Leveraging business intelligence management to business performance management in a manufacturing environment

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ABSTRACT

No business can effectively be managed without the proper management and information that reflects and creates the milieu it operates in. Business performance management creates the framework in which a structured approach can be followed in setting the scene for a predictive and controllable environment. Business intelligence creates the information structures; information relationships and a reflection of the value chain of the business. By combining the two methodologies it creates a total business solution that harmonises all aspects of value creation in an objective manner.

The aim of this study is to conduct a thorough theoretical study on the relevant aspects involved in business performance management and business intelligence, and to assess the relationship of business performance management and business intelligence within the South African natural resource' mining and manufacturing sector.

The various processes of business performance management and business intelligence are discussed in the literature study. During the literature research several approaches to business performance management implementations and the pros and cons of business performance management are discussed. A broad look at business intelligence is done, with key focus on delivering of information.

KEY WORDS: Business performance management, business intelligence, value chain, out-strategise, primary activities, supportive activities

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CHAPTER 1
NATURE AND SCOPE OF STUDY

1.1. INTRODUCTION

Businesses deliver products or services to customers in the market (Baltzan, Phillips & Haag, 2009:23). Staying in business means one needs to out-strategise competitors through successfully executing the strategy of the business (Frolick & Ariyachandra, 2004:41; Kellen, 2003:2). Businesses need to act faster in the present, to maintain market shares, out run competitors and adapt to customer needs.

Porter's value chain model for manufacturing organisations indicates the primary and supportive activities, which cost leaders focus on when competing in a cost curve market, (Turban, Leidner, McLean & Wetherbe, 2006:44). When a cost strategy is predominant in the business, business performance is key to the survival of the business, by staying the lowest cost producer by creating a wide enough gap between your business' costs and the highest cost producer (price setter) in the market; resulting in the profit margin.

Organisations acknowledge business performance management as an enabler, to define clear goals, actions and to monitor and control the business operations (Baltzan *et al*. 2009:21). Business performance management is also referred to as a series of processes and applications to reach the business's strategic objectives (Mojdeh, 2005:9).

Organisations are expecting improvement through the alignment of business strategies and knowledge, the most valuable asset of the business. No thorough studies concluded the relationship of resource alignment to knowledge management and often this is misunderstood by management and consultants, resulting in poor operational performance (Asoh, 2004:2).

Applied business processes on data are defined as information or converted data into reasonable output formats constituting information. This information could be the calculation of data points to an end result or applied business rules contributing to the information that is output to the decision processes. Business has plenty of data, but realising it into valuable

information that is relevant and could give insight to improve the business performance is mostly a challenge.

According to the Miles and Snow topology, business could be classified according to the behaviour it adopts for business strategy (Asoh, 2004:34). The analysers' profile in business strategy is those organisations that take minimum risk, but in the same time maximise growth in stable markets (Asoh, 2004:35).The processing operation could be seen as an analyser, as they will take calculated risks, while creating market shares and position the business on the best cost curve possible.

Key metrics or better known as key performance indicators is measurable indicators based on value driver information which has an effect on the business (Bacalu, 2007:36). Identifying key performance indicators, one needs to understand the business. What makes it "tick"? From input, processing and output – what are the internal and external influences effecting business performance?

1.2. BUSINESS PERFORMANCE MANAGEMENT VERSUS BUSINESS INTELLIGENCE

Business performance management enables business strategic intent to be obtainable through a series of intertwined processes. Business intelligence enables the function of addressing identifiable gaps in the business processes.

Some confusion exists to what business performance management and business intelligence is, and is not. If business performance management provides a process of improving business and business intelligence leverage the ability to disseminate the information of a business to support business decisions, it would be true to state that you need business performance management and business intelligence, but business intelligence supports the overall process of business performance management. The orchestration of the two processes advances the business's ability to improve on the bottom-line. Business performance management is also the fundamental cohesiveness of all management processes (Mojdeh, 2005:1). As much as 84% of business indicated using business intelligence in some form within the business (Miller, Brautigam & Gerlach, 2006:16).

In the rapid changing and competitive environment businesses operate in, knowledge management as leverage is not enough and not the biggest contributor to increase performance. Knowledge of the business mechanics and applying new avenues to overcome current performance is more contributing to the bottom-line of the business (Asoh, 2004:1).

1.3. IMPORTANCE OF THE STUDY

One of the most diversified mining companies in the world, consisting of more than 100 operations, across 25 countries around the globe is diversified into 10 customer sector groups, to illuminate the products offered into the market.

The manganese business is spread across Africa (South Africa and Gabon) and Australia (Tasmania and Groote Eylandt islands in the South and North of Australia). Raw materials are mined in the Kalahari Desert and sent to the processing plant in the Gauteng province for converting the ore to alloy.

This processing operation is to produce high quality, low cost Ferromanganese and Silicon manganese alloys. By combining manganese ore and other raw materials, it is smelt within sub-merge arc furnaces to the final products. The business consists of eight sub-merge arc furnaces, an energy production plant, raw material and final product management department. The business also has four supporting departments that manage the technical, health & safety, human resources and financial services.

The business has embarked onto a business improvement road, since 2008 and yet business intelligence was not focused in the sense of intelligence by means of cubes and dimensional information nor technology. If business intelligence is used effectively it could improve performance, by means of leveraging on the insight it offers to make improvement decisions (Howson, 2008:2).

The processing operation has earned the position of lowest cost producer in the manganese industry globally. Being on the lowest cost curve also indicates that to stay there, the need to improve ever more. The processing operation was faced with dead-ends to improve even further and insight to how the exact measurable key performance indicators are actually

measured on the value added processes within the business (Phelps, 2004:4). Business need to know what makes them do business, what do they know to survive and thrive in the very quick-changing markets experienced currently (Kellen, 2003:1).

1.4. PROBLEM STATEMENT

A certain amount of confusion does exist, even in the business intelligence world, to what actually is meant by the terminology. Business intelligence is neither a technology nor the warehouse in which all the business data is stored. Business intelligence is the way in which information, across functional areas within the business, is interpreted to give enriched paradigm shift information that will enable decisions to be made for the better of the business (Howson, 2008:2). The depths of business intelligence's enrichment as a tool include scorecards, dashboards, predictive analysis, and BI search and visualisation of the information. By exploiting the gaps and relationships of information dimensions bring another level of insight and knowledge to the business.

Many businesses struggle to disseminate strategic goals into workable set points in the lowest level of the business. The roll-up of the lowest level measuring points need to total up to the high level goals of the business. This sometimes does portrait its own challenges. Not only is the dynamics important but also the collaborative channels between line management and the workforce.

Businesses usually find themselves in situations where projects do not deliver as expected or consultants overpromise the deliverables and customers do not get what they had asked for. To "wire", aligning business measurement points to organisational positions, a business and the focus in the initial project start-up is what drives the business. What needs to be measured and in which frequency? How does this articulate into the strategic goals of the business? For the consultant to deliver on a real business performance management, the business sense, measurement dimensions and accountability positions is critical. Fitting all of this into a collaborative, monitoring and controllable environment is even more challenging.

1.5. CAUSAL FACTORS

The causal factors for this study are the following:

- The natural resource industries have become under high pressures around the globe and cost effectiveness is highly sought after.
- An investigation indicated that the maturity level of the natural teams in the business has been engrained and possible business improvement processes would be easily introduced into it and positive return could be capitalised on.
- Operating costs were not on satisfying levels and being on the lowest cost levels will result in more profits. This was established before the great recession the world experienced in late 2008 and the first half of 2009.
- Staying competitive is crucial as a business can easily lose market share in the very dynamic international environment.
- An initial investigation indicated that management strategy is not filtered through to the lowest level within the business.
- The investigation also indicated that measurements against these strategic goals are non-existent in some cases.
- No standardised measurements and progress review sessions existed, which highlighted risk of business continuity to address the strategic goals.
- High level indicators were not possible and countless time was dedicated to align actual facts to be rolled up to the highest level in the business.

