DEVELOPMENTS IN BUSINESS INTELLIGENCE SOFTWARE

MBA Thesis

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ABSTRACT

Business Intelligence (BI) is a broad category of applications and technologies for gathering, providing access to, and analyzing data for the purpose of helping enterprise users make better business decisions. The term implies having a comprehensive knowledge of all of the factors that affect your business. It is imperative that you have an in depth knowledge about factors such as your customers, competitors, business partners, economic environment, and internal operations to make effective and good quality business decisions. Business intelligence enables you to make these kinds of decisions.\(^1\) BI technology allows organizations to track, understand, and manage vital business information. BI is assuming an increasingly strategic role as more organizations look for ways to tap into the valuable data stored in their operational systems.

In today’s economy the requirements for Business Intelligence environments are changing, and quite dramatically. Consequent to this paradigm, this research paper tested these hypothetical constructs. Hypothesis one sought to test if vendors seek to provide complete BI solutions following all four stages of the CI cycle. In terms of the support of CI cycle phases; BI vendors were grouped according to the overall performance of four (4) phases (planning & directing, data collection, analysis and dissemination). The evaluation of BI vendors indicates that all vendors examined do not support planning & directing phase, except for Astragy that gives users a consultations to plan and arrange their CI, its absence did not influence the overall performance score. Information Builders and SAP Business Objects excel in data collection phase; SAS Institute and QlikView are the best in analysis; SAP Business Objects and IBM Cognos surpass in dissemination phase. It should be noted that Astragy was evaluated along with

\(^1\) Honesty Reporting (2008)
other vendors though it does not provide any BI functions but only provide common functions for supporting the CI cycle phases.

The second hypothesis sought to test if BI vendors fail to provide good enough solutions for the analysis part of the intelligence cycle. The research findings indicate that only two BI vendors, SAS and QlikView, delivering the analysis phase of the intelligence cycle in a proper way. The overall findings also indicate that BI vendors fail to provide good enough solutions for the analysis part of the intelligence cycle as total average score provided by the evaluation instrument (see Figure 17) among BI vendors for the analysis phase fell below the average scores for the data collection and dissemination phases of the cycle.

The third hypothetical construct concerns BI vendors’ attempts at making considerable changes in software each year, with each new upgrade. By tracing and comparing the developments of the vendors selected it has been concluded that all BI vendors, irrespective of whether it is a leading traditional vendor or small innovative BI, follow the same tendency in introducing BI enhancements by striving to make its software cost-effective, simpler, faster and flexible for use, scalable to manage increasing amounts of data in businesses, accessible to employees at all levels of organization. Most of the vendors introduced a support for heterogeneous environments and data sources from a variety of vendors.

Hypothesis four sought to find out if the BI vendors’ software tested can be divided into a number of meaningful subgroups. With reference to evaluation and analysis and empirical findings, it has been concluded that the BI vendors can be divided into subgroups and hence has been classified based on their support of the phases of the intelligence cycle, their developments and market information. The subgroups range from advanced, competent, partially competent, and inadequate to absolutely inadequate. Among the BI vendors assessed, none satisfied the criteria in the advanced category.

Hypothesis five aspired to determine if the BI software evaluated should fall under a different term as some of them do not follow the entire BI cycle. The analysis of empirical findings identified that QlikView and TIBCO Spotfire deliver the so-called next generation in-memory analytics, which is faster, much simpler, more flexible and scalable and meet the present-day business needs to a far greater extent if compared to traditional BI. Besides, they do not follow the entire BI cycle and it is suggested herein to term them as Business Analytics.
Software instead of BI software. Moreover, as Astragy does not support any BI functions, it is also suggested to term it differently as CI software, not BI software.

BI software is among the many software that organizations utilize to ensure their stay in the market. BI enables organizations to make well informed business decisions and thus can be the source of competitive advantages and perform the ultimate objective improving the timeliness and quality of decisions. Developments in BI software eventually play the role of improving the overall performance of the organization using them by enabling the company to respond quickly and adapt to changes. It is within this framework that this research has been directed and is alluded to by the hypotheses above.

Fundamentally, the evaluation of BI software development has gleaned data which shows that BI software vendors have made significant improvements with their product offerings. Developments in information delivery, user-interface, reporting, analytics, and data integration are evident with BI vendors examined for the purpose of this research. BI vendors have also seen developments in their possession of market share among these software providers. It has been observed that SAP Business Objects has the leading market share as opposed to other competitors. Majority of these BI vendors also provide multiple licence options in the market. Generally BI vendors do make significant developments with BI software over time and this they have all recognized is necessary to ensure competitive advantage. With regards to the intelligence cycle, one can allude that few are lacking much in data collection and dissemination, very few are supporting analysis duly, but all BI vendors used for the purpose of this research fell short on the planning and direction phase.

Based on the findings it is being suggested, further investigation of all BI software vendors is recommended with an in-depth analysis of CI cycle phases based on the enhanced evaluation criteria as well as newly approached analysis and evaluation of recent BI developments, present market shares and pricing structures is suggested for further studies. A further analysis of BI market share for 2008 should be carried out to reflect the present-day situation.

The research will provide further details concerning the developments that have been made in BI software among a select group of vendors, the extent to which the software provided by these vendors cover the areas which comprise the business intelligence cycle. It will also further highlight the new developments that have taken place with the software compared to
previous release by vendors, the market share of the software and the market that exists for these providers.

**KEYWORDS** business intelligence, competitive intelligence, business intelligence software, data management, development, business analytics software

**MOTIVATION**

According to the BI Journal (2008), the BI Survey 7, a leading independent survey of the BI software market has found that MicroStrategy customers lead in Web deployment. For the seventh consecutive year, MicroStrategy customers are more successful in deploying BI via the Web than are customers using any other leading BI product. Such an observation alludes to the fact that there are factors involved which propel stakeholder in the BI software market to utilize this product developed by MicroStrategy.

The Gartner Group (2006) posits that BI is gaining more visibility within the business realm. With such progress one can assume that BI software vendors will have to make improvements in their products to establish competitive advantage. A major issue with BI over the past twenty years has been cost. BI vendors provided software that attracted large companies who had the monetary and technical capabilities to utilize BI products. The last three to four years has seen innovative approaches being implemented by a growing number of BI vendors towards providing new licensing and deployment methods that are geared more towards mid-tier and smaller businesses.

BI is experiencing a transformation now. It has become more of an embedded capability within enterprise applications as mid-tier organizations are at a better advantage to access BI capabilities from their ERP or CRM system, or within other enterprise applications as opposed to having a whole separate BI capability. BI is being sold through the outsourced either as software-as-a-service, or as a supported combination of the hardware and software components that are sold together as a BI solution.

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2 BI Editor (2008)
5 Ibid
Much research has been conducted concerning BI and BI software. The Gartner, Forrester and Fuld & Company are established for performing evaluations of BI software.⁶ There is also the SSAV (Solberg Søilen, Amara, Vriens) Model. The SSAV BI Software evaluation Model was developed and tested on a sample of BI Software analyzing their various capabilities (functions). The aim was to evaluate BI Software effectiveness & efficiency as a tool in addition to assess how each BI function supports a particular CI activity in the cycle.⁷

The components of this paper are illustrated in Figure (1) which follows: Chapter One – Introduction, this chapter focuses on the general background, problem formulation, the purpose of the research & research questions. It also outlines the expected contents of the chapters which ensue. Chapter Two- Method expounds on how the study was conducted with regards to the research description and analysis of data. Chapter Three- Review of Literature/Theoretical findings delves into the literature available knowledge on Business Intelligence Software. It also highlights the data available regarding the developments that have taken place with BI Software on a general note as well as with selected products. It will also provide solutions to some of the research questions as it relates to the developments in BI software. Chapter Four- Empirical Findings, Chapter five - Analysis of Empirical Findings looks at attempts to solutions for remaining thesis questions by conducting analysis on the empirical findings in the previous chapter. Chapter Six- Recommendations and Conclusions describe how the purpose of the study has been accomplished and recommendations for further research.

FIGURE (1) COURSE OF THE PAPER

⁶ Yasmina Amara *, Klaus Solberg Søilen* and Dirk Vriens (2009)
⁷ Ibid
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ABBREVIATIONS

API – Application Programming Interfaces
BI – Business Intelligence
BPM – Business Process Management
BIRT – Business Intelligence and Reporting Tools
CI – Competitive Intelligence
CPU – Central Processing Unit or Processor
CSV – Comma-Separated Values
CRM – Customer Relationship Management
ETL – Extraction, Transformation, Loading
EMEA – Europe, Middle East and Asia
EII – Enterprise Information Integration
ERP – Enterprise Resource Planning
GUI – Graphical User Interface
OLAP – Online Analytic Processing
RIA – Rich Internet Applications
ROLAP – Relational OLAP
SaaS – Software-as-a-Service (solution)
SOA – Service-Oriented Architecture
SQL – Structured Query Language
SCM – Supply Chain Management
WYSIWYG - What-You-See-Is-What-You-Get (user interface design feature)
CHAPTER ONE
INTRODUCTION

Chapter one of this research paper will give a general background to the research topic, the purpose of the research and a synopsis of what the preceding chapters will cover.

1.1 Background to the Problem

BI has become of much interest to many organizations in the fast changing business environment. In the business week it is highlighted that the recession is fostering interest in BI software, which helps companies analyze the data they collect for new cost-cutting or sales opportunities (Rachel King, 2009). With the present dynamism in the business environment business managers are looking for answers to their questions, and they need these answers much more quickly than in the past. To this end BI software plays an integral role in his process. With all this, there is an increasing demand for a faster turnaround on information requests which places more pressure on the information technology (IT) organizations/BI software vendors who will now have to take on a more flexible and organized approach to providing for BI software users and to establish competitive advantage.

Business intelligence for competitive advantage has become one of the prime prerequisites for competitive advantage in the market place. It is the domain responsible for gathering that information and making it available to decision-makers. For improved decision making, and to enable a competitive advantage, the need for more current information continues to grow. Most companies are putting out the effort to satisfy this need, but their progress and capabilities vary widely (IBM Redbook, 2004). This research will therefore highlight the developments made by various vendors and the ones who seem to have established good competitive advantage. In addition to this, the goal is to produce and deliver products quickly and at the lowest cost possible, and to maintain good client satisfaction among BI software users.

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8 King, R. (2009)
9 IBM Redbooks (2004)
1.2 Problem Formulation

Business Intelligence plays an integral role in the decision making process of many organizations today. There are an increasing number of organizations who provide software applications that are aimed at helping companies implement BI systems. These vendors provide various packages which do development overtime while others may have few developments much to the disadvantage of the users.

BI vendors must take into consideration technological innovations and evaluate their ability for improving their existing products. At present BI has attracted much attention from information specialists as well as the business community. This increased attention has given rise to a number of software applications provided by the various vendors who seek to capitalize on these companies’ need to implement BI systems. Evaluations have been made of software provided by BI vendors however the focal point of this research is to highlight whether or not these vendors have added more value to the traditional database management software applications.

1.3 Scope of the Thesis

The purpose of this research is to examine the developments that have occurred with Business Intelligence Software in the last decade. The study will determine and analyze Business Intelligence Software available in the market and trace the developments the major business intelligence vendors are producing in order for companies to stay competitive in a rapidly changing business environment. The thesis research questions are outlined in figure 2:

FIGURE (2) RESEARCH QUESTIONS

| Q. 1 | ✔️ What subgroups can the software evaluated be divided into? |
| Q. 2 | ✔️ Do the BI vendors provide good enough solutions for the analysis part of the intelligence cycle? |
| Q. 3 | ✔️ Should some vendors of so-called BI software fall under a different category based on the components of the BI cycle? |
| Q. 4 | ✔️ Do BI vendors make considerable changes in software each year with each new upgrade? |
CHAPTER TWO

RESEARCH APPROACH

This chapter expounds on how the study was conducted with regards to the research approach, method of data collection from primary and secondary sources as well as the description and analysis of data.

2.1 Theoretical Research

In research studies we often refer two broad methods of reasoning as deductive and inductive approaches. The deductive reasoning approach takes the research from more general to specific. There is a theory, hypothesis, observation and confirmation. The conclusion follows logically from the premises formed from available facts. The inductive reasoning approach works the other way. It works from the specific observations to broader generalizations and theories. The conclusion is likely based on the premises and involves a degree of uncertainty.

This research will utilize the deductive method of starting with a theoretical framework, formulating hypothesis, and logically deducing from the results of the study. Comprehensive data will be collected from existing literature on the developments that have taken place with BI software. All data relevant for the thorough comprehension of concepts related to BI software will be gathered and analyzed. The research process will also utilize primary research which entails the use of immediate data.

Secondary research will also fall into place which is basically reprocessing and reusing collected information as an indication for betterments of the service or product.

Thus, the research work shall be commenced from thorough study of literature in order to comprehend the BI Software major concepts, functions and capabilities. Then, empirical information shall be gathered on BI Software vendors and the developments they contribute to make the BI Software more efficient and relevant to the present-day business environment. Analysis of the empirical data is to be implemented and major BI Software developments are to be commented.
2.2 Empirical Research

The empirical research was performed with the view to study, analyse and evaluate BI vendors and their products. Due to the time constraint and limited access to BI information of some vendors, not all BI vendors were covered in the research. The following BI vendors included in the empirical study: Information Builders, MicroStrategy, IBM Cognos, SAS Institute, SAP Business Objects, Microsoft, QlikView, TIBCO Spotfire, Actuate and Astragy. Having studied a number of evaluation approaches undertaken by various research organizations with inclusion of SSAV model and having taken into account the objectives of the research, the empirical study was devised to: examine general characteristics of BI functions; perform an analysis of BI software in terms of four CI cycle phases (planning & directing, data collection, analysis and dissemination) for each BI vendor (see Evaluation Template in the Appendix); trace the developments introduced by each BI vendor in their recent releases & present general comparison and similarity of where those enhancements are directed at; to perform an analysis of market share, market segments and pricing structure of BI evaluated. And finally, as per research results, the empirical study endeavoured to categorize BI vendors into a number of subgroups.

The empirical study was performed by way of observations and experiments using the free software trials available at the vendors’ web-sites as well as white papers, presentations, data sheets, news with the view to gather information on general characteristics of BI functions, recent BI releases and market statistics. Evaluation criteria of the BI software as per CI cycle phases, presented in the SSAV model as the class of process variables, were taken into consideration herein. Each vendor was evaluated as per each criterion of the four CI cycle phases and rated from not applicable (0) to excellent (4) score. An overall score and then an average score for each intelligence cycle phase were calculated to perform an analysis of BI software. However, it is necessary to point out that the SSAV evaluation model included, performed BI software evaluation according to three classes of variables as process variables (I), product variables and process variables (II). Unlike this research, which attempted to include only process variables (II) in the evaluation (examination of how a BI function supports a particular CI cycle activity), together with the study of BI software recent enhancements and analysis of market information.
2.3 Description of Methodology

As mentioned previously, the research was conducted in order to identify the developments which have taken place with BI software. The research questions outlined before looks into the changes which have taken place with BI software overtime, the extent to which BI software provide solutions for the analysis phase of the intelligence cycle and the subgroups in which BI software may be divided into based on their support of the intelligence cycle. In order to determine the solutions to these research goals, the researchers opted to utilize secondary data to assist in the compilation of the contents. Secondary data is existing information that has been gathered for some purpose outside the planning process. With regards to the theoretical study, this research attempted to examine relevant variables that are to be used to evaluate BI Software from the various user groups’ perspective. A thorough theoretical literature research of the Competitive Intelligence Cycle was done as well as that of BI Software functions and capabilities. External secondary sources as published books and journal articles formed the basis of the theoretical work for this research.

A sample of ten BI software vendors was selected for analysis concerning the nature of this research paper. These vendors selected include SAP Business Objects, SAS Institute, Microsoft, QlikTech, Astragy, TIBCO Spotfire, Information Builders, MicroStrategy, IBM Cognos and Actuate. The focus was more on the top vendors based on rankings in previous evaluations of BI software. The researchers came up with an evaluation criteria based on the CI cycle phases (see appendix for evaluation criteria) and this had scores ranging for 0 to 4 which signifies non applicability and excellent, respectively. Data gathered using these criteria were computed and analysed.

Research Design

The descriptive method of research was most appropriate to this paper. Creswell (2008) explains that this type of research involves the collection for data in order to test hypotheses or to answer questions concerning the status of the subjects of the study. This method makes room for flexibility and was chosen by the researcher in order to collect data which allowed the development of reasonable conclusions and suggestions for further research on the topic. Two types of data were collected for this research-primary and secondary data. The primary data was
garnered via the scores generated for each BI software as indicated by the template in the Appendix, while the secondary data was gathered from scientific articles and other published documents which were pertinent to the developments in BI software. With this approach the researchers were therefore able to utilize the quantitative method of data collection for the research. Creswell (1994) postulates that the quantitative method includes an inquiry into a subject based on testing a theory, measured with numbers and analyzed with statistical techniques. The major aim of this method is to determine whether the hypotheses hold true or not. The advantages of using the quantitative method is that “quantitative research design is an excellent way of finalizing results and proving or disproving a hypothesis” (Shuttleworth) 2008. And this has a structure which is applicable to all disciplines. He also states that “after statistical analysis of the results, a comprehensive answer is reached, and the results can be legitimately discussed and published.” He finally explains that quantitative experiments are very practical “for testing the results gained by a series of qualitative experiments, leading to a final answer and a narrowing down of possible directions for follow up research to take.” With this in mind, the researcher sought to utilize such methods to complete this study.

Participants

In an effort to find solutions to the research questions previously outlined, the researchers selected from among the top BI software vendors. To achieve the relevant data the software provided by these vendors were measured on the criteria of the CI cycle phases of planning and directing, data collection, analysis and dissemination. The BI vendors operate in countries across the globe and provide products that are popular enough in the BI software market. It was decided to use those among the top vendors in order to give rational representation of the vendors who actually make new developments in their software gradually. The BI vendors have been mentioned in the initial section of this description.

Instrument to Collect Data

An instrument was designed to collect the empirical data on the software. The evaluation instrument was designed to determine the level at which the BI vendors provide software based on the CI cycle represented in this study. Each phase was allotted a score of one which gives the evaluation instrument a score of zero to four. The scale which follows indicates scores which
were used to determine the support of each vendor’s software for each stage of the intelligence cycle.

<table>
<thead>
<tr>
<th>Range</th>
<th>Elucidation</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>POOR</td>
</tr>
<tr>
<td>2</td>
<td>SATISFATORY</td>
</tr>
<tr>
<td>3</td>
<td>GOOD</td>
</tr>
<tr>
<td>4</td>
<td>EXCELLENT</td>
</tr>
</tbody>
</table>

This scale was developed by the researchers in order to facilitate the use of the quantitative research method effectively. This ensured the collection of statistics for data analysis. The software provided by these BI vendors were assessed and based on the details provided by white papers, demos and information from the sites of these vendors, they were scaled accordingly.

