service that helps the retailer manage its stock control and introduce a more efficient service through centralisation. The second sign of change is the reason behind the development of the data warehouse. The organisation already has a management information system, which is built using a relational modelling techniques but, over the years, it has developed into an operational system making it difficult to extract data from it and deliver information either regularly or on an ad hoc basis. The frailty of the MI system has been exposed by competitors, who have realised the power and competitive advantage of making data and information readily available to an appreciative audience. The issue here is that the organisation has had to react swiftly to competitive forces, which in itself is unfamiliar ground.

### 7.1.2 Changing Environment

The loss of the position as market leader and declining retail sales are significant factors in the organisation's attempt to revive the company's fortunes. This has resulted in a strategic review, the implementation of which will increase the organisation's competitiveness. The loss of the market leader position is largely due to their competitor's investment in technology. Technology is one enabler of competitive advantage as, in this case, technology is not only the key to supply chain efficiency, it enables faster access to greater amounts of data for analysis and decision support. In this respect, Menzies feel the competitive strain because their difficulty in extracting and presenting data or reports is fully exposed. Their rivals are leading the way and dictating the pace in the delivery and content of management information to the suppliers. Hence, the focus on delivering a data warehouse. Added to that, the organisation was investigating the options for introducing new core technologies such as Enterprise Resource Planning (ERP), which would be in keeping with the pursuit of greater efficiency and competitiveness. It could be argued that the organisation should implement an ERP before the data warehouse, as the data source for the warehouse will have to change in parallel with each phase of the new ERP implementation. However, the delivery of the data warehouse before the ERP system, perhaps illustrates the pressure to react to the increasing demand for data and information. Indeed, the data warehouse could become a customer facing system.

While there has been a power shift between rival supply chain organisations, there is an impending change that will affect all parties in the industry, which is due to be implemented by the Office of Fair Trading (OFT). The OFT has, for 3 to 4 years, been assessing the competitive structure of the industry and has intimated that it cannot continue to operate in its present form (OFT, 2006). The balance of power prevents the retailer from exercising choice about what they want to order and sell. The OFT is preparing to introduce measures that will redistribute power more equitably, which could also affect the distributors traditional geographic domains.

## 7.2 Questionnaire Results

The questionnaire was presented to six senior Menzies Distribution employees. It was requested that four employees complete the questionnaire based on what they know about the company's activities, as at October 2006. Two employees were asked to

complete the questionnaire as they envisage the organisation in three and five year's time.

Two employees completed the questionnaire based on what they know about the organisation's activities at the time of completion (October, 2006) and one person provided their vision of the organisation in three year's time. It was stated, by the respondent, that the three year vision represents how the organisation will be if they successfully apply all of the anticipated organisational changes. It is reasonable to assume that this response may be equally representative of the five year view.

Section 7.1, presents an outline of the organisation and the key issues affecting the organisation. This is the backdrop that helps us to put the questionnaire results into context and helps to explain the appropriateness of the organisation's configuration for the challenges ahead. In Sections 7.2.1 to 7.2.4, the results of the questionnaires are presented and the configuration that each of the respondents portrays. Section 7.2.6 evaluates the results of the questionnaire completed to reflect the three year vision. The summary table for each of the respondents is shown in the Appendix 7 entitled Respondent's Scores.

### 7.2.1 Entrepreneurial Challenge Results (2006)

There are five subsections that collectively examine how Menzies manages their entrepreneurial challenge.

#### 7.2.1.1 Customer Commitment

At present, Menzies Distribution is committed to providing a narrow range of products / services to profitable market segments. That market is considered to be niche where the customers are both cost conscious and demanding of a high quality of service. There is agreement between respondents that while the customer base is currently stable and predictable, the trading environment is becoming increasing competitive. At present, the threat to stability appears to be twofold. In the first instance, competitors have found a way of stealing a competitive advantage by employing systems that enable greater centralisation and therefore, efficiency e.g. reduced duplication of effort. Those systems have also increased the availability of data and information, which is being used to enhance the service they already provide. Competitors are better able to engage with their suppliers through enhancements in the flow of data and information, which improves their standing when contracts are being negotiated. Secondly, the impending implementation of the OFT ruling will have the effect of opening up geographical

boundaries and potentially shifting a measure of power to retailers. The OFT ruling could change accepted industry practices to give retailers the choice in whose services they buy.

The distribution channels offered to the customer base are considered characteristically efficient both operationally and financially. At the same time, it is thought that Menzies' distribution systems offer standard services, in comparison to the rest of the industry. It is also felt that there is a small degree of innovation where new systems and approaches will be adopted if they can improve the service and / or levels of efficiency. For example, it is known that a new goods allocation process was being tested in a branch, which would potentially be rolled out to other branches.

In terms of distribution channels, the responses were focussed on distribution, as it relates to the supply chain i.e. the core business. The questionnaire did not define distribution channels but the term could be applied to the methods used, excluding supply chain, to communicate with all customer types. The distribution channels, with the exception of the supply chain, are an area where the level of customer commitment may be less effective. Customer commitment manifests itself through the execution of an efficient supply chain and less so on other points of contact. It is worth noting that each branch has an administration team that communicates regularly with retailers and suppliers. At Head Office, there are many individuals who also deal with customers, including Marketing and Operations. There are numerous points of contact or service distribution channels that ought to be assessed for their effectiveness.

These results indicate that the customer commitment is centred upon the efficiency and effectiveness of the supply chain but by the respondents' admission, their supply chain services are no more than that which would be expected within the industry. This appears to be the basis of their customer commitment. Competitors have extended their customer commitment by implementing new technologies that will help improve supply chain efficiencies and deliver data and information that helps their customers manage their business. Competitors are using data effectively because it has become a product or service that adds value, which in turn, is putting pressure on competitors to at least follow suit. This illustrates that the case study organisation's customer commitment is more limited in scope than that of competitors'.

As yet, the OFT ruling has still to be realised and so it is not possible to gauge the impact and the responses of the supply chain organisations. What is clear is that the industry will have to adapt and seek out a position of strength in the restructured market. This may result in the launch of new products and services and a shift of power from the supplier of goods to the recipient of those goods. This will require a revision of the customer commitment.

7.2.1.2 Understanding Customer Needs

The degree of commitment afforded to customers can be assessed by the amount of information gathered to understand their needs. With regard to understanding existing customer needs, there was agreement that some statistical analysis and complaints help to alert the company of opportunities to service needs. Competitor analysis and informal information gathering within the organisation is also thought to contribute to this understanding. However, it is clear that Menzies do not actively engage their customers with marketing initiatives and are more likely to be reactive than proactive. With regard to prospective customers, there is a lack of consensus over the methods used to identify potential customers' needs. However, the information gathering methods tend to be a mixture of statistical analysis, complaints, informal information gathering and competitor analysis. This is an important issue, as Menzies appears to rely on measures that keep the organisation rather distant from their existing and prospective customer bases. This suggests that Menzies do not feel that they need to apply advanced marketing techniques designed to bring the organisation closer to the customers at either end of the supply chain.

Simply gathering information, in itself, is not a measure of organisational effectiveness. How that information is used to satisfy customer or market needs may be assessed when considering the Sales and Growth Rate responses in Table 9:

Table 9. Growth Responses

| | Growth Area | Responses |
|---|---|---|
| 1. | Acquisition of New Customers in New Markets has: | 1. We have not pursued new customers in new markets<br>2. Grown quickly over a short period of time |
| 2. | Sales of Existing products / services in New markets has: | 1. We have not attempted to sell existing products to new markets<br>2. Developed a healthy market share in a short period of time |
| 3. | Sales of New products / services in New markets has: | We have not attempted to sell new products to new markets |
| 4. | Acquisition of New Customers in Existing Markets has: | 1. We have not tried to acquire new customers in existing markets.<br>2. Declined dramatically |
| 5. | Sales of Existing products / services in Existing markets has: | 1. Declined dramatically<br>2. Declined, in real terms, over the last 3 financial years |
| 6. | Sales of New products / services in Existing markets has: | 1. We have not developed new products / services for our existing markets<br>2. Declined dramatically |

In Table 9, items 1 to 3 deals with the acquisition of new customers and the sales of existing and new products in new markets. The responses to 1 and 2 are rather polarised. It is the clear impression of one respondent that Menzies currently has no business interests in new markets. However, one respondent feels that the sale of existing products to new customers in new markets has been successful. Both agree that Menzies has not developed new products for sales in new markets. It is possible that this indicates a rather limited foray into a new market that has not become part of the core business. It is also possible that the new market has been interpreted as a contract won in a new geographical area to provide supply chain services. The former is, perhaps, more significant, as it would indicate that Menzies are, on the basis of information gathered, looking to develop new markets. However, the lack of consensus between responses does not lead us to believe that Menzies is seeing the results of a new strategy to develop new markets.

In terms of existing markets, items 4 to 6 clearly indicate that the acquisition of customers and sales of new or existing products / services is either in serious decline or there is simply no activity. It has been assumed, therefore, that information gathered about existing and prospective customers is ineffective in helping the organisation halt a decline in sales or provide a means of acquiring customers. It may be that the

information gathered helps to refine quality issues and resolve problems but the value of the information gathered is questionable.

Despite the failing sales and customer acquisition figures, Menzies' brand primarily represents a stable and dependable organisation that endeavours to provide high quality and cost effective services. The organisation knows this to be the case because they gather information that confirms that they deliver high quality products / services at competitive prices with good after sales service. Essentially, this is the basis of Menzies commitment to its customers.

The organisation's ability to deliver on its customer commitment is dependent upon market stability and operational efficiency. They are also dependent upon services being developed through customer requests, reacting to customer behaviours and responding to information that has been gathered informally. Significantly, Menzies are aware of competitor activity, which perhaps gives the organisation ideas of what products and services they should be providing independent of customer prompting but they do not employ sophisticated competitor analysis methods to be able to react quickly to competitor activities. Similarly, these factors are also drivers for internal procedural changes. There is a strong impression that listening to customers and the pursuit of operational efficiency are the key factors that help to mould the organisation's configuration, as it strives to defend and retain its customer base. The organisation's ability to protect its customer base from competitors is crucial, given the weak growth responses highlighted in Table 9. To that end, the organisation primarily scans their own market for business development opportunities that will help deepen the current commercial relationships. One respondent did indicate that other unrelated markets will be explored but collectively, the responses would suggest that this is not a priority issue.

7.2.1.3 Customer Satisfaction

Menzies is concerned that the customer experience is not just satisfactory. They want the customer to be more than happy with their engagement with the organisation [primarily the distribution service] and that they have the opportunity to let Menzies know of areas for improvement. This indicates a willingness to change albeit at the customer's behest. However, results indicate that Menzies' customers have not acknowledged that their expectations have been surpassed. This may be due to the fact that Menzies are more reactive than proactive in engaging with their customers, to the extent that customers initiate change. It is interesting to note that the concept of after

sales service has different meaning to different departments within the organisation. On the one hand, an after sales service is considered an opportunity to develop customer relations and differentiate themselves from competitors. On the other hand, an after sales service is also viewed as a failure to get things right first time and subsequently, an unnecessary expense. This highlights a lack of unity in dealing with customers. Again, Menzies seem content to gather information about customer experiences from a distance by initiating external surveys and monitoring customer behaviour.

This is perhaps validated by the fact that Menzies' customer relationship strategy is largely undefined. With more definition it is expected that the strategy would help develop knowledge about customers and enable increased sales opportunities. An undefined strategy clearly indicates that customer contact is haphazard and not currently a matter of strategic significance. This result lessens Menzies ability to engage meaningfully with its customer base, despite the fact that they desire exceptional customer relations.

In Table 9, it can be seen that the business has not been experiencing substantial growth in customer acquisition, new product sales or sales of existing products. The lack of a well defined customer relationship strategy indicates that Menzies do not have the vehicle to deepen or strengthen the relationships with the existing customer base. This is confirmed by the fact that customer contact has only led to moderate changes in the product range and has done little, if anything, to change buying habits. In terms of operational processes, one respondent feels that the customer relationship strategy has had little effect on operational processes, while the other considers that there has been some impact and that it has helped become more focussed on the customer. Even if the impact on operational processes is slight, it could be argued that Menzies have listened and reacted to customer needs. However, it is clear that customer relations are more reactive and too haphazard to be considered positively influential in the development and growth of the organisation.

7.2.1.4 Competitor Orientation

Based on the results so far, it is surprising that a respondent should feel that competitive forces are managed by 'leading change in the current market'. Bear in mind that this is an organisation that has lost its market leader status. However, the respondents also clearly state that efficiency and customer satisfaction are factors in managing

competitive forces, which is entirely justifiable where customers are cost conscious and the supply chain service is time critical.

The source of information gathered to help manage competitive forces appears to be primarily confined to employee feedback and periodicals / journals. By omission, respondents indicated that little formal competitor analysis is carried out. This perhaps indicates that the organisation feels rather insulated from the threats of competitive forces. Indeed, Menzies' customers are more likely to lead change than the actions of competitors, as senior management tend to observe competitor activities out of interest than a potential driver of change. The exception is that management are aware that their competitors are realising the benefits of recent investments in a data warehouse and ERP systems. This awareness is now driving an initiative to investigate the possibility of following their competitor's ERP example, while a data warehouse project is now underway.

Despite the apparent lack of formal competitor monitoring or analysis, the loss of their position as market leader does mean Menzies is aware of the competitors' hold over the market and their threat to the stability of current trading conditions. It was pointed out during an interview that Menzies is not particularly good at advertising their commercial successes and while they may compare themselves with the competition in their marketing material there may be a need to declare the company's successes and project the brand image more aggressively. Another problem that Menzies face is their ability to act upon competitor and customer analysis. As will be seen in Section 7.2.3, existing systems prevent product or service developments from being implemented quickly.

#### 7.2.1.5 Innovation

While the questionnaire specifically presents questions focussed on innovation, it is known from the responses under Section 7.2.1.1 that Menzies' market does not demand high levels of product or service innovation. It is more important to be highly efficient than highly innovative and to a large extent this is the ideal that drives profitability. Innovative developments are expensive, speculative and an inappropriate endeavour for a customer base that is not prepared to pay a premium for that product or service. It can be seen that Menzies is not an innovative organisation, in the sense that they do not have research and development functions and do not look to bring products and services to markets that they would not normally be associated with.

However, innovation can be focussed internally and externally. An organisation that attempts to drive the market through its innovative products and services has an external focus and competes almost solely on that basis. Internal innovations tend to be focussed upon looking for ways to improve the efficiency of systems and processes or effectiveness of customer communications or business development initiatives. In Menzies case, it is reasonable to expect to see internal innovations, primarily to improve the efficiency of the supply chain.

Innovations may also be viewed as radical or incremental (Johannessen, Olsen & Lumpkin, 2001). Radical innovations tend to be developments that have a significant impact on the industry by driving change. When asked if Menzies had introduced radical innovations, the respondents agreed that Menzies had introduced significant changes to the production or supply chain process. The effect that this has had on the industry is not known but it seems to be consistent with their drive for efficiency. One respondent indicated that Menzies had introduced radical changes to the services that they provided. Again, it is not possible to gauge the effects on the industry as a whole, but given the growth rates over the last three years, a significant return on that investment can not be seen. Indeed, a question was raised as to whether Menzies had received industry awards for innovation but they had not. That's not to say that awards are the only measure but they are one measure where the industry can acknowledge advances within the industry.

Incremental changes are significant to the organisation but less so to the industry. It is, perhaps, a measure of willingness to adopt new methods and apply new concepts to improve organisational efficiency and effectiveness. In this regard, the respondents stated that Menzies has introduced new methods of production and ways of organising.

### 7.2.2 Information Systems Challenge Results (2006)

The information systems challenge focuses on the degree to which an organisation invests and develops its information and / or production systems. In essence, for each ideal organisational type, the systems infrastructure will have an optimum degree of sophistication if it is to compliment the organisation's strategic ambitions. For example, the Defender will have rather more sophisticated systems in the pursuit of efficiency than the Prospector, whose systems need not have reached significant levels of sophistication.

The results of the questionnaire have been plotted on the information systems continuum in Appendix 8. Each department's view of the information systems challenge, as at October 2006, is consistent i.e. their results lie in the 'Signs of Venturing' section of the continuum, close to the Defender profile. In this section of the continuum, the respondents have indicated that there are other systems priorities than simply the delivery and maintenance of high levels of efficiency. Although, efficiency still has a strong influence on managing the information systems challenge.

The responses to the information systems questions are presented in the following sections.

7.2.2.1 System Developments

Over the last three years, the priority for the IT budget has been the development and enhancement of core technologies but funds have also been allocated to some new technology initiatives. Some of those funds may have been used to create information from data held in source systems but this does not appear to have been a high priority investment. The information generated has been for control purposes rather than aiding business development initiatives, which fits well with the perceived need to drive out systems and operational inefficiencies. It is also clear that the organisation is not greatly influenced by the latest technology developments and that funds are more likely to be directed to the enhancement of existing systems. This perhaps indicates that the organisation does not view new technologies as significantly better than they already have or the effort to change to adopt new, leading edge technologies would cost too much and cause too much disruption, thus undermining the efficiency of supply chain operations.

The need for efficiency is a strong theme running through the entire organisation and this is backed up by the fact that the systems developments are rarely implemented with the need to employ manual workarounds. Implementations that require manual workarounds imply that systems developments are perhaps subject to time constraints or that an organisation is prepared to accept small to moderate levels of operational inefficiencies. The respondent's clearly indicate that systems developments should contribute to the efficiency of the organisation. That said, the systems in operation are not so rigid as to contribute to strict standardisation of roles and responsibilities throughout the organisation. It is known that the systems accommodate regional or

branch variations in procedure, as it is important to branch staff that they can accommodate customer needs at a local level.

Striking a balance between the need for efficiency and a degree of flexibility is difficult to achieve. However, the balance appears to be on the need for efficiency, as the respondents acknowledge that while they are efficient, product or service developments are slow and costly to implement. Whatever flexibility is built into the current systems has been achieved over a long period of time, which makes systems complex and difficult to change. This means that the organisation will be slow to react to sudden changes in the market. At present, the product or service lifecycle is long but changes within the industry may impact the current level of stability.

7.2.2.2 Role of IT

At present, the role of IT is to maintain the existing systems and make changes at the behest of customers and the other organisational functions. Theirs is a role that does not search for technological innovations that could improve operational efficiencies or provide innovative business development options. IT concentrate on what they have and do not deviate lightly, which is a perfectly valid approach for an organisation that operates in a niche market and relatively stable trading environment.

In section 7.1.2, the respondents indicated that the trading environment has and / or is in the process of changing. This being the case, the role of IT and the systems that they maintain may have to change too, in order to accommodate a more aggressive trading environment. The respondents indicate that the organisation is highly dependent upon its IT staff but one respondent has acknowledged that new skills may be required to accommodate the impact of changes within the industry. New IT skills imply the need for new technologies.

It was interesting to note that IT is not subject to service level agreements. While these are not essential for the running of the organisation, it does appear that performance standards have not been defined in a way that creates accountability to the customers of IT. When considering the response that the systems are the subject of staff and customer complaints it becomes even more apparent that the systems, while supporting operations efficiently, are not satisfying the needs of all interested parties.

The need for efficiency is a strong theme but the position on the information systems continuum indicates 'Signs of Venturing'. This can be attributed to the

acknowledgement for new skills, the fact that the organisation has implemented new systems to manage the value chain activities and the current data warehouse project. The knowledge that the organisation will be investigating ERP solutions may also have been a factor. In any case, the data warehouse will help to alleviate some of the dissatisfaction with the delivery of information.

While at the organisation, the author found that the organisation had built a data repository some years ago but this had been built relationally and could not readily deliver data to the business for analysis. Indeed, the data repository had become an operational system, so the existing data repository had evolved into a management information system that is not fit for its decision support purpose. This not only helps to explain the organisation's lack of ability to access data but highlights the fact that the MI database design skills lie in relational methodologies and not dimensional modelling skills. It was noted that the design skills that are more appropriate to data warehousing are not actively practised in the organisation.

### 7.2.3 Administration Challenge Results (2006)

Configuration theory states that the most effective organisations will be those that manage the entrepreneurial, information systems and administration challenges consistently. The results of this questionnaire illustrate different department's views of their organisation's configuration and the consistency with which each challenge is managed. However, the administration challenge, more than the others indicates a strong lack of consistency between the respondents, as illustrated in the Administration challenge continuum (Appendix 8 – Configuration Continua). This will be examined later in this section.

In the following sections, the respondents' views of how their organisation is structured are presented together with some insight into the policies administered.

#### 7.2.3.1 Planning

The approach to planning helps us to understand how the organisation reacts to its environment. For example, an organisation operating in a volatile environment may not be in a position to methodically plan by taking account of influencing factors, act in accordance with those plans and then evaluate the results at a later date. It may be more appropriate to evaluate a market test, act on the findings and then formalise plans for a longer term approach. The respondents consistently indicated that their organisation will plan, act and then evaluate, which would be expected of an organisation operating in a

relatively stable environment. The lack of multiple aggressive competitors means that the organisation has the time to examine and account for activities within the industry before acting on its findings.

Planning is generally based upon historical analysis but one respondent considered that competitor analysis, technological advances and market opportunities were also accounted for. Generally, the respondents believe that the outcome of the organisation's plans should be higher levels of efficiency and high quality of service. As such, individual's targets will be based upon efficiency targets as well as sales and systems delivery targets.

#### 7.2.3.2 Structure

The effectiveness of an organisation's engagement with its environment is considered to be influenced by the organisation's structure. Organisations will adopt the structure that best supports their activities. A functional structure keeps the organisation's different functions distinct with little cross functional activity. The matrix structure is one where representatives from distinct functional units join together for specific business purposes. Each representative brings a unique set of skills to give the unit cross functional expertise. The divisional structure is common to those organisations that have a diverse range of businesses to manage. For example, Virgin has many business interest (airlines, mobile phones, cosmetics, space travel, etc), which are diverse and distinct from the central controlling body.

When asked which structure best represented their organisation's form, one indicated 'functional' while the other opted for 'divisional'. Certainly, at Head Office the structure is functional but the branches operate like autonomous businesses giving the impression of a divisional structure. Indeed, the systems have been developed to support individual branch needs, as far as possible, but from predominately centralised structure. This accentuates the difficulty in defining the structure.

Under structure, the question of who exercises the most power is considered. The results were very similar to the extent that each respondent agreed that Product Development, Marketing and Operations were the least influential organisational functions. It was agreed that Finance hold the second highest position while legal (inc Risk) and IT are either the most powerful or third most powerful function. Both respondents agree that the structure, as it currently stands, seldom changes.

7.2.3.3 Control

The ability to take decisions at a local level without time consuming reference to Head Office can be a significant trading advantage. In other organisations this amount of power could be seen as a loss of control, which could undermine efficient operations. Our respondents differed slightly in their views over issues of control.

One area of difference was the level of control exercised over capital expenditure. One respondent feels that there is a tight control over capital expenditure, while the other considers that capital expenditure controls are regularly reviewed to accommodate business development opportunities.

Both agree that customer facing staff have increasingly been given more decision making authority. While one respondent believes that there is sufficient management information (MI) to assist those members of staff, it is also believed that the MI has had to be refined over the last three years to support the decision making process. Despite this, one respondent considers that senior management still become involved in matters affecting operational efficiency. The other respondent has stated that there are sufficient controls in place to allow operational staff to deal with operational incidents without referral to senior management. Although, both agree that executive and senior management are still involved in operational decision making. These results highlight that executive involvement in operational issues exists, it is the depth of control that cannot be agreed.

It should be noted that one respondent's answers are somewhat contradictory in that increased decision making authority is being granted and supported by the production of supporting MI. However, it is also stated that senior management are actively involved in decision making to rectify operational incidents. When considering both answers together, it appears that more decision making authority has been granted but senior and executive management still take decisions affecting the efficiency of the organisation.

In order to gauge the effect of these levels of control, two industry specific questions were posed about the performance of Retailer Delivery Times and the levels of fraud. Both respondents agreed that fraud losses have steadily increased but there was some disagreement over the Retailer Delivery Times. One believed that they were improving in line with expectations while the other felt that the performance figures were static. This suggests that the controls do not or cannot be applied effectively in all areas of the business but the supply chain activities are under control.

7.2.3.4 Performance Appraisal

The majority of employee roles in the operational or production environments are codified in job descriptions and bound by operational guidelines, which indicates high division of labour. In line with the drive for efficiency, staff performance tends to be measured on technical proficiency and productivity targets.

7.2.3.5 Administration Continuum Disparity

The responses to the Administration Challenge questions vary, but this can be explained, in part, by some inconsistencies in one respondent's answers.

The first question to be reviewed is question 72 where the respondent indicates that planning takes account of historical analysis, competitor analysis, technological advances and market opportunities. This answer appears to be inconsistent with the answers provided under the entrepreneurial and information systems challenges, where it is apparent that the organisation does not have a great deal of competitor analysis to draw upon, it concentrates on its own rather niche market and technological advances are difficult to apply.

The respondent also felt that senior and executive management were not aware of incidents affecting operational efficiency, as there are sufficient controls in place for the issues to be addresses locally. However, the respondent also indicated that decisions to rectify operational incidents were made by senior management.

The effect of selecting a more consistent response was tested and it was found that the score reduced from 20.56 to 17.74. With reference to the administration continuum in Appendix 8, it can be seen that this moves the respondents score away from the ideal Analyser towards the Defender profile.

7.2.4 2006 Results Summary

In the previous section, the responses were presented of the two respondents, who completed the questionnaire according to their view of the organisation, as at October 2006.

With reference to the continua in Appendix 8, it can be seen that the respondents scores, coloured red and blue, are consistent to the extent that the blue scores lean towards the Defender profile, while the red scores sit to the right or Analyser side of the blue scores. It is felt that the differences between the two respondents can be explained by a number of factors:

1. Length of service i.e. someone who has been in the organisation longer may have greater or lesser degrees of 'optimism' about the organisation's practices.

2. Guilding Coalition i.e. someone who is closer to the organisation's seat of power may be influenced by their knowledge of impending organisational changes.

3. Loyalty i.e. the respondent may or may not want to give an answer that could be interpreted negatively.

4. Breadth of Knowledge i.e. the questions require knowledge of the entire organisation, which the respondent may have but not in depth.

Altogether, the blue scores rate the organisation closely to the Defender profile with very consistent information systems and administration scores. These score do not quite match up with the organisation's conservative entrepreneurial outlook. The red scores tend to plot the organisation towards the centre ground between the Defender and Analyser. The entrepreneurial score are consistent but the administration score is very close to the Analyser's administration profile. However, as has been discussed in Section 7.2.3.5, the score could reasonably be adjusted to 17.74, which would be more consistent with the other 'red' scores. In essence, one respondent scores their organisation as a more effective Defender than the other.

Despite the differences between the respondents, it is clear that this organisation has strong Defender characteristics. Given the strong characteristics of the organisation, the organisation could have been classified as a Defender but a simple classification would not provide a view of the strength of that configuration. One respondent rated the organisation as a highly effective Defender but the company's financial and growth performance is failing. The policies and practices are no longer delivering the expected results, which indicate that all the ideals that have been good for the organisation need to be reviewed. Indeed, there are clear signs that environmental forces will have a significant role in determining the nature of the organisation's most effective configuration. The OFT ruling referred to in Section 7.1.2 will have the effect of changing the structure and power within the trading environment. The competition has found a new way of competing, not on the execution of the supply chain but by supplying customers with data and information to improve decision making.