1.6. OBJECTIVES OF THE STUDY

The objectives of the study are split into primary and secondary objectives.

1.1.1. Primary objective

The primary objective of the research is to establish a relationship between business intelligence and business performance management.

1.1.2. Secondary objectives

Secondary to this, the following will also be investigated:

1.1.3. Theory evaluation:

1.1.3.1. Perform a literature study to research the different aspects of business performance management and business intelligence.

1.1.3.2. Perform a literature study to indicate the relationship of business intelligence and business performance management.

1.1.3.3. Provide an overview of a business performance management implementation framework or models found in literature and business environments where it was implemented.

1.1.3.4. Perform a high level assessment of the current status of business performance management in the mining and manufacturing sector, with emphasis on successful implemented processes.

1.1.4. Empirical research:

1.1.4.1. Investigate the opinions of respondents of the maturity levels of different business performance management and business intelligence principles.

1.1.4.2. Investigate a readiness for implementing a business performance management process with specific emphasis on information availability to support a business performance management roll out process.

1.1.4.3. From both the theory and empirical research the final objective is to recommend practical design principles which can be used to implement a business performance management programme which will result into a competitive advantage to the mining and manufacturing sector.

As can be seen from the above objectives, a broad spectrum of aspects will be researched in business performance management. Based on the literature a survey will be designed to determine the maturity of the business performance management process, the availability of information and possible models to utilise for engraining business performance management.

1.7. SCOPE AND DEMARCATION OF STUDY

The study is to focus on the mining and manufacturing businesses of South Africa where business performance management and business intelligence are present. The focus is to understand the contribution of the correct value drivers that leads into decisions being made to enhance the performance of the business and to indicate a model for adoption by other mining and manufacturing businesses.

The study will be limited to primary sources within the mining and manufacturing sector, with specific reference to the processing operation in Gauteng. Secondary sources of information were limited to those generally available on the Internet, in the form of English documents and generally available literature study.

1.8. LIMITATIONS

The surveys will be limited to the mining and manufacturing sector from executive to engineer's level in the business. The objectives set out will be covered within the survey only.

1.9. RESEARCH METHODOLOGY

Literature Study

Various publications were reviewed during the completion of the literature review. These included text books related to the field of information management, business process management and business intelligence.

Journals and websites were also accessed. The following topics were explored:

- Defining business intelligence and business performance management.
- Frameworks of business performance management used in the industry.
- Relationship to business strategy and value chains of manufacturing and mining operations.

Empirical study

Empirical research was done conducted by means of a structured questionnaire. The study population included mining and manufacturing businesses, from executive to engineer's level. The data was collected in electronic format by means of web based survey services.

1.10. DIVISION OF CHAPTERS

Chapter 1 – Introduction and problem statement

Chapter 1 serves to supply the background to the study. Important concepts on business performance management, business intelligence, the right information, information gaps and business performance processes within the organisation are touched on, as well as a discussion on the relationship of business performance management and business intelligence of an organisation. Thereafter, a short discussion on the implementation road will follow in business improvement. The reader will be introduced to the organisation as well as the elements of a typical business improvement process constituting business performance management.

The problem statement highlights the objectives and strategy of the organisation, and from this the primary and secondary objectives of the study are derived. The remainder of the chapter covers the scope of study and research methodology.

Chapter 2 – Literature study

Chapter 2 contains a literature review on business improvement. Some concepts that will be explored include:

- Defining business performance management
- Defining business intelligence
- Relationship between business performance management and business intelligence
- Define business strategic management
- Explain Porter's value chain within business performance management
- Creating a business performance management road map, processing operation approach
- Describe in detail the elements, tools and systems utilised as part of a processing operations review and performance management process.

Chapter 3 – Research methodology and findings

Chapter 3 contains a comprehensive explanation of the research methodology that will be followed to complete the empirical study. This will include the data gathering process, as well as an analysis of the findings and presentation of results.

Chapter 4 – Conclusion and recommendations

In this final chapter conclusions will be derived from both the literature study as well as the results of the empirical research. The conclusion will aim to present a response to the problem statement and objectives as defined in Chapter 1. Practical recommendations for business performance management to the broader group will be discussed.

1.11. CONCLUSION

It is a fundamental decision to improve a business to stay competitive in the market. Even so, being more and more proactive, quicker to respond and to understand the complete environment the business operates and to stay focussed with the business strategy remains a challenge. Utilising processes, tools and knowledge to attain right of existence in the market is imperative.

1.12. CHAPTER SUMMARY

The culmination of business performance management and business intelligence to assist businesses to address the strategic gap within an organisation is of utmost importance. Insight to the processes and defining and embedding it into the organisation is instrumental to the success of investments made. Adapting to the way businesses need to run its operations, focus on the correct measurements that impacts the bottom-line and to actively control the process to reach the strategic goals will create the gap between competitors.

CHAPTER 2
LITERATURE STUDY

2.1. INTRODUCTION

No business can effectively be managed without the proper management and information that reflects and creates the milieu it operates in. Business performance management creates the framework in which a structured approach can be followed in setting the scene for a predictive and controllable environment. Business intelligence creates the information structures; information relationships and a reflection of the value chain of the business. By combining the two methodologies it creates a total business solution that harmonises all aspects of value creation in an objective manner.

Business information requirements are becoming more and more of a necessity to run a business successfully (Lonnqvist & Pirttimaki, 2006:32). Some businesses have fast amount of data but it's not formalised into aggregated management information within the system and usually gets reported in Microsoft Excel. Due to the high performance that is required in the business environment, rich information is needed to obtain proper insight into the business performance and to identify opportunities. Business performance management and business intelligence facilitate a proper approach to strategic goal setting of a business and to formulate it into lower levels within the business. Business performance management does not only facilitate the processes in identification and creation, but also addresses the planning, monitoring and corrective actions of the business management aspect, (Ariyachandra & Frolick, 2008:114).

Several invested projects have failed by poor understanding of business intelligence and business performance management processes. Project sponsors were either confused by the meaning of the processes and thought the one would deliver the other's outcome and resulted in negative perceptions on both side of these investment options.

To understand the processes and getting an understandable representation of what it purport, an explanation will be supplied on both methodologies and approaches of implementation. The aspects of only one present in a business will also be distended.

2.2. BUSINESS PERFORMANCE MANAGEMENT

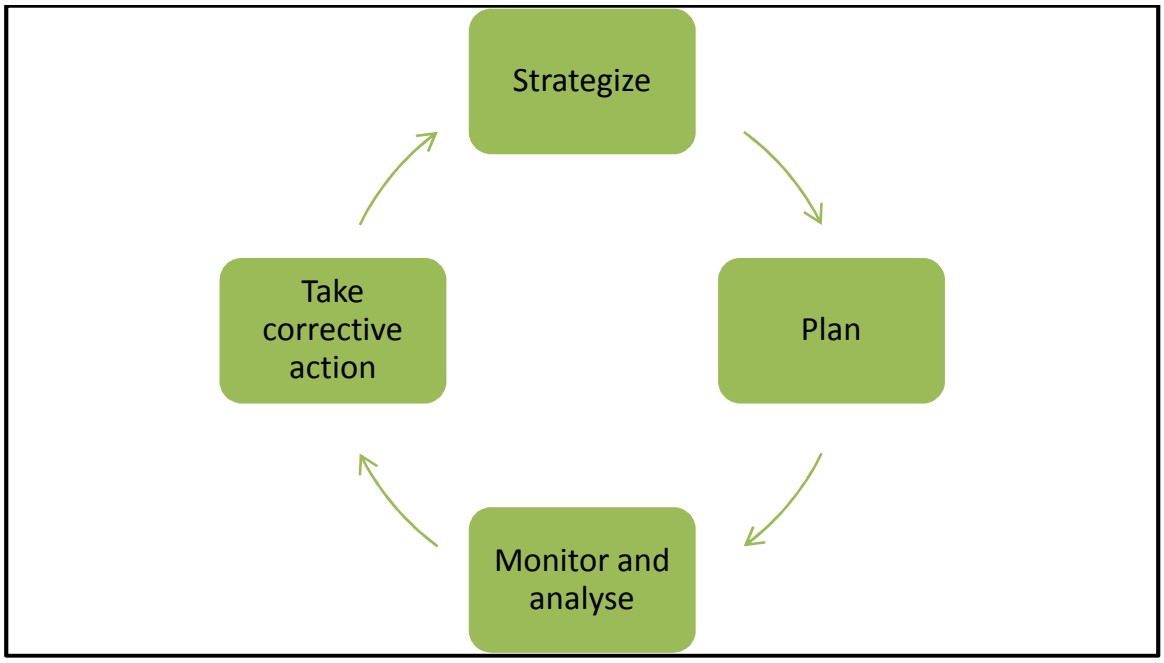
To reach the moon (goal), a road needs to be mapped, the flight needs to be monitored and controlled and the landing on the specific spot is reaching the goal set up front.

