1 Introduction

"To win without fighting is best" – Sun Tzu

1.1 Background

During the last number of centuries wars have been fought not only on the battlegrounds, but also in the boardrooms and corridors of businesses. Long before the term business intelligence became fashionable, the military world was talking about military intelligence (even though there are people who refer to it – tongue in cheek – as an example of a contradiction in terms!)

Just as the military realised that pertinent, actionable information is necessary to be successful, businesses also need information to base their decisions on. Just as military generals need to develop and implement strategies to survive, the long-term survival of businesses depends on the way in which they strategise and adapt to changing business environments. Many of the principles and guidelines that are discussed in *The Art of War*, by Sun Tzu (1991), are used successfully by business leaders in their handling of organizations in conflict – the analogy between martial art and business success is therefore not that far fetched.

Business intelligence (BI), according to the definition by Kimball and Ross (2002), is a generic term to describe leveraging the internal and external information assets of the organization to make better business decisions. Inmon, Imhoff and Sousa (Inmon et al. 2001) see BI as representing those systems that help companies understand what makes the wheels of the corporation turn and help predict the future impact of current decisions. They also add that these systems play a key role in the strategic planning process of the corporation.

Although the definitions will be further explored later on in the study, it is clear that BI has to do with **information** and **decision support.**

1.2 Major role players

1.2.1 Industrial engineers

Traditionally, industrial engineers have been involved in decision support at various levels in the organization. At first they focussed on the production function of organizations, but during the last number of decades they have also played an important role in the improvement of business processes in other business functions, such as human resource management, financial management, procurement and marketing. They are also playing an increasing role in the streamlining of transactions between businesses. The process approach that industrial engineers bring into the environment often enables different disciplines in an organization to see their role in context of the bigger business picture for the first time.

The deserved attention that supply chain management (SCM) has been receiving since 1990 is proof of the potential value that can be unlocked by improving inter-company activities and information flow – managing an even bigger picture of interdependent businesses.

Other typical industrial engineering activities such as quality management, simulation modelling, systems engineering and integration and enterprise architecture also play a role in helping businesses to clarify their information

system needs.

Industrial engineers are, however, not the only players in the field. Various other disciplines are also playing their parts and bringing specific expertise to the table. Management science and information and communication technology (ICT) are two other major players that are also involved.

1.2.2 Management science

Concepts like Management by Objectives (MBO), Total Quality Management (TQM), Balanced Scorecard (BSC) and many more were originally developed by people that entered the arena from the business management and operations research point of view. These concepts are often qualitative of nature and need some kind of quantitative support foundation to become practically usable.

Buys (2002) points out:

> *What managers need are new and improved theories and models (tools) that can be applied in practice. Theories should be embodied in conceptual models (graphical, mathematical or schematic descriptions or analogies) or practical methods (procedures or techniques).*

Currently, in the so-called "information era", the necessary quantitative support foundation for these theories very often involves information and communication technology.

1.2.3 Information and communication technology

People operating in the ICT environment are producing enabling tools that are potentially capable of supporting almost any conceptual curveball that the management science people can throw at them through sophisticated hardware and software products. The speed at which generic products are developed and introduced into the market is extremely fast and provides in itself a challenge to decide what to select and when to use it.

The reason why generic products are often developed instead of user specific solutions is obvious – the potential market is much bigger and the development cost can be recovered from various parties, making the tools also more affordable to the buyers.

The implementation of acquired tools in the existing environment and circumstances of a specific organization often proves to be a task beyond the IT product/service provider (because of a lack of business knowledge), as well as the business user (because of a lack of knowledge of the system and the way systems are integrated).