What this means is that the organisation's chosen trading environment is changing both forcibly by the OFT and within the industry. What can be drawn from the organisation's configuration is that a very good Defender profile is not the correct profile for the current trading environment. Therefore, any changes implemented to rectify the fortunes of the organisation should not simply have the effect of reinforcing the Defender profile. Those changes need to move the organisation towards the new configuration. The trading environment has created a new entrepreneurial challenge, which must be addressed while resolving the information systems and administration challenges.

In Section 7.2.2, it is apparent that the organisation has a strong dependency upon market stability, efficiency and the influence of competitor activity. The only factor that the organisation has control over is efficiency i.e. the organisation can make changes to processes that affect organisational efficiency. This organisation is vulnerable to the effects of market destabilisation and increasingly aggressive competitors. It appears that the organisation must try to take more control over these issues.

The details that the questionnaire results provide are crucial to this assessment. Had the organisation been simply classified as a Defender, it would not have possible to determine how strong a Defender configuration it had. In this case, it can be seen that a strong defender profile is not the answer to the organisation's issues. It would have perhaps been easy to try to reinforce the Defender configuration in an effort to improve the situation. The individual entrepreneurial, information systems and administration configurations also provide sufficient detail to understand the consistency with which the organisation addresses these challenges and what it needs to do to change. In terms of the data warehouse, the organisation has taken a decision to implement the technology in an effort to create 'business intelligence'. Here lies a problem, the technological solution is underway but the organisation's configuration appears to be incorrect for the current trading environment. The data warehouse will only help tackle an immediate problem posed by competitors and its extended use will, in all likelihood, reinforce the current configuration.

Fortunately, the vision of the future has been captured in the following sections.

### 7.2.5 Target Configuration

In Section 7.1.2, it is indicated that the questionnaire was completed by three senior members of staff. The results of the two respondents in the previous sections have been presented leaving one more set of results to consider. The third person to complete the

questionnaire did so as a means of presenting their vision of the future assuming that the organisation has managed to successfully negotiate all of the intervening challenges. The respondent is qualified to express this view due to the person's role and level of seniority in the organisation. In terms of time, it is how the organisation will manage their entrepreneurial, information systems and administration challenges in 2010.

### 7.2.6 Entrepreneurial Challenge (2010)

The configuration anticipated by the respondent through the results of the questionnaire are clearly based on what the respondent knows about the industry today and the known environmental challenges. In October 2006, the organisation did not know the precise outcome of the OFT ruling, but enough was known to allow the respondent to anticipate the effects the ruling and what that means for the entrepreneurial challenge. Added to that, the organisation's competitors had already implemented more contemporary technologies, which were yielding a strong measure of competitive advantage.

There may be some other influential factors but it is clear from the following results that this organisation's configuration will change. It is perhaps more accurate to state that the organisation will go through a transformation in order to achieve its strategic goals.

#### 7.2.6.1 Customer Commitment

Over the next few years, the organisation will develop its narrow and highly focussed product / service range into a broader range of high quality products / services but still targeted to highly profitable market segments. As such, it is not expected that the customer demands are likely to change significantly, as cost and quality will still be a significant feature of the customer proposition. That said, the products need to continue to be pertinent to the organisation's chosen market. At present, it appears that any changes in customer's demands may be prompted by the actions of competitors, as it is they who provide customers with the ancillary service of higher quality management information. This has put pressure on the organisation to provide similar levels of service, at least. As will be seen, meeting and anticipating customer's product / service needs appears to have more focus in the new configuration.

By 2010, it is expected that the trading environment will have moved from its stable and predictable status to one of stable and dynamic segments. The loss of market stability will be matched by increasing rivalry amongst competitors. In this environment, the organisation aims to defend its core customer base while endeavouring to at least keep apace with market opportunities. This willingness to follow market developments marks

a change in outlook, as they have previously been content to focus on what they have and defend it.

As a supply chain organisation, it appears to be more sensitive towards the distribution channels, which will be more innovative and at the forefront of industry standards. Cost effectiveness is still a factor but the organisation is aware that they cannot be seen to be relying on increasingly out dated methods and technologies. Indeed, it may be that this organisation will become known for its innovative supply chain activities. Currently, the organisation's distribution facilities are simply typical of the industry but efficient.

7.2.6.2 Understanding Customer Needs

Earlier in this section it was stated that the organisation would bring appropriate products and services to the marketplace. The question is: how will the organisation know that it has the right products and services and how will it know that they continue to do so? That depends on how much information the organisation can glean from the existing and prospective customer bases. It is interesting to note that the organisation plans to make the following changes:

1. Employ more advanced marketing techniques, which will help to capture the needs and wants of those operating in the industry. This means engaging with existing and prospective customers in an effort to develop services that are attractive and commercially viable.

2. Increased competitor activity awareness is another source of information that could help the organisation develop its understanding of the market's demands. This is important in a competitive arena, as the organisation cannot afford to let competitors' business activities lead to significant competitive advantage.

3. Developments in other markets will also provide another source of information. This means that the organisation will look to other supply chain businesses for information that could help shape the organisation's product / service portfolio.

While these sources of information are relevant to existing and prospective customers, the organisation will source more information from the existing customer base in order to refine products and services. Data analysis, complaints and trials of business

development initiatives will play a big part in educating the business. Data analysis and complaints are part of the existing sources but it is likely that data analysis will play a greater part in future than it does now. This is due to the fact that the data warehouse development is not due to be implemented until the 1st half of 2007 and it is known that the existing management information database does not fully support management information needs. Significantly, the organisation will be prepared to test the market before rolling out new or developments to products and services.

7.2.6.3 Customer Satisfaction

These results indicate a significant shift for the organisation, as in 2006, complaints and informal information gathering feature more strongly. The 2006 results led us to suggest that the organisation tends to be rather distant from its customers in terms of gathering information. Under the new configuration, the organisation will have more direct engagement with existing and potential customers, as it is they who will guide the organisation.

The organisation's brand image will continue to represent quality, value and stability but with more dynamism. This does not mean that it will be known for innovations but will have a reputation for being both proactive and reactive in its dealings with customers, which will extend to the industry, as a whole. In order to do so, the organisation will gather information about price, quality, post purchase support activities and their range of delivery channels. It is the focus on the range of delivery channels that will have changed. This means that more effort will be made to understand the effectiveness of the delivery channels for their role in providing good service. The range of delivery channels refers to the fact that there is more than one means of being on contact with a customer e.g. via the supply chain, administration, marketing, relationship managers, etc. This would seem to suggest that customer contact at any level will be under more scrutiny as the organisation monitors the effectiveness of its services.

In 2006, the organisation tended to develop its products and services according to efficiency needs, customer requests and informal information gathering. Competitor activity and advances in technology were also factors but seemed to have less influence. The new configuration requires that all of these matters be influential in product service development and more. Consistent with our findings so far, developments in other

markets and advanced marketing techniques will also play an important role in shaping the way the organisation engages with its market.

The new configuration clearly reflects a change in direction for the organisation as it relies on increased rapport with its customers while delivering an increased range of high quality services. At present, the objective of customer satisfaction is to ensure that the supply chain activities meets customer needs and that those customers have the opportunity to suggest ways of improving those services. This illustrates the reactive nature of the way business is carried out, which is a situation that will be turned around over the coming years. The organisation wants its customers to be more than satisfied with the innovative products and services bought from the organisation. This shifts the emphasis from customers to the organisation to proactively introduce ideas and anticipate solutions to problems. This does not mean that the organisation will not keep the door open to improvements suggested by customers but they will not be wholly reliant on them to keep the customer engagement stimulated. Despite this new and more dynamic approach, the organisation is conscious of the need to ensure efficiency and high service standards. The problem with taking a more innovative or dynamic approach is that success is expensive and this places a greater emphasis on keeping costs as low as possible and increasing sales. There is a balance to be struck and so it is not surprising to find that targets will be set to drive out inefficiencies and increase sales while maintaining customer satisfaction.

One way of maintaining customer contact is to develop an after sales service that delivers benefit to both the organisation and customers. One respondent for the 2006 view of the organisation indicated that the after sales service was considered an expense and an indicator of failure in the prevailing operational processes. In future, a more developed after sales service will enable differentiation from competitors and in essence, becomes a new delivery channel for promoting customer satisfaction, as well as a source of learning. This means that the organisation will not simply record instances of post sales contact, as is the practice in 2006; it will monitor customer behaviour and use various survey techniques to monitor the level of after sales service.

In assessing the 2006 results, it was suggested that there were some inconsistencies among the respondent's results. One instance of inconsistency is the existence of the customer relationship strategy. It was found that it was perhaps more likely that the customer relationship strategy was largely undefined, which will be rectified over the

coming years, as it will be regarded as a vehicle for increasing sales and limiting attrition rates. Indeed, customer attrition rates will have declined in real terms and the customer relationship strategy will have contributed to product / service innovations. It seems that the approach to dealing with customers will become by 2010 more structured and focussed on objectives rather than reactive, as previously discussed.

The measure of how the customer relationship strategy has positively impacted on the organisation are summarised as follows:

- Increased sales of core products / services
- Increased sales of ancillary products / services
- Information obtained from customers will contribute to the product / service portfolio
- Relations with existing customers will be well defined and highly interactive
- The organisation will be able to attract new customers more effectively

7.2.6.4 Competitor Orientation

The organisation has already encountered greater pressure from competitor activity and the proposed changes by the OFT will ensure that the trading environment becomes increasingly competitive. In 2006, the organisation's main tool for managing competitor activity was to run a highly efficient organisation, which would ensure competitive pricing. Customer satisfaction was also a feature and while these are still significant factors, the organisation will reinforce this by delivering more innovative services and remaining flexible enough to act and react quickly to changes and opportunities in the market.

This more agile response is due to the anticipation that competitors will have become more innovative and there will be new market entrants who will buy in business to get a foothold. It is not the organisation's intention to lead the market through innovations but they will be flexible enough to gather, interpret and react to information gathered about the market and its competitors. Customer behaviour analysis and competitor intelligence will help the organisation keep abreast of market activity, whereas they will have to look to wider economic sources if they are to make innovative improvements to the

supply chain activities. It is the aim of the organisation to be able to implement changes with competitive lead times.

Product and process enhancements and innovations will be testament to the organisation's competitive stance, as will the organisation's willingness to market itself by comparing itself with competitors on marketing materials. Allied to this is increased authority for line management to instigate change, albeit with a planning and approval framework.

Despite the increased focus on organisational flexibility and innovative, the organisation's competitive advantage will be rooted in efficiency, competitive pricing and quality. This is undoubtedly a difficult balance to achieve.

7.2.6.5 Innovation

Throughout Section 7.2.6, it is clear that the new configuration requires that the organisation become more innovative both in terms of the products and services it brings to the market and in terms of the way that it manages and executes the supply chain.

Johannessen et al (2001) classify innovations as either radical or incremental. Radical innovations are those that are perceived to be new to the industry and may be more challenging for the organisation to implement and for competitors to emulate. It is the organisation's expectation that they will have implemented radically innovative changes to the supply chain and the services provided.

Incremental innovations are those smaller changes that tend to be applied to improve internal activities. The amount of market and competitor analysis carried out by the organisation will ensure that products, services and supply chain activities are also affected by incremental innovations.

7.2.6.6 Business Impact

The question is: what does the organisation want to achieve from this new configuration? The following table summarises the growth expectations:

Table 10. Growth Expectations 2010

| | Growth Area | Responses |
|---|---|---|
| 1. | Acquisition of New Customers in New Markets has: | Remain static, in real terms, over the last 3 financial years |

| | | |
|---|---|---|
| 2. | Sales of Existing products / services in New markets has: | Grown steadily, in real terms, over the last 3 financial years |
| 3. | Sales of New products / services in New markets has: | Remain static, in real terms, over the last 3 financial years |
| 4. | Acquisition of New Customers in Existing Markets has: | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. |
| 5. | Sales of Existing products / services in Existing markets has: | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. |
| 6. | Sales of New products / services in Existing markets has: | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force and with the help of marketing initiatives. |

These results show that the organisation does not expect to have the products or services to break into new markets. From the previous sections, it is apparent that there will be significantly more effort put into gathering information from other markets but this will be used to reclaim the customer base and sales volumes that have subsided over the last few years. That does not mean that new markets will be ignored; it merely indicates the impact that the changes will have had over the next three or four years. In short, this organisation will have increased the sales to both new and existing customers with new and existing products and services. It is interesting to note the increased effort required of the sales force to generate sales of new products to the existing customer base.

### 7.2.7 Information Systems Challenge (2010)

Having considered the responses to the projected approach to the entrepreneurial challenge, it is clear that the organisation needs to become more agile and responsive if it is to compete effectively. It therefore, stands to reason that the systems infrastructure should be configured to support the organisation's entrepreneurial ambitions.

#### 7.2.7.1 System Developments

The next few years will see a mixture of investment in core and new technologies to renew the supply chain activities and its supporting functions, as well as the introduction of new products and services. These systems will feed data into the data warehouse to help improve decision support, which will also see continued investment. In essence, there will be a good mix of old and new systems to help support or defend the existing customer base and prospect for new business opportunities.

It was indicated in Section 7.2.6.4 that striking a balance is the key when adopting a configuration that requires agility and speed. Significantly, it is acknowledged that the organisation accepts that there may be some trade off between the ability to implement changes quickly and the pursuit of efficiency, which is contrary to the view of IT developments in 2006.

As previously discussed, the signs of change were already visible in 2006, as the organisation had commissioned the implementation of a data warehouse and were investigating the possibility of implementing an ERP solution. From a data warehouse perspective, there appears to be significant scope for the warehouse to have a considerable impact.

#### 7.2.7.2 Role of IT (2010)

The 2006 view of IT was that they were generally only called upon when systems developments were required. While the role seems to have been rather limited, the influence of IT was considerable since systems developments were subject to lengthy lead times. This role will change to one where they are routinely included in business communications and activities; they will scan the environment for technologies that can help to improve operational efficiencies and develop the product/ service range. Increased business awareness through contact with other departments will help IT to understand their technology needs but they will also have the remit to provide a consultative role in finding solutions. IT staff will, therefore, be valuable for their systems knowledge but will also be required to develop or employ new skills.

The implementation of new technologies will alleviate criticisms of the existing technology infrastructure, which cannot support the business as it starts to feel the need for change. Additionally, whereas IT was not bound by service level agreements (SLA), this will change, as SLAs become a means of measuring performance. However, it is expected that those SLAs will periodically be breached because this can be regarded as an indicator of an organisation pushing new limits.

### 7.2.8 Administration Challenge (2010)

#### 7.2.8.1 Planning

The planning process tells us how urgently it wants to bring its ideas to the market. An organisation that plans, acts and evaluates is slower to act, as the planning process requires that various influential factors be accounted for before acting upon those plans.

The results again take time to review before following the cycle over again. The organisation will continue to follow this cycle, as is currently practiced but it is also intended that they will adopt an evaluate, act and plan approach. This dual approach to planning allows the organisation to adopt appropriate planning procedures that will enable flexible operations. The evaluate, act and plan approach is likely to be used when the market is being tested with new products and services. More formal planning occurs when the results of the test are known.

The whole planning process, regardless of approach will be influenced by historical analysis, technological advances and market opportunities. The plans themselves will be based upon what can be achieved in terms of reducing costs, maintenance or improvements in quality, customer retention and acquisition and the ability to diversify. Allied to the planning process will be the setting of staff objectives based upon increased sales, efficiency targets, technology developments and customer satisfaction levels.

In 2006, planning was focussed upon the maintaining or improving efficiencies, which typifies a more introvert view by dealing with those issues that are primarily in the organisation's control. The projected approach to planning is consistent with the theme running through the approach to dealing with the entrepreneurial and administration challenges.

7.2.8.2 Structure

The 2006 results differed in their view of the organisation's structure i.e. functional and divisional but the projected structure is functional. However, it is not anticipated that the structure will be the same as it is today because over the next few years the organisational structure will be subject to periodic amendments. This suggests that departments and roles within departments will change in response to business development initiatives, internal and external. In particular, it is possible that the nature of the branch network will evolve to accommodate supply chain and product / service innovations. Bearing in mind too that it is anticipated that delivery channels will change, which could see new methods and policies for dealing with the customer base.

Communication in 2006 was generally cascaded 'top down' into functional areas that had fewer reasons to collaborate with other areas than in 2010. Information will continue to be passed down the organisation but greater collaboration between functions will see more cross functional information flows. This is essential to engender greater

organisational and market awareness. Indeed information generated and gathered will have a broader audience within the organisation. This could be construed as one way of breaking down barriers, as functions become more aware of other areas activities. This is important, as staff from those functional areas will be required to share ideas and work together on projects. This is one indicator of an organisation moving towards a matrix structure. Although, in this case, not officially.

In terms of the guiding coalition, the most powerful departments in the organisation will be, in order: operations, marketing, finance, IT, product development and legal / risk. This illustrates the intention to find a balance between generating business and developing opportunities and ensuring that operations can effectively and efficiently support those ambitions. The other departments will provide their specialist support.

7.2.8.3 Control

An organisation that is flexible and responsive requires that the some of the controls that may have been in place in 2006 be relaxed. It is expected that the organisation will not be able to maintain long looped decision support chains. Under the projected configuration, the executive management will rarely become involved in operational issues and there will be sufficient management information to support decision making at line management level. This compares to the 2006 position where executive management had involvement in operational issues and decisions to rectify those issues were managed by executive and senior management only. Clearly, this will require that junior management assume greater decision making authority.

7.2.8.4 Performance Appraisal

It was curious to find that employee roles would continue to be codified in job descriptions and bound by operational guidelines in the new configuration. Along with the increased decision making authority, it was expected that the roles would also exhibit greater flexibility. It could be expected that if the roles are tightly defined there will be little incentive to adapt to the innovations and does not encourage employees to use initiative. Fortunately, performance appraisal procedures will afford a degree of management discretion.

The basis of performance appraisal will be consistent with the organisation's desire to achieve sales, productivity and technical proficiency targets.

### 7.2.9 2010 Results Summary

The projected configuration presents an organisation that has made a clear shift from being rather introvert to one that is more commercially aggressive. The industry challenges require that the organisation becomes acutely aware of competitor activities, technology advances and innovations in the broader macro economic environment; all of which may be used to the organisation's advantage.

Ideas are nothing without action but again, the new configuration has determined that the organisation become flexible and responsive to opportunities and threats, as they arise. This means embracing new technologies, systems and processes that are supportive of an evolving organisation. Added to that, executive management are prepared to hand over control of operational decision making to line management in order to generate speedier response times. This too is supported by a decision support system, which is under construction.

Apart from the maintenance of tightly define role profiles, discussed in Section 7.2.8.4, there is a high degree of consistency in the way that the organisation intends on managing the entrepreneurial, information systems and administration challenges. Consistency is crucial, as it ensure that all of the organisation's entities are moving in the same direction. Miller (1999) stated that configurations are bound by a unifying theme. The theme that once unified the organisation, efficiency, is no longer the driving force behind the organisation. Efficiency meant that the organisation's services would be competitively priced and the supply chain would provide a 'slick' and trusted service. The new configuration indicates that efficiency itself is not enough. They need to strike a balance between efficiency and adaptability, which is typical of Miles and Snow's Analyser profile. Appendix 8 illustrates where the organisation will lie on each of the continua (green marker) and as expected, there is a significant move towards the ideal Analyser profile. Thematically, the organisation will be organised around efficiency and agility.

Having established the target configuration, it can be ascertained that the data warehouse architecture most appropriate to Menzies' strategic needs is the Hub and Spoke architecture. As discussed in Chapter 4, the data is modelled relationally in the Hub to ensure that the volume of data generated by many organisational functions is stored efficiently. The relational model is complex, as there is a high degree of data integration to support cross functional information needs. The Hub is generally not

interrogated directly due to the complexity of the data structures, so business functions access data via dimensionally modelled dependant data marts (Spoke). The data marts only contain the data required by the business function and the dimensional modelling approach ensures that the data can be readily accessed. This architecture is appropriate as it supports the strategic requirement to be both efficient and flexible i.e. the Hub stores data efficiently using modelling techniques that are familiar and complements the source systems' data model structures. The Spokes or dependant data marts can be deployed rapidly, which supports information / decision support needs at the lower levels of the organisation. Accordingly, the Hub and Spoke architecture is wholly supportive of Menzies' target configuration.

# 8 Evaluation and Conclusions

## 8.1 Introduction

This thesis crosses academic boundaries by drawing upon Strategic Management theory to resolve a problem faced by data warehousing professionals i.e. how to implement a data warehouse to ensure maximum business benefit. The aim has been to find solutions to issues from the business side of this equation because best practice states that a successful data warehouse must be aligned to corporate strategy and business objectives (Weir, 2000). There are options and choices to be made in the field of data warehousing and any number of configurations that an organisation can adopt. Although, it is understood that environmental forces have such an influence that organisations tend to move towards common configurations. As Guo et al. (2006) acknowledge it is not enough to simply state that a data warehouse has to be aligned to corporate strategy. When developing Best Practice for Implementing a Data Warehouse (Weir, 2000), it was found that the majority of practitioners and academics would state that a successfully implemented data warehouse will be aligned to an organisation's strategy without elaborating the point. For years, this statement has been made but few have attempted to address this issue, with the exception of List et al. (2002) and Guo et al. (2006).

The solution to this problem, the Configuration Approach, is based upon understanding the architectural and methodology options for building a data warehouse and the issues governing the definition of corporate strategy. Without this understanding data warehouse developments will remain largely technical exercises lacking in business direction. The Configuration Approach is evaluated in the following sections using case study material to illustrate the effectiveness of this strategy led framework. The conclusions in the final section draw this thesis to a close.

## 8.2 Configuration and Data Warehousing

### 8.2.1 Configuration Review

Configuration theory declares that all organisations are unique and yet configuration theorists (Miles & Snow, 1978; Miller, 1987) have found that environmental forces generate common configurations, as organisations rally their resources to compete in common marketplaces. In particular, Miles and Snow's typology, which has been frequently cited in academic journals, was found to be a predictor of organisational effectiveness (Doty et al., 1993). As a result, Miles and Snow's typology has been used to provide the theoretical foundation for this project.

Miles and Snow's typology describes three ideal organisational profiles Defender, Analyser and Prospector; there is a fourth organisational type of Reactor, but this is an organisation that is failing. Each of the ideal types is appropriate for a given set of market conditions and it is the aim of real organisations to adopt a profile as close to the Defender, Analyser or Prospector (as appropriate) in order to maximise its effectiveness. In doing so, the organisation has to manage the entrepreneurial, information systems and administration challenges consistently in the face of ever changing environmental and legislative forces. The characteristics of each of the ideal types provide us with a means to interpret an organisation's strategy and break it down into strategic issues that a data warehouse can support. That support is in the form of data that employees need for informed decision making. Full details of the Configuration School of Strategic Management are contained in Chapter 2.

### 8.2.2 Data Warehousing Review

In the review of Inmon and Kimball's architectures and development methodologies (Chapter 3), two distinct approaches were found for implementing a data warehouse. Inmon prescribed a Data Driven approach, which is a predominately technical exercise of integrating data, subject area by subject area, from disparate operational systems with little input from the business. The objective of Inmon's approach is to build a data warehouse with a hub and spoke architecture. The hub is a central repository built according to traditional relational modelling techniques with dependent dimensional data marts serving business area information needs.

Kimball, on the other hand, has a reputation for having a development approach that is closer to the business. This is due to the fact that business users feature more strongly via the requirements driven methodology, which allows users to articulate their information needs to support the business process that they are aligned to. The resulting data mart is modelled dimensionally and with the control of conformed dimensions, the resulting data warehouse is comprised of a proliferation of linked data marts, known as a Bus Architecture.

Inmon and Kimball's work was analysed because they are the most authoritative in their field, as data warehouses are built using these architectures or earlier versions of what they now prescribe. As Breslin (2004) stated, the differences between the two approaches are "many and deep", which begs the question "how do you choose an approach?" Indeed, this is a question that has been in existence within the industry for many years. While that question remains, it is clear that the industry does not know how that question should be answered. Watson and Ariyachandra (2005) conducted a study of which architectures organisations choose and the rationale behind that choice, and it was found that consultant's preference featured as a good enough reason to invest substantial amounts of money. Perhaps it should not have been a surprise to find that it is not uncommon for organisations to change their choice of architecture before implementation. Unfortunately, the study did not provide reasons for changing from their initial choice of architecture. The full list of reasons for choosing an architecture are contained in Chapter 3.

All of these reasons are perfectly valid points but there is nothing in that list that clarifies what it is about an organisation's strategy that would make a choice of architecture appropriate. Having considered how a data warehouse architecture could support an organisation's configuration, it is recommended that the most appropriate architecture for the Defender, Analyser and Prospector are the centralised, hub and spoke and bus architecture, respectively.

With regard to the methodologies prescribed by Inmon and Kimball, which are described in Chapter 3, it is clear that neither approach can demonstrate that an organisation's strategy has been fully taken into account. Inmon and Kimball are essentially technicians focussed on delivering technically robust warehouses and not strategy driven solutions. Guo et al. (2006) and List et al. (2002) understand this issue and proposed incorporating a Goal Driven phase that specifically accounts for strategic

information needs. Both were clear that neither the User Driven nor the Data Driven approaches will deliver a strategic solution, which supports the analysis of Inmon and Kimball's approaches in Chapter 3. However, it is felt that the Triple Driven approach, while a significant step forward, lays a great deal of trust in the organisation's current business initiatives to act as a proxy for the organisation's strategic objectives. As a result, the Configuration Approach is a methodological model that focuses upon aligning the data warehouse with the management of the Strategic Issues that will drive the organisation towards its target configuration. The Configuration Approach, while focussed on ensuring strategic alignment, also takes account of the need to rationalise the choice of data warehouse architecture. As such, the Configuration Approach calls for data warehouse development choices to be justified in terms of their contribution to strategic objectives.

### 8.2.3 Configuration Approach

The Configuration Approach is described in full in Chapter 4 and is presented in Figure 21. The Configuration Approach comprises of nine components, starting with the Configuration Analysis phase. This phase calls for the target Configuration to be established in order to ascertain the Strategic Issues that need to be managed by the organisation. The data warehouse will be aligned to the organisation's strategy when it can be demonstrated that the data supports decision making across all Strategic Issues. The organisation's current and target configurations can be determined using the questionnaire described in Chapter 5.

Having established the target configuration, it is then possible to finalise Development Priorities and choose the appropriate Data Warehouse Architecture. In any organisation there will be business initiatives that demand employees' attention. The Configuration Approach requires that these initiatives be assessed for their contribution to the management of the Strategic Issues, in order to understand how the data warehouse can provide support while working towards the goal of full strategic alignment. At the same time, the target configuration helps the organisation to choose the architecture that will complement the target configuration. Once the architecture is agreed, the System Architecture Development will proceed through the design, product selection and installation stages.

The Requirements Driven and Data Driven phases take account of Kimball and Inmon's preferred methodologies. The Configuration Approach includes both approaches

because no one approach will deliver the data warehouse. The subject areas and Key Performance Indicators documented in the Development Priority phase will provide guidance as to identify the range of data and the source systems. The priorities will also enable the selection of employees who can make a significant contribution to the development of the warehouse by providing requirements and business 'know how'.

Firm requirements and clear data sources, that are required for the management of the Strategic Issues, will be used by data warehouse development technicians to commence the Data Warehouse Build. This includes the development of databases, reporting applications and extract, transform and load (ETL) tools. Each of these applications and databases will move into the next phase to Deploy Data Warehouse. Once implemented, the warehouse becomes the subject of a committee tasked with Governance. It is the role of Governance to manage the integrity of the data warehouse as it matures through iterative developments.

The following section evaluates the Configuration Approach with the support of case studies and by drawing upon additional information gathered during the author's time of employment at Menzies Distribution.