**Data Processing and Analysis**

The empirical details of this research were tabulated using graphs and tables. The empirical data collected was analyzed based on the evaluation criteria of the CI cycle phases. Each BI vendor was assessed as per evaluation points of four cycle phases (planning & directing), data collection, analysis and dissemination (see Appendix) from 0-4. The scores assigned for each point of the cycle phase were summed and average scores for each phase were determined, whereupon presented in the Part 4 herein. Moreover, an examination of the latest releases of each BI vendor was provided to ensure that BI vendors introduce developments on annual basis as well as market information (market share, customers and pricing structure) of BI vendors was traced to determine how those vendors can differ in this area. Therefore, on the basis of the total average scores deduced from the evaluation of CI cycle phases, availability of developments introduced and the data obtained from the market information, the proposed classification of BI software was presented in the Part 5 hereof.
CHAPTER THREE
THEORETICAL FINDINGS

This chapter delves into the literature available on Business Intelligence and Competitive Intelligence. It also highlights the data available regarding the developments that have taken place with BI Software on a general note as well as with selected products. It will also present information on the use of BI software today, provide solutions to some of the research questions as it relates to the developments in BI software.

3.1 What is Business Intelligence?

According to the Gartner survey done in January more than 1500 CIO’s worldwide, BI software tops the list of technology spending priorities for companies in 2009. That priority remains, even though IT budgets are expected to be essentially flat in 2009. Market researcher Forrester Research expects the BI market to generate more than $12 billion in revenue in 2014, vs. $8.5 billion in 2008.¹⁰ With this data in mind, it is needless to say that developments in BI software are inevitable, but one is left with the question of the extent to which these developments have or will occur.

(King, 2009) defines BI as the technology and practice of applying information to make decisions. The goal of BI is to show the real value of information when many people can use and share it. Business intelligence software is a type of application software that is used to gather, store, analyze data, and present that data in a simple, useful manner. The software aids in business performance management, and aims to help people make better business decisions by making accurate, current, and relevant information available to them when they need it. Developments in BI will help businesses to divulge the position of their company as in comparison to its competitors, changes in customer behaviour and spending patterns, the capabilities of their company, market conditions, future trends, demographic and economic information and tell what the other companies in the market are doing.

BI sometimes referred to as Competitive Intelligence (CI) is embedded in the fibre of businesses throughout the world. Generally, (BI) is considered a support function for the management’s decision-making. The goal of BI is to improve and to speed up a company’s decision-making process and therefore to pursue higher competitiveness in its business

¹⁰ King, R. (2009)
environment. In this research, the BI concept is understood as a systematic process for collecting and analyzing a company’s strategic and operative information.11

Asif (2009) defines BI as “the key to bringing information, people and technology to successfully manage an organization.” It also entails putting the right information in the right format and in the right hands at the right moment. He further explains that it gathers information from the right organization, analyzes, prepares, reports and transmits this data to the people who need it. This definition quite fittingly illustrates the CI cycle which plays an integral role in the assessment of the developments in BI software. Alex Burns (2003) defines BI as information systems and transaction databases, in other words, Enterprise Resource Planning (ERP). He also explains it as decision making support, rationale and management framework. Burns quotes Herbert Meyer who describe BI as the “radar for business” and Richard Hames who depicts BI as “Strategic Navigation.” The interpretation by Asif augers well for the scope of this study, as among the aims of this research is to evaluate how well the BI software vendors satisfy the various phases of the CI cycle.

Microsoft Limited (2009) sees BI as a term which takes on several different technologies which are best defined according to the problems they solve. Among such technologies are data warehouse, Online Analytical Processing (OLAP) and data mining. Data warehouse is a process/system that pulls data from each operational system within an organization and acts as a central repository against which informational queries can be run. OLAP is a technological process whereby decision makers phrase complex questions with the intention of receiving comprehensible answers at a very fast pace. OLAP stores the data in cubes and hence they name OLAP cubes. The final technology which concerns data mining is a process by which raw data is used to identify particular trends within such data.

Luca Rossetti relates BI to applications and technologies for gathering, storing, analyzing and providing access to data to help enterprise users make better decisions. These applications are further explained to include the activities of decision support systems, query and reporting, OLAP, statistical analysis, forecasting and data mining. This is a very comprehensive definition of BI as it takes into considerations all the applications and technologies which are pertinent to the development of an effective BI system.

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11 ibid
3.1.1 BI Software

Business enterprises today are increasingly dependent on BI software applications. BI software is an important tool intended to connect the expanding universe of business data in order to make better decisions. It is observed that most BI applications are limited in terms of the ability to manipulate business intelligence in ways not supported by out-of-the-box capabilities.

The PCMag encyclopaedia (2009) defines BI Software as tools that enable users to obtain enterprise-wide information more easily. BI software products are considered a step up from the typical decision support tools because they more securely integrate querying, reporting, OLAP, data mining and data warehousing functions. However, there are many products which claim BI capabilities and as such this research will reveal whether some of these vendors fall in the category of BI software based on the components of the BI cycle.

Thierauf (2001) explains that BI software is not just a set of tools but rather an integrated approach to identifying, collecting, managing, and sharing the enterprise information assets with individual employees to put the business intelligence to use. In essence, BI software is comprised of specialized computer programmes that allow an enterprise to easily collect, manipulate and present data as information.

Dr. Saadia Asif of Inforica Inc. explains that “BI is more than an attitude or an enabling technology, rather it is a performance management framework, an ongoing cycle by which companies set their goals, analyze their progress, gain insight, take action, measure their success and begin the process again.” With such a paradigm in mind, BI vendors must ensure dynamism with their products and the BI cycle repeated must result in improved results at each attempt. To this end, developments in BI software over the past five years should be reflected based on the phases of this BI cycle. The figure below illustrates the cycle as explained by Saadia Asif.

FIGURE (3) BUSINESS INTELLIGENCE CYCLE

12 PCMag (2009)
The BI vendor, IBM Cognos opines that Business intelligence BI software takes the volume of data that an organization collects and stores, and turns this into significant information that people can easily use. This information are then made accessible via reports which enables people to make better and timelier business decisions in their everyday activities (www.cognos.com).

BI software plays an integral role in making companies gather, store, access and analyze data which in turn contributes to the decision making process. They include tools and systems which support the CI activities and has an important role in the procedures undertaken for strategic planning. This definition therefore illustrates the difference between BI and CI and how they support each other.
3.1.2 The Benefits of Business Intelligence Software

(Realty Software, 2009) asserts that the software aids in business performance management, and aims to help people make better business decisions by making accurate, current, and relevant information available to them when they need it. According to consulting firm McKinsey and Company, BI can help marketing managers identify those customers who might be willing to pay more and determine how to raise prices without undermining profitability. On the cost side, business intelligence can help you determine where the money is really going in your organization, and spot ways to become more efficient. Business intelligence can help you determine which activities have disproportionate costs and ineffective performance.13

As outlined by (Business Intelligence Lowdown, 2006) BI has many benefits for companies today:

- BI offers new tools for understanding customers’ needs and responding to market opportunities.
- Provides a mechanism for analyzing the performance of any operational process
- Builds new value into all financial operations including budgeting & forecasting.
- Supports the recruitment, retention & career development of key employees and future leaders.
- It lets you accurately assess the value of market segments and individual customers and help retain the customers who deliver the most profit to your company.
- Accurate BI enables an organization to move from concept to implementation with greater speed and transform existing systems by adding new capabilities and extending the value of existing investments and it enables considerable cost savings.

In essence, BI solutions are necessary for any company to keep up with the competition brought on by changing, trends and technologies and the freely available information waiting to be used. Figure 3 above gives a simple graph illustrating the benefits of Business Intelligence.

3.1.3 The Future of Business Intelligence

The Gartner Group (2009) has made predictions concerning the development of the BI market for the coming years. They predict that more than 35 percent of the top 5000 global companies will fail to make intuitive decisions about the significant changes in the BI software business and market. This they presume will occur as a result of the lack of information, process and tools in the next three years or so. They also hypothesize that the business units will control at least 40 per cent of the budget generated by BI. The Gartner Group has further suggested that by 2010, 20 percent of organizations will have an industry-specific analytic application delivered via software as a service and this will be as a standard component of their business intelligence portfolio. One prediction that proves correct, as indicated by this research, is that 2009 has seen the emergence of collaborative decision making as a new product category that combines social software with business intelligence platform capabilities.14

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14 Gartner Group (2009)
There have been quite a number of collaborations which typify this presumption. Notably among them is SAS’s acquisition of Teragram, the leader in natural language processing and advanced linguistic technology. This collaboration enhanced SAS’s text mining and analytical BI offerings which broadened their scope in the enterprise and mobile search.\textsuperscript{15} SAS recognized the importance of text mining, the analysis of text and other unstructured data and has now become the leading provider in this expanding area.

\section*{3.2 What is Competitive Intelligence?}

It is quite fitting to examine the concept of Competitive Intelligence (CI) as it has direct relation to BI. CI has been used interchangeable with BI but these are two different concepts and should not be used synonymously. The Society of Competitive Intelligence Professionals (SCIP) defines CI as “timely and fact based data on which management may rely in the decision making process and strategy development.”\textsuperscript{16} The two concepts concern decision support but CI has to do with unstructured inform while BI deals with structured information, Martell (2009). In essence CI focuses on information outside an organization while BI deals more with matters internally.

CI is an example of a particular set of information related activities that are aimed at adding value to information to enhance decision making.\textsuperscript{17} CI is the purposeful and coordinated monitoring of your competitor(s), wherever and whoever they may be, within a specific marketplace... Your "competitors" are those firms which you consider rivals in business, and with whom you compete for market share. CI also has to do with determining what your business rivals will do before they do it.

Leonard Fuld defines CI “highly specific and timely information about a corporation” while Ian Gordon defines it as “strategies to transfer market share profitably.” Both definitions highlight the point that CI involves the development of competitive advantage. Yuan et al (2001) sees CI as the process of obtaining vital information on markets and competitors, analyzing this information collected to develop strategies which are crucial to competitive advantage.

\begin{thebibliography}{9}
\bibitem{15} BI Editor (2008)
\bibitem{16} Global Intelligence Alliance (2004)
\bibitem{17} Bouthillier, F (2001)
\end{thebibliography}
Prior (2008) presents his interpretation of CI as a “systematic and ethical programme for gathering, analyzing and managing any combination of data information and knowledge concerning the business environment in which a company operates” He further highlights that role is in strategic early warning. Strategically speaking CI has to do with gaining foreknowledge of your competitor's plans and to plan your business strategy to countervail their plans. As you might expect, this will involve many methods at the tactical collection level, but it will also require integration into existing information infrastructure, analysis and distribution of the information, and finally, the calculation of business decisions on the grounds of that information and the analysis of same. This is the "intelligence" part of the formula as postulated by Johnson (2000).\textsuperscript{18}

In this case, vendors of BI software strive to maintain their competitive edge by ensuring that their products present to the various user groups in the market tools that are effective enough to make them want to utilize their product. This is the case for the SAP Business Objects whose development in BI software claim to reflect “broader data access, improved usability and greater flexibility”\textsuperscript{19} The research findings has indicates that SAP Business Objects does deliver on what it claims as illustrated by Figure 9 of the empirical findings.

\textsuperscript{18} Johnson, A. (2000)  
\textsuperscript{19} SAP Business Objects (2008)
3.3 The Competitive Intelligence Cycle

TechWriter (2008) explains the Intelligence cycle with four phases. These include planning and direction, collection, analysis and dissemination. The cycle was first developed by Jan Herring from CIA collections and analysis techniques. The cycle posited as: needs assessment, plan research and collection methods/tools, data collection/evaluation from public sources, information analysis, and actionable intelligence presented to decision-makers and policy-makers.20

Figure 5(A) below illustrates process of the cycle as expounded by TechWriters (2008) and has been used as a framework for the assessment the developments of BI software provided by Information Builders, MicroStrategy, IBM Cognos, SAP, SAS, Microsoft, QlikTech, TIBCO Spotfire, Actuate and Astragy. The software provided by these vendors have been assessed to indicate if they fulfil the requirements as indicated in the cycle in terms of planning and directing, collection of data, analysis and dissemination. The empirical research indicates that most of the BI software evaluated is lacking as it concerns phase one of the CI cycle.

FIGURE 5(A): COMPETITIVE INTELLIGENCE CYCLE

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**Planning & Directing**

(Tech-Writers, 2009) explains that the planning and direction phase of the CI cycle takes in the entire intelligence process, beginning with the threat assessment phase and culminates with the delivery of the finished intelligence products. The plans generated are those that are responsive to known intelligence requirements. There is planning of research tools and diagnostic scorecards, the identification of data requirement and sources, deciding on the scanning frame, pre-testing for personal and tool blind-spots and also team capabilities and cognitive styles.

In other words, this process encompasses outlining the details that all the phases of the CI cycle will take on. The BI vendors examined in this study pay little attention to phase and this can be seen in the preceding chapter highlighting the empirical findings. More efforts should be made by BI vendors to place valuable emphasis on this phase of the CI cycle.

**Collection**

The collection phase of the CI cycle tells precisely how the intelligence service will go about obtaining the information for customers. This phase may include specialists groups who act as liaisons between the collection sources and the users of the various applications. Planning requires analytic skills to evaluate how well the user has expressed the need; whether the collection assets are able to obtain the identified information, and how the collected information reaches the intelligence analyst (Tech Writers, 2008). Pollard (1999) explains that a thorough to the acquisition of information for CI requires both internal and external sources of information and the use of different strategies. Collection requires analytic skill to evaluate how well the user has expressed the need; the ability of collection assets to obtain the identified information, and the process by which the collected information reaches the intelligence analyst.²¹

Valuable collection sources for this phase of the cycle includes corporate publications, advertising, newspapers, periodicals, academic journals, foreign and domestic broadcasts, official documents and other published material. The global economy and its continued competitiveness also encourage the acquisition of scientific and technological information.

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²¹ Boutihillier, F. (2001)
**Analysis**

Analysis involves a series of mental operations of various types of collected data with close examination of related items of information to determine the extent to which they confirm, supplement, or contradict each other, and thus establish probabilities, relationships, and conclusions.

The purpose of this analysis is to reveal to a specific decision maker the underlying significance of selected target information. It often involves the estimation of one possible outcome, given the many possibilities in a particular scenario. The analysis typically can involve forecasting, which requires the analyst to make explicit statements about the degree of confidence held in a certain set of judgments. There are different levels of analysis associated with the production process, usually with results in corresponding levels of conclusions.

Analysis is the most challenging phase of the cycle Sawka (1996) explains that it is through this phase that executive decision making is done. The information is transformed into a more actionable form and it requires great skill to evaluate the data, determine patterns and develop scenarios. The important roles of analysis as espoused by Bernhardt (1994) are the options and recommendations which facilitate decision making by senior managers. As summed of by Albert Cruywagen (2002), analysis is the process by which the data is “collated, analyzed, integrated and converted into competitive intelligence products containing facts, elucidations, estimates, forecasts and conclusions.”

**Dissemination**

The process of dissemination is what brings all the previous phases into practice. The creation of intelligence is certainly without value unless it is timely and reaches the prospective users in a form that allows utilization of the intelligence. Like the battlefield, the business environment today is extraordinarily dynamic, with the result that information and intelligence is time sensitive, at highest value at the time of acquisition and depreciates rapidly from that moment. It is therefore a priority to have the information created and disseminated expeditiously for action to take place.

Global Intelligence Alliance, (2004) highlights that “the role of the dissemination phase is to ensure that the right people receive the right intelligence at the right time.” It is an

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extremely important part of the intelligence cycle as ensures that the product reaches the customers at the right time. Should this prove otherwise, it may erode the entire framework of the intelligence cycle. This phase of the cycle is well executed by most BI vendors as this is the phase which propels their growth in their efforts to create competitive advantage.

3.4. Theoretical Findings on BI Software Market Developments

BI continues to be popular among many organizations which hope to maintain their competitive advantage. The Cambridge, Mass.-based research firm expects the BI software market to reach nearly $13 billion in revenue by 2014, up from $8.5 billion last year. The report states that a significant portion of those dollars will come from first-time buyers of BI tools and software.  It has been stated that the BI market today is actually bigger than the $8.5 billion as believed by Boris Evelson (Forrester analyst). This is as a result of the BI-style tools that are sold as part of ERP packages in addition to HR and customer analytics tools. Another reason for the growth of the market is the emergence of a number of new categories of BI tools that Forrester predicts will eventually be absorbed into what it calls "core BI."  

The leading BI vendors for 2009 as highlighted by the Gartner Analyst firm are IBM (Cognos), Microsoft, Oracle, SAP, Information Builders, SAS and MicroStrategy. This firm presents a Magic Quadrant for the BI Platform which gives an overview of whom they think are the main BI vendors that should be considered by companies that expects to expand BI intelligence within their organizations. These leading vendors are described by Gartner as "vendors that are reasonably strong in the breadth and depth of their BI platform capabilities, and can deliver on enterprise-wide implementations that support a broad BI strategy. Leaders articulate a business proposition that resonates with buyers, supported by the viability and operational capability to deliver on a global basis."  

In order for such descriptions to be associated with these leading vendors, then developments in various areas must be evident in the quality of the software being promoted by such vendors. The visionaries and niche players on the Gartner 2009 BI platform are QlikTech,

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23 Kelly, J. (2009)
24 Ibid.
TIBCO Spotfire and Actuate, Arc plan, Board International and Panorama Software respectively.  

The empirical part carried out for the research will reveal the observed developments which have taken place with the BI software which makes them eligible to be considered among those that are deemed to be top in the BI platform for 2009. According to a survey of BI customers conducted by the Business Application Research Centre (BARC), only a quarter of this sample was fully satisfied with services provided by these vendors. The survey polled 2622 BI users, consultants, and vendors in the United States, Europe, Asia and South America. The survey found that customers of the smaller and independent BI vendors were more satisfied with the performance levels of the products and services as opposed to the big vendors such as SAP and Oracle. From such as survey, it can be gleaned that even with improved features and better services by BI vendors the use of BI software and tools may not necessarily increase significantly without proper support services.

MicroStrategy has been proven to be among the top BI vendors and seem to be above the rest in many areas of the intelligence cycle. This is also the case with the empirical findings of this research. There are specific BI vendors that are more heavily preferred by certain industries. MicroStrategy, for example, boasts more retail and telecommunications customers than average, while Information Builders is principally used by insurance and healthcare organizations.

The BARC survey also found that Oracle BIEE is the preferred BI suite for IT services and QlikView is popular with manufacturing companies. (BI) software has progressed from basic query and reporting tools to multifarious, enterprise platforms, which has included new functions such as performance management and search. This is occurring simultaneously with the rapid growth and consolidation of the BI market. Notably in this research are TIBCO and Spotfire, Oracle bought Hyperion, SAP and Business Objects, and IBM purchased Cognos as well. Such changes have initiated developments in BI software provided by these vendors. The BI software made available by the latter has seen developments in the scalability and flexibility of the product they provide. Contrary to this is the fact that although these vendors have seen recent developments in their software, they do have their issues as highlighted by Nigel Pendse (2008) in his recent survey of BI tools and the various stakeholders in this industry.

26 Ibid.
27 Kelly, J (2009)
Among the many consolidation/acquisitions which have been taking place over the past five years, the most important of these vendors have been identified in the likes of IBM, Microsoft, Oracle and SAP. Daems (2008) explains that their market share is still made up of numerous different BI products; however, there are also some companies that continue on a more independent course, for example, MicroStrategy, Information Builders, SAS and QlikTech.