In business context the following defined statement describes the reasoning what business performance management is all about. It is defined as the enabling business process that aligns business strategy, operational objectives and business activities, to manage performance through better informed and proactive decision-making actions, resulting in common organisational objectives (Ballard et al., 2005:3) and (Ariyachandra & Frolick, 2008:113).

To enhance the understanding of Business Performance Management, the framework will be exploded, as can be seen in figure 2.2.1. The framework indicates the four areas and rotation the process will follow, starting at the “Strategize” block.

- **Strategize** – defining the way to identify business strategy, the discovery of key value drivers to accomplish strategy and create metrics to monitor the performance, (Ariyachandra & Frolick, 2008:114). To be competitive, one needs to stay competitive. This is accomplished to challenge the boundaries of performance. To strategise, owners or executive management of the business, review the past performance of the business and decide on future intent or direction for the business. This is also supported by a SWOT analysis.
- **Plan** – defining a road map that is followed with specific projects, budgets and activities to fulfil the strategy. Planning to build a bridge from the current status of the business to the to-be state. If the goals were defined as part of the strategy process, planning will include the formulation of required key indicators to measure the progress towards the goals. Identification of gaps on measuring points is normally done in this process.

Figure 2.2.3.1: Business Performance Management Framework



Source: Adapted from Frolick & Ariyachandra, 2006:43

- **Monitor and analyse** – actual performance against target values are reviewed and dissected to understand the post actions taken resulting in the current position. Monitoring is continuously measuring how we are moving towards the target. Think of the GPS in your car, continuously tracking your move on the road, any deviations, you'll get the word. The same with businesses, progress need tracking and alerts to indicate to decision makers the course taken is not delivering the required results or we are on track.
- **Take corrective actions** – by understanding the status quo, rectification with identifiable reactions to re-align the actions to achieve the desired performance levels. Adjusting the driving direction will result in you reaching your destination. Available information will give you insight to what happened. Part of corrective actions is also tracking the status of the action. Have we done what we said?

These four steps are a continuous loop of processes to be followed, as long as a business exists. The goals will determine the monitoring focus, while the corrective actions will be determined by the current status of the business. The planning will follow the goals and map out the detail of achievement.

The business goals are aligned horizontally and vertically throughout the business, to ensure the business goals are measured at the source and all are focusing from the lowest level in the business to the top. This means the contribution, how small that you might have in your area of accountability, sum to the greater total of the over arching key indicator of the business.

Actions are taken proactively and directed to the source of rectifications. Employees can view the correct metrics and have insight into the performances. Business performance management improves team effectiveness and productivity (Ballard et al., 2005:5).

Business processes and applications need to be in concert with one another, destroying silo effects and misalignments of data, information and processes. This alignment brings forth the correct measurable on goals and distribution to all relevant parties. Business needs to understand what needs to be continuously monitored, how often it needs to be reviewed and what steps to put in place in order to maintain the necessary performance levels.

The objective of business performance management is to help organisations with improvement and optimization processes across all aspects of the business. In order to be rapidly flexible the business needs to understand the playing field, the current situation of the business and the players in each position to contribute, (Ballard et al., 2005:30).

2.2.1. Business Performance Management Roadmap for Manufacturing

How do we approach a beast like this? It sometimes sound very simple and when we approach it, we found it to be somewhat difficult and scope creep on the project highlights this quite quickly.

Types of approaches

Business starts off usually by one of these three approaches:

1. Enterprise wide – the approach will be top-down through strategic change. This approach has the longest timeline before realisation of benefits will be seen. Much more planning up front will take place in order to include all operations. This approach

will also have several iterations of deployment and upgrades to relevant operations, as they need to align to the processes and system standards.

2. Cross-functional – smaller approach to the above and includes some functions like finance and supply processes. It could be smaller like regional based.

3. Functional– based on functional area and will not necessarily mean the implementation will drive new strategies, but rather control and improve performance in a certain function like Human Resources.

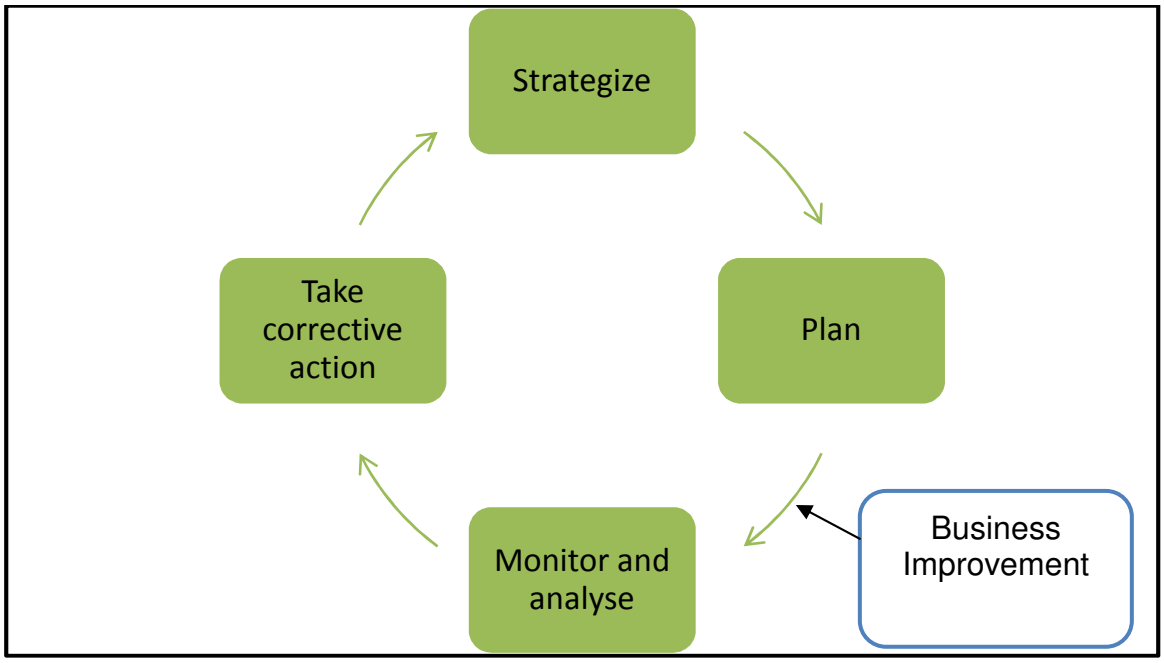
4. Mixed – this is a combination of all functional areas in the business, but is demarcated by a section within the business. i.e. a production unit of a production facility, where costing, human resources, health & safety, maintenance and production are all present, but at a very small scale of the business.

2.2.2. Business Improvement

Business performance management can include a business improvement process where innovation is supported until it realises into measurable and cultural change benefit for the organisation. This is done through an injection of improvement ideas after planning, as a secondary “planning” process that redefines, in some cases, the key performance indicators that are monitored in the next process.