## 8.3 Evaluating the Configuration Approach

In this section, the Configuration Approach, illustrated in Figure 21, is evaluated by drawing on the data warehouse implementation experiences at First American Corporation [FAC] (Cooper et al., 2000) and Menzies Distribution, who has featured strongly in this thesis due to the role the organisation played in the completion of the configuration questionnaire (see Chapter 6). FAC was described in Chapter 2 and is a good example of a data warehouse implementation that transformed the fortunes of the organisation.

### 8.3.1 First American Corporation

The First American Corporation (FAC) case study validates the Configuration Approach by demonstrating that FAC's success was attributable to the pursuit of an Analyser configuration and that the warehouse development was driven by the need to support a coherent set of Strategic Issues. While the FAC case study was not written with 'Configuration' in mind it can be illustrated that each of the Configuration Approach phases feature in a successful data warehouse implementation project.

8.3.1.1 Configuration Analysis

Cooper et al.'s (2000) case study provides a platform on which to evaluate the Configuration Analysis phase of this approach. While the executives at FAC did not determine a target configuration, they did engage in an analysis of their organisation's place in the market and their competitive challenges, which was forced upon the organisation as a result of their financial difficulties. They found that they did not have the economies of scale to compete on cost alone and differentiation would only deliver short term gains, assuming that they could deliver innovative products. In configuration terms, other banks were in a better position to drive out inefficiencies in their operations, which infers that it would have been unwise for FAC to pursue a Defender configuration. The Prospector configuration was also inappropriate, as FAC knew that any innovations that they could bring to the market would be short lived. Additionally, FAC had financial problems that restricted their ability to invest heavily in driving out inefficiencies or leading the market with innovative products. FAC settled on a customer focus strategy entitled Tailored Client Solutions, which was underpinned by the need to "know its customers exceptionally well and leverage that knowledge in product design, in distribution channel decisions, and in every interaction with its clients". As such, the strategy had four linked components:

1. Client Information (know the client better than anyone)
2. Flexible Product Line (provide what the client needs)
3. Consistent Service (help the client achieve goals)
4. Distribution Management (offer the client preferred channels)

An important feature of this approach was FAC's determination of the strategic objectives before building the data warehouse. In effect, FAC outlined a strategy which had four components bound by a common theme, customer focus. The ability of FAC to enact this strategy was dependent upon the implementation of a data warehouse that could support decision making in each of these areas. While these components lay at the heart of Tailored Client Solutions, FAC were also very sensitive of their financial situation and would not sanction any business initiative unless it could be demonstrated that it was financially viable.

In effect, FAC had determined that Tailored Client Solutions was the solution to their Entrepreneurial Challenge. FAC's Executives knew that survival depended upon their ability to understand what financial services their customers needed at a given stage of their lives and what the appropriate delivery channels should be. This meant that FAC had to design products and services based upon the knowledge of its customers' needs, which if accepted, would result in a strengthening of customer relationships. This was designed to defend their customer base from competitors, whose strengths they were fully aware of. This approach was, in itself, innovative, as FAC embarked on a strategy that was dependant upon the implementation of a new technology (i.e. data warehouse) to become an organisation driven by data. The innovative nature of the strategy is illustrated by the Executive's reluctance to publicise their strategy until they had tested their approach. In terms of planning, FAC acted on their hunch, evaluated their market tests and then rolled out their strategy, which is a characteristic of innovation. This innovative approach was balanced out by the need to exercise considerable financial control over the entrepreneurial activities of the organisation. As has previously been stated, FAC would not sanction commercial activities that could not be financially justified.

FAC's ability to manage the Entrepreneurial Challenge was also dependant upon procedural and policy changes that were made to address their Administrative Challenges. These changes were driven by the need to satisfy customer's interests while making money for the Bank. Accordingly, FAC changed business processes and introduced incentive schemes to emphasise how the Bank wanted its staff to operate. For example, branch staff performance was based upon their ability to sell products and retain customers, which meant that targets were set and reviewed on a weekly basis.

In addition to these administrative changes, it was also made clear that power and responsibility for the achievement of FAC's goals was placed in the hands of the Marketing function. The data warehouse development was led by the Director of Marketing but it is also known that the Finance function also had a position of power, as it was they who assessed business activities to ensure financial integrity. The insight into the power structure at FAC confirms that the Administrative Challenge was being addressed by making changes to the organisation's guiding coalition.

This summary of FAC's entrepreneurial and administrative activities emphasises the following key points:

1. The Executives were pursuing key Strategic Issues wholly attributable to the Analyser profile i.e. Financial Control / Stability, Products, Customer Focus and Innovation.

2. The data warehouse was developed specifically to support the management of those Strategic Issues.

3. The Executives lacked confidence in their strategy i.e. FAC did not have the comfort of knowing that their strategy was supported under the Configuration Analysis.

Clearly, FAC's story is one of success and this can be attributed to the pursuit of a target configuration that required a data warehouse to enable the management of a complementary set of Strategic Issues. Crucially, the data warehouse was specifically developed to be aligned to the newly established Strategic Issues. Unfortunately, the Executives' initial lack of confidence in their strategy delayed the organisation's drive towards the target configuration. Despite this, FAC pursued a target configuration that ultimately delivered competitive advantage that could not have been realised without the support of a data warehouse aligned to enable the management of key Strategic Issues. FAC's Executives' lack of confidence could have been alleviated had they known that their strategy had a firm foundation in the form of the Analyser configuration.

The target configuration, which is the deliverable from the Configuration Analysis using the questionnaire described in Chapter 5, explicitly states what Strategic Issues the data warehouse is required to support. As such, the Configuration Analysis provides direction and purpose for the warehouse development and ensures that alignment to Strategic Issues is a matter of design and not chance. Furthermore, no other data warehouse development approach articulates an organisation's strategy or breaks down the strategy into Strategic Issues for the purpose of directing a data warehouse development. Accordingly, no other development methodology e.g. Kimball or Inmon, can claim to be driven by the strategic interests of the organisation.

#### 8.3.1.2 Development Priorities

As an organisation pursues its target configuration, it will introduce a number of business initiatives designed to move the organisation towards its goals. These initiatives need to be identified and supported by information / data from the data

warehouse. The FAC case study makes it clear that the following business initiatives originated from the Marketing function:

- "Identified the top 20% of its customers who provided virtually all of the customer profits, and the 40% to 50% of those who were not profitable"
- Developed customer retention strategies to retain the top tier customers
- Moved unprofitable customers to lower cost distribution channels, different products and pricing structures. This was done with due consideration for customer needs and preferences
- Developed strategies to deepen the relationships with all customers
- "Redesigned products and distribution channels to increase profitability and better meet customers' needs and preferences"
- Encouraged the use of profitable products
- "Redesigned information flows, work processes and job in order to meet customers' needs"

Unfortunately, the case study does not mention the use of Key Performance Indicators (KPIs) but it is clear that the aforementioned initiatives were measurable, which means that management could monitor the pursuit of these initiatives through KPIs.

FAC's business initiatives also help to demonstrate that there are key Subject Areas about which data would have been captured and made available via the data warehouse. For example, data was required to support decisions about customers, costs, pricing and products. Indeed, it is stated that the "First goal… was to help managers to understand the overall revenue picture".

In the previous phase (Configuration Analysis), it was found that FAC were pursuing an Analyser Configuration where the Strategic Issues of Financial Control / Stability, Products, Customer Focus and Innovation featured strongly. The aforementioned Business Initiatives can be attributed to each of the Strategic Issues, as follows:

Financial Control / Stability – Customers segmented according to their level of profitability and moved to profitable products and distribution channels.

Products – Redesigned and priced products to meet customer needs

Customer Focus – Developed strategies to both retain and deepen customer relationships

Innovation – Redesigned products, distribution channels and business processes

This demonstrates that the value of identifying the Business Initiatives is that no one initiative will contribute to the management of all the Strategic Issues. It is essential to understand the range of Business Initiatives and their contribution to the management of the Strategic Issues, as the organisation moves towards its target configuration. If the data warehouse supports a range of Business Initiatives that can be mapped to Strategic Issues then the greater the degree of strategic alignment.

The Configuration Approach has clearly established the link between FAC's Strategic Issues and their Business Initiatives, providing a means to assess the degree to which a Business Initiative can contribute towards those Issues.

8.3.1.3 Data Warehouse Architectures

It can be seen that the Configuration Analysis and Development Priorities phases are business driven, but as Figure 21 illustrates, the determination of the target configuration also allows for the data warehouse architecture to be identified.

Having established that FAC's target configuration was that of the Analyser, the analysis conducted in Chapter 3 states that the Hub and Spoke architecture would be the most appropriate strategic choice. Interestingly, the case study states that "the project was hindered by poor decisions about the data warehouse architecture". Initially, FAC's IT employees were tasked with the development of that data warehouse, as they had previously implemented a "small credit information data mart". This approach was abandoned rather quickly, as it was apparent that FAC's IT employees did not have the necessary skills to build an enterprise data warehouse. This also suggests that an expansion of the data mart principles was not enough to deliver the desired solution i.e. a proliferation of data marts according to Kimball's preferred Bus Architecture (see Chapter 3) was rejected. Consequently, FAC employed external consultants (NCR) to take charge of the architectural solution and while it is not specifically stated that the architecture was Hub and Spoke, it is stated that they installed a Teradata Relational Data Base System and finance users accessed data from a "dependant data mart". This

clearly indicates that FAC's success was underpinned by a Hub and Spoke data warehouse architecture having previously rejected an expansion of the independent data mart approach.

FAC's experience of choosing a data warehouse architecture illustrates a crucial point, and it is that there was one architecture that is appropriate to the subject organisation. Analysers are typically followers of change / innovation, but FAC found themselves in a position of having to apply a new technology to support a high risk business strategy. Initially, FAC failed in their attempt to expand on the data mart principle of building a data warehouse i.e. Kimball's approach, which represented an expansion into completely new and innovative data modelling techniques. The successful approach was to build a data warehouse that was a natural extension of their existing systems infrastructure by employing more traditional and familiar relational modelling techniques for the hub and simpler dependant data marts i.e. Inmon's approach. This helped to mitigate the risk of employing the new data warehouse technology, as the data warehouse architecture had a higher degree of fit with the system's infrastructure configuration. FAC's experience illustrates, unequivocally, that the Hub and Spoke Architecture was the success behind an organisation pursuing an Analyser configuration.

8.3.1.4 System Architecture Development

As previously stated, FAC employed the services of NCR to implement their data warehouse. There is little information in the case study to expand upon this phase but it is worth pointing out that NCR consultants led the decisions about the selection of Extract, Transform and Load (ETL) to accommodate the large volumes of data. The ETL decisions could only have been made once the architecture had been agreed, as the ETL layer needs to load data into an architected environment. This illustrates why the Systems Architecture Phase follows on from the Data Warehouse Architectures phase.

In the case of FAC, NCR used their own Teradata products to supplement other technologies and applications already acquired by FAC. By defining the target architecture, NCR had a clear view of what technologies and applications were required to deliver a technically robust warehouse.

8.3.1.5 Requirements Driven Development & Data Driven Development

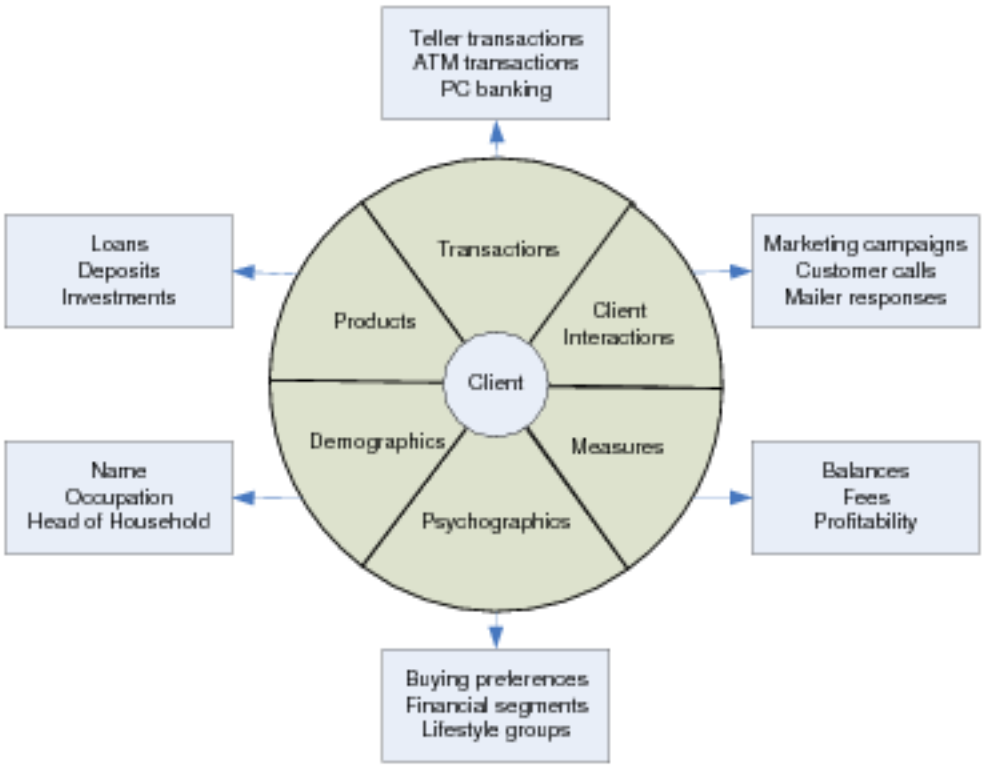
Again, the FAC case study does not discuss these phases in great detail but it is known that, in line with the Requirements Driven phase, FAC identified the target users. The

data warehouse was used by 20 marketing and 30 finance analysts. This helps to reinforce the power situation within FAC i.e. power is split between the Marketing and Finance functions.

With regard to the Data Driven Development, it is known that FAC had to integrate data from 26 legacy systems and 4 external data sources to meet the information needs for the following issues:

- Client profitability
- Product profitability
- Transaction Detail
- Retention Tracking
- Cross-sale information
- Credit reports
- Householding
- Dun & Bradstreet information

As a result of the data requirements analysis, FAC were able to build a data model, which is represented conceptually in Figure 22.




Source: Cooper et al., 2000, p. 557

Figure 22. Client Centric Data Model

Again, the case study does not detail the activities surrounding the Data Warehouse Build and Data Warehouse Deploy phases. Suffice to say that FAC's success was wholly dependant upon the successful implementation of the data warehouse.

8.3.1.6 Governance

Soon after the first release of the data warehouse, FAC found that their efforts were being undermined by systems developments in the source systems. The effect of this was a period of managing data discrepancies in the warehouse in order to retain user confidence in the data. This demonstrated to FAC that they needed to employ governance structures to communicate changes in source systems that would have an effect on the warehouse. By employing a governance structure FAC were able to plan for and implement changes to keep the data warehouse synchronised with the developments in the source systems. This helps to illustrate that the Governance phase is essential to maintain user confidence in the data.

8.3.1.7 First American Corporation Case Study Commentary

The FAC case study is perhaps the most comprehensive review of a successful data warehouse implementation where an organisation's fortunes were turned around through the application of data warehousing technology. Clearly, this case study was

not written to support the Configuration Approach, so it is not possible to fully investigate some of the issues that would have been of interest to the Configuration Approach e.g. the rationale behind the choice of architecture. However, the case study provided sufficient information to validate the phases of the Configuration Approach and helps to explain the success realised by FAC.

The Configuration Approach prescribes a Configuration Analysis phase where the organisation's target configuration is determined together with the list of supporting Strategic Issues that need to be managed. This is the driver for the whole warehouse development for those organisations intent on achieving strategic alignment. This phase is followed by the Development Priorities phase, which identifies the business initiatives that the organisation is undertaking. The data warehouse will only provide data to support the business initiatives that can be linked to the Strategic Issues identified in the previous phase. The business initiatives themselves enable the identification of KPIs and Subject Areas to be identified about which data is required. Figure 23 illustrates the links between target Configuration and the data to be stored in the data warehouse.

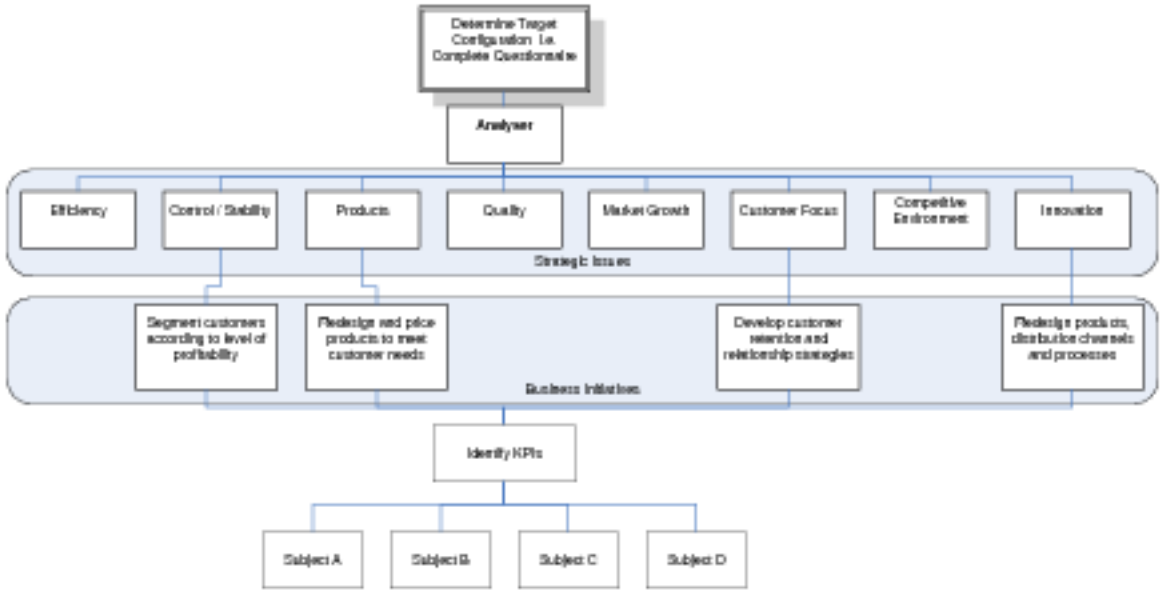



Figure 23. FAC's Configuration Approach Mappings

This approach is validated by FAC's experiences, as it is known that FAC defined their strategy first and built everything else around that vision. From the information provided in the case study, it is apparent that FAC were pursuing an Analyser Configuration and as a result, these are specific Strategic Issues (see Figure 23) that

need to be managed. Accordingly, and in an effort to realise their strategic objectives, FAC initiated a number of Business Initiatives, which are again, highlighted in Figure 23. From these initiatives it is then possible to identify KPIs and Subjects about which data is required. This analysis is key to understanding what data is required in the warehouse. Figure 23 also illustrates another key point, which is that the data warehouse, at the time of writing the case study, did not support all of the Strategic Issues. As such, the warehouse was not fully aligned to the organisation's target Configuration. The experiences at FAC demonstrate that the Configuration Approach articulates the organisation's strategic objectives with a much higher degree of detail. The Approach also provides a means to illustrate how data provided by the warehouse is supportive of Strategic Issues. The ability to link data to strategy is not provided by any other development approach.

With regard to FAC's data warehouse architecture, FAC's initial choice of building on the data mart principle to create a data warehouse was simply wrong and was quickly realised. The risk of pursuing the Bus Architecture may be attributed to the fact that this architecture suits a technically innovative organisation pursuing a Prospector Configuration and not, as it was, a Defender pursuing an Analyser Configuration. FAC's needs were best satisfied by building on traditional relational modelling techniques to form the hub of the warehouse, as this was the foundation for all of their existing operational systems. By adopting this approach, the warehouse became a natural extension of the operational systems. FAC also had experience of building small data marts and this knowledge helped to build the simpler dependant data marts. The result was a data warehouse architecture that complemented their operational systems infrastructure and fully supported the organisation's information needs. In short, the Hub and Spoke Architecture was the correct choice for the target Analyser profile.

Again, FAC could not have made their architectural choices based upon the Configuration Approach but what is confirmed is that FAC's success can be attributed to the pursuit of an Analyser Configuration supported by a Hub and Spoke architecture. This clearly supports the recommendation made in this thesis. The Configuration Approach is unique in this respect, as no other warehouse development approach uses an organisation's strategic objectives to rationalise a choice of architecture.

### 8.3.2 Menzies Distribution

At the time of writing up this thesis, Menzies' data warehouse project was in the early stages of implementation, so it is only possible to assess the effectiveness of the questionnaire in determining the target configuration. However, having determined the target configuration, it is then possible to illustrate the degree of alignment that the organisation can expect in the first phase of their data warehouse delivery.

#### 8.3.2.1 Configuration Analysis

One of the key deliverables from this thesis is the ability to determine an organisation's configuration by completing a questionnaire. This was validated by asking senior management in the organisation to complete the author's questionnaire, which was designed to convert responses into a configuration score that could be plotted along a Defender, Analyser and Prospector continuum.

There are a number of benefits to using the questionnaire:

1. The questionnaire was built in Excel, which keeps it in a familiar format for business people to complete.
2. The member of staff could complete the questionnaire at a time that is convenient to them. This helps to alleviate the problems faced by List et al. (2002) and Guo et al. (2006), who found that it was difficult to gather or meet with senior management.
3. The questions are consistent.
4. The questionnaire does not facilitate political interpretations i.e. there is no right or wrong answer and responses cannot be qualified. Again, this helps to address a problem faced by Guo et al. (2006).
5. The questionnaire did not take long to complete (between 15 and 30 minutes).

On the other hand, by relying on the questionnaire, there is little opportunity to validate responses and delve deeper into topics that could be of interest to the study.

However, it was found that two members of staff provided responses that placed the organisation's configuration in October 2006 towards the ideal Defender profile. In contrast, the third respondent, who was asked to complete the questionnaire according to their vision of the future, placed the organisation close to the Analyser profile.

What can be drawn from this is that the data warehouse cannot simply reinforce the existing configuration, as it is the target configuration that must be supported. Any actions that attempt to push the organisation towards the Defender would be working against the strategic goals of the organisation. Clearly, the data warehouse's ultimate role is to support the target configuration, which in itself, amounts to a very significant shift in direction for the organisation. An organisation in pursuit of an Analyser profile will see a change in the guiding coalition away from Production / Operations and Finance to Marketing, Applied Research and Production. This means that the activities in the organisation will be driven primarily to accommodate the objectives of the new ruling executive. As a consequence, there will be a less aggressive drive for efficiency and control, with decision making being delegated to employees at lower levels of the organisation. Marketing will drive through measures to sell the organisation's products and services while developing those products and services to generate new business opportunities. The organisation will also become more receptive and responsive to innovations and this requires an organisation to be structured accordingly i.e. adaptable systems and perhaps, the application of a matrix organisational structure. The key point is that the organisation has to find the right balance to be flexible and more aware of the market's drivers, yet not lose sight of the need for efficiency.

Having taken a particular interest in the development of supply chain organisations, Miles and Snow (2006) are very clear that the future for supply chain organisations is the sharing of knowledge and information between supply chain partners. The emphasis is moving away from simply driving out inefficiencies within the operational domain to one where organisations develop their relationships into full collaboration. In effect, boundaries that have previously existed between organisations are broken down to ensure that those parties can benefit from the skills and knowledge from each organisation. The expected result is that "a virtually endless array of innovative ideas might emerge – including ideas that might find application outside of the firm's existing industries". To achieve this, organisations must invest heavily in building trust and the "creation of organisational cultures and processes that assured equitable treatment across collaborating partners." For an organisation like Menzies Distribution, this is a very radical departure from the rather introvert Defender profile that has been in existence, but the questionnaire results show that the trading environment is already shifting and that change is on its way. Miles and Snow sum the future for supply chain organisations up succinctly:

"By incorporating the ideas and expertise of their supply chain partners, lead firms can direct the network towards innovation as well as cost reduction. Overall, the industry can be innovative as well as efficient."

This confirms three things:

1. Menzies Distribution's investment in a data warehouse to help share data with other supply chain organisations is an essential investment for any supply chain organisation.

2. The future for supply chain organisations is innovation and efficiency, which reflects the balance that the Analyser strives to secure. This validates the case study organisation's choice of target Configuration.

3. The questionnaire worked by producing an accurate target configuration. This means that the questionnaire provides the means to articulate the organisation's strategic objectives / target configuration, thereby fulfilling the Configuration Analysis phase of the proposed framework.

Having fulfilled the Configuration Analysis phase it can be asserted, with confidence, that the following Strategic Issues are the key drivers in Menzies' pursuit of its new target Configuration:

Efficiency

Control / Stability

Products

Quality

Market Growth

Competitive Environment

Customer Focus

Innovation

The challenge for Menzies Distribution is to find the right balance for managing these issues effectively, some of which are already familiar to the company but a number would have been of no significance, until now.

8.3.2.2 Development Priorities

Following on from the Configuration Analysis phase, it is essential to identify the business initiatives that will support the Strategic Issues. While there may be other business initiatives at the time of starting the data warehouse analysis phase, there was one primary reason for the warehouse and it was that Menzies had lost its market leader position to W H Smith's distribution company. This has been attributed, in part, to their competitor's ability to provide data on request and proactively supply information that was useful to the supply chain partners. As a result, Menzies has responded by instigating the implementation of their data warehouse. In terms of satisfying the Strategic Issues, this falls primarily into the Customer Focus category, as Menzies are taking steps to satisfy the information needs of their supply chain partners efficiently and accurately. In doing so, Menzies are developing a new service or Product albeit at the very early stages and underdeveloped, but that service aims to improve the Efficiency of data access internally and externally. It could also be argued that the warehouse is expected to improve the Quality of data, which is becoming an increasing valuable commodity. Ultimately, however, the data warehouse will be judged on its ability to satisfy the supply chain partner's needs for data / information, which means that it is this aspect that constitutes the business initiative to be supported by the warehouse. To satisfy that objective, Menzies focussed their attention on capturing data about their supply chain activities.

In this phase it is recommended that the Key Performance Indicators be identified, but from the information made available to this study, it has not been possible to ascertain the KPIs that Menzies have opted to monitor. Menzies currently monitors KPIs that are recognised by the industry, which may well continue and other KPIs may be planned.

While the actual KPIs are unknown, the consultancy engaged to deliver Menzies' data warehouse produced a Project Charter (Synergi, 2007) document, which identifies the subjects and dimensions that will support the organisation's information needs. The Project Charter states that the scope of the project is limited to data that affects operating costs, sales and publisher's and retailer's KPI metrics, within the supply chain. Accordingly, the warehouse will hold data about the following subjects:

Retailer Supply

Historic Retailer

Publisher Supply

Summarised Financial Information

Retailer Invoices

Focus on Distribution Initiative (organisation that monitors industry performance)

Publisher Invoices and Credits

Electronic Point of Sale

Vouchers

Collectively, these subject areas are deemed to hold the data required to satisfy the data needs of the supply chain partners, as well as satisfying internal data needs. In terms of data entities, it is known from the consultancy's 'Stage 3 Review' document that the dimensions in Table 11 were identified to be included in the development:

Table 11. Dimensions

| Dimension | Description |
|---|---|
| Calendar | Years, Months, Weeks, Dates both Calendar and Financial. |
| Wholesaler | A distribution point within Menzies Distribution |
| Supplier | A publisher or supplier of a publication |
| Retailer | The outlet where Menzies Distribution deliver publications |
| Publication | An Issue of a particular Title |
| Voucher | A discount note against a publication |
| Delivery | A drop of a publication to a retailer |
| Equipment | The equipment used to pack the publication for distribution. |
| Employee | The person employed by Menzies to pack or scan Publications |
| Delivery Contractor | The company employed by Menzies to delivery publications to a retailer. |
| Supplier Transaction Type | The classification of the Supplier – Menzies transaction |
| Type of goods In | The reason why a publication was received by Menzies |
| Stock Type | The type of stock transaction |
| Packing Method | The method employed to pack a publication |
| Packing Order Source | The reason why the publication was packed. |
| Parcel Complete Reason | The reason why a parcel was tied out |
| Retailer Transaction Type | The type of the transaction between Menzies and the Retailer |
| Retailer Transaction Category | The category of the transaction between Menzies and the Retailer |
| Delivery Status | An indication of the success against the required Delivery Time. |
| Sales Curve | The predicted sales expectancy for a particular publication. |
| Retailer Publication | A mapping to allow specified attributes of a retailer/publication combination. |
| Marketing Category | A grouping of retailers |
| Promotion | Information pertinent to the sales of a publication |
| Event | Incidents that have an affect on the sales of a publication. |

Source: Synergi, 2007

The list of entities illustrates clearly that the data to be held in the warehouse is solely about the supply chain. For example, the dimension Employee is the member of staff involved in packing or scanning materials i.e. a subset of employees and not employees from all departments across the organisation.