The empirical findings of this research indicate that SAP Business Objects along SAS are among leading in the market share. They have seen rapid and nimble innovations as is required by the BI market. He further explains that even though the business intelligence market will be dominated by the major stack vendors - like IBM, Microsoft and SAP – there will still be room in this market for the bigger independent BI vendors, like MicroStrategy. This is however highly dependent on innovative and integration for them to keep their place in the business intelligence market.

Developments in BI software market have seen the adoption of the software as a service (SaaS) model by many vendors. The recent consolidation in the market propelled new vendors to be innovative and invest in new database technologies, and create highly scalable and efficient BI platforms. BI vendors aspire to be cost effective as it concerns customer needs and as such the SaaS service model is a new development for many. Briggs (2009) highlights this model that eliminates capital expense and dramatically reduces the internal requirements for development, support, and sustaining costs of the BI platform. The SaaS model, organizations can implement changes quickly without additional capital expenses and IT staff requirements.

The theoretical and empirical findings of this research are compatible in all areas. The recent developments in BI software have seen innovative ideas by vendors who wish to be versatile in the market and maintain their customer base. Innovation and integration have become crucial to many BI software as without constant improvements, competitive advantage is lost.

3.5. BI SOFTWARE EVALUATIONS

Duggan (2006) quoted in Amara, Søilen and Vriens (2008) highlights that business organization are still having a difficult time improving the quality of information systems despite

28 Daems, J (2008)
29 Briggs, L (2009)
the many attempts at research and the experience that has been accumulated in delivering these systems. The use of BI tools is becoming a mainstay in the development processes of many organizations. As Dixon-Winters (2009) states BI tools in today’s economy is a necessary to survive in the competitive market. Consequent to such changing paradigm, many have made attempts at evaluating BI software provided by the various stakeholders in the business. Among such are the Gartner group, SSAV Model, Fuld, and Forrester and Wave.

The SSAV model has given much impetus to the aims of this research and has been mentioned previously in this work. However, only the process variables (How BI function support CI cycle activity) were taken into consideration for this research. This model was developed to test a sample of BI software by analyzing their various functions. It evaluated the effectiveness and efficiency of BI software as a tool and it also assess how a particular software support a particular CI activity in relation to the four phases of planning and direction, collection, analysis and dissemination, (Amara, Søilen, Vriens, (2008)). The variables used for evaluating the software in this model are illustrated in the figure which follows. These variables were further divided into four parts. The model also focussed only on the technological variables however suggestions were made for further analysis of the non-technological variables.

**FIGURE 5(B): SSAV BI SOFTWARE EVALUATION VARIABLES**

**SSAV MODEL VARIABLES FOR BI SOFTWARE EVALUATION**

- **Process I:** variables for evaluating the effectiveness & efficiency (quality) of BI Software functions (Capabilities).
- **Product:** effectiveness & efficiency of artefacts, document that result from BI software function.
- **Process II:** Evaluating how BI function supports a particular CI cycle activity.
As stated by Amara, Søilen & Vriens the aim of the SSAV model was to decide which BI software was the most competitive, to classify the software based on the findings and also to make the model a credible one that could be used as basis for users’ selection of BI software.

Another influential effort at evaluating BI software is by the Gartner Group. The Gartner group developed the Magic Quadrant for BI platforms evaluations which highlights that users should evaluate vendors based on the features of this quadrant. Kelly (2008) explains these as indicated by Gartner as: Leaders - the vendors that excel in the ability to execute and have completeness of vision, challengers as those have the ability to execute but are lacking in strong vision, visionaries are market though leaders but they struggle with functionality issues and the vendors that are niche players on just one or two segments of the BI market but they do very well in these areas. The 2008 quadrant featured Microsoft, IBM Cognos, Oracle, SAS, Information Builders and MicroStrategy as leaders in the quadrant. Some other examples of vendors who appeared in the quadrant are: Actuate as a niche player, and TIBCO Spotfire as a visionary and SAP as a challenger. All these vendors cited as examples are among the select for the assessment of vendors in this research. This evaluation has impacted this research paper as the vendors featured in the quadrant are among those selected for assessments of the improvements they have made with the software they provide to the various user groups.
CHAPTER FOUR

EMPIRICAL FINDINGS

This chapter presents an overview of BI software vendors, traces general characteristics of their BI functions, reflects analysis of intelligence cycle phases for each vendor, examines new developments introduced in the recent releases by vendors and introduces market share, customer base and pricing strategy information. Each vendor is evaluated as per the evaluation criteria provided in the Appendix based on four CI cycle phases with scores ranging from non applicable to excellent (0-4). Thus, the resulted scores are average scores for each cycle phase.

4.1 BI SOFTWARE EVALUATION

4.1.1. Information Builders

I. BI Software Name: WebFOCUS 7

Company Overview

Information Builders is a privately held software company, with its headquarters in New York. Information Builders is known for their Business Intelligence tools FOCUS and Web FOCUS. After 26 years of reporting knowledge from a variety of platforms, data sources and applications, in 2001 they established iWay Software, a wholly owned company that focuses on integration and service-oriented architecture (SOA) (www.wikipedia.org).

Information Builders has over 30 years of experience and more than 1,400 employees’ worldwide serving over 12,000 customers and collaborating with over 350 business partners through its 47 offices and 26 worldwide distributors. Its revenue amounted to $300 million as of 2007 (www.informationbuilders.com).

II. General characteristics of BI functions

Information Builders employs WebFOCUS comprehensive suite of BI software with functionality for many different classes of users. WebFOCUS enables users to reduce cost and time for developments and deployment of BI applications, while providing powerful, scalable and enterprise-wide solutions.

WebFOCUS fails to provide any kind of framework or project flow documents. WebFOCUS provides seamless integration with the help of iWay software, which makes any
data available regardless of its location, storage medium, or format. Its unifying integration infrastructure accesses, reconciles, cleanses and prepares data for business intelligence manipulation, analysis and delivery easily and flexibly with less delivery time and cost from one half to one third. iWay software can extract and download data marts, enterprise data warehouse & warehouses either directly or using ETL to WebFOCUS. Data warehouse is scalable and it grows with the business requirements changes and provides consistency, security and privacy to the information. WebFOCUS metadata with 360-degree view enables organizations to use transformations, reuse objects and understand how changes impact the physical layer of the business intelligence system. It acts as a buffer between users and data sources, allows working with data and business terms and easily manipulating it for analysis, reporting, ETL or enterprise integration.

WebFOCUS business analytics includes functionality of query tools, reporting tools and OLAP into a single powerful solution with one common interface so business analysts can perform analysis, slice and dice the data. OLAP features built into WebFOCUS enables users to create any report, generate ad hoc queries and perform in-depth analysis. WebFOCUS also supports the creation of Excel spreadsheets and Excel PivotTables, enables users to generate their own ad hoc queries from Web browser.

WebFOCUS employs numerous means to deliver information such as 3D bars, histograms, GIA Maps, dashboards, portal, web and other. With a single user interface, graphical views can be personalized by users by selecting, re-colouring, zooming, pivoting charts. Customizable portals enable users to personalize their environment the way they view, store and retrieve information. Users are allowed to select analytic tools for creating reports and graphs, as well as features such as matrix reporting, ranking, colour coding, drill down and font customization.

WebFOCUS Dashboards also provide security of information, search function enables user to quickly and easily locate the information required, and automated report distribution allows scheduling reports distribution via printers, faxes, e-mails and wireless devices. Dashboard WebFOCUS enables to pull up and display archived reports from its Report library.

WebFOCUS provides users with fast and simple access to data by delivering some of today’s most advanced Web-based features as integrated proactive hyperlink drill-downs in all supported formats to any report, program or location as well as multiple locations. WebFOCUS
reporting applications are very easy to use with the industry’s highest user adoption rates 2.5 times more than other BI tools.

III. Analysis of Intelligence Phases

1. Planning & Directing

Information Builder fails to support this phase of the intelligence cycle.

2. Data Collection

WebFOCUS supports collection of data from internal and external company sources, enables users to create unified and insightful reports using iWay software that accesses data from any data source, location, storage, medium and format. Internal data is collected from relational databases such as Oracle, Teradata, IBM or Microsoft, application databases (SAP), XML messages, flat files and Excel data sources. WebFOCUS enables external data to be collected by way of creating, consuming and publishing Web services. WebFOCUS Web services support the drilling down from any internal source to any other. According to the evaluation, data collection phase of WebFOCUS BI data warehousing function represents an almost excellent score of (3.75).

3. Analysis

With WebFOCUS, users can extract data, view it with multiple dimensions, obtain greater insights, and identify relationships, key patterns and trends. WebFOCUS supports various analyses from calculations to in-depth analyses. It is able to render qualitative analysis with future predictions, but WebFOCUS fails to support the advanced analytical functions. Therefore, WebFOCUS is below average at supporting analysis phase and the score for the analysis phase amounts to (1.75).

4. Dissemination

Information delivered by WebFOCUS is easy to comprehend due to dashboards, which include 3D bars, histograms, GIA Maps, dashboards, portal, web and other. In addition, WebFOCUS provides pixel perfect report designs so that users are able to arrange numerous elements on a single report. WebFOCUS allows receiving and retrieving data in any format
required. The reports delivered can be viewed, printed, or reviewed for further analysis or can be automatically sent to Web browsers, e-mail addresses, fax machines, printers, mobile and other devices. Therefore, its average score for the dissemination phase of the intelligence cycle is (3.92), which is high enough if compared to other vendors.

Information Builders’ overall intelligence cycle scores are presented in figure (6) below.

**FIGURE (6): INFORMATION BUILDERS EVALUATION SCORES**

![Information Builders Evaluation Scores](image)

Source: Evaluation Findings

**IV. Recent BI Software Developments**

Information Builders introduced new Flex technology in WebFOCUS Enable Component for Google Maps that allows users to combine Google Maps with reports, charts or any other components in a highly visual and interactive Flex Dashboard. This does not require users to comprehend API or manually enter code to develop a geographical dashboard. WebFOCUS Enable engine’s custom filtering and data aggregation capabilities can be employed along with WebFOCUS integration to rapidly develop an interactive dashboard. Users require no training as the custom interaction in the Flex dashboard guides users through the complex analytic process. Once the application is deployed, its new features can easily and quickly interpret the geographically dispersed business operations of today’s global and national enterprises.

Another developments introduced by Information Builders - WebFOCUS RStat (released in March) is the first fully integrated environment for creating BI modelling and scoring
applications. It provides a toolbox of data exploration, model building and evaluation techniques that support data mining and predictive analytics modelling. RStat combines the Top 10 data mining algorithm that answers 90 percent of the most common enterprise data mining requirements. Information Builders created a very simple interface for RStat, which is intended, both for beginners familiar with basic statistical methods and advanced users can quickly and easily use this tool to develop models and applications. RStat can deploy scoring applications on any platform and it allows organizations to standardize on a single tool for BI and analytics as well as capitalize on the open-source software.

With regard to reporting function, most companies that use WebFOCUS Web services have the need to bring fully formatted WebFOCUS Reports into the companies own applications developed in environments such as Microsoft .NET and Java. If an application required that unformatted data to be incorporated from WebFOCUS, it can be done through Reporting Server Web services available with version 7.7 of the Reporting Server.

Web FOCUS includes new feature that allows controlling the hierarchy display and makes it easier to utilize it in reports. The SHOW command can be used in conjunction with the WHEN clause to control which parts of hierarchy are shown.

Information Builders introduced Impact Analysis - Reporting Server feature that is incorporated in the Developer Studio interface for developers and server administrators. It allows users to easily run reports and evaluate the impact a synonym change may have on existing procedures by searching their applications. The Impact Analysis tool generates reports that display the affected procedures and is able to directly open procedures or save results for later evaluation. The Impact Analysis tool enables developers to perform a search against any number of applications and review the procedures (FOCEXC files) or Business Views that use the selected synonym. Lately, Impact Analysis will be enhanced to also search HTML files.

V. BI market information & comparison.

Information Builders provides BI software to both big and small & midsize companies, governmental agencies, universities and has more than 12,000 customer sites. Its customers include: most of the Fortune 100, Lloyd’s of London, BT International, The Co-operative Bank, Arcadia Group Ltd, Sony, NASA, Verizon, all major US federal agencies, and many educational institutions. Its customers occupy nearly every possible vertical sector, and to date its products
have been particularly well-used in the insurance, banking and finance, telecommunications,
retail, government, and manufacturing sectors.

Information Builders BI software market share accounted for approximately 6% in 2007. It has CPU-based licensing model.

VI. Conclusions

Information Builders provide BI software, which is almost excellent at data collection phase, very good at dissemination phase, has below average score at analysis phase and fails to support the planning & directing phase. Developments introduced in the recent release in reporting and analysis functions aim at providing simplicity of use for a large number of users. Its pricing structure is named-user and CPU-based with 6% market share as of 2007.
4.1.2 MicroStrategy

I. BI Software Name: MicroStrategy 8

Company Overview

MicroStrategy is a business intelligence, enterprise reporting and OLAP (on-line analytical processing) software vendor. Since 1989, MicroStrategy has helped corporations transform their operational data into actionable information. With thousand of satisfied customers and over 500 technology and integration partners, MicroStrategy has been proven the best, most complete solution for business intelligence (www.microstrategy.com).

As a result of the consolidation in the BI industry, MicroStrategy remains one of the few independent BI software providers. In the BI Survey 7, an independent survey of the business intelligence market released in 2008, MicroStrategy received the top product loyalty score of all BI vendors surveyed. This is the fourth consecutive year that MicroStrategy has been rated number one in customer loyalty. In 2008 and 2009, MicroStrategy was placed in the Leader quadrant of Gartner’s Magic Quadrant for Business Intelligence Platforms report. MicroStrategy has direct operations in 41 cities in 23 countries across the world (www.wikipedia.org).

II. General Characteristics of BI Functions

No framework provided by MicroStrategy. MicroStrategy is able to load database platforms and warehouses such as Teradata, IBM, Oracle, provide various supporting functions to seamlessly integrate into the other vendors’ platforms. MicroStrategy provides a scalable architecture and a single metadata, so that users are able to navigate from scorecards and dashboards to reports and analysis without being required to open and close multiple BI tools and navigate different interfaces.

MicroStrategy provides OLAP capabilities, predictive and qualitative analysis. OLAP services are easy and fast to use with high performance in-memory BI that enables to generate more reports and analysis for more users. OLAP features enable users to reduce workload on every part of the system, require less database query time. With Intelligent Cube, users are able to investigate and analyze any data faster such as pivot, sort, filter, drill up/down etc; more users
are able to share the same query results. Also users are able to create, save, reuse and share derived elements over a zero-footprint Web interface.

Users are able to move seamlessly from basic OLAP to advanced statistical analysis and full data mining capabilities. MicroStrategy provides common and easy to use functionality of statistical and data mining tools. With advanced and predictive analysis capabilities, users are able to perform hypothesis testing, churn prediction and customer scoring models with a single unified interface. MicroStrategy provides built-in support for over 400 statistical, mathematical and financial functions, which enable users to create easy to use reporting applications.

MicroStrategy Web provides full BI functionality through a zero print, browser-independent and fully customizable interface. MicroStrategy supports various analytical and formatting features. Rich and user friendly interface enables users to apply enhanced colours, gradient images, context menus, drag-and-drop manipulations, editors, multi-select and the WYSIWYG design feature.

With MicroStrategy, users are able to create and access a full range of business reports that fulfil all reporting requirements such as classic enterprise reports, dashboard or scorecard solutions. The flexible design layout enables users to access, create, edit and analyse business reports, such as operational reports, performance reports and strategic reports. MicroStrategy is able to deliver reports into one of 12 different languages as well as translate the user interface of menu bars, folders, attributes, metrics, character sets, currency formats, time and date formats. It also delivers report information or report access to unlimited number of end users and allows large-volume report distribution for offline analysis, remote access and subscription based delivery.

III. Analysis of Intelligence Phases

1. Planning & Directing

MicroStrategy fails to provide planning & directing phase of the intelligence cycle.

2. Data Collection

MicroStrategy allows data to be collected from internal and external sources: internal – terabyte-sized relational databases (Oracle, IBM, Teradata or MicroStrategy), data marts, multidimensional or cube databases, open source databases, flat files, enterprise information
integration (EII); external – ERP, CRM and SCM supporting databases and web applications. Both structured and unstructured data collected can be easily and quickly checked for inconsistencies, filtered, sorted out and archived. MicroStrategy integrates with other vendors to data integrate, warehouse and metadata reports, therefore its average score for data collection is (1.5).

3. Analysis

MicroStrategy is able to deliver slice-and-dice analysis for both limited data sets and the entire database. It provides analysis using the following features such as filter and drill up/down, sort, pivot, and page-by to flip through a series of report views. MicroStrategy enables user to deliver correlation analysis, trend analysis, financial analysis and projections aimed at power users. MicroStrategy also offers multi-pass SQL analysis that combines built-in analytical functions with database processing and provides quick and easy answers to complex questions.

MicroStrategy is assigned an average score (2.5) for the analysis phase and supports OLAP slice-and-dice analysis, advanced & predictive analyses and multi-pass SQL analysis.

4. Dissemination

MicroStrategy provides a fully customizable interface and reports that enable users to create a full range of business reports to meet present-day requirements – from classic business reports to very detailed operational reports to be distributed via e-mail, file servers and networked printers. MicroStrategy reports and dashboards can be exported to multiple formats such as HTML, PDF, Excel, CSV, Plaintext, Flash and Zip.

Thus, MicroStrategy renders a very good dissemination phase; therefore it is scored (3.94).

MicroStrategy’s overall intelligence cycle scores are presented in figure (7) below.

FIGURE (7): MICROSTRATEGY EVALUATION SCORES
IV. Recent BI Software Developments

**Query Performance** MicroStrategy 9 developed new adaptive caching technology called In-memory ROLAP and introduced improvements in SQL generation to improve query performance. In-memory ROLAP uses large memory now available on 64-bit Unix, Linux and Windows computer servers and provides a new middle-tier database that can respond directly to data requests from reports, dashboards and OLAP analyses. As the database is stored in computer memory, it avoids disk access delays. In-memory ROLAP can serve data for complex queries and offload work from database servers freeing database capacity. MicroStrategy 9 introduced SQL generation algorithm optimizations to handle complicated analysis including complex metrics. This reduces the number of SQL passes by 66% and database query time by 75%. The new capability works transparently with reports, dashboards and analysis.

**Servers** MicroStrategy 9 introduced 64-bit Web Server Support, thus the expanded memory in 64-bit JVMs (Java Virtual Machines) enables a greater number of concurrent user sessions and the running of larger number of reports in the same server. Also, it re-engineered its Web server to follow an “Extreme AJAX model”, processing is shifted from the Web server to the Web browser to minimize the frequency and volume of data transfer between server and browser. In this way, capacity on Web servers is freed and more user sessions can be supported.

MicroStrategy 9 enables Departmental BI MicroStrategy 9 developed some features to quickly set up a BI environment and create BI applications with little or no IT support. Multi-
source ROLAP capability exclude the requirement to move data from multiple source databases into a purpose-built data warehouse or data mart. The new capability enables companies to access the data directly from where it resides without additional data engineering or data movement. As a result, little time is required to set up the BI environment and technical expertise is less required.