Figure 2.2.1.1 indicates the blue block for position of this process into the business performance management process. Why is this done? Think of your old computer that may have a turbo button. This is the same. Although the business performance management puts all effort in concert, this improvement process unlocks stored potential within the business to be reaped. This is continuously asking the question: “Are we moving fast enough?” Institutionalise idea generating cultures within the business to create a capacity of improvements that can be assessed and prioritised for implementation.

Figure 2.2.3.1: Injection of Business Improvement



2.2.3. Why Business Performance Management

Business needs to become more responsive and flexible to minimise disruptions to operations. Business also needs a single place to have a current view of their organisations. The major drivers for implementing business performance management solutions are the US Sarbanes Oxley Act and the new European Basel Capital Accord (Base II). Base II is a critical piece of legislation that will impact how data and processes are integrated and how risk-management, finance and operations function. It also encourages providing information for better performance management, risk-management and capital decision-making (Ballard et al., 2005:17).

2.2.3.1. Advantages

Business performance management gives the business the ability to reduce costs, increase revenue and ultimately provides a competitive advantage. It also recognises proactive monitoring, measuring and attaining performance targets. The ability to monitor business processes also creates the opportunity to improve and manage these processes (Ballard et al., 2005:24).

By unification of the business performance management processing and business intelligence system it results in business process effectiveness. The result of the unification also defines the simplification of the data structures in the business performance management and business intelligence systems. Business performance can be compared, monitored and aligned with the business strategies, goals and objectives when integration with business intelligence is done.

2.2.3.2. Disadvantages

The disadvantageous impact of not having business performance management is bullet below:

- A common threat is information - availability for business performance management
- Silo effect of decentralised information hubs within the business
- Lack of transparency on enterprise level, only departmental or functional area views available
- Timely activities in aggregating information for higher levels within the business (Ballard et al., 2005:25).

2.3. BUSINESS INTELLIGENCE

Business Intelligence is defined in more than one way by people, like, the right information to the right people at the right time, utilising information effectively or to realise business success by means of accessible information that can be put into action (Howson, 2008:1; Schauer, 2004:58).

Business intelligence is also referred as the application or technology layer and techniques used to gather, store, analyse and provide business information in a timely and easily manner within the technology stack.

Business intelligence enables the business to make more effective decisions with the information at hand. The technology gathers information systematically, which could be analysed, disseminated (slice & dice) and compared from internal and external sources of the

business environment (Lonnqvist & Pirttimaki, 2006:32; Turban, 2006:423; Baltzan et al., 2009:11; Howson, 2008:1).

The purpose of the business intelligence process is to identify and gather vast amounts of data and information within and outside the business into a more condensed format that will bring richer information trends (intelligence) to the audience.

With the capability to extract information in ways and means that put context and patterns to information, business intelligence would add value only to the business when acting upon opportunities identified within the business performance and information patterns (Howson, 2008:4).

2.4. DATA COMPILED INTO INFORMATION

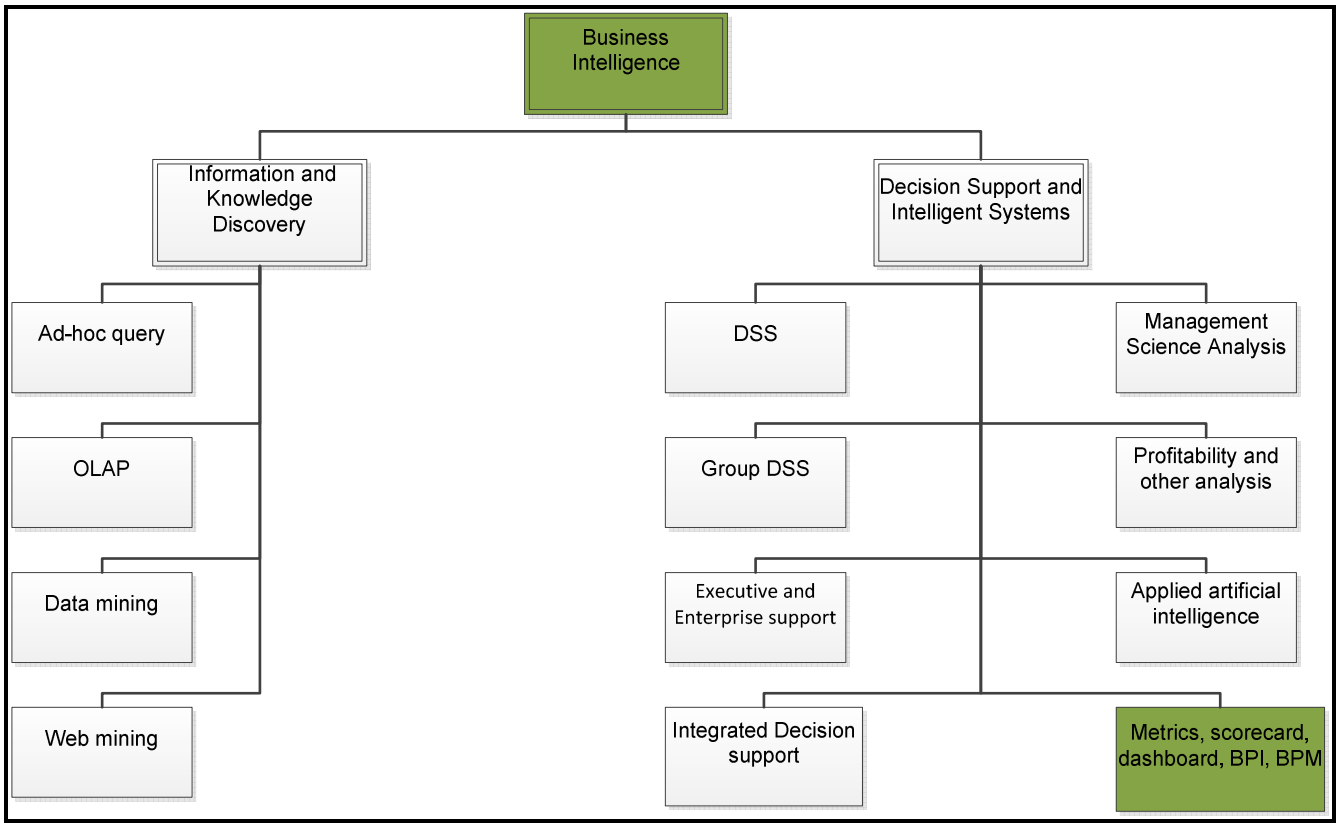
The operational raw data are usually kept in data sources like database systems, electronic documents and/or physical documents across the business. The information is gathered into a multi-dimensional data warehouse in order to construct queries, reports or analysis on the information, for decision-making (Turban, 2006:424). The information can be conducted in real-time, but is limited to the latest upload of complete data sets to the warehouse. Patterns are evaluated and meaning is added to the information. A response is formulated based on the patterns of the information and the knowledge that was added (Baltzan et al., 2009:98). Applying knowledge to the information viewed, knowledgeable actions are given to improve processes (Baltzan et al., 2009:98).

Key statistical figures or key performance indicators indicate the perfectness of a process. The data mining tools could be utilised to slice and dice between different areas in the business or to identify the underlying issues. Understanding the process failure modes, will lead to mitigating actions and be verifiable through key performance indicators.

Business intelligence (not the technology), needs to be competitive and is enabled through fairly available technologies, distribution of intelligent information to all people within the business and a performance based culture within the business (Baltzan et al., 2009:98, 99).

A typical business intelligence environment could be broken into reporting, analysing and data mining. Figure 2.4.1 below depicts the split of the two major categories in the business intelligence layer from a business process perspective.

Figure 2.2.3.2.1 Categories of business intelligence



Source: Adopted from Turban, 2006:425.

The “Information and Knowledge Discovery” stream defines the analytical processes of searching for opportunities within the business environment. The “Decision Support and Intelligence Systems” stream refers to the analytical result to be put through decision processes to identify the most valuable option for the business to take. The “Metrics, scorecard, dashboard, BPI, BPM”-process block is also utilised to perform the monitoring process in business performance management. This metrics and scorecards are key performance indicators defined to support the goals of the business. When fully developed, the metrics and dashboards are deployed to all within the business that has a part of accountability towards the over arching indicators of the business.