8.3.2.3 Requirements Driven Development

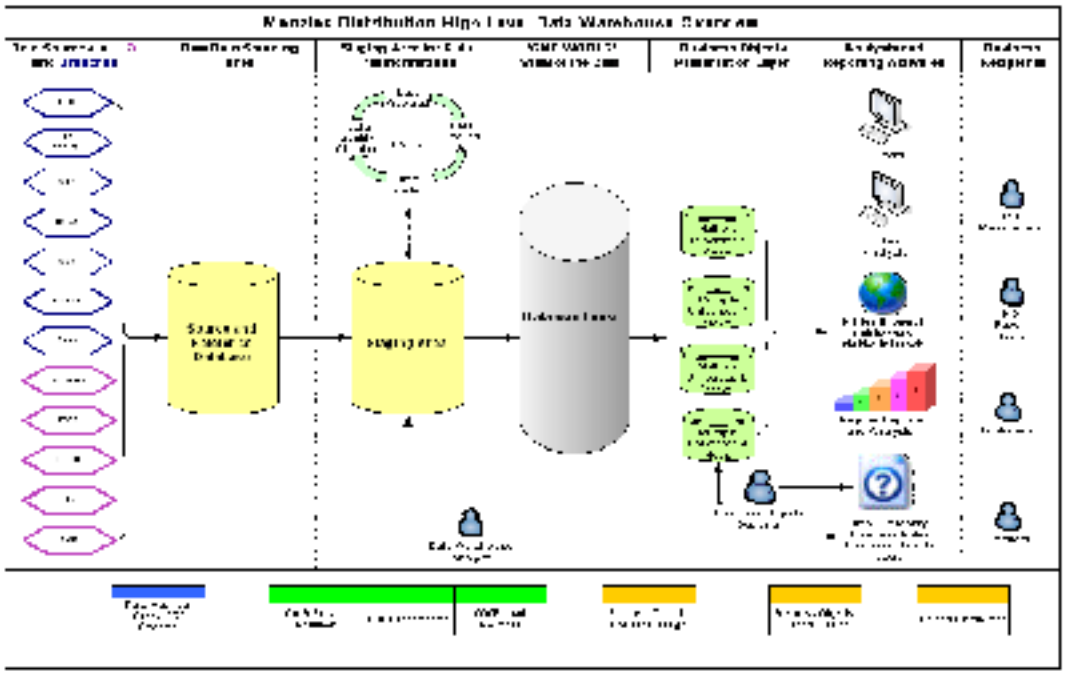
Again, due to the stage of Menzies' development, it is not possible to fully assess this phase, but the Project Charter (Synergi, 2007) document names individuals that will be

involved in the project through its development, including Key Users. It is interesting to note that those named are in management positions in Marketing, Finance, IT and Operations. From the perspective of best practice, it is considered essential to have management and end user buy-in but there appears to be only one business user who is not a senior manager. As such, there is a risk that end user buy-in will not be achievable for implementation. Consequently, to what extent can requirements be articulated and documented with significant business rationale if end users have little project presence? Indeed, the individuals named are also more representative of the IT function than any other, which is peculiar when the object of the warehouse is to support the Customer Focus initiative. A more business focussed representation would have been expected. The requirements driven approach adopted by Menzies may well undermine the efficacy of the Requirements Driven Development phase.

According to the Requirements Driven Development phase of the Configuration Approach, it is necessary to Identify Target Users who will actively participate in the project by providing detailed knowledge of the business processes and supporting systems. This business logic is essential when trying to understand the availability and use of data. End users will also be able to express their preferences for the way data is to be accessed. As it is, it may take some time before Menzies' end users fully accept and utilise the data warehouse.

#### 8.3.2.4 Data Warehouse Architectures

Having established the preferred architecture for an Analyser to be Hub and Spoke, it was found that the architecture to be adopted by Menzies is a Bus Architecture (i.e. the architecture most relevant to the Prospector), as illustrated in Figure 24.



Source: Synergi, 2007

Figure 24. Menzies Data Warehouse Architecture

At first glance, the warehouse appears to be centralised but it is being constructed using Kimball's Star Schema featuring dimensions and facts. In essence, the warehouse represents several sub-business processes under the higher level business process, the supply chain. Under Kimball's approach, the sub-processes may have been split into individual data marts joined together using the conformed dimensions protocol. This warehouse treats the supply chain as a business process and so, the warehouse is built to represent a business process at the higher level. In itself, this is a reasonable approach but there are concerns for future developments of the warehouse.

The first is that the modelling approach is a radical departure for Menzies, as they have no dimensional modelling experience and they are used to employing efficient methods that the relational modelling approach brings. A relational model for the Hub would have been a recognisable, easily maintained system and consequently a more evolutionary approach i.e. a natural extension of their existing systems estate. Spokes will still be built using dimensional modelling techniques but the dependent data marts have a simpler structure and more easily maintained. The integrity of the warehouse is crucial to the performance and reliability of the data being extracted.

The second concern is that any additions to the warehouse could mean snowflaking the star schema, which means that the star schema will become increasingly complex.

Again, from a maintenance point of view, this means that Menzies have to be comfortable with this prospect. With the relational Hub, it is relatively straight forward to add to the relational structure and keep the dependent data mart structures as simple as possible.

Thirdly, as the volumes of data increase and the warehouse holds cross functional data, it becomes more sensible to hold that data in as efficient a manner as possible. It seems that the possibility of incorporating the information needs of various functions have not been accounted for and a decision made on the grounds of future data requirements. As an Analyser, the organisation will need to meet those needs, as the Strategic Issues to be addressed cross a wide range of subjects.

Finally, Menzies did not have a choice in the architecture to be delivered. As Watson and Ariyachandra (2005) stated, the data warehouse implemented may be the preferred approach for that consultancy. It would perhaps have been more appropriate to put the architectural options in front of the client to ensure that informed choices were made. The implementation of a data warehouse is a strategic decision for the organisation and not the consultancy.

The issue here is not what is delivered 'today' but what will meet the needs for the target Analyser configuration. There are a number of Strategic Issues that need to be supported in the future and it is suggested that it may have been more prudent to implement a Hub and Spoke architecture.

#### 8.3.2.5 Menzies Distribution Case Study Commentary

The Configuration Analysis phase highlights the degree of strategic alignment. Figure 25 helps to illustrate why the approach taken at Menzies is some way off from having a strategically aligned data warehouse, as it can be asserted that the warehouse is being built primarily to satisfy an issue relating to Customer Focus. The Business Initiatives to improve information quality, develop an information portal and efficiency of data access are essentially supportive of the dominant initiative to provide data to meet customer's needs.

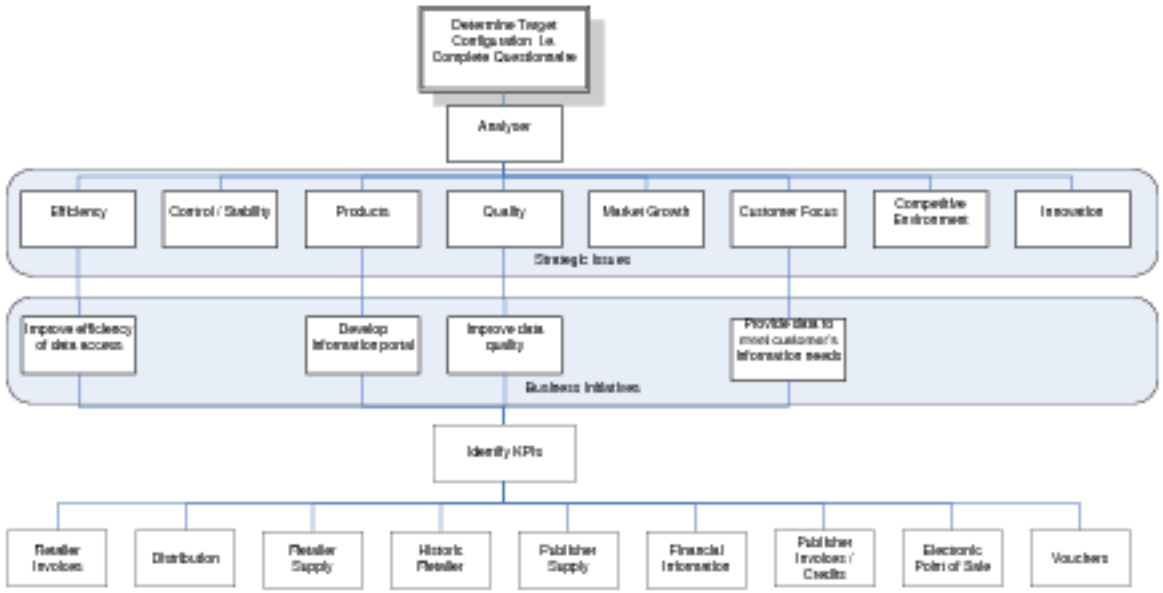



Figure 25. Menzies Configuration Approach Mappings

Figure 25 also highlights that the Subject Areas supporting the KPIs and Business Initiatives is wholly focussed on the supply chain activities. The lines connecting the Strategic Issues and the Business Initiatives helps to illustrate the extent to which the warehouse development supports organisational strategy. There is no information being delivered for subjects that would reside outside the supply chain domain.

The development methodology adopted by the consultants engaged by Menzies was primarily a requirements driven approach, where the Business Analyst documented business processes that were integral to the supply chain. Information requirements were gathered while under the instruction to pose the question "what information do you need to do your job?" The emphasis behind this question is: how can we make it easier for you to get access to the data that you require to do your job today? The problem with this question from Menzies' point of view is that the information being delivered 'today' is not sufficient to satisfy the needs of the supply chain partners, who ask for data but have to wait until a job can be either run or coded. Internally to Menzies, satisfying 'today's' data needs is to reinforce the tasks and roles required for the Defender configuration whereas the target configuration is that of the Analyser. This assessment is validated by List et al. (2002), who were adamant that the requirements driven approach cannot deliver a strategically aligned warehouse. Although, the requirements driven approach does have its place in the Configuration Approach because it is important to have access to end users who understand the nature of the business in sufficient detail that the project can absorb that business logic. Ongoing end

user involvement also helps to ensure that there is broad early acceptance of the data warehouse when it is implemented. However, as previously discussed, there are some concerns regarding the degree of end user involvement in the project.

On a more positive point, this is merely the start of the data warehouse project, as the warehouse has to be built incrementally. The point to be made here is that there are a number of Strategic Issues that had not been identified or prioritised before the warehouse project was started. What the Configuration Approach does is state clearly, at the outset, what the issues are that have to be managed if the organisation is to move towards the ideal Analyser. This view helps the organisation to question what Strategic Issue is being supported when there are requests to develop the warehouse. In effect, this model can be used to formulate the ongoing data warehouse development strategy. In configuration terms, the Strategic Issues are borne out of the entrepreneurial challenge and administration challenge, which means that if the data warehouse delivers data to help manage those issues then it can be asserted that the data warehouse is aligned to an organisation's strategy.

In addition, Configuration theory provides a rationale for selecting a data warehouse architecture, which helps to ensure that the choice made is driven from the perspective of the organisation as a whole. In this respect, Menzies has opted for a Bus Architecture as opposed to the Hub and Spoke Architecture recommended in this thesis. It is arguable that the chosen architecture could be a suitable choice if the warehouse was not to be extended beyond representing the supply chain. Complexity would be kept to a minimum and the immediate needs of Menzies would be satisfied. However, the range of Strategic Issues that need to be managed for the Analyser shows that a more comprehensive decision support system is required and so, for the reasons stated in Chapter 4, the recommended architecture is Hub and Spoke to support the strategic ambitions of the organisation.

## 8.4 Conclusions

### 8.4.1 Reflection on Research Aims and Questions

In establishing the principles of Best Practice for Implementing a Data Warehouse, Weir, Peng and Kerridge (2003) found that practitioners and academics alike agreed that a data warehouse was most effective when aligned to an organisation's strategic objectives. This commonly held view gave way to the need to justify data warehousing by delivering an acceptable return on investment, despite acknowledgements that it is

difficult to quantify the benefits. Indeed, if a data warehouse failed then it seemed to be as a result of 'business issues' (Sammon & Finnegan, 2000; Trembly, 2001). Unfortunately, nobody was able to define those 'issues' and it has since been observed that advice for producing acceptable return on investment metrics has subsided. The problem with this situation is that the whole reason for implementing a data warehouse is to generate business benefit from data, as it is data that has become an economic asset alongside the traditional economic resources of man, machine and money. In essence, the data warehouse community has failed to articulate how data can be used to drive an organisation towards its strategic ambitions. Instead, practitioners, academics and data warehousing vendors have tended to focus upon the technical aspects of data warehousing, leaving the resolution of 'business issues' to chance. This problem was highlighted in Chapter 3, where it was established that the leading authorities in the field of data warehousing prescribed implementation approaches that are focussed on delivering technically robust warehouses all but independent of the business rationale that underpin the organisation's need for data. This is confirmed by Preslan et al.'s (2004) study, which found that "85% of customer analytics projects help companies' access data, but they do not achieve return on investment". Given the apparent failure to give data warehouse developments a meaningful business purpose, it is clear that there is a need to articulate the benefits of data warehouses in supporting an organisation's strategic objectives. Accordingly, this study posed the question: how can a data warehouse be successfully and demonstrably aligned to an organisation's strategic objectives?

The answer to that question lies in the adoption of the Configuration Approach, which is a framework designed to guide data warehouse development choices based upon the strategic direction of the organisation. The Configuration Approach, described in full in Chapter 4, is based upon taking the time to understand and articulate an organisation's strategy. This problem was resolved through the Configuration School of Strategic Management, which is reviewed in Chapter 2. In particular, Miles and Snow's typology of Defenders (D), Analysers (A) and Prospectors (P) were identified as the model on which to base a configuration analysis questionnaire. Having established that the Ideal Types are required to manage a given set of Strategic Issues and that they lie on a D-A-P continuum, it was possible to build a questionnaire that examines how an organisation approaches or would like to approach their Entrepreneurial, Administration and Information Systems challenges. The mechanics of the questionnaire is explained in full

in Chapter 5, which was designed to expose an organisation's target configuration and the relevant Strategic Issues. The results of the questionnaire also provide the means to plot an organisation's Configuration on the D-A-P continuum. The questionnaire was subsequently completed by members of staff from Menzies Distribution and the results are contained in Chapter 6, which clearly show that the organisation will move from a Defender profile to an Analyser over the next few years, signifying a fundamental change in strategic direction. The position on three continua (Entrepreneurial, Administration and Information Systems) was also clearly illustrated. This is a significant step forward, as this analysis makes it clear what the critical Strategic Issues are that an organisation must address in the management of its Entrepreneurial, Administration and Information Systems challenges. Crucially, these Strategic Issues are interrelated and must be viewed and managed collectively to be maximally effective in realising strategic goals. Consequently, the data warehouse's role is to support all Strategic Issues if it is to be considered to be fully aligned to the organisation's strategic objectives. It is not sufficient to assume that alignment to any one business initiative or issue is enough to assert that the data warehouse is fully aligned. As a result, it was necessary to develop the Configuration Approach to implementing a data warehouse, which gives a data warehouse development a strategic context, as opposed to simply aligning the technology to a prevailing business initiative. This is clearly illustrated in Figure 25, where it is apparent that Menzies' data warehouse development is only partially aligned to the organisation's target configuration. This is, however, only the first stage of the warehouse's development and full alignment can only be achieved through incremental development initiatives. As such, it is recommended that Menzies consider how future data warehouse developments are to contribute to the management of the Strategic Issues and by doing so, Menzies can demonstrate the degree of alignment to strategy.

The adoption of the Configuration Approach is advantageous for the following reasons:

1. The Configuration Approach is driven by a holistic view of an organisation's strategy. This means that the organisation's strategy is expressed as a target Configuration, which relies on the management of a given set of interrelated Strategic Issues. In effect, this expression of an organisation's strategy is a firm foundation and focuses attention on the most important issues affecting the future success and direction of that organisation. The establishment of a target Configuration is a clearer and more in depth expression of an organisation's

strategy than say, a mission statement. List et al. (2002) and Guo et al. (2006) found that the articulation of an organisation's strategy was a particular problem due to the fact that they could not get all Executives together for long enough to elicit clear requirements. In addition, it was also found that their responses had political undertones. The difficulties that List et al. (2002) and Guo et al. (2006) experienced only serve to underline the fact that strategic requirements are difficult to articulate and that Kimball's approach is not appropriate. Likewise, Inmon's data driven approach that relies on the end user (Explorer) to develop a data warehouse cannot be expected to deliver a strategically aligned solution. Additionally, if it is difficult to articulate the strategic direction of the organisation, there may be a tendency to rely of the Business Initiatives to act as a proxy for strategic objectives. The Configuration Analysis phase ensures that this will not happen where the target Configuration and Strategic Issues have been revealed.

2. The questionnaire used in this study poses a number of questions that examine an organisation's management of its entrepreneurial, administration and information systems challenges. The questions and range of responses are consistent and do not lend themselves to political interpretation, as it is the consistency of responses that is measured i.e. no one answer will distort the overall results. The questionnaire can also be completed quite quickly (20 minutes approx) and at a convenient time, which means that respondents are not tied up in meetings to agree requirements. However, it may not always be possible to discuss responses further, which could be considered a drawback. The questionnaire eliminates the problems of articulating organisational strategy, as experienced by List et al. (2002) and Guo et al. (2006), as the questionnaire results clearly articulates an organisation's strategy in the form of a target Configuration and Strategic Issues. The completion of the questionnaire by Menzies Distribution illustrates this point.

3. The establishment of a target Configuration and Strategic Issues provides a means of measuring to what degree the data warehouse is strategically aligned. This is illustrated in Sections 8.3.1.7 and 8.3.2.5 where it is clear that, based on available information, neither FAC nor Menzies had or will have a fully aligned warehouse. This is not a failing, as data warehouses are built incrementally, but it becomes apparent that data is not being made available to specifically manage

one or a number of Strategic Issues. In their Triple Driven Approach, Guo et al. (2006) have a Goal driven phase but they specifically had problems articulating the organisation's strategy. The Configuration Approach not only articulates strategy comprehensively, it also provides a means of illustrating the degree of strategic alignment. No other methodology provides this functionality.

4. The benefit of plotting an organisation's configuration on the D-A-P continuum is the ability to view the position in relation to the target Ideal Type i.e. the closer the organisation is to the target configuration, the more effective that organisation is deemed to be. A periodic review of the organisation's position on the continuum provides that organisation with a tool to gauge progress or otherwise. It may then be possible to determine how much of that progress can be attributed to the management of the Strategic Issues and the support of the data warehouse.

5. The analysis of Kimball and Inmon's development methodologies in Chapter 3 concluded that neither Kimball's requirements driven nor Inmon's data driven approaches could ensure the delivery of a strategically aligned warehouse. List et al. (2002) and Guo et al. (2006) made similar statements but found that both approaches were necessary and complementary. As such, the Configuration Approach follows this rationale but it ought to be noted that the difference between the Configuration Approach and the others is the ability to trace or map activities back through the Business Initiatives to the Strategic Issues of the target Configuration. It is asserted that this traceability feature ensures greater accountability.

6. By revealing and documenting the target Configuration and Strategic Issues the organisation has a clear view of the range of issues that need to be managed. Accordingly, it is explicitly stated what issues require the support of the data warehouse as a decision support tool. Consequently, this provides the organisation with not only a means of measuring contribution but also provides a data warehouse development strategy to ensure full strategic alignment.

7. In Chapter 3, it was also found that Inmon and Kimball have a major influence in the field of data warehousing through their architectural preferences. The debate surrounding whose architecture is best has been an issue within the data

warehousing community for a number of years with no clear 'winner'. However, as discussed in Chapter 4, it is possible to use Configuration Analysis to rationalise and recommend architectural choices. In short, the centralised, hub and spoke and bus architectures are appropriate choices for the Defender, Analyser and Prospector respectively. Clearly, this analysis brings a new dimension to the whole Inmon versus Kimball debate, but more importantly this provides organisations with a means of choosing a data warehouse architecture that will contribute positively to the resolution of that organisation's Information Systems challenge. Again, no other data warehouse development methodology attempts to link architectural choices with the organisation's configuration. This thesis argues that there is an appropriate architecture for a given organisational configuration, as illustrated by FAC in Section 8.3.1.7. This is an important point, as it is known through Watson and Ariyachandra's (2005) study that organisation's will change their data warehouse architecture. The reasons are not known but it is clear that a choice has to be made and better guidance is required.

In conclusion, it is asserted that the research question "how can a data warehouse be successfully and demonstrably aligned to an organisation's strategic objectives?" has been fully satisfied. The contribution of this thesis to the field of data warehousing may be summarised as follows:

- It has been demonstrated that the implementation approaches prescribed by the industry's leading authorities, Inmon and Kimball are inadequate for those organisations who want to maximise the business impact of data warehousing.

- An organisation's strategy can be articulated in terms of a target Configuration by using the questionnaire produced for this study.

- The Configuration Approach is the only development framework that uses strategic objectives to drive data warehouse development choices. Other 'strategy' driven frameworks rely on business initiatives to act as a proxy for the organisation's strategy. As such, a data warehouse based on the Configuration Approach becomes a genuine strategic investment.

- The Configuration Approach makes it possible to illustrate the degree of strategic alignment i.e. data from the warehouse can be mapped back to the

management of Strategic Issues. This makes it possible to assess how the data warehouse helps to resolve the organisation's Entrepreneurial and Administration challenges.

- The data warehousing community has debated for many years regarding whose architecture is best, Inmon's or Kimball's. This study makes a significant contribution to that debate by demonstrating that the choice of architecture must be driven by the target Configuration. Consequently, an organisation can have confidence that the data warehouse will make a positive contribution to their Information Systems Challenge.

In essence, the alignment of a data warehouse to an organisation's strategic objectives need no longer be left to chance. It is an achievable goal with its roots in understanding the dynamics of organisational configuration and using that knowledge to build a strategic solution.

### 8.4.2 Generalisation

In Chapter 2 section 2.3.2.1, the benefits of using a case study are discussed. In particular, a case study can help to understand the multi-dimensional nature of a given problem i.e. the problem cannot be solved using a linear approach. The case study in this thesis helps to illustrate this point, as configuration theory takes a holistic view of organisations, which represents the multi-dimensional nature of organisations. Consequently, this thesis examines how a data warehouse can make an impact in the multi-dimensional context of the case study and in so doing, crosses academic boundaries. Indeed, it is a single case study of particular interest due to the fact that it is an organisation in the midst of organisational transformation, where the implementation of a data warehouse is a key strategic initiative. As such, the case's importance can not be overlooked, as the case is of interest "not because by studying it we learn about other cases or about some general problem, but because we need to learn about that particular case" Stake (1995, p. 3-4). The problem with this examination is how the results can be used to generalise, but given that this is a single case study it is not possible to generalise to the wider population but it is possible to generalise to theory Yin (2003, p. 10).

In considering this study's contribution to knowledge (see previous section), it must be stated that this study cannot assert that Menzies Distribution is representative of the

wider business population. What can be asserted from this study is that Miles and Snow's typology, as it is represented in the questionnaire, can be used to determine the configuration of any organisation and that the results of the questionnaire can be used to strategically align a data warehouse development. The typology acknowledges the fact that organisations have to manage their entrepreneurial objectives supported by administration duties and information systems, whether the organisation is a Small to Medium sized Enterprise (SME), large corporate organisation or sole trader. Any organisation can use the questionnaire to determine their configuration and make choices based upon the need to manage the Strategic Issues in an appropriate manner.

The use of the continuum to plot the case study organisation's current and target configuration must also be considered for generalisation. In this case, by plotting Menzies' current configuration on the continuum, it can not be asserted that the plotted position relates to a total business population. However, organisations that use the results of the same questionnaire can be compared on the same scale. This means that if there were multiple case studies using the questionnaire, the results would be comparable using the continuum scale defined in this thesis.

The key point to be made here is that notwithstanding the clarification of the generalisation issue, this study has developed a method of determining an organisation's configuration and that any organisation can use it to give their data warehouse development strategic direction. In doing so, the organisation is able to explicitly consider its actions and initiatives against its target configuration and develop data warehousing capabilities to drive the organisation towards its ideal profile. By plotting the organisation's configuration on the Defender, Analyser and Prospector continuum, it is possible to visualise the degree of its effectiveness in relation to Miles and Snow's Ideal Types. As such, effectiveness can be measured, which gives the organisation the means to assess its competitive capabilities.

### 8.4.3 Future Research

The Configuration Approach is founded on principles that cross academic boundaries i.e. computing and strategic management. As such, there are developments in each of these domains that could be investigated further to in order to refine the insight and effectiveness of the framework. The following are areas that could influence the direction of the Configuration Approach:

- The Configuration theorist Danny Millar established four organisational Archetypes that essentially build on the Ideal Types theme. Millar's Archetypes were not used, as they had not been tested in the way that Miles and Snow's Ideal Types had. To test the Archetypes was beyond the scope of this project. However, it is worth investigating the Archetypes further as a possible means of refining the range of target Configurations.

- It is suggested that research is required to fully test the effectiveness of different data warehouse architectures in organisations pursuing the same target Configuration. This would help to clarify the degree of flexibility required in choosing the right architecture.

- It has become apparent that a hybrid architecture has been introduced to the range of data warehouse architectures, which is modelled relationally and built dimensionally. There is very little information about this approach and it has not been assessed for its effectiveness. The concern is that a hybrid approach ultimately results in satisfying none of the entrepreneurial, administration and information systems challenges. The effectiveness of this architecture requires further investigation.

- It would clearly be beneficial to this thesis to revisit Menzies Distribution to review the progress of the data warehouse project. This would help to empirically validate the assertions made in this thesis by interviewing those involved in the project.

Research of this nature requires the time of employees from subject organisations and the dedication to pursue the ideal of strategic alignment.