In-memory ROLAP capability includes a database that can serve data to reports, dashboards and OLAP analysis. Building an in-memory database is easy to set up and no data modelling required. MicroStrategy 9 automatically designs and configures the in-memory database based on the relationships between the attributes and metrics determined by the user. The in-memory database technology operates in the main memory of computer server for high-speed performance, is stored on disk for greater permanence and allows swapping memory based on usage.

Simplified extract and load capability allows to periodically repopulate the in-memory database with the latest information from the source system databases. Employing MicroStrategy’s out-of-the-box query engines and scheduling systems, departments can plan data extractions from relational databases, Excel workbooks, flat files, and multidimensional databases, and Microsoft Analysis Services and Hyperion/Oracle Essbase. Together with Multi-source ROLAP capability, the query system can even join data across multiple relational databases and Excel to populate the in-memory database.

MicroStrategy 9 developed some features to make the rapid creation of BI metadata. Graphical Architect capability helps non-IT people to select one or more source databases, indentify the tables and columns desired, load them into the BI system and change them into formats that business people can understand and use to compile reports and dashboards.

**Reports** MicroStrategy 9 developed a major structural enhancement to support multi-part document reports, which helps customers to make very complicated enterprise reports and statements without programming. Each part of report can be independently developed and maintained by different developer teams and seamlessly put together into a report book or statement. In addition, pagination and table of content across all report parts is automatically created. Also, formatting of complex reports were improved by inclusion of watermarks, horizontal repeating sections, dynamic images and conditional formatting.
MicroStrategy 9 provided with a new comprehensive internationalization capability that supports unlimited number of languages in both single-byte and double-byte alphabets. The BI system identifies the user language preferences from their browser and renders reports and dashboards, changes interface, data and other formats to match language preference.

MicroStrategy 9 provides with new features to make assembling reports simpler and faster and easily within reach of business users` skills. This is a simplifies mechanism to browse through available dimensions, attributes and metrics; drop zones that provide visual cues to users and a formatting control for report formatting that is intuitive to Microsoft Office users. Graph-style reports with dozens of visualization options can be built interactively. MicroStrategy 9 includes a redesigned Web user interface to adjust familiar Microsoft paradigms.

ROLAP architecture enables business users to freely investigate the data through the data warehouse without having to design a new report for each new combination of data. MicroStrategy 9 now allows users to carry out OLAP manipulations such as pivoting and drilling directly on graphs. Another new innovation is that users can perform OLAP manipulations directly on grids and graphs contained within dashboards.

Distribution services capability gives users greater control of reports and dashboards distribution. Users are able to set up report distributions for themselves or for other users, send reports via e-mail, networked printers or directly to recipients` computers or servers. Managing and creating their own information subscriptions can be made by users without the intervention of a centralized IT administrator. Besides, business users can set up their own personal alerts with data thresholds.

New dashboard creation feature in MicroStrategy 9 allows users to quickly create their own dashboards, including out-of-the-box dashboard templates, support for custom designed templates and support for importing dashboards design from other projects. Besides, MicroStrategy 9 presented a set of on-screen design assistants that help guide user design, including a smart-placement assistant that automatically sizes and aligns dashboard elements, new visual cues that help users add new analytics, data sets and tabs without going to menus and a new dashboard map that help users see all of the items on a dashboard and switch between them quickly.

MicroStrategy 9 allows enterprises to seamlessly combine departmental islands of BI into a larger, more expansive enterprise BI system. Using Multi-source ROLAP, metadata and reports
from departmental BI can be merged into enterprise BI metadata at the same time providing access to the original data source. This first step does not require the movement of data from departmental data sources to the enterprise data warehouse, but the process of BI servers and metadata consolidation starts. This capability allows metadata definitions to be merged gradually into a single cohesive metadata.

Graphical Architect in MicroStrategy 9 enables companies to take the second main step in merging islands of BI by moving the data smoothly from the different databases into fewer higher performance data warehouses and data marts. This capability helps to re-point the metadata to access the data at its new location and all of the reports, dashboards and OLAP analysis automatically will begin using the new data location, with no disruption to reports or redesign required.

**Analytics** MicroStrategy supports extensive analytical functions that can range from simple calculations to data mining models and predictive analysis. Besides, MicroStrategy promotes user adoption through enhanced usability and flexible delivery mechanisms that match each user’s skills and roles within the organization. Unified Web interface where users can access any style of business applications starting from complex analysis to advanced visualizations and dashboards. Comprehensive software development kit (SDK) that enables fast integration with operational workflows and existing applications via open standards. Corporate portals and operational applications that can be easily augmented with MicroStrategy BI.

Distributed Development and Operation MicroStrategy 9 introduced several features to support distributed development teams. Change journaling capability enables changes to metadata objects to be tracked automatically and logged into a centralized system to monitor the activities of different development teams. It also allows developers and teams to communicate with one another about their changes.
IV. BI Market Information (Market Share, Customers, Pricing Strategy)

MicroStrategy sells mainly corporate customers and its customers represent the most successful businesses in the world. Its customer base includes a great variety of industries such as commercial banking, health care, insurance, manufacturing, pharmaceuticals, telecommunication, media & entertainment, retailing, government agencies and other. According to the independent survey, MicroStrategy has been given the highest score in customer loyalty during four consecutive years.

MicroStrategy BI software market share accounted for approximately 5.88% in 2007. MicroStrategy provides multiple pricing options as named-user and CPU-basis, perpetual and term licenses, including SaaS on subscription basis.

V. Conclusions

MicroStrategy does not provide planning & directing phase in the intelligence process. It is excellent at dissemination phases, poor at data collection and, has an above average score at analysis phase. Its recent developments in data collection, analysis and reporting phases are devised for simplicity of user, money and time saving. MicroStrategy renders business intelligence services mainly to corporate clients. Its pricing structure is flexible and market share was nearly 5.88% in 2007.
4.1.3 IBM Cognos

I. BI Software Name: IBM Cognos 8

Company Overview

Cognos is an Ottawa, Ontario based company that makes business intelligence and performance management software. It used to be Cognos Incorporated, now is a part of IBM. Cognos was founded in 1969, employs almost 3,500 people and serves more than 23,000 customers in over 135 countries. Cognos was originally known as Quasar and adopted its current name in 1982. On January 31, 2008, Cognos was officially acquired by IBM. IBM Cognos solutions bring together technology, analytical applications, best practices and a broad network of partners to give customers an open, adaptive and complete performance solution (www.wikipedia.org).

II. General Characteristics of BI functions

IBM Cognos delivers the following range of BI capabilities: reporting, analysis, dashboarding and scorecards on a single, service-oriented architecture. IBM Cognos delivers a unified, powerful data warehouse providing access to structured and unstructured information and operational and transactional data in real time. It allows users to access all the data by way of published interfaces across transaction systems, relational and OLAP warehouses, flat, legacy and modern sources. It has an ability to add and change data sources easily with low maintainability cost and very fast development of information with its modellers. With its InfoSphere Warehouse Cubing Services Feature, IBM Cognos provides insights into the data; multidimensional analysis server enables OLAP applications to access up to a terabyte of base OLAP data without requiring multiple choices. It allows users to segment, predict and analyse large amounts of data to deliver analytics in real-time. IBM Cognos warehouses provide a consistent, accurate, quality and reusable data foundation by conforming key dimensions as time, product and customer to enable reporting and analysis across different business areas.

IBM Cognos provides business analytics by way of OLAP software, IBM Cognos PowerPlay. It delivers OLAP and multidimensional analysis, besides it enables users to analyze and navigate large data volumes using IBM Cognos Power Cubes built from any data source to ensure faster decision-making and information delivery. It also provides access to a complete
range of heterogeneous relational and OLAP data, gives a complete and consistent view of any business information, regardless of the data source. IBM Cognos delivers deep comparative analysis by providing extensive features and functions that simplify the complex analysis of data such as sophisticated filtering, asymmetric analysis, and business-oriented calculations. Besides, IBM Cognos enables users to manage large data volumes with a help of advanced features as searching and subsets so that users see only the information they need and unimportant data is hidden.

IBM Cognos offers the full range of dashboards – operational, tactical and strategic – to help organizations monitor, measure and manage their performance. IBM Cognos dashboards are easy to personalize: charts (bar, line, gauge, scatterplot, maps) and graphs can be customized, common business patterns and relationships are communicated as trends, rank, part-to-whole, deviation, correlation; thresholds and alerts can be set, new dashboards are easily created by a simple point-and-click interface; aggregate data from disparate systems can be brought into a single view; drill-down and drill through to reports and analysis can be performed for additional information and context. IBM Cognos provides a single architecture for viewing, querying, analyzing and authoring for collaborative contributions to any report or dashboard, as well as global dashboard filters enable users to seamlessly trace changes across multiple objects.

IBM Cognos is able to deliver any and all types of reports from simple inventory list to high-volume billings. Users are able to create reports containing any number of report objects – charts, cross tabs, lists and non-BI components such as images, logos and live embedded applications that can be linked to the information. IBM Cognos Web-Based Reporting enables users to create and deliver any reports in an easy and prompt manner to meet the needs of all types of users. Users can use any charts such as bar/3D bar, cross tabs, pie/doughnut, line, gauge, funnel, scatter, dot density, waterfall etc; IBM Cognos supports 10+ languages and is able to deliver reports in 25+ languages.

III. Analysis of Intelligence phases

1. Planning & Directing

IBM Cognos fails to provide planning & directing phase of the intelligence cycle.
2. Data Collection

IBM Cognos enables data to be collected from internal and external sources: internal structured data – from relational and OLAP databases, flat files and modern systems such as XML, JDBC, LDAP and WSDL; external data is collected from the legacy systems. IBM Cognos provides an open data access as it has a single query engine and choice of sourcing strategies that enables users to access all data sources irrespective of its location. Any data collected can be easily and quickly viewed for inconsistencies, filtered, sorted out and archived. IBM Cognos also provides extensive data profiling to explore and discover undocumented data sources for irregularities to be revealed and solved. IBM Cognos delivers data collection by way of data integration, warehouse and metadata reports. Though it does not provide any web crawling; therefore, its data collection average score is a quite high (3.63).

3. Analysis

IBM Cognos delivers deep comparative analysis by means of OLAP and multidimensional analysis such as sophisticated filtering (focus on relevant information), asymmetric analysis (integrate different data to easily recognize business issues), business-oriented calculations (exclusion of unimportant data). In addition, IBM Cognos delivers trend analysis with built-in customizable time series for analysing events and data over previous years, quarters, months, thus rendering forecasting and optimization and qualitative data analysis. Besides, IBM Cognos provides analysis for Microsoft Excel for analysts to develop new BI content in Excel through exploration and analysis. Thus, IBM Cognos delivers very strong OLAP and multidimensional analysis, trend analysis and qualitative analysis though fails to support other business analysis with a satisfactory average score for analysis phase (2.25).

5. Dissemination

IBM Cognos delivers a full list of easily customizable report types and adaptable to any data source. It is able to deliver reports in 25+ languages, provides multiples export formats: Excel, PDF, XML, HTML and CSV. IBM Cognos has flexible distribution methods as centralized access, e-mail, application integration and Microsoft Office. It provides collaborative contributions to any report including dashboards with a single architecture for viewing, querying, analyzing. Reports can be created against any heterogeneous data source and can be web-based
deployed. IBM Cognos represents strong reporting and thus scores very high on the dissemination phase (4).

IBM Cognos’s overall intelligence cycle scores are presented in figure (8) below.

**FIGURE (8): IBM CONGOS EVALUATION SCORES**

![IBM CONGOS Evaluation Scores](image)

Source: Evaluation Findings

IV. Recent BI Software Developments

IBM Cognos 8 version 8.4 introduces unique scalability and flexibility where all users at all levels of organizations are able to take advantage of BI on daily basis. It combines an industry-leading set of capabilities with the user interface that seamlessly integrate into a broad range of existing tools. With IBM Cognos 8 BI version 8.4, users can create more visually appealing reports by providing a simplified user experience and enabling annotations. It provides a broader range of analytical capabilities; ensuring business users have access to trusted information that includes data and report lineage and a broader range of data sources.

IBM Cognos 8 Go! Dashboard version 8.4 introduces new features for dashboard. Now, instead of spending time hunting down data sources and writing individual static reports, any user can create a dashboard once and then track performance over time. BI environment can be personalized with a simple-to-use drag-and-drop interface that enables users to create dashboards on the fly without any IT support, modular report creation helps user to build dashboards using existing report elements. Attractive and interactive dashboards can be built quickly with flash-based graphics and client-side data capture gives an almost immediate response times to repeated queries and layout changes. Besides, IBM Cognos 8 version 8.4 can bring external information
into a business with RSS feeds and widgets and integrate dashboard into third-party portals. IBM Cognos scorecards, like dashboards show performance over time, provide real-time insight for better-decision making. It links performance to organizational strategy and help users understand how their specific roles connect to and ultimately drive company performance.

IBM Cognos 8 version 8.4 provides full content search of structured and unstructured data. Users are able to create queries based on search items that can be refined in Query Studio. Search can be easily integrated with third-party portals and search application that provides the broadest range of users with access to ranked and relevant content. IBM Cognos 8 version 8.4 works seamlessly with Microsoft Excel and other end user tools so that users are able to work with their everyday tools and take advantage of BI-sourced data.

IBM Cognos 8 Go! Mobile in version 8.4 enables users to automatically reformat reports for a wide range of environments from Blackberry to Microsoft Excel and the Web. Users now can write one report and it will be reformatted to the required format.

V. BI Market Information (Market Share, Customers, Pricing Strategy)

IBM Cognos renders its services to both corporate and small & midsize enterprises (SME). Its customer base includes a great variety of industries such as automotive/manufacturing, consumer packaged goods, energy & natural resources/chemicals, banking & financial services, government & education, healthcare, hospitality & entertainment, insurance, pharmaceuticals, professional services, publishing, retail & restaurant chain, technology and transportation. IBM Cognos has over 23,000 customers in more than 135 countries around the world and its top 100 enterprise customers consistently outperform market indexes.

IBM Cognos market share accounted for 13.7 percent with revenue 710.0 million USD in 2007.

IBM Cognos pricing model can be characterized as tiered, flexible, cost-effective and scalable. Pricing depends on the functionality the end user requires i.e. the less senior the end user is, the less expensive their seat is. Besides, pricing is based both role- and task-based. Roles consist of administrator, author and consumer. The tasks consist of reporting, analysis and score
carding. Companies can also purchase functionality on either a per user or per-CPU basis. Besides, IBM Cognos delivers web-based software therefore providing SaaS pricing model. IBM Cognos pricing is cost-effective as a productivity improvement of less than 3 percent would cover the cost of the software.

VI. Conclusions

IBM Cognos does not provide planning & directing phase of the intelligence process. It is strong at data collection and dissemination phases, and has an average score at analysis phase. Its recent version 8.4 was developed with a view to extend BI to a broader range of business users at all levels of organization, provide greater access to information through advanced search capabilities, encourage cross-functional collaboration that maximizes each individual’s and team’s contributions. IBM Cognos operates both in corporate and SME segments. Its pricing strategy is flexible and cost-effective and can be purchased either on per user or per CPU and SaaS-basis.
4.1.4 SAP Business Objects

I. BI Software Name: SAP Business Objects XI

Company Overview

Business Objects is a French enterprise software company, specializing in business intelligence. The company claims more than 42,000 customers worldwide. Their flagship product is Business Objects XI, with components that provide performance management, planning, query and analysis and enterprise information management. Like many enterprise software companies, Business Objects also offers consulting and education services to help customers deploy their business intelligence projects. As of 22 January 2008, the corporation is fully operated by SAP; this is seen as part of a growing consolidation trend in the business software industry with Oracle acquiring Hyperion in 2007 and IBM acquiring Congos in 2008 (www.wikipedia.org).

II. General Characteristics of BI functions

SAP Business Objects provide powerful data integration capabilities that enable users to access all types of structured and unstructured data from any source, databases to Web forums. It is able to integrate and deliver data in real-time in a simple user-friendly way or batch using flexible approaches through data federation or extraction, transformation and loading (ETL). Besides, it can improve data quality with the ability to profile, cleanse and match data during the ETL process.

SAP Business Objects deliver OLAP through Voyager, which allows business analysts to deliver a full range of functions for the analysis of multidimensional data sets. Voyager enables users to find out trends, outliers and details stored in the financial systems without any IT help, get answers to business questions quickly and efficiently, access the full range of OLAP data sources and share the results using a simple and intuitive Web interface, interrogate, analyse, compare and forecast business drivers as well as use a wide range of business and time calculations. SAP Business Objects enables users to perform predictive analysis by automatically forecasting trends and future business conditions using algorithms as well as forward looking decisions. Besides, it has a powerful analytic engine that creates data preparation processes and train accurate models automatically and very quickly.
SAP Business Objects user interfaces can be integrated with Microsoft Office environment and resemble the browsing techniques the end users deploy on the Web. Users are able to access information from a wide range of wireless devices. SAP Business Objects use Xcelsius, which is an easy-to-use data visualization software designed specifically to create interactive analytics and dashboards for business users at any level of organization. Users can share these visualizations live via Microsoft Office, Adobe PDF, the Web, Crystal Reports or SAP Business Objects BI portal. Besides, users can create dashboards with the power of what-if analysis and providing visual simplicity in analysis. With SAP Business Objects, interactive dashboards can be created quickly with the drag-and-drop functionality and deployed across the organization.

SAP Business Objects provide comprehensive report deployment options with Crystal Report software that enables users to easily design interactive reports and connect them to virtually any data source. Users are able to benefit from on-report sorting and filtering, create highly formatted reports with what-if scenario models, easy-to-use interactive charts and deliver them via the Web, e-mail, Microsoft Office, Adobe PDF or can be embedded in enterprise applications. Besides, it is able to provide powerful, online and offline ad hoc query and reporting using web intelligence and desktop Query and analysis.

III. Analysis of Intelligence phases

1. Planning & Directing
SAP Business Objects does not support planning & directing phase of the intelligence cycle.

2. Data Collection

SAP Business Objects is able to gather both internal and external data. It collects structured internal data from different databases, external unstructured from customer call records, analyst reports, news sites, market blogs, comments found in customer relationship management (CRM) systems, wikis and financial documents. External data is collected via Web searches. With SAP Business Objects, any data can be quickly viewed, checked, monitored for inconsistencies, filtered and sorted out. It has categorization and summarization capabilities, which enable users to quickly identify and understand the concepts, people, organizations, places and other information that exists only in unstructured text sources. It also allows users to easily
and flexibly change data and see when data was updated and where it came from that contributes to cataloguing and archiving of collected documents. Thus, SAP Business Objects average score for the data collection phase is quite high and accounts for (3.81).

3. Analysis

SAP Business Objects analyses data by way of Voyager that enables users to perform a full range of functions for the analysis of multidimensional data sets. It also delivers predictive analysis so that users can reveal trends and patterns to solve business issues and forecast changes. With SAP Business Objects Text Analysis, users are able to perform qualitative analysis i.e. extract information in more than 30 languages, relations and events, categorize data to define the concepts, sentiments, people, organizations, places and other information. Therefore, SAP Business Objects supports analysis phase in an above average manner with average score (2.75).