1.3 The gap between different worlds

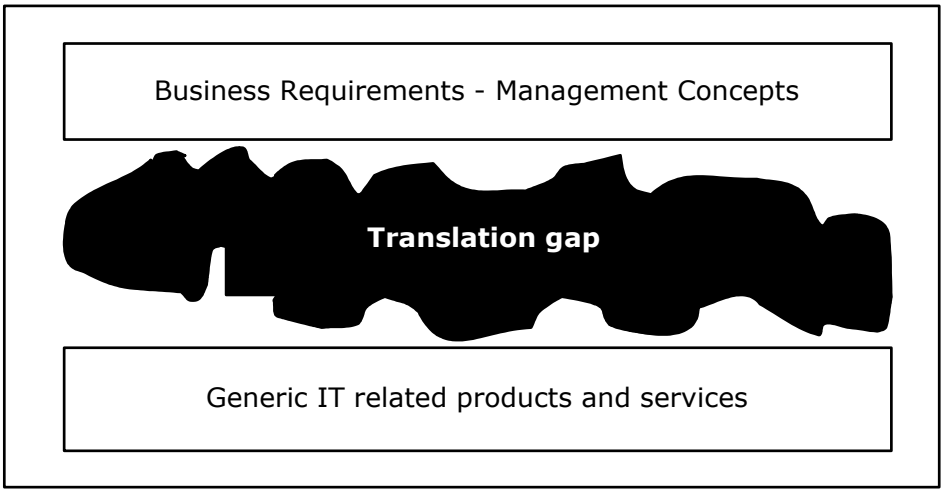

Figure 1. Translation gap between IT and business

Given this background, it can be stated that various gaps still exist in the ideal picture. First of all, there is the gap between business end-users and information technology. As Jim Kanzler (2003) summarizes the situation in the title of one of his internet articles, *"IT is from Mars, End-Users are from Venus"*. The struggle between end-users and IT over reporting and data responsibility is far from over, and each party has a valid case. Business intelligence tools have progressed over time to empower end-users to generate their own reports, but they often still need bits of data that are not provided for in the Enterprise Data Warehouse (EDW). This leads to cutting and pasting into spreadsheets – a manual process prone to error and open to criticism when the business user, who comes up with a figure, cannot answer the common question: How did you get that number?

The traditional management gap between strategic planning and operational execution (the strategic alignment question) is still haunting most organizations. Various management models have been developed to address this issue, but they are not always successfully implemented.

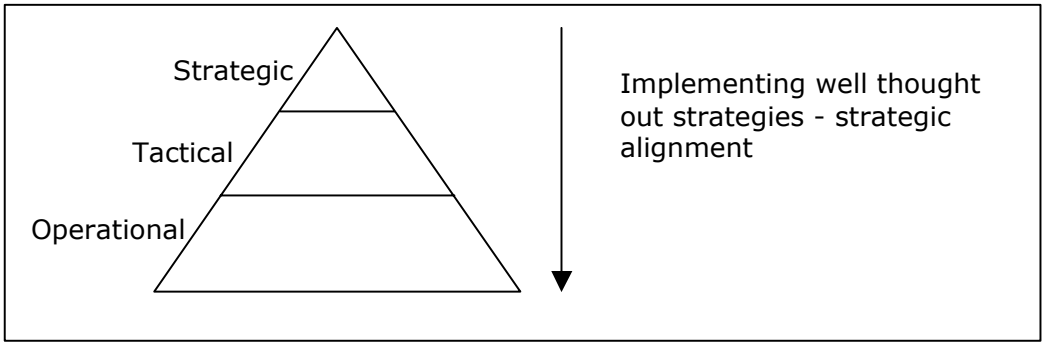

Figure 2. Strategic alignment

The concept of identifying key performance indicators (KPIs) to guide people's efforts in the right direction (strategically speaking) is an old technique, dating back to the early days of Peter Drucker's concept of Management by Objectives (MBO). Combined with performance measurement, it can be a powerful instrument. However, people often find it difficult to define the right KPIs and to get objective measurements from the existing information sources.

The use of a Balanced Scorecard approach, as proposed by Kaplan and Norton *(1996)*, goes a long way to ensure that the right KPIs are identified (instead of just a list of measurements that sound good or are easy to measure). It also links measurements from various business perspectives in a cause-and-effect manner that supports the selected business strategy.

Various other less traditional approaches to identify innovative products, services and total solutions (such as the "*Lessons in radical Innovation*" by Wolfgang Grulke, 2001), and structured methods to do scenario planning that will give strategic direction (such as the *Foxy Matrix* by Illbury and Sunter, 2001) will have to find a place in the bigger picture framework.