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# 10 Appendix 1 Ideal Type Characteristics

| Characteristics of Defender (p48) | | |
|---|---|---|
| Entrepreneurial Challenge | Engineering (Information Systems) Challenge | Administrative Challenge |
| Problem: | Problem: | Problem: |
| How to "seal off" a portion of the total market to crate a stable set of products and customers. | How to produce and distribute goods or services as efficiently as possible. | How to maintain strict control of the organisation in order to ensure efficiency. |
| Solutions: | Solutions: | Solutions: |
| 1. Narrow and stable domain | 1. Cost efficient technology | 1. Financial and production experts most powerful members of the dominant coalition; limited environmental scanning. |
| 2. Aggressive maintenance of domain (e.g. competitive pricing and excellent customer service) | 2. Single core technology | 2. Tenure of domain coalition is lengthy; promotions from within. |
| 3. Tendency to ignore developments outside of domain. | 3. Tendency toward vertical integration | 3. Planning is intensive, cost oriented, and completed before action is taken. |
| 4. Cautious and incremental growth primarily through market penetration. | 4. Continuous improvements in technology to maintain efficiency. | 4. tendency toward functional structure with extensive division of labour and high degree of formalisation. |
| 5. Some product development, but closely related to current goods or services. | | 5. Centralised control and long looped vertical information systems. |
| | | 6. Simple coordination mechanisms and conflicts resolved through hierarchical channels. |
| | | 7. Organisational performance measured against previous years; reward system favours production and finance. |
| Costs and benefits: | Costs and benefits: | Costs and benefits: |
| It is difficult for competitors to dislodge them from its small niche in the industry, but a major shift in the market could threaten survival. | Technological efficiency is central to organisational performance, but heavy investment in this area requires technological problems to remain familiar and predictable for lengthy periods of time. | Administrative system is ideally suited to maintain stability and efficiency but is not well suited to locating and responding to new product or market opportunities. |
| Characteristics of Prospector (p79) | | |
| Entrepreneurial Challenge | Engineering (Information Systems) Challenge | Administrative Challenge |
| Problem: | Problem: | Problem: |
| How to locate and exploit new product and market opportunities | How to avoid long term commitments to a single technological process | How to facilitate and coordinate numerous and diverse operations |
| Solutions: | Solutions: | Solutions: |
| 1. Broad and continuously developing domain. | 1. Flexible prototypical technologies | 1. Marketing and research and development experts most powerful members of the dominant coalition. |
| 2. Monitors wide range of environmental conditions and events. | 2. Multiple technologies. | 2. Dominant coalition is large, diverse and transitory; may include an inner circle. |
| 3. Creates change in the | 3. Low degree of routinisation | 3. Tenure of dominant coalition |

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|---|---|---|
| industry. | and mechanisation; technology embedded in people. | not always lengthy; key managers may be hired from outside as well as promoted from within. |
| 4. Growth through product and market development | | 4. Planning is broad rather than intensive; problem oriented and cannot be finalised before action is taken. |
| 5. Growth may occur in spurts. | | 5. Tendency toward product structure with low division of labour and low degree of formalisation. |
| | | 6. Decentralised control and short looped horizontal information systems. |
| | | 7. Complex coordination mechanisms and conflict resolved through integrators. |
| | | 8. Organisational performance measured against important competitors; reward systems favours marketing and research and development. |
| Costs and benefits: | Costs and benefits: | Costs and benefits: |
| Product and market innovation protects the organisation from a changing environment, but the organisation runs the risk of low profitability and over extension of its resources. | Technological flexibility permits a rapid response to a changing domain, but the organisation cannot develop maximum efficiency in its production and distribution system because of multiple technologies. | Administrative system is ideally suited to maintain flexibility and effectiveness but may underutilised and misutilise resources. |
| Characteristics of Analyser (p79) | | |
| Entrepreneurial Challenge | Engineering (Information Systems) Challenge | Administrative Challenge |
| Problem: | Problem: | Problem: |
| How to locate and exploit new product and market opportunities while simultaneously maintaining a firm base of traditional products and customers. | How to be efficient in stable portions of the domain and flexible in changing portions. | How to differentiate the organisation's structure and processes to accommodate both stable and dynamic areas of operation. |
| Solutions: | Solutions: | Solutions: |
| 1. Hybrid domain that is both stable and changing. | 1. Dual technological core (stable and flexible components). | 1. Marketing and applied research most influential members of dominant coalition, followed closely by production. |
| 2. Surveillance mechanism mostly limited to marketing; some research and development. | 2. Large and influential applied research group. | 2. Intensive planning between marketing and production concerning stable portion of domain; comprehensive planning among marketing, applied research and product managers concerning new products and markets. |
| 3. Steady growth through market penetration and product market development. | 3. Moderate degree of technical efficiency. | 3. Matrix structure combining functional divisions and product groups. |
| | | 4. Moderately centralised control system with vertical and horizontal feedback loops. |
| | | 5. Extremely complex and |

| | | |
|---|---|---|
| | | expensive coordination mechanisms; some conflict resolution through product managers, some through normal hierarchical channels. |
| | | 6. Performance appraisal based on both effectiveness and efficiency measures, most rewards to marketing and applied research. |
| Costs and benefits: | Costs and benefits: | Costs and benefits: |
| Low investment in research and development, combined with limitation of demonstrably successful products, minimises risk, but domain must be optimally balanced at all times between stability and flexibility. | Dual technological core is able to serve a hybrid stable-changing domain, but the technology can never be completely effective or efficient. | Administrative system is ideally suited to balance stability and flexibility, but if this balance is lost, t may be difficult to restore equilibrium. |

Source: Miles & Snow, 1978, pp. 48, 66 &79

# 11 Appendix 2 The Data Warehouse Lifecycle Toolkit Project Plan

| | Project Task | Business End Users | Business Sponsor | IS Sponsor | Business Driver | Business Project Lead | Project Manager | Business Sys. Analyst | Data Modeler | DW DBA | Data Staging Designer | DW Educator | EU Appln Developer | Tech/Security Architect | Tech Support Specialist | Data Staging Programmer | Data Steward | DW/QA Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PROJECT MANAGEMENT AND REQUIREMENTS** | | | | | | | | | | | | | | | | | | |
| | **PROJECT DEFINITION** | | | | | | | | | | | | | | | | | |
| 1 | Assess Data Warehousing Readiness | | ❍ | ❍ | ❍ | ● | ● | • | • | • | • | | | • | | | | |
| 2 | Develop Preliminary Project Scope | | ❍ | ❍ | ❍ | ● | ● | • | • | • | • | | | • | | | | |
| 3 | Build Business Justification | • | • | • | ● | ● | ❍ | • | | | | | | | | | | |
| | **PROJECT PLANNING & MANAGEMENT** | | | | | | | | | | | | | | | | | |
| 1 | Establish Project Identity | | | | • | ● | ● | | | | | | | | | | | |
| 2 | Identify Project Resources | | ❍ | ❍ | ❍ | ● | ● | | | | | | | | | | | |
| 3 | Prepare Draft Project Plan | | | | • | • | ● | • | • | • | • | • | • | • | • | • | • | • |
| 4 | Conduct Project Team Kick-Off & Planning | | ❒ | ❒ | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| 5 | Revise Project Plan | | | | • | • | ● | • | • | • | • | • | • | • | • | • | • | • |
| 6 | Develop Project Communication Plan | | • | • | • | ❍ | ● | • | • | • | • | • | • | • | • | • | • | • |
| 7 | Develop Program to Measure Success | | ❍ | ❍ | ❍ | ● | ❍ | | | | | | | | | | | |
| 8 | Develop Process to Manage Scope | | | | ❍ | ❍ | ● | | | | | | | | | | | |
| 9 | Ongoing Project Management | | | | | ❍ | ● | | | | | | | | | | | |
| | **USER REQUIREMENT DEFINITION** | | | | | | | | | | | | | | | | | |
| 1 | Identify and Prepare Interview Team | | | | | | ● | ❍ | ❍ | | | | | | | | | |
| 2 | Select Interviewees | | • | • | • | ● | ● | | | | | | | | | | | |
| 3 | Schedule Interviews | | | | | ❍ | ● | | | | | | | | | | | |
| 4 | Conduct User Kick-Off & Prepare Interviewees | ❍ | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | | | | | | | | | |
| 5 | Conduct Business User Interviews | ❍ | ❍ | | ❍ | ❍ | • | ● | • | | | | • | | | | | |
| 6 | Conduct IS Data Discovery Interviews | | | | | | • | ● | ● | ❍ | ❍ | | • | | | ❍ | | |
| 7 | Analyze Interview Findings | | | | | ❍ | ❍ | ● | | | | | | | | | | |
| 8 | Document Findings and Review | • | | | • | ❍ | ❍ | ● | ❍ | | | | • | | | | | |
| 9 | Publish Requirements Deliverables | ❒ | ❒ | ❒ | ❒ | ❍ | ❍ | ● | ❍ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| 10 | Prioritize and Revise Project Scope | • | • | • | ❍ | ● | ● | • | • | | | | • | | | | | |
| 11 | User Acceptance/Project Review | • | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | • | ❍ | • | • | ❍ | • | • |
| **DATA DESIGN** | | | | | | | | | | | | | | | | | | |
| | **DIMENSIONAL MODELING** | | | | | | | | | | | | | | | | | |
| 1 | Build Matrix | | | | | ❍ | ❍ | ● | ● | ❍ | • | | | | | | | |
| 2 | Choose Data Mart | | ❍ | ❍ | ❍ | ● | ● | • | • | | | | | | | | | |
| 3 | Declare Grain | | | | | ❍ | ❍ | ❍ | ● | • | | | | | | | | |
| 4 | Choose Dimensions | | | | | | | ❍ | ● | • | | | | | | | | |
| 5 | Develop Fact Table Diagram | | | | | | | ❍ | ● | • | | | | | | | | |
| 6 | Document Fact Table Detail | | | | | | | ❍ | ● | • | | | | | | | | |
| 7 | Design Dimension Detail | | | | | | | ❍ | ● | • | | | | | | | | |
| 8 | Develop Derived Fact Worksheet | ❍ | | | • | ❍ | ❍ | ● | ❍ | • | | | ❍ | | | | | |
| 9 | User Review & Acceptance | ❍ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | • | | | | | | | | |
| 10 | Review DB Design Recommendations for BIU Tool | | | | | | | | ❍ | ● | ❍ | | ❍ | | | ❍ | | |
| 11 | Review DB Design Recommendations for DBMS | | | | | | | | ❍ | ● | | | | | | | | |
| 12 | Complete Logical Database Design | | | | | | | | ❍ | ● | | | | | | | | |
| 13 | Identify Candidate Prestored Aggregates | • | | | | ❍ | | ❍ | ● | ❍ | | | | | | | | |
| 14 | Develop Aggregation Table Design Strategy | | | | | | | | ❍ | ● | | | | | | | | |
| 15 | Review Logical Database Design w/Team | | | | | | ❍ | ❍ | ❍ | ● | ❍ | • | ❍ | | | ❍ | | |
| 16 | Certify DB Design with DSS Tool Vendor | | | | | | | | | ● | | | | | | | | |
| 17 | User Acceptance/Project Review | ❍ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | • | ❍ | • | • | • | • | • |
| | **ANALYZE DATA SOURCES** | | | | | | | | | | | | | | | | | |
| 1 | Identify Candidate Data Sources | | | | | | | • | ❍ | ❍ | ● | | | | | • | | |
| 2 | Browse Data Content | | | | | | | • | ❍ | ❍ | ● | | | | | • | | |
| 3 | Develop Source to Target Data Map | | | | | | | | ❍ | ❍ | ● | | | | | ● | | |
| 4 | Estimate Number of Rows | | | | | • | • | • | ❍ | ● | ❍ | | | | | | | |
| 5 | User Acceptance/Project Review | ❍ | ❒ | ❒ | ❒ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | • | ❍ | • | • | ❍ | • | • |

| | ARCHITECTURE | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TECHNICAL ARCHITECTURE DESIGN** | | | | | | | | | | | | | | | | |
| 1 | Create Architecture Task Force | | | | | ❍ | ❍ | | | | | | ● | ❍ | | | |
| 2 | Gather & Document Technical Requirements | | | | | | + | + | + | + | + | | ● | ❍ | | | |
| 3 | Review Current Technical Environment | | | | | + | ❍ | ❍ | ❍ | ❍ | ❍ | | ● | ❍ | | | |
| 4 | Create Architecture Plan | | | | | | + | + | + | + | + | | ● | ❍ | | | |
| 5 | Determine Phased Implementation Approach | | | | | ❍ | ❍ | | | | | | ● | ❍ | | | |
| 7 | Create Infrastructure Plan | | | | | | | | | | | | ● | ❍ | | | |
| 8 | Develop Configuration Recommendations | | | | | | | | | | | | ● | ❍ | | | |
| 9 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❒ | ❍ | ● | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❍ | ❍ | ❒ | ❒ | ❒ |
| | | | | | | | | | | | | | | | | | | |
| | **IMPLEMENT TACTICAL SECURITY MEASURES** | | | | | | | | | | | | | | | | |
| 1 | Develop Tactical Security Plan | | | | | ❍ | ❍ | | | | | | ● | ❍ | | | |
| 2 | Secure Physical Environment | | | | | | ❍ | | | | | | ❍ | ● | | | |
| 3 | Install Virus Checking Software | | | | | | ❍ | | | | | | ❍ | ● | | | |
| 4 | Secure Access into Environment | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 5 | Secure Access out of Environment | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 6 | Implement Rigorous Password Scheme | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 7 | Implement Controls for Software Installation | | | | | | ❍ | | | | | | ❍ | ● | | | |
| 8 | Audit Security Violations | | | | | ❍ | ❍ | | | | | | ● | ❍ | | | |
| 9 | Monitor Security Privileges by Individual | | | | | ❍ | ● | | | | | | ❍ | ❍ | | | |
| 10 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❒ | ❍ | ● | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❍ | ❍ | ❒ | ❒ | ❒ |
| | | | | | | | | | | | | | | | | | | |
| | **DEVELOP STRATEGIC SECURITY PLAN** | | | | | | | | | | | | | | | | |
| 1 | Design Security Architecture | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 2 | Implement Access Tokens (Elim. Passwords) | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 3 | Implement Public/Private Keys for Authentication | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 4 | Implement Secure Tunneling for Remote Access | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 5 | Centralize Authentication & Access Control | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 6 | Impl. Signed Certificates for Software Downloads | | | | | | ❍ | | | | | | ● | ❍ | | | |
| 7 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❒ | ❍ | ● | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❍ | ❍ | ❒ | ❒ | ❒ |
| | | | | | | | | | | | | | | | | | | |
| | **PRODUCT SELECTION** | | | | | | | | | | | | | | | | |
| | (Repeat for each selection area) | | | | | | | | | | | | | | | | |
| 1 | Develop Evaluation Matrix | | | | | ● | ● | ❍ | ❍ | | | | ● | ❍ | | | |
| 2 | Research Candidate Products | | | | | | ❍ | ❍ | ❍ | ❍ | ❍ | | ❍ | ● | ❍ | | |
| 3 | Develop Product Short List | | | | | | ❍ | ❍ | ❍ | ❍ | ❍ | | ❍ | ● | | | |
| 4 | Evaluate Product Options | + | | | | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | | ❍ | ● | ❍ | | |
| 5 | Optional Prototype (May repeat for diff. products) | | | | | | | | | | | | | | | | |
| | Select Business Process / Data for Evaluation | | | | | ● | ● | ❍ | ❍ | | | | | | | | |
| | Define Completion Criteria | | | | | ● | ● | | | | | | ❍ | | | | |
| | Acquire Resources (Internal/Vendor) | | | | | ❍ | ● | | | | | | | | | | |
| | Determine Test Configuration | | | | | | ❍ | | | ❍ | ❍ | | ❍ | ● | ❍ | | |
| | Install Evaluation Prerequisites & Components | | | | | | | ❍ | ❍ | ❍ | ❍ | | ❍ | ❍ | ● | | |
| | Train the Evaluation Team | ❍ | | | | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | | |
| | Develop & Tune Prototype | | | | | | ❍ | ❍ | ● | ● | ● | | ● | ❍ | ● | | |
| | Conduct Tests | + | | | | + | + | + | + | ● | ● | + | ● | + | ● | | |
| | Analyze & Document Results | + | | | | ❍ | ● | + | + | + | + | | + | ● | ❍ | | |
| 6 | Determine Product Recommendation | + | ❒ | ❒ | ❒ | ● | ● | ❍ | ❍ | ❍ | ❍ | | ❍ | ● | ❍ | | |
| 7 | Present Findings / Results To Management | | ❒ | ❒ | ❒ | ● | ● | + | + | + | + | | + | + | + | | |
| 8 | Negotiate Contract | | | | | | ● | | | | | | | | | | |
| 9 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❒ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | + | + | + |
| | | | | | | | | | | | | | | | | | | |
| | **PRODUCT INSTALLATION** | | | | | | | | | | | | | | | | |
| | (Repeat for each product) | | | | | | | | | | | | | | | | |
| 1 | Installation Planning | | | | | | | | | | | | ● | ❍ | | | |
| 2 | Meet Prerequisites | | | | | | | | | | | | ❍ | ● | | | |
| 3 | Install Hardware / Software | | | | | | | | | | | | ❍ | ● | | | |
| 4 | Test Hardware / Software | | | | | | | | | | | | ❍ | ● | | | |
| 5 | User Acceptance/Project Review | + | ❒ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | + | ❍ | ❍ | ❍ | + | + | + |

| | IMPLEMENTATION | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PHYSICAL DATABASE DESIGN** | | | | | | | | | | | | | | | | | |
| 1 | Define Standards | | | | | | | | | ● | | | | | | | | |
| 2 | Design Physical Tables & Columns | | | | | | | | + | ● | | | | | | | | |
| 3 | Estimate Database Size | | | | | | + | • | + | ● | • | | | | | | | |
| 4 | Develop Initial Index Plan | | | | | | | • | + | ● | | | + | | | | | |
| 5 | Develop Initial Aggregation Plan | | | | | | | ❍ | ❍ | ● | | | | | | | | |
| 6 | Develop Initial Partitioning Plan | | | | | | | | | ● | | | | | | | | |
| 7 | User Acceptance/Project Review | | ❒ | ❒ | ❒ | ❒ | ● | ❍ | ❍ | ❍ | ❍ | • | ❍ | • | • | ❍ | • | • |
| | | | | | | | | | | | | | | | | | | |
| | **PHYSICAL DATABASE IMPLEMENTATION** | | | | | | | | | | | | | | | | | |
| 1 | Determine DBMS Fixed Parameters | | | | | | | | | ● | | | | | | | | |
| 2 | Install DBMS | | | | | | | | | ● | | | | ❍ | ❍ | | | |
| 3 | Optimize DBMS Changeable Parameters | | | | | | | | | ● | | | | | | | | |
| 4 | Build Physical Storage Structure | | | | | | | | | ● | | | | | | | | |
| 5 | Setup RAID | | | | | | | | | ● | | | | ❍ | ❍ | | | |
| 6 | Complete Table and Index Sizing | | | | | | | | + | ● | | | | | | | | |
| 7 | Create Tables and Indexes | | | | | | | | | ● | | | | | | | | |
| 8 | User Acceptance/Project Review | | ❒ | ❒ | ❒ | ❒ | ● | ❍ | ❍ | ❍ | ❍ | • | ❍ | • | • | • | • | • |
| | | | | | | | | | | | | | | | | | | |
| | **DATA STAGING DESIGN & DEVELOPMENT** | | | | | | | | | | | | | | | | | |
| 1 | Design High Level Staging Process | | | | | | | | | | ● | | | | | ❍ | | |
| 2 | Develop Detailed Staging Plan by Table | | | | | | | | | | ● | | | | | ❍ | | |
| 3 | Set Up Development Environment | | | | | | | | | ● | ❍ | | | ❍ | ❍ | ❍ | | |
| 4 | Define & Implement Staging Metadata | | | | | | | | + | • | ● | | | | | ● | | |
| 5 | Develop 1st Static Dimension Table Process (Extract, Transformation & Load) | | | | | | | | + | • | ❍ | | | | | ● | | |
| 6 | Develop 1st Dimension Maintenance Process | | | | | | | | + | • | ❍ | | | | | ● | | |
| 7 | Develop Remaining Dimension Table Processes | | | | | | | | + | • | ❍ | | | | | ● | | |
| 8 | Develop Fact Table Process (Extract, Transformation & Load) | | | | | | | | + | • | ❍ | | | | | ● | | |
| 9 | Develop Incremental Fact Table Process | | | | | | | | + | • | ❍ | | | | | ● | | |
| 10 | Design & Implement Data Cleansing | | | | | | | • | + | • | ● | | | | | ● | ❍ | ❍ |
| 11 | Design & Develop Agregation Process | | | | | | + | • | + | • | ● | | + | | | ● | | |
| 12 | Automate Entire Process | | | | | | ❍ | | | | ❍ | | | | | ● | | |
| 13 | Develop Data Quality Assurance Processes | | | | | | ❍ | ❍ | ❍ | ❍ | ❍ | | | | | ❍ | ❍ | ● |
| 14 | Implement DB Administration (Archive, Backup & Recovery) | | | | | | ❍ | | | ● | • | | | | | • | | ❍ |
| 15 | User Acceptance/Project Review | | ❒ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | • | • | ❍ | ❍ | ❍ |
| | | | | | | | | | | | | | | | | | | |
| | **POPULATE & VALIDATE DATABASE** | | | | | | | | | | | | | | | | | |
| 1 | Set Up Production Environment | | | | | | | | | ● | | | | ❍ | ❍ | | | |
| 2 | Load Initial Test Data | | | | | | | | | | ❍ | | | | | ● | | |
| 3 | Initial Data Validation/Quality Assurance | | | | | ❍ | ❍ | | | | ❍ | | | | | ❍ | ❍ | ● |
| 4 | Load Historical Data | | | | | | | | | | ❍ | | | | | ● | | |
| 5 | Perform Data Validation/Quality Assurance | | | | | ❍ | ❍ | | | | ❍ | | | | | ❍ | ❍ | ● |
| 6 | User Acceptance/Project Review | | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | • | • | ❍ | ❍ | ❍ |
| | | | | | | | | | | | | | | | | | | |
| | **PERFORMANCE TUNING** | | | | | | | | | | | | | | | | | |
| 1 | Set Up Benchmark Queries | | | | | ❍ | ❍ | ❍ | ❍ | ● | | | ● | ❍ | ❍ | | | |
| 2 | Review Indexing & Aggregation | | | | | ❍ | ❍ | ❍ | ❍ | ● | | | ❍ | | | | | |
| 3 | Review Tool Specific Tuning | | | | | ❍ | ❍ | | | ❍ | | | ● | | | | | |
| 4 | Conduct Ongoing Database Monitoring | | | | | ❒ | ❒ | | | ● | | | | | | | | |
| 5 | User Acceptance/Project Review | | ❒ | ❒ | ❒ | ❍ | ● | • | • | ❍ | ❍ | • | ❍ | • | • | • | • | • |
| | | | | | | | | | | | | | | | | | | |
| | **END USER (E/U) APPLICATION SPECIFICATION** | | | | | | | | | | | | | | | | | |
| 1 | Identify & Prioritize Candidate Reports | + | | | | ● | ❍ | ❍ | + | | | | ● | | | | | |
| 2 | Design Template Navigation Approach | | | | | • | ❍ | • | + | | | | ● | | | | | |
| 3 | Develop E/U Application Standards | | | | | ❍ | ❍ | • | + | | | | ● | | | | | |
| 4 | Document Detailed Template Specifications | | | | | • | ❍ | ❍ | + | | | | ● | | | | | |
| 5 | Review End User Application Specs w/Users | ❍ | | | ❒ | ● | ❍ | ❍ | ❍ | | | | ● | | | | | |
| 6 | Revise End User Application Specs | | | | | • | ❍ | • | | | | | ● | | | | | |
| 7 | Revise Project Scope | ❒ | ❒ | ❒ | ❍ | ● | ● | • | + | • | • | • | • | + | + | • | • | • |
| 8 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | • | ❍ | • | • | ❍ | ❍ | • |
| | | | | | | | | | | | | | | | | | | |
| | **END USER (E/U) APPLICATION DEVELOPMENT** | | | | | | | | | | | | | | | | | |
| 1 | Select Implementation Approach | ❍ | | | | ❍ | ❍ | ❍ | ❍ | | | | ● | | | | | |
| 2 | Review Application Specifications | ❍ | | | | ❍ | ❍ | ❍ | ❍ | | | | ● | | | | | |
| 3 | Review Application Standards | | | | | ❍ | ❍ | ❍ | | | | | ● | | | | | |
| 4 | Populate E/U Tool Metadata | | | | | • | | • | + | • | • | | ● | | | • | + | |
| 5 | Develop E/U Applications | | | | | | | ❍ | | | | | ● | | | | | |
| 6 | Provide Data Accuracy & Cleanliness Feedback | | | | | ❍ | ❍ | ❍ | | | ❍ | | ❍ | | | ❍ | ❍ | ● |
| 7 | Develop E/U Navigation | | | | | • | | ❍ | | | | | ● | | | | | |
| 8 | Review w/Users | ❍ | | | | ❍ | ❍ | ❍ | | | | | ● | | | | | |
| 9 | Document E/U Applications | | | | | • | | ❍ | | | | | ● | | | | | |
| 10 | Develop E/U Application Maint. Procedures | | | | | ❍ | ❍ | | | | | | ● | | | | | |
| 11 | Develop E/U Application Release Procedures | | | | | ❍ | ❍ | | | | | | ● | | | | | |
| 12 | User Acceptance/Project Review | ❍ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | • | • | • | • | • |

| | DEPLOYMENT & GROWTH | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **DEPLOYMENT PLANNING** | | | | | | | | | | | | | | | | |
| 1 | Develop Desktop Infrastructure Checklist | | | | | | ❍ | | | | | | • | ● | • | | |
| 2 | Develop Initial User Education Strategy | • | | | ❒ | ● | ● | ❍ | ❍ | | | ● | ❍ | | | | ❍ | ❍ |
| 3 | Define User Support Strategy | | | | ❒ | ● | ● | ❍ | | | | ❒ | ❍ | ❒ | | | | |
| 4 | Define Release Plan | | | | ❍ | ● | ● | • | + | • | + | + | • | + | • | + | • | + |
| 5 | Review Deployment Strategies & Release Plan | ❒ | ❒ | ❒ | ❍ | ● | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| 6 | Develop User Course Materials | • | | | | • | + | • | + | | | ● | • | | | | | |
| 7 | Develop Support Procedures | | | | | ● | ● | ❍ | ❍ | ❍ | ❍ | | ❍ | | | ❍ | | |
| 8 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❒ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | • | + | ❍ | ❍ | ❍ |
| | | | | | | | | | | | | | | | | | | |
| | **COMPLETE SYSTEM TEST** | | | | | | | | | | | | | | | | | |
| 1 | Run Complete Data Staging Process | | | | | | ❍ | | | ● | ● | | | | | ● | | |
| 2 | Perform Standard QA Procedures | | | | | ❍ | ❍ | | | ❍ | ❍ | | ❍ | | | ❍ | ❍ | ● |
| 3 | Run Core End User Applications | | | | | ❍ | ❍ | ❍ | | | | | ● | | | | | |
| 4 | Review Overall Process | | | | | ● | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| 5 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| | | | | | | | | | | | | | | | | | | |
| | **DEPLOYMENT (ALPHA, BETA & PROD'N)** | | | | | | | | | | | | | | | | | |
| 1 | Assess Deployment Readiness | | | | | ● | ● | | | | | | | | | | | |
| 2 | Configure & Test Desktop Infrastructure | | | | | | | | | | | | ❍ | | ● | | | |
| 3 | Set Up Security Privileges | | | | | | ❍ | | | ❍ | | | ❍ | ● | ❍ | | | |
| 4 | Educate Users | ❍ | | | | ❍ | ❍ | ❍ | • | | | ● | ❍ | | | | | |
| 5 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| | | | | | | | | | | | | | | | | | | |
| | **DATA WAREHOUSE MAINTENANCE** | | | | | | | | | | | | | | | | | |
| 1 | Provide Ongoing User Support | ❍ | | | | ● | ● | ❍ | | | | ❍ | ❍ | | ❍ | | ❍ | ❍ |
| 2 | Provide Ongoing User Education | ❍ | | | | ❍ | ❍ | • | + | | | ● | • | | | | • | + |
| 3 | Maintain Technical Infrastructure | | | | | | ❍ | | | ● | | | | ● | ● | | | |
| 4 | Monitor End User Query Performance | | | | | • | ❍ | • | | ● | | | ● | | | | | |
| 5 | Monitor Data Staging Performance | | | | | | ❍ | | | ● | ● | | | | | ● | | |
| 6 | Monitor Ongoing Success | • | ❒ | ❒ | + | ● | ● | • | + | • | + | • | • | + | • | + | • | + |
| 7 | Communicate Continuously and Market Success | ❍ | ❍ | ❍ | ❍ | ● | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| 8 | User Acceptance/Project Review | ❒ | ❒ | ❒ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| | | | | | | | | | | | | | | | | | | |
| | **DATA WAREHOUSE GROWTH** | | | | | | | | | | | | | | | | | |
| 1 | Establish Data Warehouse Steering Committee | | ● | ● | ● | ❍ | ❍ | | | | | | | | | | | |
| 2 | Establish Enhancement Prioritization Strategy | | ● | ● | ● | ❍ | ❍ | | | | | | | | | | | |
| 3 | Iteratively Use Business Dimensional Lifecycle | ❍ | ❍ | ❍ | ❍ | ● | ● | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

| LEGEND: | |
|---|---|
| Primary Responsibility for the Task – | ● |
| Involved in the Task – | ❍ |
| Provides Input to the Task – | • |
| Informed Task Results – | ❒ |
| Optional Involvement in the Task – | + |