4. Dissemination

SAP Business Objects enables users to create interactive customizable reports easily and connect them to any data source. Reports can be delivered via Web or exported to Microsoft Office, Adobe PDF or embedded in enterprise applications. It can share reports to any required decision maker within an organization as well as any number of external users. SAP Business Objects represents the dissemination phase with excellent characteristics and has a score (4).

SAP Business Objects ‘s overall intelligence cycle scores are presented in figure (9) below.

FIGURE (9): SAP BUSINESS OBJECTS EVALUATION SCORES
III. Recent BI Software Developments

SAP Business Objects XI 3.1 is the next major release of BI: it delivers a superior BI platform for heterogeneous environments for businesses to provide a complete view of all information assets; provides improved usability for analysts and business users, enabling self-sufficiency and faster well-informed decisions.

Integration with Microsoft and Oracle Environments SAP Business Objects XI 3.1 supports all the latest releases of Microsoft technology platform and offers native Microsoft.NET Framework. It can be the answer for organizations wishing to extend insight from BI to any Web or Microsoft.NET application. SAP Business Objects XI 3.1 is able to integrate with Oracle Enterprise applications. It provides direct connectivity to Oracle E-Business Suite so that organizations can consolidate and transform vast amounts of Oracle application data into reports, analyses, visualizations and dashboards. In addition, SAP Business Objects XI 3.1 also supports other Oracle applications such as PeopleSoft Enterprise, JD Edwards Enterprise One and Siebel applications.

Data Access and Supported Platforms SAP Business Objects XI 3.1 is able to connect to all data regardless of format or location so that users are able to have a broader data access and therefore can make decisions confidently. The following new data sources are HP NeoView 2.3, Microsoft SQL Server 2008, Microsoft Analysis Services 2008, Netezza 4.0, Oracle 10g RAC, Oracle 11g, Oracle 11g RAC, PostgreSQL. It also meets the needs of heterogeneous system and business environment by offering organizations the ability to mix operating systems and servers by expanding the number of operating systems supported such as Red Hat Enterprise Linux 5,

**Information Discovery and Delivery** SAP Business Objects XI 3.1 introduces a number of improvements in Voyager that enables users to discover data using new data visualizations and exception highlighting such as box plots, scatter plots, radar charts and bubble plots. Other significant enhancements in Voyager include: Microsoft Analysis Services 2008 as a supported data source, drill through to Web Intelligence or Crystal Reports to allow context as row and column headings to be passed to an existing report or analysis, personalized favourite members so that users can define a group of favourite members from any dimension and then use that metadata selection to quickly get a personalized view of the information.

SAP Business Objects XI 3.1 represents several interface improvements in Web Intelligence that provide a more powerful analysis experience for business users and analysts: flexible comparison between data sets as onward, backward, in blocks, sections, breaks and over any number of dimensions; simple data filtering with new report filter bar; expanded Microsoft Excel export functionalities – Web Intelligence documents can be saved as comma-separated values (SCV) files and multiple Microsoft Excel sheets if they have more than 65,536 rows; option to cancel refresh on open; automatic loading of list of values.

SAP Business Objects XI 3.1 offers a new life-cycle management application that simplifies BI content management, reduces maintenance and maximizes platform utilization by providing complete control over any content or objects, dependency check and analysis, auditing and scheduling, delegated administration and rollback.

Platform Administration SAP Business Objects XI 3.1 introduces many improvements that simplify platform deployment and administration. It is now able to support 128-bit Internet protocol version 6 (IPv6) address syntax so that users are able to work either in IPv4-only environments or IPv6-only environments or a combination of both. It also supports Microsoft Active Director authentication across multiple domains and repository diagnostic tool that scans for and repairs inconsistencies that may occur in the metadata in repository.

Besides, SAP Business Objects XI 3.1 represents more intuitive user interface enhancements in translation manager that include new menus and toolbars, updated wizards for importing and exporting XML Localization Interchange File Format and streamlined views for
improved translation workflow. In addition, SAP Business Objects XI 3.1 supports 17 languages in total, with inclusion of 3 additional one as Norwegian, Danish and Thai.

IV. BI Market Information (Market Share, Customers, Pricing Strategy)

SAP Business Objects deliver BI to both corporate clients and SME with industries that range from financial and public services, manufacturing to other services as media, professional services, retail, and telecommunications etc. With over 35 years of experience, SAP Business Objects supports more than 82,000 customers worldwide with over 140,000 installations in 120 countries. And with 185,000 certified partner employees, 77 training centres, 7 global support centres, 9 custom development centres and 24h7 support that shows its commitment to maximize customers business success.


As per information collected, SAP Business Objects’ pricing structure is based on named user license fee for one of two roles such as consumer role (called "view and explore") and power user authoring role (called "design and analyze") plus a server fee that includes all the platform services as well as concurrent user licenses for a group of users. In addition, set up test and development environments are provided at no additional charge and supports SaaS (Software-as-a-Service) pricing model.

V. Conclusions

SAP Business Objects does not support any planning & directing phase of the intelligence cycle. It provides very good services at data collection phase and dissemination phases and supports analysis in an above average way. Its recent release SAP Business Objects XI 3.1 gives users more flexibility and power to access all information regardless of format, shape, size or location with BI platform that supports heterogeneous environments and offers integration with data sources from a variety of vendors. It delivers BI to corporate and SME companies.
4.1.5 SAS Institute

I. BI Software Name: SAS Business Intelligence

Company Overview

SAS is one of the leading companies in business analytics software and services, and the largest independent vendor in the business intelligence market. With consistent revenue growth and profitability since 1976, SAS delivers superior software and enhances customer relationships. SAS solutions are used at more than 45,000 sites in over 100 countries with inclusion of 91 of the top 100 FORTUNE Global 500 companies. More than 11,000 SAS employees in more than 50 countries and 400 SAS offices provide local support for global implementations (www.sas.com).

II. General Characteristics of BI functions

SAS provides users with extensive BI capabilities that are easy to integrate into existing environments, to deploy and maintain. Capabilities include dashboards/portals, report viewing, report building, advanced data exploration, Microsoft Office integration, guided analysis, metadata management, OLAP cube creation and application development. As a result, users at all levels are able to quickly and easily obtain the information needed to make decisions at the lowest overall cost to the organization.

With its Data Integration server, SAS enables users to access virtually all data sources: extract, cleanse, transform, conform, aggregate, load and manage data, support data warehousing, migration, synchronization; create real-time data integration services in support of service-oriented architectures. It delivers GUI (graphical user interface), which is easy to use and provides a standard interface for building and documenting work. SAS allows users to extract, transform and load data from across the enterprise using its ETL capabilities that enable organizations to create consistent and accurate information in the data warehouses. With its intuitive, point-and-click process design desktop, users are able to easily build logical process workflows, quickly identify the input and output data flows and create business rules in metadata thus providing the rapid generation of data warehouses, data marts and data streams. With its Metadata server, SAP delivers the power to integrate, share, centrally manage and leverage easy-to-use metadata across entire organizations.
SAS Analytics provides an integrated environment for predictive and descriptive modelling, data mining, text analytics, forecasting, optimization, simulation, experimental design. SAS provides a number of techniques and processes for the collection, classification, analysis and interpretation of data to reveal patterns, anomalies, key variables and relationships resulting in better decisions and insights.

With its Enterprise Miner, SAS provides the data mining process to create predictive and descriptive models based on analysis of data to detect fraud, anticipate resource demands, increase acquisitions and other. SAS delivers OLAP capabilities through its OLAP server, which is a powerful multidimensional database, enables users to access summarized data generated from vast amounts of detailed data using wizards or web-based interfaces in a fast and easy manner without any IT help. SAS OLAP Server has a multithreaded query engine that allows multiple queries to run in parallel, a single shared layer of metadata and provides a simplified process for ETL data from back-end systems and file formats to ensure consistency of both data and resulting reports. SAS delivers predictive analysis with its Forecasting Software and descriptive and predictive statistics, users can analyse and forecast processes, identify previously unseen trends, anticipate fluctuations to effectively plan for the future. Users can define and select the best functions that can be applied to specific business problems and its features include custom analytic models and scoring algorithms. It is able to analyse huge amount of data and accesses data through portals, the web and Microsoft Office Excel.

Its user interfaces deliver information into SAS Information Delivery Portal and dashboard as part of an application or freestanding graphic which serves as ad hoc requests through its user self access. SAS provides an easy-to-use Web-based dashboard so that users can create their own dashboards with a simple point-and-click dashboard development. Users are able to present and summarize data using a variety of customizable charts and plots, provide highly interactive business graphics such as animated bubble plots, 3D scatter plots, trellis plots, summary and needle charts.

III. Analysis of Intelligence phases

1. Planning & Directing

SAS does not support planning & directing phase of the intelligence cycle.
2. Data Collection

With its comprehensive data integration environment, SAS is able to read and collect internal data in any format and file type such as variable-length records, binary files and free-formatted data and other. It is able to access internal data of other vendor’s files directly such as BMDP, SPSS and OSIRIS files. With its SAS/ACCESS software, it is able to access external data as if it were native to SAS. It provides seamless and transparent read/write/update access to more than 60 data sources, including relational and non-relational databases, PC File Formats and Data Warehouse Appliances. SAS enables users to transform and combine different data, check for inaccuracies and remove if necessary, cleanse dirty data very flexibly, standardize on common values and create consistent and reliable information ready for analysis. Besides, it provides a framework for publishing information to archives, a publishing channel, e-mail or various messages queuing middleware, though it does not support web-based crawling. Thus, SAS average score for the data collection phase is rather good and accounts for (3.5).

3. Analysis

SAS provides a range of advanced and predictive modelling algorithms, including market basket analysis, decision trees, gradient boosting, neutral networks, linear and logistics regression. It also delivers regression analysis, memory-based reasoning, clustering, time series and associations. SAS supports text analysis that enables analysts to explore concepts and relationships between documents, recognize trends and predict business opportunities.

Besides, it is able to deliver a wide range of statistic analysis as analysis of variance, mixed models, regression, categorical data analysis, Bayesian analysis, multivariate analysis, survival analysis, psychometric analysis, cluster analysis, nonparametric analysis, survey data analysis, study planning. Users are also able to deliver trend analysis, econometric analysis, financial analysis and decision analysis. SAS is able to provide predictive analysis by identifying previously unseen trends and anticipate fluctuations that help better plan for the future. Moreover, its predictive analysis helps users to identify fraud, increase revenue and build customer loyalty. Therefore, SAS provides a wide array of analyses for both business and advanced users with an excellent score (4).
4. Dissemination

With SAS Web Report Studio, SAS provides role-based, interactive interfaces for report building and distribution. Its intuitive report wizard guides users through report creation. Data in reports is clearly reflected as it is presented in business terms, so non-technical users are able to create a report they need. Newly created reports are shared with large and diverse audiences through report bursting capabilities. SAS enables users to easily and simply customize reports by selecting predefined filters, set groups and sorting, defining various layouts, using data from multiple sources, performing OLAP-specific interactions such as drilling and expanding tables and graphs, rotating, filtering, sorting and exporting data to various target formats and other. SAS can add links to other reports or Web pages, print reports to PDF or export data, formatted tables and graphs to Excel. Besides, reports can be delivered via hard copy or electronic means. Thus, SAS delivers an almost excellent reporting capabilities and its score is (3.6). SAS’s overall intelligence cycle scores are presented in figure (10) below.

FIGURE (10): SAS INSTITUTE EVALUATION SCORES

![SAS Institute Evaluation Scores](image)

Source: Evaluation Findings

IV. Recent BI Software Developments

SAS 9.2 is the latest release of SAS software that delivers a wealth of new capabilities and a wide range of benefits for both business users and IT. With SAS 9.2, business users are able to gain insights hidden in data to reach evidence-based decisions with confidence and IT can easily integrate with existing IT infrastructures and deploy, manage and scale SAS environment
to efficiently meet organizational needs. SAS 9.2 offers an integrated and comprehensive framework for fast implementation and deployment of reports and analyses aimed not only at advanced users but decision makers at all levels of organization.

SAS 9.2 provides substantial improvements in data integration development and design processes that allows faster and better resource utilization and better service levels to the organization from a data integration perspective. Users can now define components and reuse them as needed to streamline the data integration process. Some of major improvements in data integration include: user interface – persistent layout, ability to add post-in notes on process flow diagrams, full undo to reverse an action and redo to reverse the undo operation, integrated and customized design-time checks for early notifications of potential problem; new debugging capabilities - integrated toolbar, status indicators; new performance monitoring capabilities to identify bottlenecks: new metadata reporting features to generate reports and review the metadata for tables and jobs in an convenient format, enhanced support for Netezza, NeoView and Teradata, integration with Oracle, IBM DB/2, access to the latest data quality technologies from DataFlux, including more real-time and Web services support.

SAS 9.2 advanced analytic data preparation, model development and model deployment capabilities, easy-to-use production quality graphics and numerous enhancements to many existing products and procedures. Users can have an access to more sophisticated analyses directly from their interface of choice without any IT help that speeds up development of analytical applications. SAS introduces more than 200 changes and enhancements to SAS/STAT software. Some of them are addition to Bayesian analysis methods for several procedures, enhancements to survey analysis procedures with inclusion of new variance estimation methods, new ESM procedures that provides forecasting using exponential smoothing models with optimized smoothing weights, new OPTMODEL mathematical modelling language, an enhanced programming environment for advanced statistical users who need to extend the functionality available in SAS analytical procedures. Besides, SAS presents new and improved variable selection algorithms in SAS Enterprise Miner, improved integration of model scoring into enterprise warehouses, better management of large predictive modelling assets, new Scenario Analyzer for testing what-if scenarios, interface enhancements and full integration with SAS ODS Graphics and other.
SAS provides reporting enhancements that expand information user to a wider community within an enterprise, promoting a culture of fact-based decision making. With new features such as Microsoft SharePoint integration, high-impact and engaging Adobe Flash-based interactivity and other user-centric capabilities, more users are able to access valuable intelligence within familiar environments with less costs and IT help. Some other reporting enhancements include: utilization of AJAX in SAS Web Report Studio to provide more drag-and-drop capabilities, simplified user interface with context-sensitive menus and toolbars that show only the relevant options for the task, add-in for Microsoft Office uses the latest Microsoft Office ribbon bar technology to group similar items and deliver a consistent user experience, report linking to a specific report section within the same report, new charting and graphing options, wizard-driven report creation within Microsoft Office tools and other.

Besides, SAS 9.2 enhances the manageability of SAS processes and improves the traceability of SAS programs. This mechanism offers tremendous value for program and batch auditing and tuning. In addition, users can obtain their software electronically over the Internet providing more distribution options and its new deployment wizard supports a “silent mode” and enables replays. SAS 9.2 technologies are now available as 64-bit extended architectures and this enables customers to build upon affordable and scalable commodity hardware.

V. BI Market Information (Market Share, Customers, Pricing Strategy)

SAS Institute is a leader in business intelligence and analytics with its 16.6 percent growth in BI tools revenue in 2007. Therefore, its total market share accounted for 31.9 percent share – more than twice that of the nearest competitor. For the 11th consecutive year, SAS holds the No. 1 worldwide market share position among all advanced analytics software vendors.

SAS customers represent many of the most innovative and successful organizations in the world. Its customers are 91 of the top 100 companies on the 2008 Fortune Global 500 List, more than 45,000 business, government and university sites use SAS. It delivers BI to customers in 115 different countries. SAS works both with corporation and small & midsize companies in a wide range of industries such as automotive, financial and banking services, business services, communications, education, government, healthcare & health insurance, hospitality &
entertainment, oil & gas, media, transportation and other. SAS BI software market share accounted for approximately 14.4% in 2007.

SAS pricing strategy allows users to choose among multiple options as named-user and per-CPU basis pricing, individual, annual licenses as well as SaaS model on subscription basis.

VI. Conclusions

SAS Institute supports no planning & directing phase of the intelligence cycle. It provides rather good services at data collection phase and strong at analysis and dissemination phases. SAS 9.2 release provides users with collaborative data integration, improved advanced analytics, and enhanced reporting capabilities designed for both business users at all levels and IT that are easy to use, enables organizations to make better decisions and to efficiently meet organizational needs. It operates both in corporate and SME segments. It has multiple option pricing strategy and its market share was 14.4% as of 2007.
4.1.6 Microsoft

I. BI Software Name: Microsoft SQL Server

Company Overview

Microsoft Corporation is an American-based multinational computer technology corporation that develops, manufactures, licenses, and supports a wide range of software products for computing devices. Headquartered in Redmond, Washington, USA, its most profitable products are the Microsoft Windows operating system and the Microsoft Office suite of productivity software. Other Microsoft products include: Microsoft Servers, Windows Developer Tools, Microsoft Expression, Business Software, Games & Xbox 360, Windows Live, Windows Mobile and Zune. As of 2008, Microsoft employees accounted for 89,809 in 105 countries (www.wikipedia.org).

II. General Characteristics of BI functions

Microsoft business intelligence is delivered through a trusted and familiar environment through Microsoft SQL Server, Microsoft office system – Excel, Outlook and SharePoint Server 2007. Its products are integrated and interoperable from top to bottom, so users don’t need to get used to different user interfaces for all the different product versions and it requires less support time from IT and less training time for users.

Microsoft SQL Server 2005 is the foundation of Microsoft BI technologies. It delivers a robust, scalable, and enterprise-ready platform to enable the delivery of critical BI information to business users at all levels of organization. It provides a central location for storing data and keeps historical and current business information while maintaining quality by way of cleansing and standardizing the information in the data warehouse and translates to native languages to enable easy access to any user. It can integrate multiple data sources quickly and efficiently with inclusion of Oracle, Teradata, systems by SAP, Oracle, IBM and etc.

Microsoft delivers analytics through data mining and OLAP capabilities that help users to build complex analytical models easily due to its extensible and flexible capabilities. IT provides a central metadata repository defining business entities, business logic, calculations and metric. Its OLAP engine stores data in a format that is easily comprehended and data can be taken from single or multiple data sources and can be rearranged into multidimensional structure that helps
in extracting and analysing data. Its data mining is delivered through algorithms and statistical analyses to discover patterns and uncover business data to reveal hidden trends. Data mining algorithms include decision and regression trees, time series, clustering and sequence clustering, association rules, neutral networks and text mining.

With Microsoft Reporting Services, users are able to create, manage and deliver both traditional, paper-oriented reports and interactive, Web-based reports. It combines a single, complete reporting platform with a scalable and extensible architecture that enable users to create their own reports and explore corporate data with a user-friendly model, access ad-hoc reports from third-party applications and customize them or create new ones for specific needs, deploy interactive Web-based reports to deliver information to customers or partners over extranets or Internet.

III. Analysis of Intelligence phases

1. Planning & Directing

Microsoft does not support planning & directing phase of the intelligence cycle.

2. Data Collection

Microsoft enables users to collect internal structured data virtually from any data source with inclusion of Oracle and Teradata databases as well as SAP, Oracle, IBM applications. Besides it is able to use common sources as text files, OLEDB and ADO.NET (including ODBX for .NET). Though it is not able to gather external data and does not support any web searches capabilities. Besides, Microsoft provides a wide range of powerful and productive components as conditional operations for partitioning and filtering, lookups, data and character conversions, aggregation and merges that result in better and flexible data collection and categorization and filtering. Microsoft delivers rather good data collection phase and is scored (3.25).