For some businesses the products and services delivered by business intelligence is not on the same level of maturity as some will reflect on it through a single market-project and others through a continuous process that delivers products and services to different users (Lonnqvist & Pirttimaki, 2006:33).

Performance metrics can be developed for business intelligence to indicate investment positions of the business intelligence project to executives and to indicate the correctness of application to the user group, (Lonnqvist & Pirttimaki, 2006:33). Investment costs for a business intelligence solution and the benefits that it will deliver are pivotal in the success delivery of the project. Although these measurements are quite challenging to measure, the proposed benefit of a Business Intelligence solution, is to measure the realised cost saving, ideas generated from using the intelligent information (Lonnqvist & Pirttimaki, 2006:34).

Business intelligence performance measurements within an organisation could typically phase:

1. Identification of information needs
2. Information acquisitions
3. Information analysis
4. Storage and information utilisation

The above phases could be defined as what information is needed to be measured and why it needs to be measured. What information could be combined with other information to indicate a key relationship of business activities that impacts business performance? The third is how to analyse the information. Relationships between information groups are in some cases not relevant at all and knowledge of the business is required to understand the relationships. Lastly, the period of storage and how often the information is available, on-time and to the right people making the decisions (Lonnqvist & Pirttimaki, 2006:37).

2.4.1. Investment into Business Intelligence

Some of the very difficult calculations to do are the return on investment (ROI) on information technology projects. Although ROIs get compared to see viability of investment options to the business, key project stakeholders do find it very difficult to stick the neck out on a number to

indicate for business intelligence, (Howson, 2006:40). The best practice in the business intelligence space is to rather evaluate the business performance after implementation of such functionality (Howson, 2008:68).

2.4.2. Technology

Source systems like operational or manufacturing, sales, supply, financial, customer relationships (CRM) and external sources feed into the data warehouse through the Extract Transform and Load (ETL) layer of business intelligence. The data warehouse' data structures are set up in multi-dimensional tables to give the richness of slicing and dicing of information to relationships like time dimensions.

The integrity of the data, management of the data in the warehouse and development of front-end tools to the users will dominate the success of the business intelligence project. Business intelligence tools like query, reports, analysis and alerts could be set up to view the information. Business involvement to assist in the selection process and tools that are available in the technology will support the adoption rate by the users (Howson, 2008:166).

Different levels of users will use different depths of data and tools of the business intelligence technology. Normally the tool will be able to secure data points to restrict the users access. The famous Excel spread sheets are not demolished from the environment. Microsoft has seen the flexibility the product offers by itself and incorporated it as an add-on to the environment whereby cubes can be refreshed into the sheets and additional slice and dice power could be added like Microsoft PowerPivot add-ons.

The depth of the tools being deployed into the business and segmentation of the users, will define the platform of information the user will excel from. It is notable that the production environment is not to be seen as being utilising analysis or statistical business intelligence tools, as mentioned in a survey result (Howson, 2008:173). The picture has somewhat changed due to these gaps being identified by the maturity of the manufacturing execution system (MES) manufacturers. New products in this space have been developed like Dynamic Process Management (DPM) and Enterprise Manufacturing Intelligence (EMI) of

Wonderware software suite, to give the production user the capability to analyse real-time financial and production data, (Martin, 2004:1).

2.4.3. Advantages

- Single point of truth is one of the advantages all businesses familiarise themselves with. Information is scattered all over the business and to try to pinpoint the exact source or latest update, could be a daunting task. If data is managed within a business intelligence environment, there is only one source of the data, where everybody gets their information from. With a matured business intelligence system, it is possible to do predictive analysis for the business, based on the external pressures. Such businesses normally are very innovative, flexible and could easily adapt to market and economic conditions (Miller, 2006:4).
- It also allows people to interact with the same data concluding several different scenarios, performance measures and information patterns, whereby source data is aligned and the business picture painted can be trusted (Howson, 2008:2).
- Better decision making to improve the business processes (Schauer, 2004:58).

2.4.4. Disadvantages

- Implementation of such systems are very costly and timely
- Business understanding of deliverables versus consultants promises
- Business' clear understanding of its value chain and processes – reflects in rework in the development layer of the project

2.4.5. Summary

Business intelligence is not about having a BI-software suite available in your business, but it's the combination of having sensible, structured and representative information available at the right time to the right people.

Approaching a business intelligence project would not be easy and justification of the ROI would be very difficult. Businesses would struggle to survive without it, as information is not

readily available to the decision makers. This will result in opportunity losses when it count the most.

2.5. RELATIONSHIP BETWEEN BUSINESS PERFORMANCE MANAGEMENT AND BUSINESS INTELLIGENCE

With the look at defining business performance management and business intelligence it is clear that both processes need information. It is also evident that business intelligence encompasses the workhorse of information, by means of extractions, manipulations to data, based on the business rules and by reporting and analysing information by means of dashboards, reports and analytical capabilities (Ballard et al., 2005:28).

Analytical capabilities from a business intelligence perspective, is to build and demonstrate relationships between entities and to supply the user with rich functionality to explore the possibilities within the information patterns.

Business performance management on the other hand was defined with some processes not being built into systems due to the collaborative aspects of outcomes that is finalised between groups of people. This type of functionality is not technology driven, but is based on knowledge obtained and available at the individuals to design, agree and monitor objectives for the business. It is also clear that it would be very difficult to maintain high level of success with only one of the processes. It is also evident that the one fulfils the other in a relationship where information is transferred between processes to overcome the obstacles in order to reach the desired goals.

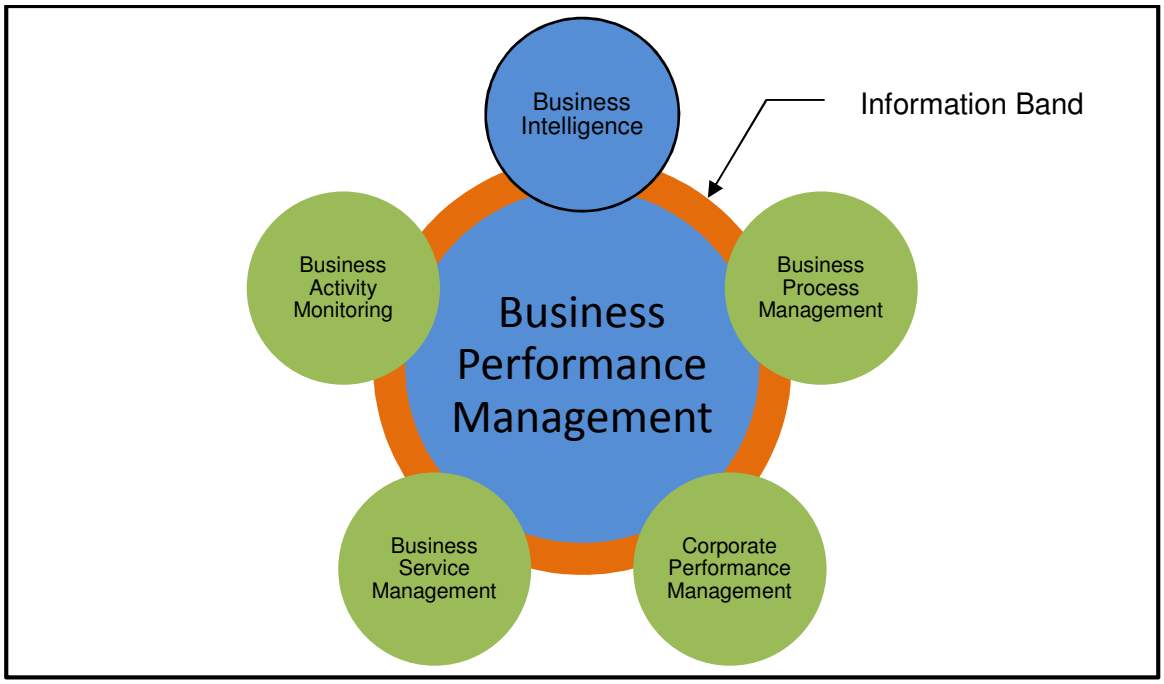
Business process effectiveness is enhanced by unifying the business performance management and business intelligence environments. Information is distributed across the enterprise through the use of information technology.