Source: Kimball et al., 1998, pp. 737-746

# 12 Appendix 3 Profile Analysis

The following pages contain a detailed analysis of a Defender, Analyser and Prospector

| SECTION A | | |
|---|---|---|
| DEFENDER | PROSPECTOR | ANALYSER |
| **ENTREPRENEURIAL PROBLEMS & SOLUTIONS** | | |
| Management attempt to seal off a portion of the total market in order to create a stable set of products and services directed at a clearly defined market segment. | The Prospectors prime capability is that of finding and exploiting new product and market opportunities. | How to locate and exploit new product and market opportunities while simultaneously maintaining a stable core of products and customers. |
| Success depends on its ability to maintain aggressively its prominence within the chosen market segment. | Maintaining a reputation as an innovator in product and market development may be as important, perhaps even more important that profitability. | Ideal analyser is always poised, ready to move quickly toward a new product / market that has recently gained a degree of acceptance. |
| Competes on price and quality | Prospectors may find it difficult to attain consistently the profitability levels of the more efficient Defenders. | |
| **DOMAIN ESTABLISHMENT AND SURVEILLANCE** | | |
| Product market domain is narrow and stable | Domain is usually broad and in a continuous state of development | Domain is a mixture of products and markets, some stable, others changing |
| Chosen market typically one of the healthiest of entire market. | Prospectors products and markets 'fluid' - dynamic domain. | Successful imitation is accomplished through extensive marketing surveillance mechanisms. |
| Offers clients a full range of products and services | Prospector must maintain and develop the capacity to monitor a wide range of environmental conditions, trend and events. | Analyser is an avid follower of change. |
| Evidenced by continuous and intensive effort to become more efficient technologically. | Prospector invests in individuals / groups that can scan the environment for opportunities. | Don't get involved in R&D but adopts most promising innovations. |
| Focus on reducing manufacturing and distribution costs while improving product quality | Scanning may be decentralized. | |
| Management tend to ignore developments outside of their domain. | Scanning not limited to current domain. | |
| Allocate small amount of time to monitoring other organisations / events / trends. | Frequently the creators of change in their industries, which gives them an edge over rivals. | |
| Environment scanning performed by only a few executives. | Prospectors must develop their own responses to change | |
| Regard external environment as basically predictable. | | |
| **GROWTH** | | |
| Growth by penetrating deeper into their current market | Primarily results from the location of new markets and the development of new products | Growth pattern is a mix of Defender and Prospector |
| Narrow and stable domain allows organisation to become thoroughly familiar with customer needs. | Expands horizontally into related products and markets | Most of the growth occurs through market penetration. |
| Product development usually a simple extension of current product line or expansion into closely related areas. | As Defender, Prospector penetrates deeper into current markets. | A substantial amount of growth may also occur through product and market development. |
| Growth is normally cautious and incremental | Grows in spurts | |
| Expansion of production capacity is often generated internally than by acquisition. | Prospecting is uncertain but results can be spectacular | |
| **COSTS AND BENEFITS OF THE ENTREPRENEURIAL SOLUTION** | | |
| Competitors find it difficult to dislodge Defenders due to their grip on the market. | The entrepreneurial problem is how to perform elaborate environmental surveillance continually | |
| Defender runs the risk of fairly rapid extinction in the event of a major market shift. | Prospector is a domain definer as opposed to a domain defender | |
| Gambling on the continued viability of its limited set of products and markets. | Immune to the pressures of changing environment, as keeps pace with change or leads change. | |
| | Seldom attains efficiency necessary to reap max economic benefits | |
| | Cannot establish stable technologies or organizational structures | |
| | Prospector can overextend itself with constant shifting of markets and products | |

| SECTION A | | |
|---|---|---|
| DEFENDER | PROSPECTOR | ANALYSER |
| **ENGINEERING PROBLEMS & SOLUTIONS** | | |
| Defenders invest majority of financial and managerial resources in solving the engineering problem. | Entrepreneurial activities have primacy | Analyser must achieve and protect an equilibrium between conflicting demands for technical flexibility and technical stability |
| Relies heavily on cost efficient technology | Technologies are not usually developed until late in the process of product development | Equilibrium achieved by the partitioning of production activities to form a dual technical core |
| Stable environment required in the pursuit of technology efficiency. | Guided by questions: 'what products should we make?' not 'what products can we make?' | Stable component resembles Defender's technology |
| Disregard for monitoring events in external domain reduces the need for expensive surveillance systems. | Products life expectancy relatively short | Flexible technical component resemble the Prospectors technological orientation |
| Defender looks for improvements in quality, inventory control, production scheduling and distribution methods. | Minimize long term capital investment in production processes | Analysers dual technological core is a marriage of engineering solutions with stable and flexible components welded together by an influential applied research group. |
| Defenders generally establish only one core technology. | Only commit when viability has been ascertained. | Analyser can update its product line without incurring the Prospector's extensive R&D expenses. |

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| Purchasing is an important function. | Considerable portion of technical core is frequently engaged in the production of prototypes. | Analysers capability for updating portions of its domain eliminates the desirability of some of the more constraining structural mechanisms used by the Defender to protect technical stability. |
| Vertical integration is very important in pursuit of efficiency. | Develops multiple technologies. | Technological system is characterised by a moderate degree of technical efficiency. |
| Defenders only concentrate on updating current technology to maintain efficiency. | Prospector protects technological flexibility by employing individuals who have a variety of skills to apply to a given situation. | |
| As much as possible, processes are routinised and automated. Resources utilised at optimal levels. | Technological processes are disposable but people who operate it are indispensable. | |
| Systems lack flexibility. | Prospectors technologies are embedded in people, not in routine or mechanical operations. | |

## SECTION A

| DEFENDER | PROSPECTOR | ANALYSER |
|---|---|---|
| **ADMINISTRATIVE PROBLEMS & SOLUTIONS** | | |
| Administration solution must provide management with the ability to control all organisations operations centrally. | Prospectors domain is encouraged to change. | How to differentiate the organisation's structure & processes to accommodate both stable and dynamic areas of operation. |
| | Admin problem is how to facilitate rather than control organisational operations. | |
| | Admin system needs to be able to deploy & co-ordinate resources among many decentralised units and projects rather than plan and control operations. | |
| **DOMINANT COALITION & MANAGERIAL SUCCESSION** | | |
| Dominant coalition tends to comprise of CEO, the Controller and Heads of Production and Sales. | Dominant coalition centres around the Marketing and Research & Development functions. | Focuses on the function of marketing, applied research and production. |
| Marketing in Defenders does not include research and promotion. Head of Marketing ranks well below Production Manager. | Dominant coalition larger and more diverse and more transitory than Defender's. | Particular composition of critical functions reflects both the Prospectors and Defenders dominant coalitions. |
| Financial and Production experts wield considerable power. | Prospectors tend to be organised into product divisions and are responsible for nearly all phases of development, production, marketing and sales. | Marketing specialists are best suited for identifying those newly developed products and markets which are likely to be profitable. |
| Tenure of dominant coalition tends to be lengthy and promoted from within i.e. need to know the business. | Due to 'local' knowledge, divisional general managers and key staff may be members of dominant coalition as well as top executives. | Dominant coalition tends to be large & transitory (influence ebbs & flows) |
| | Influence of segments of dominate coalition ebbs & flows. | Analysers substitute an applied engineering group or similar group, for the Prospector's R&D group. |
| | Top managers tend to be soured from Prod Dev & Marketing. | New products are moved into standardised production early. |
| | Prospectors are as likely to be hired from outside as promoted from within. | Engineering and marketing provides the main source of top executive talent. |
| | Develops a cosmopolitan managerial team. | Analysers include production function in its dominant coalition. |
| | Tenure of members of dominant coalition is seldom as long as the Defender's. | Production may not wield as much power as marketing. |
| **PLANNING** | | |
| Intensive rather than extensive. | Planning is usually broad rather than extensive, oriented toward problem finding and contingent upon feedback from experimental action. | Must plan for both stability and change - planning is both intensive and extensive. |
| Oriented toward problem solving than problem finding. | Management perceive a complex and changing environment, which leads to a comprehensive planning approach accounting for numerous factors. | Intensive planning occurs primarily between functional division of marketing and production and concerns the stable portion of the analysers business. |
| Undertaken prior to organisational action. | Prospectors frequently act on the basis of incomplete information and await feedback for the market. | In this respect Plan > Act > Evaluate |
| Lack of environmental threat facilitates sequential planning i.e. Plan > Act > Evaluate. | Planning approach: Evaluate > Act > Plan i.e. more intensive planning when they have a clearer picture of the market. | Broad market planning for the development of new products occurs through the close interaction of applied research and marketing's product manager. |
| Focus on selling of output and cost control translated into specific operating goals and budgets. | | Evaluates product and markets being investigated by Prospectors. |
| | | In this respect Evaluate > Plan > Act |
| **STRUCTURE** | | |
| Defenders tend to rely on functional organisational structures. | Willing to alter organisational structure in response to change. | |
| Within functional subunits there is extensive division of labour. | Focus resources in the most productive and effective business areas. | |
| High degree of formalisation i.e. codification of job descriptions and operating procedures. | Decentralised entrepreneurial and engineering activities unconstrained by central control. | |
| | Prospector maintains a pool of expertise. | |
| | Less extensive division of labour. | |
| | Develop a low degree of structural formalisation i.e. no codification of job descriptions or operating procedures. | |
| | Encourages 'deviant' behaviour. | |
| **CONTROL** | | |
| The prevention and correction of deviations from plan. | Control system is results oriented. | Achieving adequate control is both critical and problematic. |
| Defenders want early notification of deviation. | Emphasises measures such as product acceptance rather than input measures. | Success contingent upon maintaining an equilibrium among subunits that have disparate structures and processes. |
| Centralised control. | Decentralised control. | Assortment of control techniques employed to maintain performance of differentiated subunits. |
| Top executives control. | Control information required within the | Employ long looped vertical information |

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| | operating unit and not be central management. | system |
| Decision making prerogatives may be centralized at executive levels. | Exercise self control | Some projects may employ short looped info systems |
| Decision making may be polycentralized i.e. department heads act in a relatively independent manner in their own area of responsibility and engage in limited lateral communications. | Prefer short, horizontal feedback loops | Dominant coalition must manage fundamentally different control mechanisms |
| Defenders normally restrict information flows to vertical channels | Operating unit requires timely performance information to act upon it immediately | Efficiency continuously traded off against effectiveness |
| Instructions down, progress up | | |
| Information flow is long looped. | | |
| | | |
| **COORDINATION & CONFLICT RESOLUTION** | | |
| Functional structures require greater interdependence between functions | Prospector must employ complex and expensive forms of coordination in order to manage subunit interdependence | Uses both single and complex forms of coordination |
| Defenders manage interdependence with uncomplicated and inexpensive forms of coordination e.g. standardisation & scheduling | Fluidity can result in diffused and varied forms of conflict i.e. wide and varied views over direction of the organisation | stable operating areas rely on simple inexpensive functional coordination structures |
| Standardisation and scheduling reduces the amount of communication flows between subunits. | Conflict must be directly confronted by the affected units and resolved through the use of coordination and integrators who act as liaisons between interdependent project groups. | Product and project groups more likely to follow Prospector structures |
| Later relations are limited | | Conflict resolution combines Defender and Prospector systems |
| Conflicts between subunits usually handled through normal hierarchical channels. | | |
| **PERFORMANCE APPRAISAL & MAINTENANCE** | | |
| Efficiency rather than effectiveness ("doing things right" rather than "doing right things") | Prospectors usually define organisational performance in terms of output or results | In stable units performance tends to be defined in terms of efficiency |
| Appraisal involves comparing present indices of efficiency with those achieved by the organisation during previous time periods. | Appraisal effectiveness by comparing past and recent performance with that of similar organisations | In adaptive sub units performance tends to be defined in terms of effectiveness. |
| Do not compare themselves to other similar organisations. | Boundary spanning positions such as Marketing and Product development are regarded as crucial which are reflected in rewards systems and opportunities for promotion | |
| Rewards reflect this ethos. | In hard times, Prospectors protect R&D and Marketing | |
| **COSTS & BENEFITS OF THE ADMINISTRATION SOLUTION** | | |
| Emphasis on lagging or rationalizing aspects of administration role e.g. planning, centralised decision making. | Structure and process characteristics for solving admin problem emphasise the innovative or leading aspect of the admin role. | |
| Risks ineffectiveness | Temporary project teams, decentralised decision making and control, few operational procedures facilitate rapid response to change | |
| A Defenders leading or innovative activities are primarily focussed internally. | Major risk is the inefficient use of resources | |
| Cannot adapt rapidly to new opportunity even if it became apparent | May under utilise or misuse resources. | |
| | Learning curve may be lengthy with any given project. | |
| | High priced professional employees required to break down tasks into managerial portions | |
| | Projects with different time horizons difficult to co-ordinate | |
| | Prospecting is risky, many projects will not be successful. | |

| SECTION B | | | SECTION C | SECTION D | | | | SECTION E |
|---|---|---|---|---|---|---|---|---|
| DEFENDER | ANALYSER | PROSPECTOR | DOTY ET AL'S CONSTRUCTS | D MILLER'S IMPERATIVES | | | | |
| CONTINUUM | | | | ENVIRONMENT | ORG STRUCTURE | LEADERSHIP | STRATEGY | |
| ENTREPRENEURIAL PROBLEMS & SOLUTIONS | | | | RELATIONSHIPS AMONG IMPERATIVES | | | | Indices |
| Focussed market | | Broad market | Defender attempts to limit **environmental turbulence** and increase **market predictability**. Analyser has a foot in both camps while Prospector thrives in a dynamic and less predictable market. Market **scope** is much more open for the Prospector. | **Environmental uncertainty:** Highly attuned intelligence systems for environmental scanning | decentralised, divisionalised structure, less vertical integration | | greater differentiation, flexible, high innovation, greater customer focus. Org will be less driven by the strategy imperative | %age share of the market |
| Competes on price | | Less competetive on price | The Prospector and Dfender have different **Product-market development** issues to manage. The Prospector and Analyser depend on **environmental scanning** more than Defender. | **Environmental stability:** No environmental scanning, few intelligence gathering systems | greater centralisation, functional structure, more vertical integration | | greater standardisation, rigid, low innovation, less need to know the customer. Org will be more driven by the strategy imperative | Client profile - maturity |
| High focus on costs | | Lower cost focus | **Focus on efficiency** will drive the price/quality issue for the Defender. | **Environmental uncertainty:** Environment imperative more likely to affect smaller to medium sized firms | Size | | **Strategy driven forms** tend to be larger | Product profile |
| High focus on efficiency | | Low efficiency focus | | **Environmental stability:** Environment imperative less likely to have an impact in larger firms. | Size | | | Benchmarking |
| Customer base demands less innovation | | Customer base demands higher innovation | | | Needs structures that facilitate innovation | | **Differentiation** through state of the art products | Range of products |
| Stable market | | Volatile market | **environmental turbulence** | | | | **Innovative** firms solicit customers looking for novelty products | Innovation awards |
| | | | | | | | **Innovative** firms avoid cost conscious customers | Market leadership claims |
| | | | | | | | **Cost leaders** operate in stable industries | Price comparison |
| | | | | | | | **Cost leaders** provide standard products at low prices | Service indicators |
| | | | | | Planning dept strong and influential - involved in | | **Strategy driven firms** consciously formulate and | |
| | | | | Sophisticated IS | decision making | Decision making analytical | implement strategy | Quality indicators |
| | | | | | | | **Strategy driven firms** - will be codified and widely disseminated | Size of product range |
| | | | | | | | **Strategy driven firms** buy and sell parts of the organisation | Size of production departments |
| | | | | | | | **Strategy driven firms** - success gauged by | Rates of attrition i.e. high = v.competitive & less stable |

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| | | | | | | | financial indices | |
| | | | | | | | | Relative size of organisation |
| | | | | | | | | Reputation |
| | | | | | | | | Size of marketing & Product Development departments |
| | | | | | | | | Description of market - maturity, degree of regulation, etc |
| **DOMAIN ESTABLISHMENT AND SURVEILLANCE** | | | | | | | | |
| Stable market | | Changing market | Defender attempts to limit **environmental turbulence** and increase **market predictability**. Analyser has a foot in both camps while Prospector thrives in a dynamic and less predictable market. Market **scope** is much more open for the Prospector. The Prospector and Defender have different **Product-market development** issues to manage. The Prospector and Analyser depend on **environmental scanning** more than Defender. | | | | | Indicators of changing customer needs |
| Low environmental scanning | | High environmental scanning | | | | | | Product range crosses boundaries eg Banking, lifeassce, insurance, etc |
| Technology highly tuned | | Technology continuously adapting | as above | | | | | Channel exists for environmental scanning. |
| Stable environmental factors | | Volatile environmental factors | **Focus on efficiency** and **technological routinisation** and **technological interdependence** are important to the Defender. The Prospector and Analyser depend on environmental scanning more than Defender. | | | | | Funds invested in technology as a percentage of sales. |
| More efficienct | | less efficient | Focus on degree of **centralisation / decentralisation** | | | | | Nature of organisation's KPI's |
| | | | scanning & scope | | | | | Funds spent of R&D as a percentage of ? |
| | | | Perhaps an indication of **strategic clarity**. | | | | | Number of product launches over ? |
| | | | | | | | | Period of time |
| | | | | | | | | Degree to which technology is the basis of the product |
| | | | Environmental predictability & environmental turbulence. | | | | | Lead time to product launch |
| | | | | | | | | Signs of diversification / vertical integration |
| | | | | | | | | Investment in R&D. Size of Prod Dev departments (size of all departments) |
| | | | | | | | | Scope, Prod/Mkt Dev |
| **GROWTH** | | | | | | | | |
| cautious & incremental | | rapid | Market **scope** and **futurity** attract different degrees of focus. | | | | | Analyse own market / analyse potential markets |

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| Penetrate existing markets | | | Degree of **specialisation** | | | | Existing customer analysis / buy contact lists<br>Client sales / penetration stats for product range<br>Increase in market share - rate & trend<br>Market share by sector and product sales<br>Staff movement in total and by department i.e. increase in Mktg or Finance issue of **balance.**<br>Rates of attrition<br>Customer focus<br>Horizontal & vertical integration |
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| **COSTS AND BENEFITS OF THE ENTREPRENEURIAL SOLUTION** | | | | | | | |
| Dominate market | | Wide market coverage | Defender gambling on the strength of their chosen market and product-market mix<br>**Efficiency** measures | | | | Are there products / services that are unprofitable to launch / support - may indicate another Defender's market.<br>High cost of R&D<br>Efficiency measures - eg Call Centre capacity stats<br>Measures of change? |
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| **SECTION B** | | | **SECTION C** | **SECTION D** | | | | **SECTION E** |
|---|---|---|---|---|---|---|---|---|
| DEFENDER | ANALYSER | PROSPECTOR | DOTY ET AL'S CONSTRUCTS | D MILLER'S IMPERATIVES | | | | |
| CONTINUUM | | | | ENVIRONMENT | ORGSTRUCTURE | LEADERSHIP | STRATEGY | |
| **ENGINEERING PROBLEMS & SOLUTIONS** | | | | **RELATIONSHIPS AMONG IMPERATIVES** | | | | **Indices** |
| Inflexible systems | | Adaptable systems | Degrees of **formalisation** and **specialisation. Technical routinisation** will affect Prospector and Analyser's ability to be responsive. | Less need to know customers, lower competition, greater market maturity | **Rigid Structure:** Higher routinisation, standardisation, specialisation and formalisation<br>**Less Rigid structure:** Lower routinisation, standardisation, specialisation and formalisation | Inviolate rules, people tend to be less driven by growth | prevents adaptation, lower innovation, low differentiation, limited range of strategies, supports cost leadership / efficiency | Investment in existing technology |
| Efficiencies through technology | | Technologies less efficient | **Technical routinisation** and **technical interdependence** | Greater need to know customers, greater competition, less market maturity | | Flexible attitudes, people may be more driven by growth | greater range of strategies, greater innovation, greater differentiation, less supportive of cost leadership / efficiency | Investment in new technology |
| | | | | Automated and inflexible modes of production prohibit exceptions | **Rigid Structure:** Change forced | Greater specialisation of roles, Less personal discretion among managers | measure performance by looking internally to costs containment and output measures | Spend on R&D / Prod Dev |

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| Focus on value chain | | | | | | | |
| One core technology | | Multiple technologies | | | | | |
| Pursues vertical integration | | Does NOT pursue vertical integration | | | | | |
| Highly routinised | | low routinisation | | | | | |
| Highly standardised | | low standardisation | **Technical routinisation** and **technical interdependence** | External forces: Monopoloy, political cooptation, trade protectionism, patents, economic decline, deregulation | **Less Rigid structure:** Change welcomed | More personal discretion among managers | Efficiency measures - industry measures such as Cost : Income |
| Less dependent on people | | More dependent on people | **Technical routinisation** and **technical interdependence** | | | | Capex investment |
| | | | | | | | Quality measures |
| | | | | | | | Diverse technologies<br>Range and nature of si-ubsidiary companies |
| | | | | | | | Systems efficiency measures |
| | | | | | | | Technology performance measures |
| | | | | | | | Investment in technology |
| | | | | | | | Number of systems<br>Technology spend on non regulatory developments |
| | | | | | | | Manual work arounds |

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| | | | | Sophisticated IS | | Decision making analytical | **Strategy driven firms** - will be codified and widely disseminated | Size of product range |
| | | | | | | | **Strategy driven firms** buy and sell parts of the organisation | Size of production departments |
| | | | | | | | **Strategy driven firms** - success gauged by financial indices | Rates of attrition i.e. high – v.competitive & less stable |
| | | | | | | | | Relative size of organisation |

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| | | | | | | | | Reputation<br>Size of marketing & Product Development departments<br>Description of market - maturity, degree of regulation, etc |
| **DOMAIN ESTABLISHMENT AND SURVEILLANCE** | | | | | | | | |
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| More efficient | | less efficient | Focus on degree of **centralisation / decentalisation** | | | | | Nature of organisation's KPI's |
| | | | scanning & scope<br>Perhaps an indication of **strategic clarity**. | | | | | Funds spent of R&D as a percentage of ?<br>Number of product launches over ?<br>Period of time |
| | | | | | | | | Degree to which technology is the basis of the product |
| | | | Environmental predictability & environmental turbulence. | | | | | Lead time to product launch |
| | | | | | | | | Signs of diversification / vertical integration<br>Investment in R&D. Size of Prod Dev departments (size of all departments) |
| | | | | | | | | Scope, Prod/Mkt Dev |
| **GROWTH** | | | | | | | | |
| cautious & incremental | | rapid | Market **scope** and **futurity** attract different degrees of focus. | | | | | Analyse own market / analyse potential markets<br>Existing customer analysis / buy contact lists |
| Penetrate existing markets | | | Degree of **specialisation**. | | | | | Client sales / penetration stats for product range |
| | | | | | | | | |

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|---|---|---|---|---|---|---|---|
| | | | | | | | Increase in market share - rate & trend<br>Market share by sector and product sales<br>Staff movement in total and by department i.e. increase in Mktg or Finance issue of **balance.**<br>Rates of attrition<br>Customer focus<br>Horizontal & vertical integration |
| COSTS AND BENEFITS OF THE ENTREPRENEURIAL SOLUTION | | | | | | | |
| Dominate market | | Wide market coverage | Defender gambling on the strength of their chosen market and product-market mix<br>**Efficiency** measures | | | | Are there products / services that are unprofitable to launch / support - may indicate another Defender's market.<br>High cost of R&D<br>Efficiency measures - eg Call Centre capacity stats<br>Measures of change? |

| SECTION B | | | SECTION C | SECTION D | | | | SECTION E |
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| DEFENDER | ANALYSER | PROSPECTOR | DOTY ET AL'S CONSTRUCTS | D MILLER'S IMPERATIVES | | | | |
| CONTINUUM | | | | ENVIRONMENT | DMG STRUCTURE | LEADERSHIP | STRATEGY | |
| ENGINEERING PROBLEMS & SOLUTIONS | | | | RELATIONSHIPS AMONG IMPERATIVES | | | | Indices |
| Inflexible systems | | Adaptable systems | Degrees of **formalization** and **specialisation**. **Technical routinisation** will affect Prospector and Analyser's ability to be responsive.<br><br>**Technical routinisation** and **technical interdependence** | Less need to know customers, lower competition, greater market maturity<br><br>Greater need to know customers, greater competition, less market maturity<br><br>Automated and inflexible modes of production prohibit exceptions<br><br>External forces: Monopoloy, political cooptation, trade | **Rigid Structure:** Higher routinisation, standardisation, specialisation and formalisation<br>**Less Rigid structure:** Lower routinisation, standardisation, specialisation and formalisation<br><br>**Rigid Structure:** Change forced<br><br>**Less Rigid structure:** Change welcomed | Inviolate rules, people tend to be less driven by growth<br><br>Flexible attitudes, people may be more driven by growth<br>Greater specialisation of roles, Less personal discretion among managers<br><br>More personal discretion among managers | presents adaptation, lower innovation, low differentiation, limited range of strategies, supports cost leadership / efficiency<br>greater range of strategies, greater innovation, greater differentiation, less supportive of cost leadership / efficiency measure performance by looking internally to costs containment and output measures | Investment in existing technology<br><br>Investment in new technology<br><br>Spend on R&D / Prod Dev<br><br>Efficiency measures - industry measures such as Cost : Income<br><br>Capex investment |
| Efficiencies through technology | | Technologies less efficient | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Focus on value chain | | | | | | | | |

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|---|---|---|---|---|---|---|---|
| | | | | protectionism, patents, economic decline, deregulation | | | |
| One core technology | | Multiple technologies | | | | | Quality measures |
| Pursues vertical integration | | Does NOT pursue vertical integration | | | | | Diverse technologies |
| Highly routinised | | low routinisation | | | | | Range and nature of si–ubsidiary companies |
| Highly standardised | | low standardisation | **Technical routinisation and technical interdependence** | | | | Systems efficiency measures |
| Less dependent on people | | More dependent on people | **Technical routinisation and technical interdependence** | | | | Technology performance measures |
| | | | | | | | Investment in technology |
| | | | | | | | Number of systems |
| | | | | | | | Technology spend on non regulatory developments |
| | | | | | | | Manual work arounds |