3. Analysis

Microsoft provide a range of analytics as data mining and predictive analysis with inclusion of text mining referred to as text classification as it identifies the relationship between business categories and the text data (words and phrases) from articles. With data mining, users can discover patterns and reveal business data to identify trends about products, customers,
market and analyze them. Besides, it is able to provide qualitative analysis and extract relationships between data. Thus, Microsoft provides comparatively good analytics with the score (3).

4. Dissemination

Microsoft delivers reports via its server-based enterprise reporting environment and is managed via web services. Reports can be delivered in a variety of formats with a range of interactivity and printing options. Users are able to distribute reports to a broad audience as data source via hard copy or electronic means. Microsoft enables users to easily create and customize their own reports to meet specific business needs. With Microsoft reporting services, organizations can deploy interactive web-based reports to deliver information to customers or partners over extranets of the Internet. Thus, Microsoft supports dissemination phase with a quite good score (3.8).

Microsoft’s overall intelligence cycle scores are presented in figure (11) below.

**FIGURE (11): MICROSOFT EVALUATION SCORES**

IV. Recent BI Software Developments

Microsoft presents a significant product release SQL Server 2008 that delivers many new features and key improvements. It is delivered on the Microsoft data platform vision by enabling organizations to run their most mission critical applications with high levels of security,
reliability and scalability while lowering the cost and time of managing the data infrastructure and delivering insights and information to all users.

SQL Server 2008 provides a comprehensive and scalable data warehouse platform that enables users to perform powerful analyses with a single analytical store that meets the needs of thousands of users across terabytes of data. It allows organizations to store huge data volumes in data warehouses through data compression more efficiently, it requires less storage to keep backups online, provides improved query performance for common data warehouse scenarios by reducing query response time, enables concurrent workloads to ensure consistent performance, integrates the latest information into the data warehouse with change data capture and other. Besides, SQL Server 2008 presents key advances in scalability of Integration Services such as available resources and large workload are managed and used more effectively, high-performance connectors for SAP Netweaver BI, Oracle and Teradata designed for high-performance loading of data into an enterprise data warehouse. Users are also able to analyze source data for a variety of properties such as data type, length, histograms of data values and the strength of integrity relationship that improve the quality of data going into a data warehouse.

SQL Server represents reporting enhancements to enable organizations to deliver relevant, personalized reports to thousands of users in a format and the location that makes the most sense for them. Reports can be easily delivered throughout the organization with simplified deployment and configuration that help users to simply create and share reports of any size and complexity. With new Report Designer, users can take advantage of unique layout capabilities that allow the design of reports of any structure, while new visualization enhancements further enrich the user experience. With redesigned Report Builder, users can build reports with any structure through this end-user tool that has the familiar look and feel of Microsoft Office 2007, including a “ribbon” interface and the ability to integrate powerful visualizations into reports. Enhanced visualization tool such as charts and gauges make reports more accessible and easy to understand. With new Microsoft Rendering, users can access reports directly from within Word. The existing Excel renderer has been greatly enhanced to support features as nested data regions, sub-reports and merged cells that enable users to maintain layout fidelity and improve the overall usability of reports created in Microsoft Office applications. In addition, SQL Server 2008 Reporting Services represent deep integration with Microsoft Office SharePoint Server 2007 and Microsoft SharePoint Services, providing central delivery and management of enterprise reports.
and other business insights that enable users to access reports that combine structured as well as unstructured information relevant to their decision making directly in their business portals.

SQL Server 2008 builds on the strong OLAP capabilities of SQL Server 2005 by delivering faster query times for all users. This performance boost enables organizations to perform highly complex analyses with a large number of dimensions and aggregations. Fast performance combined with deep integration with Microsoft Office, allows Analysis Services to enable every user to derive actionable insights. The following SQL Server 2008 Analytical Services include: new cube design tools that help users streamline the development of the analysis infrastructure, enabling them to build solutions for optimized performance; best practice design alerts enable developers to integrate real-time alerts at design time, which optimize design; dimension designer enables easy viewing and editing of attribute relationships and also provides multiple built-in validations for support of ideal dimension design. Block computations provide a significant improvement in processing performance that helps users to increase the depth of their hierarchies and the complexity of the computations. New MOLAP-enabled write-back capabilities remove the need to ROLAP partitions that provide users with enhanced write-back scenarios from within analytical applications without sacrificing OLAP performance.

With new Resource Monitor, the database administrator can quickly and effortlessly monitor and control the analysis workload that help to identify which users are running which queries and how long they are run, enabling the administrator to better optimize server utilization. With better time series support, SQL Server 2008 extends forecasting capabilities by delivering more flexibility to perform focused analysis through filtering and deliver complete information in reports beyond the scope of the mining model. New cross validation enables confirmation of both accuracy and stability for results. Besides, the new feature delivered with SQL Server 2008 Data Mining add-ins for the 2007 Office System empowers every user in the organization with more actionable insight at the desktop.

V. BI Market Information (Market Share, Customers, Pricing Strategy)

Microsoft’s goal is to give customers and partners the best end-to-end experience possible and to become a satisfaction leader in the technology industry through CPE (Customer & Partner) strategy by building a culture of accountability, listening and responding to customers, improving product quality and security through continuous innovation. Microsoft
delivers business intelligence to both corporate and small & midsize companies in a wide range of industries used all over the globe such as government, manufacturing, financial services, higher education, health care, retail and other. Some of Microsoft customers are Hyundai, London Stock Exchange, Citi Group, Bank of America, BP, City of Miami etc.

Microsoft BI software market share accounted for nearly 10.6% in 2007. Its pricing structure includes named-user and CPU-based, perpetual licenses with or without Software Assurance and also supports SaaS (single or multi-tenant) model. Microsoft introduces aggressive pricing with SQL Server that changed the dynamics of the overall BI market with its no-charge-for-end-users pricing to enable implementation of pervasive BI cost-effectively. Its new pricing model includes licensing costs only for report designers, end users who consume these reports and dashboards to BI capabilities at no charge.

VI. Conclusions

Microsoft supports no planning & directing phase of the intelligence cycle. It provides rather good services at data collection and analysis, and almost excellent at dissemination phases. Microsoft SQL Server 2008 provides the technology and capabilities that organizations count on to manage the growing challenges of managing data and delivering actionable insights to users. It operates both in corporate and SME segments. Its pricing strategy is cost-effective with market share 10.6% as of 2007.
4.1.7 QlickTech

I. BI Software Name: QlikView

Company Overview

QlikTech was founded in 1993 as a consulting company. The office was established in Lund, Sweden at Ideon, one of the oldest science parks in the world. QlikTech developed the new software QlikView as it provided a point-and-click simple way to view data and information. At first the company grew slowly, but by 2004 there were over 1500 customers across the globe. At the end of 2004, QlikTech decided to expand globally and since then the growth has been rapid. Today QlikView has more than 457,000 users in 92 countries, over 10,000 customers and continues to add an average of 14 customers every day. QlikView 8 was released in May 2007. Now recognized as the leading provider of next generation BI solutions and, QlikTech is also the fastest growing BI software company in the world for two years running (2004-2006) according to IDC. QlikTech’s revenue is growing at a rate of 80% annually.

II. General Characteristics of BI functions

QlikView presents all of the capabilities that traditionally required a complex and costly suite of products on a single unified platform. It provides flexible ad-hoc analysis capabilities, powerful analytic applications and simple printable reports that can be deployed to all users at any level of organization. Besides, it enables users to eliminate unused paper reports and replace them with demand-driven reporting.

QlikView offers a complete analysis solution such as dashboards and alerts, multidimensional analyses, slice-and-dice of data without the limitations and complexity of traditional OLAP. It is able to analyze massive amounts of data at unprecedented speed due to its in-memory data model design. As a result of this design, users get sub-second response times on queries and calculations and the ability to process massive datasets as well as deliver data to large user population in a fast and affordable manner. By taking full advantage of 64-bit technology ’s memory capacity, QlikView enables users to provide summary level metrics and record detail on the same architecture. Thus companies can gain scalable business analysis solutions that provide summary KPIs and highly detailed analyses.
QlikView is able to integrate data from most data sources (i.e. ODBC and OLEDB sources, using vendor specific drivers, any text or table data file (i.e. delimited text files, Excel files, XML files etc.), and any format as well as data warehouses and data marts (although these are not required) and also offers web-services through a plug-in model. It is designed to handle a remarkable amount of data. There is no limit to the number of tables allowed in an application, no limit to the number of fields, rows or cells in a single table. As QlikView loads data from a source database, the data is highly compresses and optimized, usually resulting in a QlikView application of only 10% of the size of the original source. QlikView is able to load data as high as 4 million records per second in comparison with traditional OLAP that can take half a day to load even tens of millions of records.

QlikView interface is designed to provide a perfect data overview in various dimensions such as simplifying analysis and reporting for everyone. Users are able to question anything and everything from all types of objects and to any aspect of the underlying data regardless of where the data is located in a hierarchy. Key elements of user interface include sheets & tabs, list box, multi-box, charts & gauges and tables. With its integrated report editor, users are able to easily use application specific reports. The reports can be simply updated and created by a simple drag-and-drop procedure and all data displayed can be exported at any time to Excel or other applications by a simple click of a button.

III. Analysis of Intelligence phases

1. Planning & Directing

QlikView does not support planning & directing phase of the intelligence cycle.

2. Data Collection

QlikView supports data collection from virtually any structured data sources (i.e. ODBC, and OLEDB sources, using vendor specific drivers), any text or table data file (i.e. delimited text files, Excel files, XML files etc.), and any format as well as data warehouses and data marts (although these are not required). It is also able to load external on-demand data sources through web-services using a plug-in model. Data can be loaded from generic table, cross tables, mapping tables and interval-matching tables. Tables can be joined, concatenated, sampled and linked to external information such as other programs, bitmaps, URLs, etc. With its wizards and
scripts, users can easily and flexibly change or cleanse data sources to ensure the filtering of the data collected as well as bookmark and export features for share knowledge with others.

Though QlikView does not support traditional warehouses or metadata reports, but it performs data collection phase in a rather good way that scores (3).

3. Analysis

With its analysis or calculation engine, QlikView is able to deliver multidimensional analysis, slice and dice of data. It supports ad hoc analysis through queries that are not constrained by the underlying, prebuilt data mode without use of traditional OLAP and helps organizations to save money and time. It is able to analyze massive amounts of data at unprecedented speed due to its in-memory data model design and provide summary KPIs and highly granular and detailed analysis. Besides, it provides not only past and current business snapshots, but also supports predictive analysis.

With QlikView, organizations can analyze performance in unlimited dimensions such as by representatives, customers, regions, products, groups for greater profitability; determine true cost of sales, track commissions and incentive programs, pinpoint underperforming products, perform customer-specific sales analysis and determine customer-by-customer profitability; conducts predictive analysis on pricing, bundled products and territories. With its in-memory model, it allows users to perform what-if memory analysis, trend analysis, on-line and off-line analysis or to do budgeting and planning directly in QlikView. QlikView is able to perform multiple analyses by function such as product portfolio analysis, cost/benefit analysis, analysis by division/business unit, six sigma/process analysis, maintenance analysis, sales/customer/performance analyses, procurement/logistics analysis.

QlikView does not follow traditional business analytics and deliver in-memory analytics, which is significantly faster, more efficient way on a single platform. Therefore, it delivers a wide range of analyses with an excellent score (4) together with SAS Institute.

4. Dissemination

QlikView delivers data and analysis through a simple point-and-click user interfaces using different charts, list boxes and pivot tables that allow questioning anything and everything, from all types of objects and to any aspect of the underlying data regardless of its locations. With
its single environment, QlikView enables any user to provide a consistent and simple reporting as well as highly skilled analysts doing ad-hoc reporting. It helps organizations to eliminate unused paper reports and replace them with demand-driven reporting. The reports can be simply updated and created by a drag-and-drop procedure and all data displayed can be exported at any time to Excel or other applications by a click of a button. It also delivers timely and secure distribution of personalized reporting and analysis. Thus, QlikView supports dissemination phase in a very good way with score (3.5).

QlikView’s overall intelligence cycle scores are presented in figure (12) below.

**FIGURE (12) QLIKVIEW EVALUATION SCORES**

Source: Evaluation Findings

**IV. Recent BI Software Developments**

QlikView 8.5 is designed to make BI even smarter. Its most of the enhancements are evolutionary improvements aimed to simplify analysis for every user. With its Set Analysis feature, users are able to compare two or more selected states at once, “lock” or “choose” selected states for comparison, view multiple selection states and extend the power of QlikView bookmarks in the same view and on the fly. For instance, users can compare this year’s sales to last or the product mix of sales people who exceed quota with those who don’t at any time irrespective of the current selection state. This enhancement is a major advancement of QlikView’s patented “associated analysis” approach. In addition to several new visualization and charting features, end users can drag-and-drop QlikView objects live inside PowerPoint, Word and Excel that makes it even more accessible for presentation and collaboration.
With its Enterprise Deployment and Integration features, QlikView 8.5 enables users to simplify deployment and integration in organizations with complex existing infrastructures. Exposing management APIs and infrastructure to non-QlikView management software simplifies management tasks and integration with third-party software with inclusion of J2EE server applications.

With its Mass Deployment Clients features, QlikView 8.5 provides simple and secure deployment of large numbers of QlikView to large number of users, putting personalized analysis into the hands of the right user at the right time. AJAX and JAVA clients provide desktop level interactivity and capabilities and allow customers to deploy QlikView to large number of users in seconds.

In addition, QlikView 8.5 supports simplified licensing feature that makes it even easier to do business with QlikTech. The product distinction between 32- and 64-bit QlikView and QlikView server has been removed. Thus, all users are able to use the full power of 64-bit.

V. BI Market Information (Market Share, Customers, Pricing Strategy)

QlikTech is the world’s fastest-growing BI vendor with dramatic growth that took place in 2008. The number of users of QlikTech’s flagship product – QlikView - grew by 45% to approximately 500,000. In contrast to the software industry trend toward downsizing, QlikTech added 160 new employees in 2008, a 50% increase over 2007. QlikTech BI software market share accounted for approximately 1.57% in 2007.

Throughout the downturn in 2008, QlikTech’s customer base grew by 45% to 10,585 customers in 92 countries. QlikTech delivers its BI to both corporate and small & midsize businesses, being a leader in the mid-market segment. However, its sales to larger enterprises grew significantly in 2008, including many worldwide brands such as Volvo, Deutsche Telekom, Novartis, Fujitsu, Campbell Soup, Shell, 3M and ADP.

It has a simple, scalable and cost-effective user-licensing model as per user basis (i.e. users have to buy only what they use) and alternative pricing models.

VI. Conclusions

QlikView is the in-memory leader and the fastest spreading business intelligence platform in the world. It is leading a new class of business analysis solutions that utilizes next
generation parented in-memory association technology to make sophisticated analysis and reporting dramatically easier to deploy, use and maintain.

QlikView supports no planning & directing phase of the intelligence cycle. It provides good services at data collection phase, excellent at analysis and dissemination phases. It operates both in corporate and small & midsize businesses. Its pricing strategy is cost-effective user-licensing model with market share 1.57% as of 2007.
4.1.8 TIBCO Software Inc.

I. BI Software Name: TIBCO Spotfire

Company Overview

TIBCO Software Inc. provides enterprise software that helps companies achieve service-oriented architecture (SOA) and business process management (BPM) success with headquarters in Palo Alto, California. With over 3,000 customers and offices in 40 countries, TIBCO provides organizations with innovative software that helps them pursue initiatives in three important areas as SOA, BPM and business optimization. TIBCO is focused on leveraging and extending the capabilities of its software to help companies move toward predictive business such as anticipate customer needs, create opportunities and avoid potential problems. (www.tibco.com)

II. General Characteristics of BI functions

TIBCO Spotfire enables all users to answer their own questions of any data in seconds. In-memory processing gives instant answers and frees up IT cycles and unique, visual and interactive approach to analysis provides new insights into data. Spotfire is not a traditional BI system; it is fully adaptable to business processes across the organization, providing IT with an extensible BI platform that reduces the number of custom and packaged applications they must support. Its enterprise analytics platform meets the needs of all users from ad-hoc analysis to interactive reporting and dashboards to domain-specific applications, integrates with existing data sources and security models and enables IT to centrally administer and deploy analytics across the business.

With TIBCO Spotfire, users can easily access new local and enterprise data sources in the same analysis, ask and answer new and unforeseen questions, perform “free form” data exploration and modify settings on the fly. With its flexible in-memory architecture, users can process data on either desktop client CPUs or central servers. Users are provided with drag-and-drop access to local sources such as spreadsheets, flat files and custom sources. Besides, data is securely kept on the server as web clients receive only HTML and images.

TIBCO Spotfire delivers predictive analysis as analytical models that go beyond traditional BI tools to help users quickly and easily identify patterns, trends, outliers and unexpected relationships, which can be customized for a wide number of industries. With
desktop clients, local CPU is leveraged and allows memory for online and offline analysis by integrating powerful statistics and dynamic calculations to make computer-driven applications that are easy to interpret with drag-and-drop feature and simple selection & filtering. With its Library Services, TIBCO Spotfire enables users to save analyses into the library and make it available to its web communities.

With TIBCO Spotfire, business users are able to create and publish new analytic applications and interactive reports in minutes by sharing their findings and enabling other users to gain their own insights. TIBCO Spotfire does not produce any static reports, users simply save an analysis to the Library and it is automatically made available to communities of TIBCO Spotfire Web users. It provides immediate and secure publishing of any analysis as a dynamic dashboard with no separate tool or programming; it makes analyses, dashboards and applications available to large number of users as interactive, AJAX web applications; embeds applications into corporate portals or use them to build new mash-ups. Its user interfaces are easy-to-use by simple drag-and-drop feature that enables free interaction with data using dynamic filters and rich visual tools for various industries. Besides user interfaces work off-line, so business users are able to create analysis on the road.

III. Analysis of Intelligence phases

1. Planning & Directing

TIBCO Spotfire does not support planning & directing phase of the intelligence cycle.

2. Data Collection

TIBCO Spotfire enables users to access and pivot data from multiple databases simultaneously without having to know anything about installing database drivers, underlying data schemas or SQL. With its sever-based information services, data can be easily accessible form any JDBC, ODBC or OLEDB accessible data source such as Oracle, IBM DB2, Microsoft SQL Server, Microsoft Access, MySQL, SAS/SHARE, PostgreSQL, Sybase or Informix. TIBCO Spotfire enables users to easily change data, flexibly manage larger volumes of data while ensuring data security. It allows data to be loaded into memory on-demand rather than in its entirety. Besides, new data can be accessed and queried easily and new questions can be tested without making special requests to IT and without reconfiguring a database with a simple
click of a mouse. TIBCO Spotfire supports data collection phase in a good manner and therefore is scored (3).

3. Analysis

TIBCO Spotfire supports predictive and qualitative analysis. With TIBCO Spotfire, users can easily and quickly identify trends, spot patterns, discover outliers and identify unanticipated relationships. Beyond the traditional BI, it enables users to explore and analyze information in a multidimensional and self-configuring environment without any IT help. It also supports standard and advanced statistic analyses as Bayesian modelling, advanced analyses (signal and image analysis, time series analysis, statistical signal estimation, data compression analysis), market basket analysis. It also delivers a wide range of analyses in research (in particular, life science as gene analysis, genotyping analysis, protein analysis, chemistry and biology analysis), manufacturing (product analysis, process effectiveness analysis, inventory analysis, spares & parts analysis and more).