From the definitions it is apparent that there are two processes and it is aimed at achieving business performance. Literature confirms this and states that there is a clear differentiation between business intelligence and business performance management and researchers generally agree that business performance management is not business intelligence and vice versa (Ballard et al., 2005:13; Ariyachandra & Frolick, 2008:42, 113). What was also evident

is that the business performance management area is still new and not widely distributed as a product in businesses. For managers it is crucially important to understand the processes, but more importantly to invest into these processes from an organisational perspective. A survey done in 2006 indicated a 53% of companies cited budgeting as the leading component in a business performance management initiative (Stamford, 2006:2).

The integration of business intelligence, business process management, corporate performance management, business service management and business activity monitoring; as shown in figure 2.5.1; creates a single view of the business performance management functions (Ballard et al., 2005:3) that supports it. These functions are interlinked by an "information band". It is apparent that business intelligence will contribute to the business with information structures and dimensions, as previously discussed. By having these insight to the processes and information, results in better actions to be taken against goals to reach the business objectives.

Figure 2.2.3.2.1: A holistic view of Business Performance Management



Source: Adapted from Ballard, et al., 2005:3

The strategic goals of a business in not always very well understood within the business, as a survey result showed, less than 60% of senior managers had a clear understanding of the goals in the business (Phelps, 2004:6).
The common theme across the functions for business performance management is information, as can be seen in figure 2.5.1, with the orange band. It is the common ground for all in the business, to know what is to be monitored and controlled in order to attain organisational objectives.

2.5.1. Business Strategic Management

Strategy is the action plan that is derived to excel the business into a more favourable position based on profit, stakeholder interest and strengthening of the business for the future (Thompson, et al., 2009:6). By having a sustainable competitive advantage will ensure a lasting customer preference to be formed for your product and your business (Thompson et al., 2009:7).

The strategy a business' executives put forward is the best future indication that will influence investments and market share. This is influenced by a number of approaches:

- "Actions to gain sales and market share via lower prices, more performance features, more appealing designs, better quality or customer services, wider product selection, or other such actions.
- Actions to respond to changing market conditions or external factors.
- Actions to enter new geographic or product markets or exit existing ones.
- Actions to capture emerging market opportunities and defend against external threats to the company's business prospects.
- Actions to strengthen market standing and competitiveness by acquiring or merging with other companies.
- Actions to strengthen competitiveness via strategic alliances and collaborative partnerships.
- Actions and approaches used in managing R&D, production, sales and marketing, finance and other key activities.
- Actions to strengthen competitive capabilities and correct competitive weakness.

- Actions to diversify the company's revenue and earnings by entering new measures. (Thompson et al., 2010:10).

These approaches all reflect the need for information to ensure timely decisions.

2.5.2. Summary

The equation reads, good strategy and good strategy execution will result in good management (Thompson et al., 2010:17). The good strategy plan that is derived based on intent of moving the business from the current status quo to the future position and executing against the strategic plan will result in a good performance of the business. In order to obtain this good performance, the Business Performance Management and Business Intelligence processes support the capability to be available for management to obtain good results. As described earlier, Business Performance Management is the culmination of strategy, performance and actions. Business Intelligence on the other hand will supply the information available to make strategic decisions.

2.6. CONCLUSION

It is apparent that business performance management is an information "requester" to move from the one process to the next. Business intelligence is an information workhorse, extracting, transforming and loading relevant information and supplying it to the appropriate decision makers.
It is not transparent to what the relationships are between the two spheres.

Business performance management are not based on technology nor information, but the success of the process is dependent of having information to action against. Business intelligence on the other hand fulfils the need of the business performance management processes.

Highlighting some key aspects to both processes:

- Business performance is influenced by the means to have the right information available to the right people in the organisation at the right time.

- Business ability to grow in the respective industry is related to the capability that is possible to lower the business strategic goals to the lower levels within the business.
- Business Performance Management is a different process that entails strategizing, planning, monitor and controlling and corrective actions to be taken.
- Business Intelligence is the culmination of data to supply rich information through queries, reports and analytical tools within the technology.
- Business Performance Management delivers improvement to the business by means of leveraging on Business Intelligence for informational substance to make decisions.

2.7. CHAPTER SUMMARY

Firstly we discussed what business performance management is and what it is constructed of. The sphere starts with the strategising, planning, monitor & analysis and finally corrective actions processes.

Secondly, the approaches for embedment of a business performance management were discussed. It would be dependable on the business' approach to which approach is applicable for their project.

Thirdly, business improvement as a "turbo" button to the business performance management process was discussed and can be seen as a second planning process delivering inputs into the business performance management process.

The reason why business performance management is a needed process in today's businesses were discussed and the pro's and con's were weight up. It is more advantageous to have it, than not having it.

Business intelligence were discussed in brought context through what it is, how data gets transformed into sensible information and justifying investment of such a project. The technology of business intelligence in lower levels of the business like operations is a newly added dimension in the market. The technology is developed for real-time environments that

are quite different to transactional based systems like enterprise resource planning (ERP) systems.

Advantages and disadvantages are weight up and two major factors on both sides are to be taken of note: advantage – information availability, disadvantage – return on investment and delivery of a successful project.

Lastly the relationship between business performance management and business intelligence are discussed and indication is that there should be. The two spheres are dependent on each other to produce workable output for the business.

Chapter 3 will cover the research methodology and findings of this literature study and conclusion of some relationships will be drawn.

CHAPTER 3
RESEARCH METHODOLOGY AND FINDINGS

3.1. INTRODUCTION

In chapter 2, Business Performance Management and Business Intelligence were defined and assumptions were made if the two spherical processes could have some relationship(s) with one another and in what context. In this chapter the focus is on obtaining evidence for the research objectives laid out in §1.6. In addition, the survey findings are presented.

The aim of the survey is to understand the relationship of business intelligence on business performance management within the mining and manufacturing sector. Both these supporting frameworks have huge benefits to the business, if deployed and understood correctly.