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| ADMINISTRATIVE PROBLEMS & SOLUTIONS | | | | RELATIONSHIPS AMONG IMPERATIVES | | | | Indices |
| Centralisation | | Decentralisation | **Decentralisation** | | | | | Number of centralised and decentralised control functions |
| Less change | Operate in stable & dynamic areas | More change | **Decentralisation** | | | | | Range of control measures |
| More planning | | Less planning | | | | | | Resource allocation to centralised and decentralised functions |
| More control mechanisms | | Fewer control mechanisms | | | | | | |
| DOMINANT COALITION & MANAGERIAL SUCCESSION | | | | | | | | |
| Power with Production, Finance & Sales | Leaning towards Marketing but Production included | Marketing and R&D more powerful | | Unsuitable in complex markets, high growth arenas or highly diversified industries, more complex surveillance systems for competition and employees | More centralised, direct influence, more influential in smaller firms overburdens functionally based structures, increases admin complexity Needs divisionalised, market based structures, formal controls and MI systems, elaborate interdivisional committees | **Greater personal influence from leadership imperative:** Influences culture, uniformity among other managers, tend to be young owner managed, highly knowledgable managers are key decision makers, less delegation among managers, leader dominates decision making | More entrepreneurial, direct influence on goals policies and strategies, possible greater diversification, greater innovation | Could the weightings be determined by the no. of staff / resource allocation in the dominant coalition. |
| Little R&D / Marketing | | Considerable focus on in Mktg and R&D | | | | | **Diversification** | |
| | | Divisional structure | | | | | **Diversification** | Org structure - certain structures are more appropriate for particular ideal types. |
| Likely to be promoted from within | | Likley to hire from outside organisation. | | | | | | |
| PLANNING | | | | | | | | |
| Intensive NOT extensive | Intensive AND extensive | broad NOT extensive | **Strategic clarity** | | | | | Use of targets and measurement metrics<br>Time allocated to planning by department |
| Problem solving | | Problem finding | | | | | | |
| Plan > Act > Evaluate | Depends on portion of the business | Evaluate > Act > Plan | | | | | | Time allocated to review against plan. |
| Goals and budgets focus on sales and costs control | | Less focus on cost control | | | | | | |
| STRUCTURE | | | | | | | | |
| Functional structure | | Divisionalised | | | | | | This is perhaps supporting evidence of a particular ideal type and may simply be construed as either a |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | positive or negative factors. |
| Extensive division of labour | | Less extensive division of labour | Degrees of **formalisation** and **specialisation**. | | | | | Role clarification high ly structured. |
| Centralised | | Decentralised | | | | | | |
| Less entrepreneurial | | More entrepreneurial | | | | | | |
| Greater formalisation | | Less formalisation | | | | | | |
| **CONTROL** | | | | | | | | |
| Focus on exceptions reporting | | | **Focus on efficiency**<br><br>**Decentralisation** | | | | | Control measures - KPI's, dashboards |
| Exercise greater control | Struggle to achieve adequate control | Exercise less control | | | | | | |
| Centralised control | | Decentralised control | | | | | | |
| Decision making at senior management levels | | Delegated decision making | | | | | | |
| Information flow is long looped | | Information flow is short looped | | | | | | |
| Pursue efficiency | Efficiency continuously traded off against effectiveness | Pursue effectiveness | | | | | | |
| **COORDINATION & CONFLICT RESOLUTION** | | | | | | | | |
| Greater interdependence | | Less interdependence | **Technology interdependence** | | | | | |
| Manage by standardisation and scheduling | Use standardisation and scheduling where possible | Coordination complex and expensive | | | | | | |
| **PERFORMANCE APPRAISAL & MAINTENANCE** | | | | | | | | |
| Efficiency over effectiveness | balanced approach | Effectiveness over efficiency | **Focus on efficiency** | | | | | |
| Introvert performance measures | | Extrovert performance measures | | | | | | |
| **COSTS & BENEFITS OF THE ADMINISTRATION SOLUTION** | | | | | | | | |
| Inflexible | | Flexible | | | | | | |
| Risk averse | | Risk takers | | | | | | |

# 13 Appendix 4 Questionnaire

## Entrepreneurial Challenge

Market Orientation

Customer Orientation

| Question | Customer commitment | Option A | Option B | Option C | Option D | Option E | Option F | Option G | Option H |
|---|---|---|---|---|---|---|---|---|---|
| 1 | This organisation is committed to providing: | A broad, high quality product / service range, which is focussed on highly profitable market segments. | A narrow but highly focussed product / service range, which is focussed on highly profitable segments | A high quality product / service range with broad appeal at competitive prices, which incorporate emerging innovations | Highly innovative products / services incorporating leading edge technologies | | | | |
| 2 | Our product range / services are appealing because: | Our products / services suit niche markets | Our customers are cost conscious | Our customers demand a high quality of service | Our customers demand innovative product features | | | | |
| 3 | Which statement is true of your customer base? | Very stable and predictable | Contains stable and dynamic segments | Unstable and very dynamic | | | | | |
| 4 | The trading environment in our industry is: | Stable and predictable | Relatively stable but becoming more competitive | Becoming less stable and increasingly competitive | Highly competitive and constantly changing | | | | |
| 5 | Our success may be attributable to: | Focussing on a core and stable / loyal customer base that is lucrative. | Maintaining a stable core customer base while following developing markets | Leading the market through innovative products / services | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Which statements are true of your distribution channels? | Our distribution channels are characteristically efficient but only offer standard facilities for our industry | Our distribution channels offer standard facilities but lack high levels of efficiency | Our distribution channels are relatively innovative compared to the majority of competitors but costly to operate | Our distribution channels are relatively innovative compared to the majority of competitors and cost effective | Our distribution channels are innovative for our industry and help to maintain our innovative reputation | | | |
| 7 | For existing customers, select the methods used to gather / identify customer needs: | Data analysis e.g. data mining, statistical analysis | Complaints | Informal information gathering e.g. staff awareness | Competitor analysis | Marketing initiatives e.g. customer surveys, focus groups | Developments inother markets / industries | Trials from Research & Development initiatives | |
| 8 | For prospective customers, select the methods used to gather identify customer needs: | Data analysis e.g. data mining, statistical analysis | Complaints | Informal information gathering e.g. staff awareness | Competitor analysis | Marketing initiatives e.g. customer surveys, focus groups | Developments inother markets / industries | Trials from Research & Development initiatives | |
| 9 | Our brand image represents: | High quality products / services | Value for money | Stability | Dynamism | Innovation | | | |
| Create customer value | | | | | | | | | |
| 10 | This organisation gathers information that allows us to measure the value of our products on the following basis: | Price | Post purchase support | Product / Service quality | Technology advances | Brand Image / Reputation | Range of Delivery channels | Unique product features | |
| Understand Customer Needs | | | | | | | | | |
| 11 | We develop our product and service range in response to the following: | Efficiency needs | Customer requests | Customer behaviour | Informal information gathering e.g. staff awareness | Competitor Activity | Advances in technology | Marketing initiatives e.g. customer surveys, | Practices in other Markets / Industries |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | focus groups |
| 12 | Internal processes have changed primarily as a result of: | Address operational inefficiencies | Enable the organisation to engage more effectively with its customers | Staff suggestions | Customer complaints | Take advantage of efficiencies afforded by advances in TECHNOLOGY | Competitor Activity | Practices in other Markets / Industries |
| 13 | We scan the following markets for ideas / business development opportunities. | Our current market | Markets that are related to our industry but are not yet engaged in | Markets that this organisation would not normally be associated with | | | | |
| Customer satisfaction objectives: | | | | | | | | |
| 14 | The primary objective of customer satisfaction is to ensure that: | Customers have an opportunity to inform the organisation of areas for improvement | Delivery channels meets customer needs | The products / services purchased represent value for money in terms of price and quality | The customer service / contact experience exceeds customer expectations | Product innovations satisfy customer expectations | We do not actively enquire about customer satisfaction | |
| 15 | Please indicate the areas where customers have expressed their satisfaction: | Customers have suggested areas for improvement, which have been actioned | Delivery channels meets customer needs | The products / services purchased represent value for money in terms of price and quality | The customer service / contact experience exceeds customer expectations | Product innovations satisfy customer expectations | | |
| 16 | There are staff in this organisation whose targets are focussed upon: | Increasing organisational efficiency / effectiveness | Customer satisfaction | Increasing revenues (sales / cross sales) | Gathering market intelligence | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| After sales service | | | | | | |
| 17 | We regard our after sales service as | An expense | A failure of production / service delivery processes | A means of differentiating the organisation from competitors. | An opportunity to ensure customer satisfaction. | A means of learning and developing products |
| 18 | We gather information to measure our level of after sales service from the following sources: | Record instances of post sales contact. | External surveys e.g. mystery shopper | Direct Customer Feedback / Survey | Competitor intelligence | Customer behaviour e.g. attrition rates |
| Relationship strategy | | | | | | |
| 19 | The primary aim of our customer relationship strategy is to: | Increase sales to our existing customer base | Limit attrition rates | Research customer's changing needs | | |
| 20 | As a result of our customer relationship strategy, customer attrition rates have: | Remained static, in real terms, over the last 3 financial years | Declined, in real terms, over the last 3 financial years | Declined dramatically | Grown steadily, in real terms, over the last 3 financial years | Increased dramatically |
| 21 | As a result of our customer relationship strategy, our product range has: | Had little impact on product innovations | Changed but only moderately | Become significantly more innovative | Helped maintain our innovative reputation | |
| 22 | As a result of our customer relationship strategy, our existing customers | Not changed their buying habits | Bought more products and services from us | Increased the sales of our most innovative products | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | have: | | | | | | | | |
| 23 | Our customer relationship strategy has: | Not significantly changed operational processes | Resulted in a more focussed approach to dealing with existing customers | Changes to operational processes | Resulted in new methods for attracting new customers | Enabled a greater understanding of who our customer are | Resulted in improvements to existing products | Resulted in the launch of new, innovative products from Research & Development activities | |
| Competitor Orientation | | | | | | | | | |
| 24 | We manage competitive forces by : | Running a highly efficient organisation | Endeavouring to keep our customer base satisfied | Rapidly following industry trends | Delivering innovative products | Endeavouring to find new markets | Leading change in our current market | | |
| Respond rapidly to customers' actions | | | | | | | | | |
| 25 | In our market, customers primarily move to competitors because of: | Quality of product / service | Product / service price | New market entrants buying business | Product / service features | | | | |
| 26 | We gather competitor information in order to respond to competitor advances PRIMARILY from the following sources: | We gather little or no competitor intelligence | Customer behaviour | Competitor product / service analysis | Employee feedback | Journals, papers, periodicals, etc | Buying customer products / services | Networking e.g. trade shows, conferences, etc) | |
| 27 | We gather information from wider business and economic sources in | Improve organisational processes | Monitor competitive activities | Anticipate existing and prospective customer demands | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | order to: | | | | | | | |
| 28 | We introduce new product / services / internal processes: | Infrequently and in a highly measured way | With competitive lead times | Rapidly | | | | |
| 29 | Our competitor analysis has led to: | We gather little or no competitor intelligence | Process enhancements | Product enhancements | Product innovations | Implementation of new technologies | Development of core technologies | Changes to our distribution channels |
| Top managers discuss competitors' strategies | | | | | | | | |
| 30 | Competitor activity is monitored: | With interest only | As a strategic imperative | Actively but in equal measure to advances in technology | | | | |
| 31 | Line Managers respond to competitor strategies: | Only under Executive direction | Subject to planning and approval | With full autonomy and accountability | | | | |
| 32 | Does you organisation ACTIVELY compare your products / services with competitor's? | No, we operate in a niche market | Yes, Products may / or have been compared in marketing material | Yes, but our products are leading edge and there are few competitor products to compare with | | | | |
| 33 | The actions of our competitors are monitored: | For their threat to market stability | In terms of price and service | In terms of product innovations and advancements | | | | |
| Target opportunities for competitive advantage | | | | | | | | |
| 34 | Within the last three years, we have regularly been first to market with new | Never | No, we're content to follow the market | Yes, it is important to stay ahead of competitors | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | products / services: | | | | | | |
| 35 | Our product launch process ensures that we regularly introduce new products ahead of our competitors: | No | No, we regularly lag behind the majority of our competitors | Yes, we have the capacity to launch products ahead of competitors | Yes, we often lead the market | | |
| 36 | Systems restrictions mean that we do not get our products to market when we would like: | Yes, but we never put 'quick to market' ahead of quality and efficiency | Yes, a lack of systems flexibility affects our ability to be quick to market | No, but we are satisfied with the flexibility of our systems | No, we often lead the market | | |
| 37 | Our competitive advantage is due to: | Our highly efficient operations | Having captured a lucrative market segment. | A product range that offers value for money in terms of quality and price | Our differentiated product range | Our innovative product range | |

Interfunctional Orientation:

Interfunctional customer calls

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 38 | Which of the following statements is true of the communications between your organisation's functions / departments: | Our organisation's functions are essentially distinct and do not need to collaborate on a regular basis | Interfunctional communication do occur but predominately for the fulfilment of projects | Interfunctional communications are dynamic and essential for organisational effectiveness | | | |
| 39 | The organisational function that you have most contact with is: | Production / Operations | Accounting / Finance | Risk / Compliance | Legal | IT | Marketing |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Information shared among functions | | | | | | | | |
| 40 | Information is actively shared throughout the organisation | Yes, but information is generally cascaded 'top down' | Yes, essentially 'top down' but information flows are frequently cross functional | Yes, it is essential to inform, educate and enable business development initiatives | | | | |
| 41 | We endeavour to gather information from: | Subjects that specifically affect our market | Subjects that affect our market with an emphasis on competitor activity | Across a broad range of subjects that may be of interest to the development of this organisation | | | | |
| 42 | Which of the following statements resembles the flow of information in your organisation: | Information flow is vertical i.e. little information passed between functions | Information is freely available between functions | Our business demands that information and ideas are shared and explored | | | | |
| 43 | Our organisational structure encourages staff to work closely with other departments | No, each function operates quite independently | Yes, but usually for specific projects | Yes, it is essential for effective organisational performance | | | | |
| Functional integration in strategy | | | | | | | | |
| 44 | This department adds value in the following ways: | It is run efficiently and organisational resources are effectively controlled | We specifically tend to customer needs | We have extensive competitor knowledge | We highly adaptable | There are strong working relationships between functions | We are innovative | We have extensive market knowledge |
| Share resources with other business units | | | | | | | | |
| 45 | The greatest share of organisational resources have | Efficiency drives | Sales | Product / Service delivery | Product / Service development | Marketing | Research & Development | Developing market |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | tended to focus on the following: | | | | | | | knowledge |
| Innovation: | | | | | | | | |
| 46 | Within the last three years, we have introduced radical innovations in the following areas i.e. innovations perceived to be new to the industry | None | New methods of production | New ways of organising | New sources of supply | New products | New services | Opening new markets |
| 47 | Within the last three years, we have introduced incremental innovations i.e. innovation which may have been used or initiated by another firm | None | New methods of production | New ways of organising | New sources of supply | New products | New services | Opening new markets |
| 48 | Our organisation is regularly the recipient of innovation awards | No | No, we are content to follow market innovations | No, but we endevour to offer innovative products | Yes, innovation is a major part of our business | | | |
| Growth Rates: | | | | | | | | |
| 49 | Acquisition of New Customers in New Markets has: | We have not pursued new customers in new markets | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years | Grown quickly over a short period of time | Increased dramatically |
| 50 | Sales of Existing products in New | We have not attempted to sell existing products to | Declined dramatically | Declined, in real terms, over the last 3 | Remain static, in real terms, over the last 3 | Developed a healthy market share in a short | Grown steadily, in real terms, | Increased dramatically |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | markets has: | new markets | | financial years | financial years | period of time | over the last 3 financial years | |
| 51 | Sales of New products in New markets has: | We have not attempted to sell new products to new markets | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown quickly over a short period of time | Grown steadily, in real terms, over the last 3 financial years | Increased dramatically |
| 52 | Acquisition of New Customers in Existing Markets has: | W have not tried to acquire new customers in existing markets. | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically |
| 53 | Sales of Existing products in Existing markets has: | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically | |
| 54 | Sales of New products in Existing markets has: | We have not developed new products for our existing markets | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 55 | Lending Growth to New customers has: | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically |
| 56 | Lending Growth to Existing customers has: | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically |
| 57 | Deposit Growth to New customers has: | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically |
| 58 | Deposit Growth to Existing customers has: | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years, primarily through the efforts of the sales force | Grown steadily, in real terms, over the last 3 financial years but with the help of marketing initiatives. | Increased dramatically |

Staff Growth rates determine which business area is employing significant resources.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 59 | Our departmental headcount has: | Declined dramatically | Declined, in real terms, over the last 3 financial years | Remain static, in real terms, over the last 3 financial years | Grown steadily, in real terms, over the last 3 financial years | Increased dramatically | |

## Information Systems Challenge

| | | Option A | Option B | Option C | Option D | Option E | Option F | Option G | Option H |
|---|---|---|---|---|---|---|---|---|---|
| 60 | In the last three years, the of our IT budget has been invested in: | Developing our core technologies | Creating information to help us control operations | A mixture of core system enhancements and new technology initiatives | Creating information to enhance our business development activities | Leading edge technologies that are flexible but ultimately underdeveloped | Accommodating regulatory requirements | | |
| 61 | The principal aim of our systems developments over the last three years is to: | Drive out organisational inefficiencies | Enhance existing products | Deliver business intelligence | Improve existing delivery channels | Introduce new delivery channels | Develop new products | | |
| 62 | Our systems developments often result in a number of manual work around: | Never | Rarely, as we endeavour to ensure high levels of operational efficiency | Occasionally, we have to strike a balance between the speed of product launch and operational efficiency | Yes, operationally, we have to make operational sacrifices | | | | |
| 63 | Our systems developments have helped the organisation to standardised our roles and responsibilities: | Yes, it's the basis of organisational efficiency | Yes, but we allow a small degree of flexibility | No, our staff fulfil roles that are necessarily loosely defined | | | | | |
| 64 | Which of the following statements fairly reflects your system's influence on product development: | Our systems deliver existing products in an efficient manner but product development is slow and expensive | We have a good mix of systems that support existing product lines and innovations | Our systems are highly adaptive and fully support product innovations | | | | | |
| 65 | Our IT staff: | Scan the environment for new technologies that would facilitate organisational efficiency: | Are only contacted when a systems development is required | Are routinely included in business communications and meetings: | Scan the environment for new technologies that would facilitate product and service innovations: | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 66 | Our IT staff are: | Valuable but replaceable, as the technologies in operation are well documented and subject to high control standards | Valuable for their knowledge but we always need to consider employing skills in new technologies | Indispensable due to their in depth knowledge of our systems and technologies | | | | | |
| 67 | Our technologies are the subject of: | Rarely, if ever, the subject of complaints | Customer complaints | Staff complaints | | | | | |
| 68 | Technology Service Level Agreements (SLA) are breached: | There are no SLAs in place | Very rarely | Occasionally | Regularly | | | | |
| 69 | Technology developments have increased our competitive advantage by: | Helping to secure our chosen market | Enabling greater operational efficiency | Ensuring that we keep pace with the competition | Broadening our trading environment | Developing our market knowledge | Enabling innovative product developments | Not a factor for competitive advantage | |
| 70 | Product life expectancy is: | Long, with low product development initiatives | Mixed, as some products will outlive others by a considerable period of time | Short with a high turnover of new product developments | | | | | |

## Administration Challenge

| | | Option A | Option B | Option C | Option D | Option E | Option F | Option G | Option H |
|---|---|---|---|---|---|---|---|---|---|
| Planning | | | | | | | | | |
| 71 | Which of the following best describes this organisation's planning process? | Plan > Act > Evaluate | Plan > Act > Evaluate & Evaluate > Act > Plan | Evaluate > Act > Plan (e.g. prototyping) | | | | | |
| 72 | We tend to plan by taking account of: | Historical analysis | Competitor analysis | Technological advances | Market opportunities | | | | |
| 73 | We base individuals objectives upon the following: | Efficiency targets | Increased sales to existing customer base | Technology developments | Customer satisfaction levels | Customer acquisition targets | Market intelligence | | |
| 74 | Planning tends to focus on (rank in order of importance): | Cost reduction | Quality of service | Customer retention | Differentiation | Customer acquisition | Product acquisition | | |
| Structure | | | | | | | | | |
| 75 | Which of the following best represents your organisational structure? | Functional | Matrix | Divisional | | | | | |
| 76 | Organisational structure changes: | Seldomly | Occasionally | Regularly | | | | | |
| 77 | In your opinion, which executive positions hold the most power (rank from 1-5, 1 has most power)? | Finance | Operations | Risk & Compliance | Product Development | Marketing | | | |
| | | Range 1 to 5 | Range 1 to 5 | Range 1 to 5 | Range 1 to 5 | Range 1 to 5 | | | |
| Control | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 78 | Over the last 3 years, our Retailer Delivery Times (RDT) have been: | Improving in line with expectations | Static in comparison expected performance | Failing to impress | |
| 79 | Over the last 3 years, our fraud losses have been: | Declined in line with expectations | Remained static in comparison expected performance | Increased steadily | |
| 80 | We regularly review Capital expenditure controls | No, we always retain tight control | Yes, in accordance with business development requirements | Yes, to ensure that innovation and market development is adequately funded | |
| 81 | Over the last 3 years we have increased the decision making authority of customer facing staff | No | Yes, competition drives the need to be ever responsive but with a measure of control | No, our structure has always encouraged flexibility and autonomy | |
| 82 | Over the last 3 years, we have provided the necessary MI to increase the decision making authority of customer facing staff: | Yes, our MI has been refined to help management control decisions | Yes, we have increased the amount of information to support control and business development (marketing) decisions | No, the executive rarely become engaged in operational incidents | No, we produce sufficient MI |
| 83 | Our executive team are aware of all operational incidents that affect the efficiency of our operations: | Yes, in the majority of instances | No, there are sufficient controls in place to manage most incidents | Yes, but mainly to support marketing / sales decisions | |
| 84 | Decisions to rectify operational incidents are predominately made by: | Executive Mgmt | Snr Management | Line Managers | Operational staff |
| 85 | The majority of employee roles in the operational or | Codified in job descriptions and bound by | Subject to a moderate degree of codification and | Loosely defined with a low level of structural | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | production environments are: | operational guidelines. | formalisation. | formalisation. | | | | | | | |
| Performance appraisal | | | | | | | | | | | |
| 86 | Please select the statements that are most appropriate: | Our staff are appraised according to productivity targets | Our staff are appraised according to sales targets | Our staff are appraised according to their technical proficiency | Our staff are appraised according to their market knowledge | | | | | | |
| 87 | Employee performance is: | Methodically assessed to ensure standardised procedures | Assess according to a set of guidelines with some management discretion | Assessed with complete management discretion | | | | | | | |

# 14 Appendix 5 Configuration Questionnaire Functional Specification

## Open Questionnaire

The questionnaire opens automatically at the welcome page (UserForm20). The following function may be found in the object Excel Workbook:

```
Private Sub Workbook_Open()
    UserForm20.Show
End Sub
```

## Welcome Page

The welcome page (UserForm20) has two command buttons labelled 'Enter' and 'Quit'. The 'Quit' button simply closes the workbook - ActiveWorkbook.Close.

The 'Enter' button calls a function GoToForm, which checks for a value in cell B15 in the worksheet 'Decision Table'. If the cell is empty, the respondent is taken to the start of the questionnaire in page 1. A value in cell B15 signifies that the questionnaire has been started but may not be completed, as the respondent's answers are stored in cells B15 to B101. In this case, the following question is posed: "Do you want to restore previous responses?". If the answer is 'no', the responses and associated scores are cleared and the respondent is taken to the start of the questionnaire on page 1.

If the answer is 'yes', the function RestoreValues is called (Module2), which reinstates the previous responses, from cells B15 to B101. The function GoToForm then continues by opening the appropriate page of the questionnaire to continue with its completion. For example, if the respondent returns to complete the questionnaire having completed the first ten questions, the GoToForm function will open UserForm3 with the previous responses restored.

Example of code:

```
If Range("B15") = Empty Then
        UserForm1.Show
        Exit Sub
    Else
        Msg = "Do you want to restore previous responses?"    ' Define message.
        ButtonType = vbYesNo                                  ' Define buttons.
        Title = "Open Questionnaire"                           ' Define title.
        Response = MsgBox(Msg, ButtonType, Title)
        If Response = vbNo Then                          ' User chose "No".
            Range("B15:C101").ClearContents
            UserForm1.Show
            Exit Sub
        Else                                              ' User chose "Yes".
            Call RestoreValues
            For Each Cell In Range("B15:B20")            'Q1-6
                If Cell.Value = Empty Then
                    UserForm1.Show
                End If
            Next Cell
            For Each Cell In Range("B21:B23")            'Q7-9
                If Cell.Value = Empty Then
                    UserForm2.Show
                End If
            Next Cell
            For Each Cell In Range("B24:B27")            'Q10-13
                If Cell.Value = Empty Then
                    UserForm3.Show
                End If
            Next Cell
```

Questionnaire Pages

Each page of the questionnaire has a series of questions or statements that require a response or answer. The question may have between three (A, B, C) and seven responses (A – G). The respondent marks their response by activating the appropriate CheckBox.

When each page is complete, the respondent has three choices of what to do next:

'Cancel & Exit' – By clicking this command button, the respondent closes the questionnaire without saving their responses.

```
Msg = "Your responses will not be saved. Do you want to proceed?"    ' Define
message.
       ButtonType = vbYesNo                                  ' Define buttons.
       Title = "Close Questionnaire"                              ' Define title.
       Response = MsgBox(Msg, ButtonType, Title)
       If Response = vbYes Then                                   ' User chose Yes.
             ActiveWorkbook.Close SaveChanges:=False
       Else                                                       ' User chose No.
             Exit Sub
       End If
```

'Save & Exit' – This command button allows the option of closing the questionnaire and saving their responses.

```
Msg = "Do you want to save and close the questionnaire?"   ' Define message.
ButtonType = vbYesNo                                        ' Define buttons.
Title = "Close Questionnaire"                                 ' Define title.
Response = MsgBox(Msg, ButtonType, Title)
If Response = vbYes Then                              ' User chose Yes.
    ActiveWorkbook.Close SaveChanges:=True
Else                                                  ' User chose No.
    Exit Sub
End If
```

'Next' is the third option, which takes the respondent to the next page of questions.

When the 'Next' command button is clicked, the activated CheckBox is converted to it's corresponding character value, as described above and the cumulative response is stored in the string Qn i.e. if the response to question 48 is A and B then Q48 = AB.

```
' Question 48
If UserForm11.CheckBox8.Value = True Then Q48 = "A"
If UserForm11.CheckBox9.Value = True Then Q48 = Q48 + "B"
If UserForm11.CheckBox10.Value = True Then Q48 = Q48 + "C"
If UserForm11.CheckBox11.Value = True Then Q48 = Q48 + "D"
```

The corresponding numerical score is selected from a decision table via the Excel HLookup function. The character response and numerical response are stored in Qn and Score respectively, which are then held in appropriate cells in the Decision Table worksheet. Character values are stored in column B (B15:B101) and numerical values in column C (C15:C101).

```
Score = Application.WorksheetFunction.HLookup(Q48, Range("B4:P5"), 2, False)
    Worksheets("Decision Table").Range("B62").Value = Q48
    Worksheets("Decision Table").Range("C62").Value = Score
```

The respondent cannot move to the next page of questions until the questions on the current page are complete. The following check ensures that the next page on the questionnaire is not displayed until the question has been answered:

```
If Q48 = Empty Then MsgBox "Question 48 has not been answered": Exit Sub
```

These functions may be found as a function in each UserForm.