Thus, TIBCO Spotfire delivers analysis phase in an almost excellent manner with the score (3.8) after SAS Institute and QlikView.

4. Dissemination

TIBCO Spotfire supports dissemination through TIBCO Spotfire Web Player and Enterprise Player that do not deliver static reports as in traditional BI but use the so-called interactive reports through a zero-print web interface, which allows easily and instantaneously share content and insights, view & navigate configured analysis workflows with no software or plug-ins installed, answer new questions interactively using filtering, visualizations, custom-developed tools and with visual clarity, share information with broadly disperses colleagues, customers and business partners and work with applications online and offline. All in all, TIBCO Spotfire delivers interactive reports and has a good score (3.1).

TIBCO Spotfire ’s overall intelligence cycle scores are presented in figure (13) below.

**FIGURE (13) TIBCO SPOTFIRE EVALUATION SCORES**
IV. Recent BI Software Developments

New release TIBCO Spotfire 2.2 introduces enhancements for users on the desktop and web, as well as administrators and developers.

TIBCO Spotfire 2.2 presents some analysis and reporting enhancements that include a new 3-Dimensional Scatter Plot visualization which enables users to gain new insights into their data by interactively filter, zoom data in 3 dimensions; new intelligent formatting that automatically optimizes the display of values, making visuals easy to read and interpret while providing much greater control over formatting to make reporting easier; data delivery can now be used with Web Player that enable users to export data from tabular visualizations where data is downloaded in CSV format and is made available as formatted or unformatted data and is limited to the columns displayed;

TIBCO Spotfire 2.2 improves scalability and performance, Web Player can now be deployed to more users and more data with reduced memory footprint that delivers faster responses for web users and desktop clients while making common interactions such as filtering, marking, changing pages and calculations faster in many cases. It also provides faster load times for Web Player applications as administrators can configure scheduled loading and update of these applications. Besides data refresh notifies when fresh data is available.

TIBCO Spotfire 2.2 introduces new add-on application Network Graph in Network Analytics that allows users to gain insights into complex interaction networks. This highly interactive visualization fully integrates social networks analysis techniques into the Spotfire
environment so that analysts can interactively filter and explore network data along time series and geospatial data and out-of-the-box functionality can be extended through APIs for custom layout and calculation algorithms.

V. BI Market Information (Market Share, Customers, Pricing Strategy)

TIBCO Spotfire delivers BI to both corporate and small & midsize business to different industries as life sciences, energy, semiconductor, academics, government, financial services, consumer goods. Its consumers include industry leaders as AMD, Boehringer Ingleheim, BP, ChevronTexaco, Kerr McGee Corporation, Lilly, L'Oreal, Merck, Nestle, Pfizer, Procter & Gamble, Shell, Texas Instruments, Toshiba, Unilever, and a variety of government agencies involved in both civilian and intelligence services.

TIBCO BI software market share accounted for approximately 0.59% in 2007. Its pricing structure provides multiple license options to customers such as named-user and per-CPU basis as well as alternative pricing models.

VI. Conclusions

TIBCO Spotfire is the next generation BI that equips all employees to answer their own questions of any data in seconds with in-memory processing, which delivers instant answers and requires little or no IT help while unique, visual and interactive approach to analysis reveals new insights into data.

TIBCO Spotfire supports no planning & directing phase of the intelligence cycle. It provides good services at data collection and dissemination phases, and almost excellent at analysis. It operates both in corporate and SME segments. It provides multiple license options with the market share nearly 0.59% as of 2007.
4.1.9 Actuate

I. BI Software Name: Actuate 9

Company Overview

Actuate Corporation was founded in 1993, develops BI, Performance Management and Java Reporting software. Actuate is also heavily involved in the Eclipse Foundation as a board member, strategic developer and co-leader of the BIRT (Business Intelligence and Reporting Tools) project. Actuate Corporation employs approximately 600 people and serves over 4,000 customers worldwide (www.wikipedia.org).

Actuate experienced growth of BIRT-based business form $1 million in 2006, $8 million in 2007 to $15.4 million in 2008 has not only made it one of the most dynamic open source BI vendors but also one of the most profitable software companies of its size. Actuate ’s non-GAAP operating margin of 18.6% in 2008 is the highest among software companies with revenues between $100 million and $200 million. Actuate also generated a record $29.5 million in cash flow from operations in 2008 (www.actuate.com).

II. General Characteristics of BI functions

Actuate presents a platform for creating RIAs (rich internet applications) without limits through a portfolio of content and application-specific business intelligence products designed to meet 100% of information and online channel application, performance management and Java reporting needs. Its applications generate the rich information to business users by providing BI tools accessible with a single interface, on-demand enterprise information delivered via Web 2.0 technology in an intuitive, standards-based portal interface, support limitless data presentation formats and integration possibilities.

Actuate provides a metadata layer that delivers a unified data access across organization for the Actuate product line and create logical business data models, centralized metric and KPI definitions as well as reusable query definitions for a reporting environment easily managed by IT. It provides centralized access to corporate data sources, KPIs and operational metrics with central IT controls access to this metadata and its underlying layers. Layering enables changes at the lowest level to have minimum impact on those above it, while seamlessly continuing to feed application, reports and dashboard widgets with information as well as ensuring consistency
across reporting applications and projects. Actuate enables user to reduce the number of Structured Query Language (SQL) queries operating against data sources – allows distributed query processing, the ability to query multiple sources at once with an exceptional response times.

Actuate provides full OLAP analytic functionality to business and power users through an easy-to-use web interface. Users are able to enjoy self-service business analytics, offline mobility and desktop performance with access to cubes designed and published by IT developers. These cubes can be accessed by and are scalable to thousands of power and business users. It delivers rich, robust OLAP capabilities such as slice and dice, filter, sort, hide, calculate, drill-to-detail etc. IT controls the extent to which a user can interact with the data by setting which features users can access in the Analytics Cube Viewer. Besides, end users can work in varied presentation formats, online or offline, export to Excel, PDF or other desktop products for continued analysis or data redistribution. Users can seamlessly embed Actuate Analytics within existing applications and portals.

Actuate provides an entire collaborative reporting architecture that includes web reports based on the open source BIRT technology, ad hoc report development, interactive viewing to enable end users to customize a report to meet their needs and standards-based portal environment for hosting and accessing report content from Actuate. With Actuate, users are able to create their own ad hoc queries against enterprise data sources and generate a wide range of reports, analyze and answer a number of additional questions from the data in an existing report with little or no IT help, zero training and support costs.

III. Analysis of Intelligence phases

1. Planning & Directing

TIBCO Spotfire does not support planning & directing phase of the intelligence cycle.

2. Data Collection

Actuate improves data integration through the use of Enterprise Information Integration (EII) technology and delivers the benefits of traditional metadata layers such as separating query composition from report construction, business-friendly data access and objects reuse across reports and reporting products. Actuate enables users to access information in disparate data
sources in real time, which allows businesses to combine data warehouse trend information with current operational statistics in order to quickly assess today’s performance. With Actuate Information Objects, users can create, store and reuse queries as they write reports, create spreadsheets; IT can control how data from various enterprise sources is exposed to users. New sources can be introduced gradually and changes can be made quickly and transparently. With EII technology, Actuate enables users to retrieve the right information from any system and present it in the preferred format for all users, pull and transform data from multiple sources simultaneously, at the same time optimizing data access and performance across the heterogeneous data sources. Therefore, Actuate deliver collection phase in an above average way resulting in score (2.5).

3. Analysis

With Actuate analytics, users can slice and dice, filter, sort, hide, calculations, drill to details and more. Users are able to perform e-analysis, self-serve analytics, deliver interactive multidimensional analysis both on-line and offline and get more insight from the data.

Actuate delivers full OLAP capabilities and does not carry out predictive and qualitative analysis, therefore it has a poor score (1.5).

4. Dissemination

Actuate provides a collaborative reporting environment where business users can create and share easy-to-use web-reports, analysis ready excel reports or report designs with IT and other users in organization. With its Report Studio, users start from selecting the report’s data from report templates available by IT. Report templates are reusable report designs that speed up the report creation process and completely customizable and can be of any level of complexity that enable users to create standard company reports. Report designs or output documents can be saved on the iServer and shared with other users. Actuate provides users with a rapid access to data using predefined queries that allows users to select fields, sort and filter to get the required data. It also allows users to create rich and beautiful reports with minimal efforts through various formatting capabilities and report templates. Users are provided with flexible print and export options i.e. reports can be viewed in the browser or printed. Therefore, Actuate delivers information in an almost excellent manner with score (3.4).
Actuate`s overall intelligence cycle scores are presented in figure (14) below.

**FIGURE (14) ACTUATE EVALUATION SCORES**

![Figure 14: Actuate Evaluation Scores](image)

Source: Evaluation Findings

**IV. Recent BI Software Developments**

Recent release Actuate 10 introduces a new generation of RIAs with interactive visual content and flexible Web-based integration with comprehensive platform that enable organizations to deliver BI and reporting application in efficient way.

Actuate 10 presents enhanced Interactive Viewer that provides users of BIRT reports with AJAX-based interface to change report formats with no training to meet users individual needs. New features include an activity-sensitive cursor that guides the novice user, drag-and-drop column manipulation and new report panning control for easier navigation within portlet windows, afford increased deployment flexibility for IT with inclusion of features to control and expose Viewer on a role-by-role basis and its introduction for embedding within Java applications.

With Actuate 10, users can easily content from BIRT reports, reportlets, interactive reports and flash objects to external applications, dashboards and mash-ups. New JavaScript API enables users to leverage the Actuate 10 platform to drive information-based applications seamlessly within their larger applications, portals and products. It also introduces Page Level Security (PLS) to BIRT that allows a single report on the server to offer personalized report views to each recipient based on security rules, while allowing a single report to serve the function of multiple reports and eliminating excessive report generation. Actuate 10 supports
embedding objects from the Flash Object Library containing more than 250 flash charts and visualizations such as gauges, thermometers, bullet charts, spark charts and more than 300 world-wide geographic maps as well as the use of user-defined and third-party flash objects.

Besides, Actuate 10 presents improvements to e.Spreadsheet that enables users to generate analysis-ready Excel reports with new support for Microsoft Excel 2007, PDF output, a new chart builder and query builder. Users can request reports in PDF and Excel 2007 formats and allow the creation of more types of Excel reports and increase developer productivity. Besides, reports can be run or viewed in either Excel or PDF on demand. e.Reports used to create brochure quality reports, now enhanced to provide significantly improved PDF support with new table of content capabilities.

V. BI Market Information (Market Share, Customers, Pricing Strategy)

Actuate has over 4,200 enterprise and small & midsize customers with strong present across a number of industries including financial services, pharmaceuticals, insurance, distribution services as well as the government sector. Some of its customers are Bank of America, Citigroup, Safeco Insurance, Lehman Brothers, US Army, Boeing, IBM etc. Actuate BI software market share accounted for approximately 2.76 % in 2007. Its pricing structure is based on named-user and CPU-basis pricing.

VI. Conclusions

Actuate delivers Rich Information-ready, open source-based BI tools with strong reporting capabilities. Recent release Actuate 10 is designed to provide a comprehensive RIA-ready platform to deliver robust and cost-effective BI and reporting applications that reduce costs and ensure efficiency. Actuate supports no planning & directing phase of the intelligence cycle. It provides satisfactory services at data collection, poor at analysis phases and almost excellent at dissemination phase. It operates both in corporate and SME segments. Actuate employs named-user and CPU-basis pricing with market share 2.76% as of 2007.
4.1.10 Astragy

I. BI Software Name: Astragy Enterprise Edition

Company Overview

Astragy is a privately held software company. The company was founded by experts in software development and business consulting. They firmly believe that information management and -interpretation will be the deciding factor in corporate competition in the future. Based on this conviction the Astragy technology and methodology supports customers in winning their competitive battles. Astragy operates worldwide through a network of partners and its leading Software-as-a-Service platform. The companies head office is located in Amsterdam (www.astragy.com).

II. General Characteristics of BI functions

General characteristics of BI functions cannot be provided as Astragy does not offer any BI functions.

VI. Analysis of Intelligence phases

1. Planning & Directing

Astragy Enterprise/Professional Edition fails to provide planning & directing phase of the intelligence cycle.

2. Data Collection

Astragy Enterprise/Professional Edition is able to collect data from multiple sources both external and internal. It can gather internal data from almost every database and XML data source. External data is collected from various sources such as News feeds, newsletters, research rumours, RSS feeds, factoids, SMS and other. In addition, Astragy Competitor is able to access any required data from Internet, web and e-mail. Both structured and unstructured data collected can be easily and quickly checked for inconsistencies, filtered, sorted out and archived. Astragy enables data to be verified before it enters the database. As primary sources of information are centralized into one globally available information portal, therefore it becomes cost-effective and takes less time.
Astragy approaches data collection phase differently if compared to other BI vendors without the need of integration, warehousing or metadata report functions. Astragy Competitor fulfils almost all evaluation criteria for the data collection phase, therefore it has a nearly excellent score (3.6).

3. Analysis

Astragy Enterprise/Professional Edition is able to provide a range of analysis such as real time analysis, drill downs, can predict the future by way of trend analysis and perform predictive modelling. It performs quick comparative analysis that can help companies to choose correct and prompt business decisions. Astragy supports competitor analysis, market intelligence by way of single overview creation of the external environment and its key players. It is also able to create SWOT analyses that help users to create value proposition and strategic insight into product development. Astragy performs value chain analysis trend, watching that helps to comprehend customer’s markets, lifestyle trends and other required data.

Astragy Enterprise/Professional Edition utilizes a range of good quality, fast and insightful analysis and is scored quite high (3.5) though it employs different analyses if compared to other traditional vendors support.

4. Dissemination

Astragy Enterprise/Professional Edition is able to generate and deliver reports both on demand and periodical. Reports are provided in either printable or electronic formats and can be sent via e-mail automatically to the required users. Astragy enables users to customize and personalize reports for different types of users. Besides, data can be exported to Microsoft Office formats, PDF promptly requiring little effort and additional expenses. Astragy introduces rather good dissemination phase, therefore it is scored (3.4).

Astragy’s overall intelligence cycle scores are presented in figure (15) below.

FIGURE (15): ASTRAGY EVALUATION SCORES
IV. Recent BI Software Developments

Astragy Enterprise/Professional Edition introduces new features as add-on modules on request for additional fee. The Aquabrowsing module is a visual add-on to Astragy that provides insight into complex relations between entities such as companies, markets, people and products. By a simple click of a mouse, the complete Astragy information on entity and relation is shown in quick pop-ups. The Aquabrowser is automatically adjusted to any company’s data definition and content. It allows users to gain insight into complex relations between entities, save time digesting huge loads of information, better comprehend market dynamics and networks.

Another new feature – the Collexis search module – scans and links information from external websites, documents libraries and Astragy itself and conducts detailed analysis of the meaning of their content. The Collexis module enables users to automatically scan competitors’ websites for relevant information, link interesting documents on the company network to competitor and market profiles and remove identical news messages from the news tab in Astragy. It enables users to improve the accuracy of searches and automatic data imports, import the required competitor data from external websites, search internal networks for documents on markets and competitors, and automatically convert various file formats, including PDF and Microsoft Office (ppt, doc, xls), remove duplicate news messages from multiple sources, automatically detect the language of a specific document or news items.

The Newsletter module is an easy to use add-on to Astragy that enables users to quickly create and send newsletters to multiple target groups in organization via e-mail. It allows users to
add any report from company and/or market profiles in Astragy directly into the newsletter. This helps to keep employee, customer and other audience informed about the latest news, competitor moves, turnover and profit comparisons, product specifications and other. The Newsletter module enables users to save time, keep staff updated on competitor changes on a regular basis, use a single validated source of information, inform and quickly distribute comparisons.

The Personal Homepage module enables users to place content from the various reports on a single page with an easy to change and reorder content at any time. With the new feature, users can personalize the view in Astragy based on their preferences, save time searching for any data, create an instant overview of relevant information in one screen, create a personal information dashboard and edit content directly from the homepage (editors only).

VI. BI Market Information (Market Share, Customers, Pricing Strategy)

Astragy is the leading CI solution provider, and the only provider with a fully web-based application. Astragy Company wished not to disclose their market share.

Astragy sells both corporate customers with the Astragy Enterprise editions as well as small and medium-sized enterprises with Astragy Professional Edition. The vendor provides its CI solution to various industries starting from utilities to chemicals, insurance to automotive. Some of Astragy customers are DSM, Friesland/Campina, Boskalis, Essent and others.

Astragy pricing policy is based on the users’ fees. Professional edition varies from 100€/user/month per one user and 60€/user/month for five users. Enterprise edition pricing is provided upon request and includes unlimited number of users.

VII. Conclusions

Astragy does not provide planning & directing phase in the intelligence process. It is strong at data collection and analysis phases, and has a good score at dissemination phase. Its recent developments in data collection, analysis and reporting phases are devised for simplicity of user, money and time saving. Astragy works both with corporate clients and SME. Its pricing strategy is based on user fees per month.
CHAPTER FIVE

ANALYSIS OF EMPIRICAL FINDINGS

This chapter presents a summary and results of the analysis of BI software and its developments carried out in the previous chapter. It also attempts to present an analysis of BI market data such as market share, customers & pricing structure. And according to the information obtained, it endeavours to divide BI software evaluated into subgroups.

5.1. Analysis of BI vendors’ evaluation

5.1.1. Analysis of BI vendors as per CI cycle

The table presented below shows a summary of empirical findings that include BI software evaluation as per evaluation criteria reflected in the Appendix with the average scores calculated for each phase of the intelligence cycle, examination of developments introduced by the tested BI vendors and analysis of their market information i.e. market share, customers and pricing strategy.