3.2. DISCUSSION OF MINING AND MANUFACTURING ENVIRONMENT

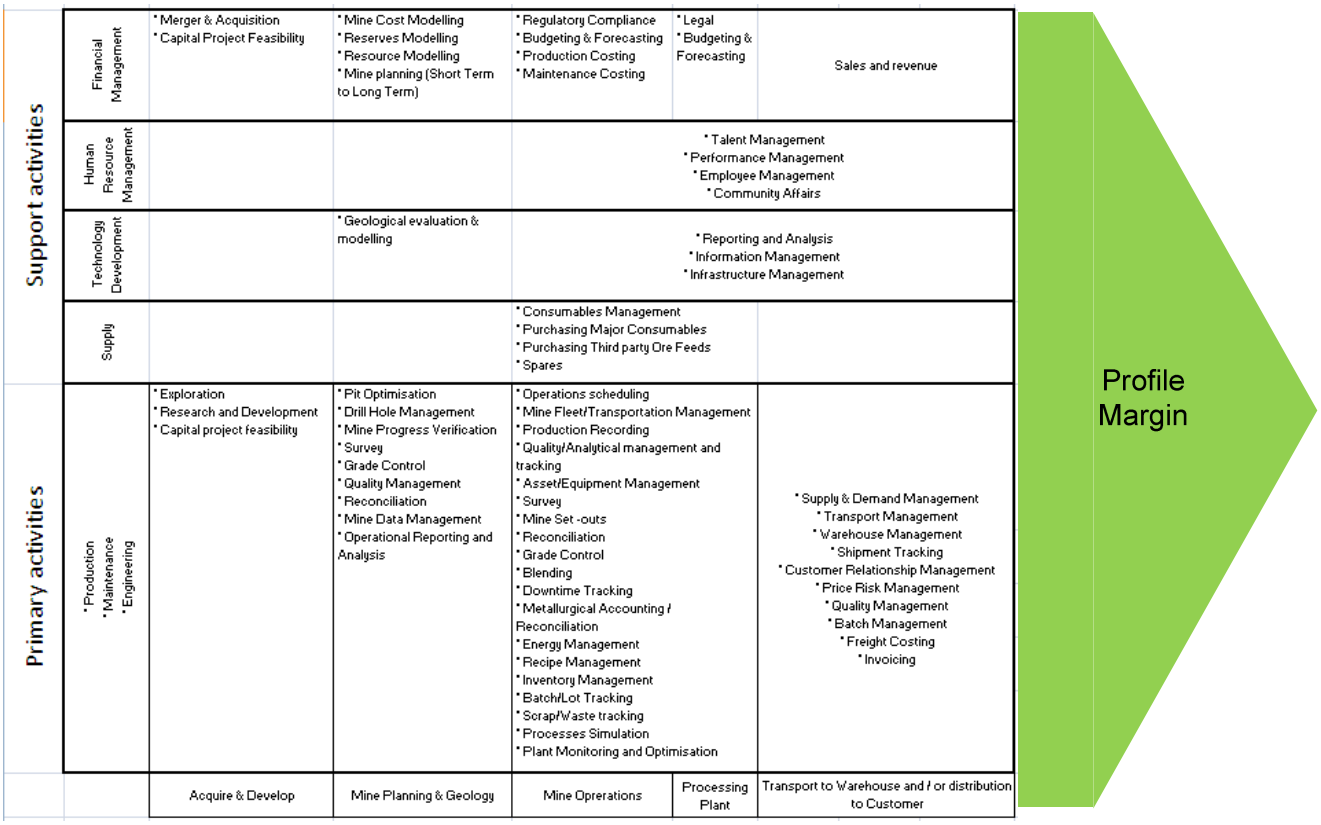
The mining sector of South Africa is the fifth or sixth biggest contributor to the GDP of South Africa. Also the largest producer of platinum and one of the leading producers of gold, diamonds, base metals, coal and the best grade in manganese ores in the world. The biggest natural reserves held in South Africa are gold, platinum-group metals, chrome ore and manganese ore.

The metals industry, subset of the manufacturing sector, makes up a third of South Africa's manufacturing. As this is seen as a beneficiated process or processing of primary resources to a final or semi-finished product for the market. The manufacturing environment is running under utilisation due to raw material input constraints, caused by rail capacities. South Africa is a net exporter of steel products.

The value chain of the mining and manufacturing industry could be summarised as the acquiring, mining and supplying of natural resources to the market in raw or processed into semi - or final product format. Manufacturing downstream in the same commodity is usually considered due to supply chain constraints and/or better value propositions for units of

products sold or placed through the value chain. Figure 3.2.1 indicates a common value chain for mining and manufacturing.

Figure 2.2.3.2.1: Porter's Value Chain for Mining and Manufacturing



Source: Adapted from Turban, 2006:515

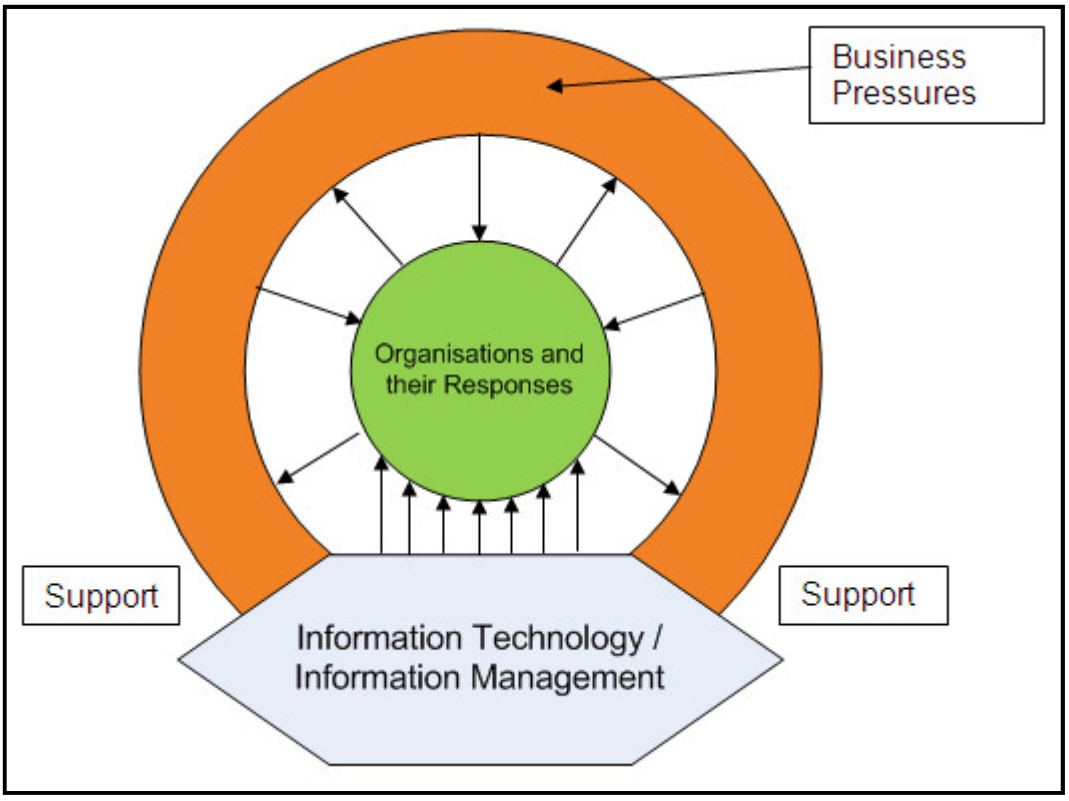
It could be considered a given to understand the internal operation of a business and in today's milieu external factors or pressures are having more impact on high performance.

The macro-economic policy is the major driving force behind economic activity and also environmental impacts. The policy aims at economic growth, increasing employment, positive trade balances, combating inflation and equity.

As earlier stated, mining and manufacturing can only be profitable if the cost to produce is kept to the minimum. From Figure3.2.1 it is also visible that the value chain can become complex and management spans across a wide range of functions to support it.

When external pressures; indicated by Figure 3.2.2; like societal and external market are forced onto the business, it would require synchronised efforts in the right direction, to keep the boat afloat, (Turban, 2006:13).

Figure 2.2.3.2.2: Information Technology Supporting Organisations



Source: Adapted from Turban, 2006:12

These external pressures in respect to South African context are rail constraints that impacts mine production output to terminals for exports; unskilled worker class, stable and adequate energy supplies to feed production facilities, environmental impacts currently experienced around the globe and equity imbalances within the mining industry.

The aim of the questionnaire is to establish an understanding of the relationships between business performance management and business intelligence's level of application within the natural resource sector.

3.3. THE PROCEDURE AND SCOPE OF THE QUANTITATIVE RESEARCH

The empirical study focuses on the mining and manufacturing, of natural resources industry. It spanned across a range of natural resource sectors and across the management levels within the businesses. The usage of business intelligence and business performance management were analysed, based on sub-processes of business performance management, as well as the relationship in which business intelligence assisted the businesses through information.

The reason for the study was due to the most minuscule study in the manufacturing and mining for these two aspects. Other studies are starting to develop in this area and software vendors are aligning their products to deliver on some aspects. Some studies now starting to surface, indicates the need for real-time business intelligence within a production environment. These industries are real-time based, which enlarge, are captive to quick response against negative impacts in the business. This indicates a far more robust and enhanced business intelligence system to support such quick response times.

3.3.1. Survey instrument

Conducting data collection through surveying is one of four data sources that are used in gathering data from the sample in a population. The other three: distribution of data by organisations, designed experiments and observational studies are the other three data sources, (Levine, Stephan, Krehbiel & Berenson, 2008:6,7).