1.4 Problem statement

This thesis explores the important role that industrial engineers may play in the selection, implementation and integration of relevant IT solutions to meet business requirements, when they position themselves on the side of businesses instead of products and specific IT solutions. The goal is to develop a bigger picture model, or framework, that will put a number of the existing theoretical models into context and will provide a generic process for implementing BI in organizations.

The roles of change agent, translator of user requirements into functional specifications and integrator of various components in a total solution are not really new to industrial engineers. The focus of this study, however, is on bridging the gap between business requirements and the suppliers of ICT products and services with special attention to

- a structured approach to link business strategy to an information technology strategy in such a way that the value stream and underlying business processes of the organization are supported by appropriate transactional and business intelligence information systems, which are in turn supported by appropriate and flexible IT infrastructure;
- data warehousing as the foundation for information needs;
- performance measurement to support strategic, tactical and operational goals;
- management information systems (MIS) for decision support – the delivery mechanisms of relevant information at the right time.

Having stated where the emphasis of the thesis lies, it is also appropriate to state what is not included in the study:

- Purely technical issues in the information technology arena such as specific differences between various databases (e.g. SQL Server and Oracle, or the differences between various versions of Oracle).
- The differences between and detail algorithms used by various data mining methods.
- Detail comparisons between various BI related tools – for example Cognos vs. Business Objects, or Datastage vs. Sagent. One reason for excluding such comparisons is the fact that it is almost impossible to have thorough enough knowledge of all the products at a certain point in time to compare them effectively. Furthermore, all the products are constantly in a mode of development with enhancement releases at least once a year and from time to time products are acquired and packaged differently with other new or existing products.

1.5 Research methodology

Buys (2002) clearly distinguishes between pure management practice and research. "To qualify as a research project, there must also be some generation of new knowledge." This new knowledge can be demonstrated in three different ways:

- Application of existing theories, models and methods to a new problem.
- Testing of existing theories, models and methods.
- Building of new or improved theories, models and methods.

The research methodology followed in this case was the following:

- The identification of relevant existing theories, models and methods in the fields of strategic management, enterprise architecture, performance management, data warehousing and knowledge management through literature studies, internet searches and practical exposure.
- Critical testing and comparison of a number of these theories, models and methods.
- The integration of a number of these theories, models and methods into a new framework of integrated theories, models and methods that can assist businesses in bridging the gap between their requirements and information technology offerings.
- Testing the new integrated framework and parts thereof in a limited number of case studies, which have led to further refinements of the framework and supporting templates.

What makes the work different from pure management practice is the **integration** of the various existing theories, models and methods and the development of **supporting templates** to assist the user in various steps within the bigger framework. The **design of a set of data marts** that support the value chain of a typical consulting firm is a further deliverable that should have reusability in similar environments.

1.6 Organization of this thesis

1.6.1 Document structure

Chapter 2, a literature study, provides insight into a number of subjects that form the foundation for the bigger picture model that is later developed. The literature study is presented along a number of themes:

- Strategic positioning and scenario planning
- Frameworks for enterprise architecture
- Data warehousing
- Knowledge management
- Performance measurement
- Business intelligence and technology tools

In Chapter 3 the various theories and conceptual models are analyzed and a new contextual framework is developed where the existing theories, together with some new inputs, are integrated in the Bigger Picture BI Context Model. Practical and simplistic templates are developed and discussed.

In Chapter 4 this contextual framework is applied to a consulting company and

the results are discussed. Other case studies where elements of the framework were used are also discussed, as well as situations that were handled without the framework.

Chapter 5 summarizes the thesis and evaluates the study. Various recommendations regarding further enhancements are made.

1.6.2 CD-ROM

In addition to the thesis document a CD-ROM is provided with a rich collection of current literature (mostly dated from 1999 to 2004), as well as electronic versions of the templates that were developed. Many of the sources that are on the CD have not been referenced directly in the document and do therefore not appear in the bibliography.

Numerous references to web sites of relevant service providers are also included. Some of the electronic articles on the CD have links to the internet and it is recommended that one should be linked to the internet while browsing the CD. However, since many of the internet links change sooner or later, the majority of articles were captured in such a way that they will be usable off line.