As per the Table (1) below, BI software evaluation determined that the planning & directing phase of the intelligence cycle is not supported by any vendor. Though, Astragy consultants advise users to plan and direct as well as arrange their intelligence system. With respect to the data collection phase, BI software vendors tested support this phase in a fair way with the total average score (3.16) for all vendors (Figure 16). SAP Business Objects is assigned the highest score for the data collection phase, followed by Information Builders, IBM Congos and Astragy. Though, Astragy does not provide any BI functions and can be considered more as CI vendor, it was also included and evaluated along with all other vendors. MicroStrategy turned out to have the lowest score for data collection phase and is the last in the list.
TABLE (1): SUMMARY OF BI SOFTWARE EVALUATION

<table>
<thead>
<tr>
<th>Information Builders</th>
<th>IBM Congos</th>
<th>SAP Business Objects</th>
<th>SAS</th>
<th>MicroStrategy</th>
<th>QlikView</th>
<th>TIBCO Spotfire</th>
<th>Actuate</th>
<th>Microsoft</th>
<th>Astragy</th>
</tr>
</thead>
</table>

I. BI SOFTWARE EVALUATION BY CI CYCLE PHASES (with indication of average total scores)

<table>
<thead>
<tr>
<th>1. PLANNING &amp; DIRECTING</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. DATA COLLECTION</td>
<td>3.75</td>
<td>3.62</td>
<td>3.81</td>
<td>3.5</td>
<td>1.5</td>
<td>3</td>
<td>3</td>
<td>2.5</td>
<td>3.25</td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ANALYSIS</td>
<td>1.75</td>
<td>2.25</td>
<td>2.75</td>
<td>4</td>
<td>2.5</td>
<td>4</td>
<td>3.8</td>
<td>1.5</td>
<td>3</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. DISSEMINATION</td>
<td>3.92</td>
<td>4</td>
<td>4</td>
<td>3.6</td>
<td>3.94</td>
<td>3.5</td>
<td>3.1</td>
<td>3.4</td>
<td>3.8</td>
<td>3.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

II. BI SOFTWARE DEVELOPMENTS

DATA WAREHOUSING

BUSINESS ANALYTICS

INFORMATION DELIVERY

III. BI MARKET INFORMATION

<table>
<thead>
<tr>
<th>MARKET SHARE AS OF 2007</th>
<th>6.00%</th>
<th>14.00%</th>
<th>26.00%</th>
<th>14.40%</th>
<th>5.88%</th>
<th>1.57%</th>
<th>0.59%</th>
<th>2.76%</th>
<th>10.60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUSTOMER SEGMENTS</td>
<td>C</td>
<td>M</td>
<td>C</td>
<td>M</td>
<td>C</td>
<td>M</td>
<td>C</td>
<td>M</td>
<td>C</td>
</tr>
<tr>
<td>PRICING STRATEGY</td>
<td>S</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>S</td>
</tr>
</tbody>
</table>

Source: Evaluation Summary

Note: Cells highlighted in Part II of the Table (1) shows the areas where BI enhancements took place (either in data warehousing, analytics or information delivery). Part III - BI Market information – market share for Astragy is not provided by the vendor, therefore is highlighted in grey. Those BI vendors that deliver its BI products to corporate & SME segments are highlighted in grey, but for MicroStrategy, which provides its BI software to mainly corporate customers (with “C” indication) and QlikView cell is indicated with “M” sign that means this vendor is a leader in the midmarket segment. Pricing strategy is indicated with “S” for standard pricing structure that include named-user and CPU-based, “F” – flexible pricing structure that include other pricing choices but for standard ones.
As per the Figure (17) presented below, SAS Institute and QlikView are the best in delivering the analysis phase. Again, Astragy was ranked with other vendors though it does not support any BI functions. Actuate was given the lowest score and support analysis in a poor way. In general, total average score for the analysis phase amounts to (2.9) for all BI software evaluated, which is below the scores for the data collection and dissemination phases. Thus, the evaluation findings prove the thesis hypothesis that BI vendors fail to provide good enough analysis part of the intelligence cycle.
With respect to BI vendors rating in the dissemination phase provided in the Figure (18) below, SAP Business Objects, IBM Cognos, MicroStrategy and Information Builders are the best in dissemination followed by Microsoft, SAS Institute, and QlikView. TIBCO Spotfire has the lowest score for the dissemination phase, therefore is the last among BI vendors. Total average score for the dissemination phase is (3.67) for all BI vendors tested, which is the highest among all CI cycle phases and determines that BI vendors deliver this phase in a more competent way if compared to other CI cycle phases.

FIGURE (18): BI VENDORS RATING IN DISSEMINATION
### 5.1.2 Summary & Analysis of BI Software Developments

#### TABLE (2) SUMMARY OF BI IMPROVEMENTS

<table>
<thead>
<tr>
<th>VENDOR NAME</th>
<th>PREVIOUS RELEASE</th>
<th>RECENT RELEASE</th>
<th>IMPROVEMENTS INTRODUCED IN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Information Builder</td>
<td>WebFOCUS 7</td>
<td>WebFOCUS 7 (with new features)</td>
<td>✓ Information Delivery-User Interface &amp; Reporting; ✓ Analytics;</td>
</tr>
<tr>
<td>3. IBM Cognos</td>
<td>Cognos 8</td>
<td>IBM Cognos 8 version 8.4</td>
<td>✓ Data Integration; ✓ Information Delivery: User Interface &amp; Reporting; ✓ Analytics;</td>
</tr>
<tr>
<td>4. SAP Business Objects</td>
<td>Business Objects XI 3.0</td>
<td>Business Objects XI 3.1</td>
<td>✓ Data Integration; ✓ Information Delivery: User Interface &amp; Reporting;</td>
</tr>
<tr>
<td>5. SAS Institute</td>
<td>SAS 9.1</td>
<td>SAS 9.2</td>
<td>✓ Data Integration; ✓ Analytics; ✓ Information Delivery: User Interface &amp; Reporting;</td>
</tr>
<tr>
<td>6. Microsoft</td>
<td>SQL Server 2005</td>
<td>SQL Server 2008</td>
<td>✓ Data Warehousing; ✓ Analytics; ✓ Information Delivery: User Interface &amp; Reporting;</td>
</tr>
<tr>
<td>7. QlikView</td>
<td>QlikView 8</td>
<td>QlikView 8.5</td>
<td>✓ Analytics;</td>
</tr>
</tbody>
</table>
8. **TIBCO Spotfire**

<table>
<thead>
<tr>
<th>Spotfire DXP</th>
<th>TIBCO Spotfire 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Data Integration;</td>
<td></td>
</tr>
<tr>
<td>✓ Information Delivery;</td>
<td></td>
</tr>
<tr>
<td>✓ Analytics;</td>
<td></td>
</tr>
<tr>
<td>✓ Information Delivery: User Interface &amp; Reporting;</td>
<td></td>
</tr>
</tbody>
</table>

9. **Actuate**

<table>
<thead>
<tr>
<th>Actuate 9</th>
<th>Actuate 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Information Delivery: User Interface &amp; Reporting;</td>
<td></td>
</tr>
</tbody>
</table>

10. **Astragy**

<table>
<thead>
<tr>
<th>Astragy Enterprise Edition</th>
<th>Astragy Enterprise Edition (with new features as add-on modules on request)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Analytics;</td>
<td></td>
</tr>
<tr>
<td>✓ Data Collection;</td>
<td></td>
</tr>
<tr>
<td>✓ Dissemination;</td>
<td></td>
</tr>
</tbody>
</table>

The Table (2) presented above, provides an overview of BI previous and recent releases introduced by the vendors with indication of areas where these improvements or developments took place either in data warehousing, business analytics or information delivery. Upon the information provided above, one can come to a conclusion that each vendor endeavours to introduce significant and new enhancements/developments each year either with current release or presenting upgrades within an existing release. The following vendors delivered new BI releases: MicroStrategy, IBM Cognos, SAP Business Objects, SAS Institute, Microsoft, QlikView, TIBCO Spotfire, and Actuate. Information Builders presented its BI software under name WebFOCUS 7 with new enhancements and Astragy introduced new features in its product Astragy Enterprise Edition as add-on modules on request.

MicroStrategy, with its recent release MicroStrategy 9, delivers BI with greater scalability, performance and efficiency as well as merges BI applications cohesively and consistently to all departments and workgroups at the organization. IBM Cognos version 8.4 endeavours to extend BI to a broader range of business users at all levels of organization and provide greater access to information through advanced search capabilities. SAP Business Objects in Business Objects XI 3.1 empowers users with flexibility to access all information regardless of format, shape & size and location; deliver BI platform that support heterogeneous environments and offer integration with data sources from a variety of vendors. SAS, through its
recent release SAS 9.2., delivers a wide range of benefits for both business users and IT departments, for instance, by improving and simplifying advanced analytics to all decision makers. Microsoft, with its SQL Server 2008, provides businesses with high levels of security, reliability and scalability, enables to reduce time and cost to develop and manage their data infrastructure as well as delivers a comprehensive platform.

Information Builders significantly improved reporting and analysis functions to deliver efficiency and simplicity of use to all business users. QlikView 8.5 with its in-memory business analysis endeavours to deliver BI with greater speed, flexibility, ease-of-use and visual interactivity. Actuate 10, with its comprehensive RIA-ready platform strives to provide cost-effective BI and reporting applications that reduce costs and ensure efficiency. And finally, TIBCO Spotfire and Astragy also introduced improvements with the aim to deliver more efficiency, simplicity and cost-effectiveness to a wide range of business users.
5.1.3 Summary & Analysis of BI Market Information

According to the Table (1) Evaluation Summary presents the worldwide market shares of the BI software of the following vendors: SAP, IBM, Information Builders, MicroStrategy, SAS Institute, Microsoft, QlikView, Actuate, and TIBCO. Astragy market share is not reflected in the figure as the vendor did not wish to reveal the market share of its product. Unfortunately, due to limited access to these data and inability to separate and identify BI revenues from the overall revenues of some vendors as IBM, Microsoft and TIBCO, the BI vendors’ market shares for 2008 were not presented herein. Market share of the following BI software: Information Builders, MicroStrategy, QlikView, Actuate and TIBCO for 2007 was derived with BI software market revenue as of 2007 (5.1 billion USD) and the vendors company revenues. Therefore, the market share of the aforementioned vendors is approximate and rough. More clear graphical presentation of BI software market shares presented in the Figure (19).

FIGURE (19): BI SOFTWARE MARKET SHARES AS OF 2007

According to the summary of BI software market shares, SAP has the leading market share with 26% followed by SAS Institute – 14.4%, IBM – 14 % and Microsoft - 10.6%. The BI vendors having the least market shares are QlikTech and TIBCO. Astragy is listed in the
summary table with no indication of its market share as the vendor wished not to disclose its market share. The remaining part of BI market - 18.2% pertains to the rest BI vendors, not included into the research due to the time constraint.

With respect to customer segments (Table 1), the analysis revealed that almost all vendors deliver its BI software to both enterprise and SME businesses with the exception of MicroStrategy that provides BI to mainly corporate customers and QlikTech is considered a leader in mid-market segment.

As per the Table (1) shows that the majority of BI vendors evaluated provide customers with flexible or multiple license options, these are SAP, IBM, SAS Institute, Microsoft, MicroStrategy and TIBCO. Other vendors as Information Builders, Actuate and Astragy have standard pricing structure based on either named-user or CPU-based or both. Besides, some vendors deliver web-based software and offer SaaS pricing model such as SAP, IBM, MicroStrategy, SAS Institute, Microsoft and QlikView. In addition, some vendors offer distinctive features in their pricing models: SAP delivers user-role-plus-server approach, IBM Cognos ’s pricing is role and task-based, Microsoft offers no-charge-for-end-users pricing and QlikTech ’s pricing is cost-efficient as users have to buy what they use.
5.2 BI Software Classification

As per the evaluation and analysis of empirical findings, the BI software can be logically classified into subgroups in terms of its intelligence cycle phases with consideration of their developments and market information. BI vendors, in terms of the support of CI cycle phases, were grouped according to the overall performance of four (4) phases (planning & directing, data collection, analysis and dissemination). BI software is grouped as follows:

1. **Advanced:**
   BI software in this group outperforms in all four CI cycle phases such as planning & directing, data collection, analysis and dissemination. This BI software has one of the leading market shares, is employed successfully in all market segments, introduce significant developments on annual basis and have the flexible pricing strategy.

2. **Competent:**
   As all BI software evaluated does not support planning & directing phase, they can be termed “competent” as they support other three CI cycle phases (data collection, analysis and dissemination) in an excellent or almost excellent way. They also have the leading market shares, work in all market segments, introduce developments on annual basis and have the flexible pricing strategy together with the standard one.

3. **Partially competent:**
   If BI software perform well at least in two CI cycle phases, it is included in this group. Besides they can work either in all or some of the market segments, have either leading or non-leading market shares, provide enhancements annually and have either flexible or standard pricing structure.

4. **Inadequate:**
   If BI software outperform only in one of four CI cycle phase, they are included in this group. Moreover, they work either in all or some of the market segments, provide enhancements annually and have either flexible or standard pricing structure.

5. **Absolutely inadequate:**
   When BI software fails to excel in any of the four CI cycle phases, it is positioned in this group. It can be present either in all or some of the market segments, have significantly
small market share, provide developments annually and have either flexible or standard pricing structure.

This classification is applied in the Figure (20) as follows.

**FIGURE (20) BI SOFTWARE CLASSIFICATION**

On the basis of the evaluation criteria, SAS Institute and Microsoft are positioned in the group of competent BI software; SAP Business Objects, IBM Congos, Information Builders and QlikView are included in the group of partially competent BI software; and finally, MicroStrategy and Actuate are placed in the group of inadequate BI software. There is not any BI software, at least among the software tested, that could be positioned in the advanced and absolutely inadequate category. QlikView could be placed into the competent group if it had the market share relevant to this category.
In addition to the BI software classification presented above, QlikView and TIBCO Spotfire software can fall under a different term other than BI software as they deliver the so-called next generation in-memory analytics, which is faster, much simpler, more flexible and scalable and meet the present-day business needs to a far greater extent if compared to traditional BI. These software vendors are completely different from traditional BI vendors as they provide greatly enhanced & efficient analytic capabilities and do not follow the entire BI cycle, and therefore we propose to term them as “Business Analytics Software” instead of BI software. Besides, as Astragy does not support any BI functions, it should also be termed differently as CI software, not BI software.
CHAPTER SIX
CONCLUSIONS & RECOMMENDATIONS

The objectives of this research were inclined towards analyzing BI software available in the market as well as tracing the developments that have taken place within the sphere of BI software. Specifically, the improvements which have taken place over the past five years, determine the compatibility of BI software to the phases of the intelligence cycle, determine subgroups that BI software vendors may be classified as and assess the changes that these BI vendors have made based on the new upgrades that are announced at intervals.

The empirical and theoretical research has revealed a number of findings as it relates to the developments in BI software. It has been deduced that of the selected BI vendors used for his research, most satisfy all three phases of the cycle, except that of planning and direction. Data collection, analysis and dissemination were applicable to all vendors from a satisfactory basis to excellence in terms of compatibility with the phases. The research has also revealed that BI vendors have made significant improvements in data integration, information delivery, analytics, user interface and reporting. BI vendors are therefore cognizant of the fact that innovation plays an integral role for survival in the BI market. Assessment of the developments in BI software has been propelled by the need to create cost effective products for the various users groups of their software.

As per the analysis of the empirical findings of only (10) BI vendors due to time constraint, we identified that SAP Business Objects followed by Information Builders, IBM Congos and Astragy excel in data collection phase; SAS Institute and QlikView are the best in analysis; SAP Business Objects and IBM Congos surpass in dissemination phase. It should be noted that Astragy was evaluated along with other vendors though it does not provide any BI functions but only provide common functions for supporting the CI cycle phases. Besides, it is made obvious that analysis phase is not supported in a good enough way by BI vendors basing on the total average score for all BI software for analysis (2.9) compared to the total average scores for data collection (3.16) and dissemination (3.67).

Besides, the empirical findings helped to identify that BI vendors introduce their releases with new developments each year. By tracing and comparing the developments of all (10)
vendors, we came to a conclusion that all BI vendors, irrespective of whether it is a leading traditional vendor or small innovative BI, follow the same tendency in introducing BI enhancements by striving to make its software cost-effective, simpler, faster and flexible for use, scalable to manage increasing amounts of data in businesses, accessible to employees at all levels of organization. Moreover, most of the vendors introduced a support for heterogeneous environments and data sources from a variety of vendors.

In addition, the analysis of BI software market share, customers and pricing strategy in the empirical findings revealed that SAP Business Objects had the largest BI market share of 26% percent as of 2007, followed by SAS Institute, IBM Congos and Microsoft. Hence, further analysis of BI market share for 2008 should be carried out to reflect the present-day situation. The analysis of customers’ segments showed that almost all vendors deliver its BI software to enterprises and SME businesses, but for MicroStrategy that work mainly with corporate segment. The investigation of BI software pricing strategy identified that majority of BI vendors employ flexible or multiple choice licensing models along with traditional licensing as named-user and CPU-basis. Some of BI vendors as SAP Business Objects, IBM, MicroStrategy, SAS and Microsoft also support SaaS pricing model. Yet, more detailed analysis of pricing structure and actual cost ought to be made to create a much clearer picture of BI software market.

Finally, as per the results of the software evaluation, based on the overall scores of CI cycle phases, BI software can be classified into five groups: Advanced, Competent, Partially Competent, Inadequate and Absolutely Inadequate. SAS Institute and Microsoft are positioned in the group of competent BI software; SAP Business Objects, IBM Congos, Information Builders and QlikView are included in the group of partially competent BI software; and finally, MicroStrategy and Actuate are placed in the group of inadequate BI software. The analysis of empirical findings identified that there is not any BI software, at least among the software tested that could be positioned in the advanced and absolutely inadequate category.

Moreover, QlikView and TIBCO Spotfire with its in-memory analytics are suggested to term as Business Analytics Software due to its distinction with traditional BI software and non-adherence to the entire BI cycle. Accordingly, the objectives hereof were fulfilled through the theoretical and empirical findings as well as analysis of the empirical findings.

In conclusion, further investigation of all BI software vendors is recommended with an in-depth analysis of CI cycle phases based on the enhanced evaluation criteria, as well as newly
approached analysis and evaluation of recent BI developments, present market shares and pricing structures is suggested for further studies.

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## APPENDIX

### EVALUATION TEMPLATE

### ANALYSIS OF INTELLIGENCE CYCLE PHASES

#### 1. PLANNING & DIRECTING

| Ability to determine the strategic information requirements | 4 | 3 | 2 | 1 | 0 |
| Ability to articulate what information users need | 4 | 3 | 2 | 1 | 0 |
| Ability to construct a model for defining relevant data | 4 | 3 | 2 | 1 | 0 |

**AVERAGE SCORE FOR PLANNING & DIRECTING**

#### 2. DATA COLLECTION

| Ability to gather internal data | 4 | 3 | 2 | 1 | 0 |
| Ability to gather external data | 4 | 3 | 2 | 1 | 0 |
| Ability to extract data from sources with different data carrier human, paper & technical. | 4 | 3 | 2 | 1 | 0 |
| Flexibility & easiness of changing data sources | 4 | 3 | 2 | 1 | 0 |
| Web-based crawling or intranet-based environment. | 4 | 3 | 2 | 1 | 0 |
| Automatic filtering of collected information based on user-defined criteria | 4 | 3 | 2 | 1 | 0 |
| Automatic categorization of collected information | 4 | 3 | 2 | 1 | 0 |
| Ability to catalogue, bookmark, and archive collected documents. | 4 | 3 | 2 | 1 | 0 |
### AVERAGE SCORE FOR DATA COLLECTION

#### 3. ANALYSIS

- Providing an assortment of analysis (10 types +) 4 3 2 1 0
- Capability of providing qualitative analysis 4 3 2 1 0
- Ability to predict the future 4 3 2 1 0
- Ability to extract relationships between people, places, dates, event etc. 4 3 2 1 0

#### AVERAGE SCORE FOR ANALYSIS

#### 4. DISSEMINATION

- Presentation clarity 4 3 2 1 0
- Distribution to relevant decision makers 4 3 2 1 0
- Providing standardized & customizable report 4 3 2 1 0
- The ability to link and export reports to Microsoft Office formats, CorelDraw, PDF, multimedia formats, other databases, and/or other reporting systems. 4 3 2 1 0
- The capability to deliver reports via hard copy or electronic means 4 3 2 1 0

#### AVERAGE SCORE FOR DISSEMINATION