Final Page of Questionnaire

Question 87 is the last question, which is found in UserForm19 and the final or closing page of the questionnaire is UserForm21.

When the closing page is activated, a message box appears thanking the respondent for completing the questionnaire. Four functions are also called to perform calculations and classifications using the respondent's data:

```
MsgBox "Thank you for completing the questionnaire!"
Call ThisWorkbook.DefineBands
Call ThisWorkbook.EntreStrength
Call ThisWorkbook.EngineeringStrength
Call ThisWorkbook.AdminStrength
```

The functions DefineBands, EntreStrength, EngineeringStrength and AdminStrength take the respondents data and compare this with stored profiles of the ideal Defender, Analyser and Prospector held in the worksheet, Decision Table. These functions are described in more detail later in this document.

The closing page contains details of where to send the completed questionnaire and invites the respondent to key their name and department. It is not compulsory to enter the respondent's name but the department name is required. The checks and storing of the respondent's details occur when the 'Save & Exit' command button is clicked.

```
If TextBox3.Value <> "" Then
    Worksheets("DecisionTable").Range("B112").Value = TextBox3.Value
End If
If TextBox4.Value = "" Then
    MsgBox "Please enter your department": Exit Sub
End If
If TextBox4.Value <> "" Then
    Worksheets("DecisionTable").Range("B113").Value = TextBox4.Value
    ActiveWorkbook.Save
    ActiveWorkbook.Close
End If
```

Scoring System

In the introduction to this document, it is stated that organisations are found to fall into one of four organisational types (Miles & Snow, 1978) i.e. Defender, Analyser, Prospector and Reactor. Miles and Snow profiled these organisations and the questions in the questionnaire are based upon these profiles. It is also known from the work of Doty, Glick and Huber (1993) that Defenders, Analyser and Prospectors lie along a continuum but no advice is given as to where the Reactor lies on that spectrum. A scoring system is therefore required to enable the classification of organisations along the continuum. Conceptually, the continuum will resemble Figure 1.

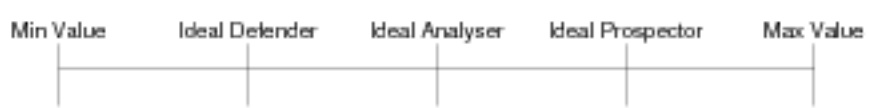


Figure 1. Ideal Type Continuum

This means that to find an organisation's position on the continuum, it is necessary to know the scores for each point on the continuum.

There are 87 questions and the responses range from a choice of three (A – C) to seven (A – G) options and the respondent is unrestricted in the number of response combinations that they can make.

| Score | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
|---|---|---|---|---|---|---|---|
| 7 options | A | B | C | D | E | F | G |
| 6 options | A | B | C | | D | E | F |
| 5 options | | A | B | C | D | E | |
| 4 options | | A | B | | C | D | |
| 3 options | | | A | B | C | | |

Table 1. Scoring System

The worksheet, Scoring System contains a table of response combinations for all options in Table 1. However, this table contains raw scores, as normalised scores are contained in the normalised scores table (cells A1:DX13) in the worksheet, Decision Table.

The scores were normalised on the basis that an individual score has to be consistent with all other response scores. For example, the maximum possible score is where a respondent is offered seven response options and selects them all i.e. A, B, C, D, E, F & G. The score associated to this response is 2+4+8+16+32+64+128 = 254. Where the response option is any combination of A, B and C, the maximum score is 8+16+32 = 56. A three option response score is normalised by taking the response score and multiplying it by 254/56. This logic is repeated for all response options. This means that when a respondent answers a question, the response is allocated a normalised score via the normalised scores table in the worksheet, Decision Table.

Question 77 (Q77) is an exception, as it has its own scoring system. Q77 is a question about an organisation's guiding coalition or power structure. The question is asked, In your opinion, which executive positions hold the most power (rank from 1-5, 1 has most power)? The response, in this case, may be any numerical combination involving the numbers 1 to 5 but a number cannot be repeated. There are 120 possible combinations, which have been sorted into ascending order and scored from 2 to 254.

## Analysing Results

One of the key objectives of the questionnaire is to take the respondents score and place the profile of that organisation on the continuum illustrated in Figure 1. Until now, the aim has been to classify an organisation into Defender, Analyser and Prospector but the proximity of the subject to any one of the ideal types is an indication of the organisation's effectiveness as a Defender, Analyser or Prospector. Accordingly, the continuum has been divided into subsections in order to refine the classifications. For example, an organisation close to the ideal Defender score will be a 'Strong Defender', while an organisation with a score closer to the minimum score will be a 'Failing Defender'. The subsections are defined more fully in the next section.

## High Level Analysis

The ability to analyse results is wholly dependent upon defining and scoring the Ideal Defender, Analyser and Prospector. In accordance with the profiles offered by Miles and Snow (1978), the questionnaire was completed for the ideal Defender, Analyser and Prospector. The scores have been retained and stored in cells B14:M101 in the Decision Table worksheet. The maximum and minimum values are also stored to define the boundaries of the continuum.

The total score for each organisation type is stored in line C102, including the subject organisation. When the questionnaire is complete and the respondent enters the closing page, function DefineBands is called. This function is stored in ThisWorkbook and it divides the distance between Minimum Score and Ideal Defender, Ideal Defender and Ideal Analyser, Ideal Analyser and Ideal Prospector and Ideal Prospector and Maximum Score into six equal parts respectively. These subsections have been labelled accordingly and so the continuum now looks like this:


Note that while the distance between the ideal profiles was divided into sixths, some sub groups are comprised of two sixths. The actual band structure is as follows:

```
Var1 = (DVal - MinVal) / 6      ' Dval is the Ideal Defender score
Var2 = (AVal - DVal) / 6          'Aval is the Ideal Analyser score
Var3 = (PVal - AVal) / 6          'Pval is the Ideal Prospector score
Var4 = (MaxVal - PVal) / 6      ' MinVal and MaxVal are the min and max scores

Band1Val = MinVal + (Var1 * 2)     'Defines bands for classification
Band2Val = Band1Val + (Var1 * 2)
Band3Val = Band2Val + Var1
Band4Val = DVal + Var2
Band5Val = Band4Val + Var2
Band6Val = Band5Val + (Var2 * 2)
Band7Val = Band6Val + Var2
Band8Val = AVal + Var3
Band9Val = Band8Val + Var3
Band10Val = Band9Val + (Var3 * 2)
Band11Val = Band10Val + Var3
Band12Val = PVal + Var4
Band13Val = Band12Val + Var4
Band14Val = Band13Val + (Var4 * 2)
```

Once the bands have been defined the total score of the subject organisation is classified and named in cell B106 of the Decision Table worksheet. Example of code:

```
If QVal < MinVal Then                          'This section classifies the
organisation
    Range("B106").Value = "Quest not complete"
ElseIf QVal >= MinVal And QVal <= Band1Val Then
    Range("B106").Value = "Reactor"
ElseIf QVal > Band1Val And QVal <= Band2Val Then
    Range("B106").Value = "Failing Defender"
ElseIf QVal > Band2Val And QVal <= Band3Val Then
    Range("B106").Value = "Conservative Defender"
ElseIf QVal > Band3Val And QVal < Band4Val Then
If QVal = DVal Then
    Range("B106").Value = "Perfect Defender"
Else
    Range("B106").Value = "Strong Defender"
End If
```

Lower Level Analysis

Miles and Snow (1978) in their analysis of organisational types, stated that organisations must be consistent in their approach to dealing with their entrepreneurial, information systems and administration challenges. The entrepreneurial challenge represents the organisation's efforts to bring goods and services profitably to its chosen market. The information systems challenge relates to the systems that the organisation adopts and the systems development ethos. The administration challenge is the management of the organisation's internal support structure and functional dependencies.

Each of these challenges has to be managed in a way that is mutually supportive and consistent. The questionnaire has fifty-nine questions associated to the entrepreneurial challenge, ten questions dealing with the information systems challenge and eighteen questions focussed on the administration challenge. The scores for the entrepreneurial, information systems and administration challenges have been calculated for all

organisational types and the subject organisation. This ensures that the same logic can be used to classify the organisation according to the way that it deals with each of the challenges.

The code for managing this lower level analysis is contained in the functions EntreStrength, EngineeringStrength and AdminStrength. The coding for the groups is summarised below and see Appendix 6 for the Entrepreneurial, Information Systems and Administration scores continuum.

Entrepreneurial Challenge

```
EntVar1 = (DEntVal - MinEntVal) / 6      'Divides dist between min
questionnaire resp and Ideal Defender value into 6 equal parts
    EntVar2 = (AEntVal - DEntVal) / 6        'Divides dist between Ideal
Defender and Ideal Analyser value into 6 equal parts
    EntVar3 = (PEntVal - AEntVal) / 6        'Divides dist between Ideal
Analyser and Ideal Prospector value into 6 equal parts
    EntVar4 = (MaxEntVal - PEntVal) / 6      'Divides dist between Ideal
Prospector and Max questionnaire value value into 6 equal parts

    EntBand1 = MinEntVal + (EntVar1 * 2)     'Defines bands for classification
    EntBand2 = EntBand1 + (EntVar1 * 2)
    EntBand3 = EntBand2 + EntVar1
    EntBand4 = DEntVal + EntVar2
    EntBand5 = EntBand4 + EntVar2
    EntBand6 = EntBand5 + EntVar2
    EntBand7 = EntBand6 + EntVar2
    EntBand8 = EntBand7 + EntVar2
    EntBand9 = AEntVal + EntVar3
    EntBand10 = EntBand9 + EntVar3
    EntBand11 = EntBand10 + EntVar3
    EntBand12 = EntBand11 + EntVar3
    EntBand13 = EntBand12 + EntVar3
    EntBand14 = PEntVal + EntVar4
    EntBand15 = EntBand14 + EntVar4
    EntBand16 = EntBand15 + (EntVar4 * 2)
```

Example of Classification Code:

```
If QEntVal < MinEntVal Then          'This section classifies the organisation
    Range("B107").Value = "Quest not complete"
ElseIf QEntVal >= MinEntVal And QEntVal <= EntBand1 Then
    Range("B107").Value = "Reactor"
ElseIf QEntVal > EntBand1 And QEntVal <= EntBand2 Then
    Range("B107").Value = "Poor Entrepreneurial Score"
ElseIf QEntVal > EntBand2 And QEntVal <= EntBand3 Then
    Range("B107").Value = "Very Conservative Entrepreneurial Score"
```

The classification name is held in the cell B107 in the Decision Table worksheet.

Information Systems Challenge

```
EngVar1 = (DEngVal - MinEngVal) / 6
EngVar2 = (AEngVal - DEngVal) / 6
EngVar3 = (PEngVal - AEngVal) / 6
EngVar4 = (MaxEngVal - PEngVal) / 6

EngBand1 = MinEngVal + (EngVar1 * 2)  'Defines bands for classification
EngBand2 = EngBand1 + (EngVar1 * 2)
EngBand3 = EngBand2 + EngVar1
EngBand4 = DEngVal + EngVar2
EngBand5 = EngBand4 + EngVar2
EngBand6 = EngBand5 + EngVar2
EngBand7 = EngBand6 + EngVar2
EngBand8 = EngBand7 + EngVar2
EngBand9 = AEngVal + EngVar3
EngBand10 = EngBand9 + EngVar3
EngBand11 = EngBand10 + EngVar3
EngBand12 = EngBand11 + EngVar3
EngBand13 = EngBand12 + EngVar3
EngBand14 = PEngVal + EngVar4
EngBand15 = EngBand14 + EngVar4
EngBand16 = EngBand15 + (EngVar4 * 2)
```

Example of Classification Code:

```
If QEngVal < MinEngVal Then
    Range("B108").Value = "Quest not complete"
ElseIf QEngVal >= MinEngVal And QEngVal <= EngBand1 Then
    Range("B108").Value = "Reactor"
ElseIf QEngVal > EngBand1 And QEngVal <= EngBand2 Then
    Range("B108").Value = "Poor Engineering Score"
ElseIf QEngVal > EngBand2 And QEngVal <= EngBand3 Then
    Range("B108").Value = "Very Conservative Engineering Score"
ElseIf QEngVal > EngBand3 And QEngVal < EngBand4 Then
    If QEngVal = DEngVal Then
        Range("B108").Value = "Perfect Defender"
    Else
        Range("B108").Value = "Efficient Systems"
    End If
```

The classification name is held in the cell B108 in the Decision Table worksheet.

Administration Challenge

```
AdminVar1 = (DAdminVal - MinAdminVal) / 6
AdminVar2 = (AAdminVal - DAdminVal) / 6
AdminVar3 = (PAdminVal - AAdminVal) / 6
AdminVar4 = (MaxAdminVal - PAdminVal) / 6

 'Defines bands for classification
AdminBand1 = MinAdminVal + (AdminVar1 * 2)
AdminBand2 = AdminBand1 + (AdminVar1 * 2)
AdminBand3 = AdminBand2 + AdminVar1
AdminBand4 = DAdminVal + AdminVar2
AdminBand5 = AdminBand4 + AdminVar2
AdminBand6 = AdminBand5 + AdminVar2
AdminBand7 = AdminBand6 + AdminVar2
AdminBand8 = AdminBand7 + AdminVar2
AdminBand9 = AAdminVal + AdminVar3
AdminBand10 = AdminBand9 + AdminVar3
AdminBand11 = AdminBand10 + AdminVar3
AdminBand12 = AdminBand11 + AdminVar3
AdminBand13 = AdminBand12 + AdminVar3
AdminBand14 = PAdminVal + AdminVar4
AdminBand15 = AdminBand14 + AdminVar4
AdminBand16 = AdminBand15 + (AdminVar4 * 2)
```

Example of Classification Code:

```
If QAdminVal < MinAdminVal Then
    Range("B109").Value = "Quest not complete"
ElseIf QAdminVal >= MinAdminVal And QAdminVal <= AdminBand1 Then
        Range("B109").Value = "Reactor"
    ElseIf QAdminVal > AdminBand1 And QAdminVal <= AdminBand2 Then
        Range("B109").Value = "Poor Admin Score"
    ElseIf QAdminVal > AdminBand2 And QAdminVal <= AdminBand3 Then
        Range("B109").Value = "Very Conservative Admin Score"
    ElseIf QAdminVal > AdminBand3 And QAdminVal < AdminBand4 Then
    If QAdminVal = DAdminVal Then
        Range("B109").Value = "Perfect Defender"
    Else
        Range("B109").Value = "Supports defensive structure"
    End If
```

The classification name is held in the cell B109 in the Decision Table worksheet.

# 15 Appendix 6 Configuration Continua Examples

## Entrepreneurial Score Continuum


## Information Systems Score Continuum


## Administration Score Continuum

## 16 Appendix 7 Respondent's Scores

| Question | Respondent A's | | Respondent B's | | Respondent C's | | Min Values | | Ideal Defender | | Ideal Analyser | | Ideal Prospector | | Max Values | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answers | Score | Answers | Score | Answers | Score | Answers | Score | Answers | Score | Answers | Score | Answers | Score | Answers | Score |
| Q1 | A | 9 | A | 9 | B | 19 | A | 9 | B | 19 | C | 75 | D | 151 | ABCD | 254 |
| Q2 | C | 75 | AB | 28 | ABC | 103 | A | 9 | ABC | 103 | BCD | 245 | CD | 226 | ABCD | 254 |
| Q3 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q4 | C | 75 | B | 19 | C | 75 | A | 9 | A | 36 | C | 75 | D | 151 | ABCD | 254 |
| Q5 | C | 145 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q6 | D | 66 | A | 8 | DE | 197 | A | 8 | A | 8 | C | 33 | E | 131 | ABCDE | 254 |
| Q7 | ABCD | 30 | AB | 6 | ABDEFG | 246 | A | 2 | ABC | 14 | ABCDEF | 126 | ACEFG | 234 | ABCDEFG | 254 |
| Q8 | ABCE | 46 | A | 2 | DEF | 112 | A | 2 | A | 2 | ABCDEF | 126 | ACDEFG | 250 | ABCDEFG | 254 |
| Q9 | C | 33 | ABC | 57 | ABCD | 123 | A | 8 | ABC | 57 | ABCD | 123 | ADE | 205 | ABCDE | 254 |
| Q10 | ABC | 14 | ABC | 14 | ABCF | 78 | A | 2 | ABCD | 30 | ABCDEFG | 254 | CDEFG | 248 | ABCDEFG | 254 |
| Q11 | BE | 36 | ABCD | 30 | ABCDEFG | 254 | A | 2 | ABCE | 46 | BDF | 84 | BCEFG | 236 | ABCDEFG | 254 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q12 | ABEFG | 230 | ABCDEF | 126 | ABEFG | 230 | A | 2 | ABCDE | 62 | ABCDEF | 126 | BCG | 140 | ABCDEFG | 254 |
| Q13 | A | 36 | AB | 109 | ABC | 254 | A | 36 | A | 36 | AB | 109 | ABC | 254 | ABC | 254 |
| Q14 | ABD | 41 | AB | 6 | DE | 102 | A | 2 | ABC | 15 | ABCDE | 117 | CE | 77 | ABCDEF | 254 |
| Q15 | ABE | 156 | AB | 25 | ABCDE | 254 | A | 8 | ABC | 57 | ABCDE | 254 | CE | 164 | ABCDE | 254 |
| Q16 | ABD | 179 | ABC | 103 | ABC | 103 | A | 9 | AC | 85 | ABC | 103 | BCD | 245 | ABCD | 254 |
| Q17 | CD | 98 | AB | 25 | CDE | 229 | A | 8 | AB | 25 | CD | 98 | DE | 197 | ABCDE | 254 |
| Q18 | BE | 73 | B | 4 | BCDF | 184 | A | 2 | BF | 141 | BCDEF | 252 | DEF | 239 | ABCDE | 254 |
| Q19 | BE | 147 | A | 8 | BC | 49 | A | 8 | BD | 82 | BCD | 115 | BDE | 213 | ABCD | 254 |
| Q20 | A | 8 | A | 8 | B | 16 | A | 8 | A | 8 | B | 16 | B | 16 | ABCDE | 254 |
| Q21 | B | 19 | B | 19 | C | 75 | A | 9 | A | 9 | B | 19 | D | 151 | ABCD | 254 |
| Q22 | A | 8 | A | 8 | BCD | 115 | A | 8 | BC | 49 | BCD | 115 | BDE | 213 | ABCDE | 254 |
| Q23 | BC | 12 | A | 2 | BCDEFG | 252 | A | 2 | BC | 12 | BCDEF | 124 | EFG | 224 | ABCDEFG | 254 |
| Q24 | AF | 139 | AB | 6 | ABCD | 49 | A | 2 | AB | 6 | BCD | 47 | DEF | 239 | ABCDEF | 254 |
| Q25 | D | 151 | AB | 28 | CD | 226 | A | 9 | AB | 28 | ABCD | 254 | BD | 169 | ABCD | 254 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q26 | E | 32 | D | 16 | BCG | 140 | A | 2 | A | 2 | BCDG | 156 | BEFG | 228 | ABCDEFG | 254 |
| Q27 | AB | 28 | AB | 28 | ACD | 235 | A | 9 | A | 36 | B | 73 | BCD | 245 | ABCD | 254 |
| Q28 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q29 | BE | 36 | AB | 6 | BCD | 28 | A | 2 | A | 2 | BCDFG | 220 | DEG | 176 | ABCDEFG | 254 |
| Q30 | C | 145 | A | 36 | C | 145 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q31 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q32 | B | 73 | B | 73 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q33 | A | 36 | AB | 109 | ABC | 254 | A | 36 | A | 36 | BC | 218 | C | 145 | ABC | 254 |
| Q34 | C | 145 | B | 73 | C | 145 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q35 | C | 75 | A | 9 | C | 75 | A | 9 | B | 19 | C | 75 | D | 151 | ABCD | 254 |
| Q36 | A | 9 | AB | 28 | AB | 28 | A | 9 | A | 9 | C | 75 | D | 151 | ABCD | 254 |
| Q37 | A | 2 | AB | 6 | AC | 11 | A | 2 | ABC | 15 | BCDE | 115 | CF | 145 | ABCDEF | 254 |
| Q38 | C | 145 | B | 73 | BC | 218 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q39 | ABCF | 152 | ABF | 143 | ABCEF | 220 | A | 2 | AB | 6 | ABCEF | 220 | CEF | 213 | ABCDEF | 254 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Q40** | B | 19 | B | 19 | CD | 226 | A | 9 | B | 19 | C | 75 | D | 151 | ABCD | 254 |
| **Q41** | A | 9 | AB | 28 | ABD | 179 | A | 9 | AB | 28 | BC | 94 | BCD | 245 | ABCD | 254 |
| **Q42** | BC | 218 | A | 36 | C | 145 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| **Q43** | B | 73 | B | 73 | BC | 218 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| **Q44** | ADFG | 210 | AB | 6 | ABDFG | 214 | A | 2 | AB | 6 | ABCE | 46 | DEFG | 240 | ABCDEFG | 254 |
| **Q45** | ACE | 42 | ABC | 14 | ABC | 14 | A | 2 | ABC | 14 | ABCDE | 62 | BDEFG | 244 | ABCDEFG | 254 |
| **Q46** | BF | 68 | B | 4 | BF | 68 | A | 2 | A | 2 | BCDEF | 124 | EFG | 224 | ABCDEFG | 254 |
| **Q47** | BCF | 76 | BC | 12 | BEF | 100 | A | 2 | BCD | 28 | BCDEF | 124 | BEFG | 228 | ABCDEFG | 254 |
| **Q48** | A | 9 | A | 9 | D | 151 | A | 9 | B | 19 | C | 75 | D | 151 | ABCD | 254 |
| **Q49** | A | 2 | F | 64 | D | 16 | A | 2 | A | 2 | F | 64 | G | 128 | ABCDEFG | 254 |
| **Q50** | A | 2 | E | 32 | F | 64 | A | 2 | A | 2 | E | 32 | D | 16 | ABCDEFG | 254 |
| **Q51** | A | 2 | A | 2 | D | 16 | A | 2 | A | 2 | E | 32 | G | 128 | ABCDEFG | 254 |
| **Q52** | AB | 6 | A | 2 | F | 64 | A | 2 | E | 32 | F | 64 | G | 128 | ABCDE | 254 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | FG | |
| Q53 | AB | 6 | B | 4 | E | 68 | A | 2 | D | 34 | E | 68 | C | 9 | ABCDEF | 254 |
| Q54 | B | 4 | A | 2 | F | 64 | A | 2 | E | 32 | F | 64 | G | 128 | ABCDEFG | 254 |
| Q55 | A | 2 | B | 4 | E | 68 | A | 2 | D | 34 | E | 68 | F | 137 | ABCDEF | 254 |
| Q56 | B | 4 | B | 4 | E | 68 | A | 2 | D | 34 | E | 68 | C | 9 | ABCDEF | 254 |
| Q57 | E | 68 | C | 9 | E | 68 | A | 2 | D | 34 | E | 68 | F | 137 | ABCDEF | 254 |
| Q58 | E | 68 | C | 9 | E | 68 | A | 2 | D | 34 | E | 68 | C | 9 | ABCDEF | 254 |
| Q59 | B | 16 | C | 33 | B | 16 | A | 8 | B | 16 | D | 66 | D | 66 | ABCDE | 254 |
| Q60 | AC | 11 | ABC | 15 | ABC | 15 | A | 2 | ABF | 143 | CDF | 179 | DEF | 239 | ABCDEF | 254 |
| Q61 | ABC | 15 | AB | 6 | BCD | 47 | A | 2 | ABCD | 49 | ABCDEF | 254 | CDEF | 248 | ABCDEF | 254 |
| Q62 | B | 19 | B | 19 | C | 75 | A | 9 | A | 9 | C | 75 | D | 151 | ABCD | 254 |
| Q63 | B | 73 | B | 73 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q64 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q65 | B | 19 | B | 19 | ACD | 235 | A | 9 | AB | 28 | C | 75 | CD | 226 | ABCD | 254 |
| Q66 | C | 145 | B | 73 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q67 | BC | 218 | BC | 218 | A | 36 | A | 36 | A | 36 | A | 36 | C | 145 | ABC | 254 |
| Q68 | A | 9 | A | 9 | C | 75 | A | 9 | B | 19 | C | 75 | D | 151 | ABC | 254 |
| Q69 | BC | 12 | ABC | 14 | ABF | 70 | A | 2 | AB | 6 | BCD | 28 | DEF | 112 | ABCDEFG | 254 |
| Q70 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q71 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q72 | ABCD | 254 | A | 9 | ACD | 235 | A | 9 | AC | 85 | BC | 94 | CD | 226 | ABCD | 254 |
| Q73 | AC | 11 | AB | 6 | ABCD | 49 | A | 2 | A | 2 | BDE | 107 | CEF | 213 | ABCDEF | 254 |
| Q74 | AB | 6 | AB | 6 | ABCDE | 117 | A | 2 | ABF | 143 | CDE | 111 | DEF | 239 | ABCDEF | 254 |
| Q75 | C | 145 | A | 36 | A | 36 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q76 | A | 36 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q77 | 314562 | 88 | 413562 | 131 | 314652 | 89 | 123456 | 0.35 | 213465 | 43 | 453621 | 159 | 543612 | 201 | 654321 | 254 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q78 | A | 36 | B | 73 | A | 36 | A | 36 | A | 36 | C | 145 | C | 145 | ABC | 254 |
| Q79 | C | 145 | C | 145 | A | 36 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q80 | B | 73 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q81 | B | 73 | B | 73 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q82 | A | 9 | D | 151 | AB | 28 | A | 9 | A | 9 | B | 19 | B | 19 | ABCD | 254 |
| Q83 | B | 73 | A | 36 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q84 | B | 19 | A | 9 | C | 75 | A | 36 | A | 36 | B | 73 | CD | 226 | ABCD | 254 |
| Q85 | A | 36 | A | 36 | A | 36 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Q86 | C | 75 | A | 9 | ABC | 103 | A | 9 | ABC | 103 | BC | 94 | BCD | 245 | ABCD | 254 |
| Q87 | B | 73 | B | 73 | B | 73 | A | 36 | A | 36 | B | 73 | C | 145 | ABC | 254 |
| Total Score | | 54.97 | | 31.79 | | 92.27 | | 12.98 | | 30.02 | | 85.07 | | 143.26 | | 221 |
| Entrepreneurial Score | | 37.16 | | 17.6 | | 71.04 | | 6.58 | | 17.87 | | 60.34 | | 96.55 | | 149.9 |
| Information Systems Score | | 5.57 | | 4.82 | | 7.72 | | 1.77 | | 3.98 | | 9.41 | | 17.07 | | 25.4 |
| Administration Score | | 12.24 | | 9.37 | | 13.51 | | 4.63 | | 8.17 | | 15.32 | | 29.64 | | 45.72 |
| Organisation Type: | | Defender / Analyser | | Strong Defender | | Strong Analyser | | | | | | | | | | |
| Entrepreneurial Strength: | | Defender / Analyser - | | Operating in Niche Market | | Signs of Prospecting | | | | | | | | | | |

| | | | |
|---|---|---|---|
| | Defensive side | | |
| Information Systems Strength: | Signs of Venturing | Efficient Systems | Good Analyser Balance but Cautious |
| Administrative Strength: | Defender / Analyzer - Analyser side | Signs of Venturing | Good Analyser Balance but Cautious |

# 17 Appendix 8 Configuration Continua