Research can be grouped into two categories: quantitative and qualitative. Quantitative, also known as positivist can be summarised as the natural-scientific method in human behavioural research. It is limited to what can be observed and measured objectively. Qualitative, also known as anti-positivist, can be summarised as the inverse of human behavioural research, also seen as the experience of the human behaviour for specific humans researched, (Welman, Kruger & Mitchell, 2007:6).

A quantitative approach was chosen by the author to objectively meet the research objectives. The sampling approach was non-randomly (voluntarily).

3.3.2. Overview of questionnaire

A questionnaire was chosen for data collection and other instruments were also considered. The advantage and disadvantage was considered and found more favourable due to the timing and cost to gather the data. The sources used for the compilation of the questionnaire included the following sources: Vlerick Leuven Gent Management School (2007:17-26); plus author experience within the business performance management and business intelligence area. The primary objective was not visible within previous studies and interpretation of literature and experience was used to formulise some of the questions. The questionnaire's questions compose of 42 questions with the following answering methods:

- Questions (31,33 to 47) were based on a 4-point Likert scale, 1 (Very relevant) to 4 (Irrelevant)
- Questions (17, 18, and 20 to 27) were based on a 4-point Likert scale, 1 (Completely) to 4 (Not at all).
- Questions (10 to 15) - The fourth option don't allow for analysis beyond the frequency. Therefore the second variable which only includes responses of participants, who had an opinion, was included. The new scale was re-coded with the answers 1 (Exceeds expectations) to 3 (Below expectations) and is referred to after this as 10R to 15R, annexure B.
- Questions 16 and 19 are multiple selection criteria questions and would be used in frequencies.

The layout of the questionnaire can be grouped as follow:

1. Questions 1 – 6 → demographics
2. Questions 7 – 9 → background of business performance management within the business
3. Questions 10 – 15 → satisfaction of business performance management within the business
4. Questions 16 – 19 → values and challenges of business performance management within the business
5. Questions 20 – 27 → usage of business intelligence within the business
6. Questions 28 – 30, 32 → usage of reports for processes within the business

7. Questions 31, 33, 34, 36 – 43 → business intelligence support of business performance management processes
8. Questions 35, 47 – → business performance management support of business performance management processes
9. Questions 48 – 51 → information relationships within business performance management processes

The questionnaire was developed within an electronic web based system hosted on an external environment plus hard copies were also printed for companies close to the author's base of work. The questionnaire is included in annexure A. The distribution was done through an electronic link in a web group and physical delivery of hard copies to companies. A time frame of three weeks was given for respondents.

3.3.3. Sample group and size

The main target group of the study was from executive level down to engineering. All functions within the business were included finance, production, maintenance, human resources, technical, health and safety, strategic and general management. The reason for the wide spread, is due to the value chain depicted in figure 3.2.1, indicating a complex interlinked processes that needs orchestration by all. The sample composition was a broad spectrum in regards to gender, experience, levels and functions within the mining and manufacturing of natural resources.

The number of returns from a population of 467 was 187. Table 3.2.3 indicates the sample response. Table 3.2.4 summarises the response according to management level within he business. The major groups contributing to the questionnaire were engineering and middle management levels, contributing 81% of the response.

Table 3.3.1: Detail of response size

Area of responsibility Position Level	Number (N)
Engineering	
Middle Management	6
Senior Management	4
Engineering	15
Financial	

Middle Management	10
Senior Management	2
Executive Management	1
Engineering	21
General Management	
Middle Management	2
Senior Management	4
Executive Management	1
Engineering	6
Health & Safety	
Middle Management	2
Senior Management	1
Engineering	4
Human Resources	
Middle Management	8
Senior Management	5
Engineering	7
Other	
Missing	1
Middle Management	7
Engineering	2
Production	
Middle Management	12
Senior Management	6
Engineering	16
Technical	
Middle Management	6
Senior Management	7
Engineering	16
Missing	
Missing	1
Middle Management	2
Strategic	
Middle Management	7
Senior Management	2
Engineering	3

Table 3.3.2: Summary of response size

Area of responsibility Position Level	Number (N)	Percentage of response
Summary		
Middle Management	62	33%
Senior Management	31	17%
Executive Management	2	1%
Engineering	90	48%
(blank)	2	1%
Grand Total	**187**	**100%**

Sample sizes are determinable on the collection of the data to ensure that the confidence levels are marginal enough to make decisions on the statistics. To determine the sample size three aspects need to be considered; the confidence level desired, acceptable sampling error and the population proportion.

The following equation is used to determine the sample size for the proportion in equation 3.1 below:

Equation 3.1: Sample size determination for the proposition

$$n = \frac{Z^2 \pi(1-\pi)}{e^2}$$

Where:

n = sample size

Z = desired confidence level (1.96 for 95% confidence level)

π = population proportion (no prior estimate of the population proportion select 0.5 for maximum result)

e = sampling error, in this case 10%

Source: Levine, *et al*. (2008:303)

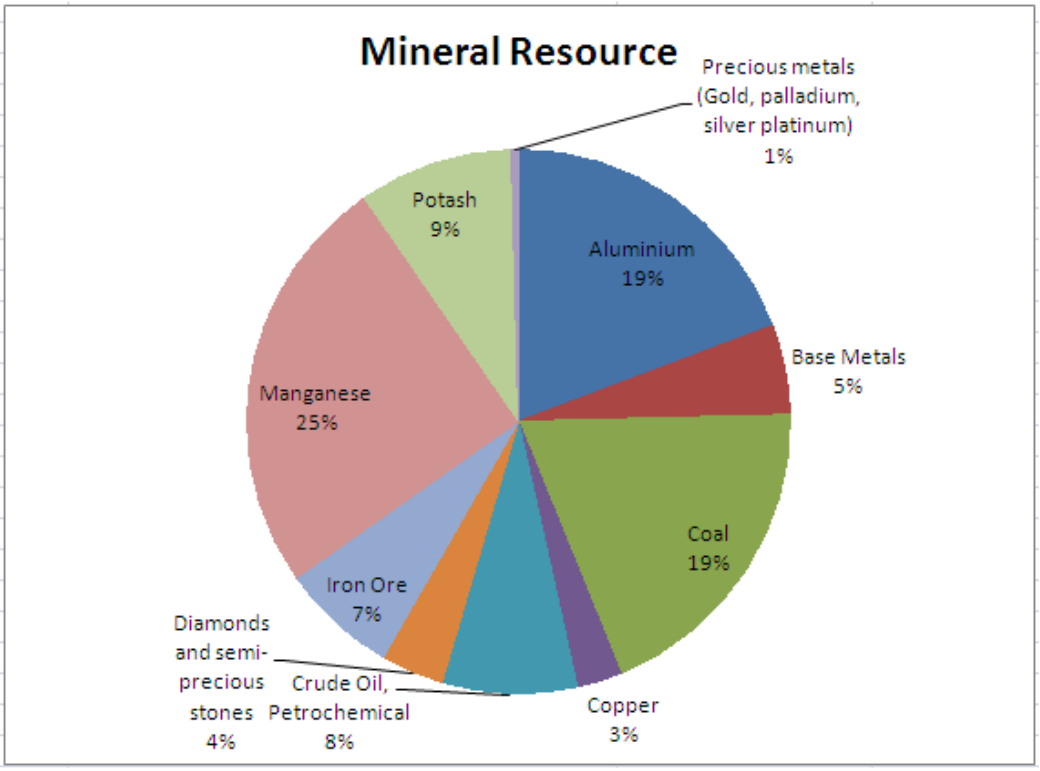
From equation 3.1 above, it was calculated with the set values to have a sample of 97 questionnaires to be returned. The total received was 187, for which is above the minimum requirement and we can conclude that it is representative of the opinion of the population.

3.4. DESCRIPTION OF DEMOGRAPHICAL INFORMATION

Percentage of respondents per natural resource sector is summarised below in figure 3.4.1.

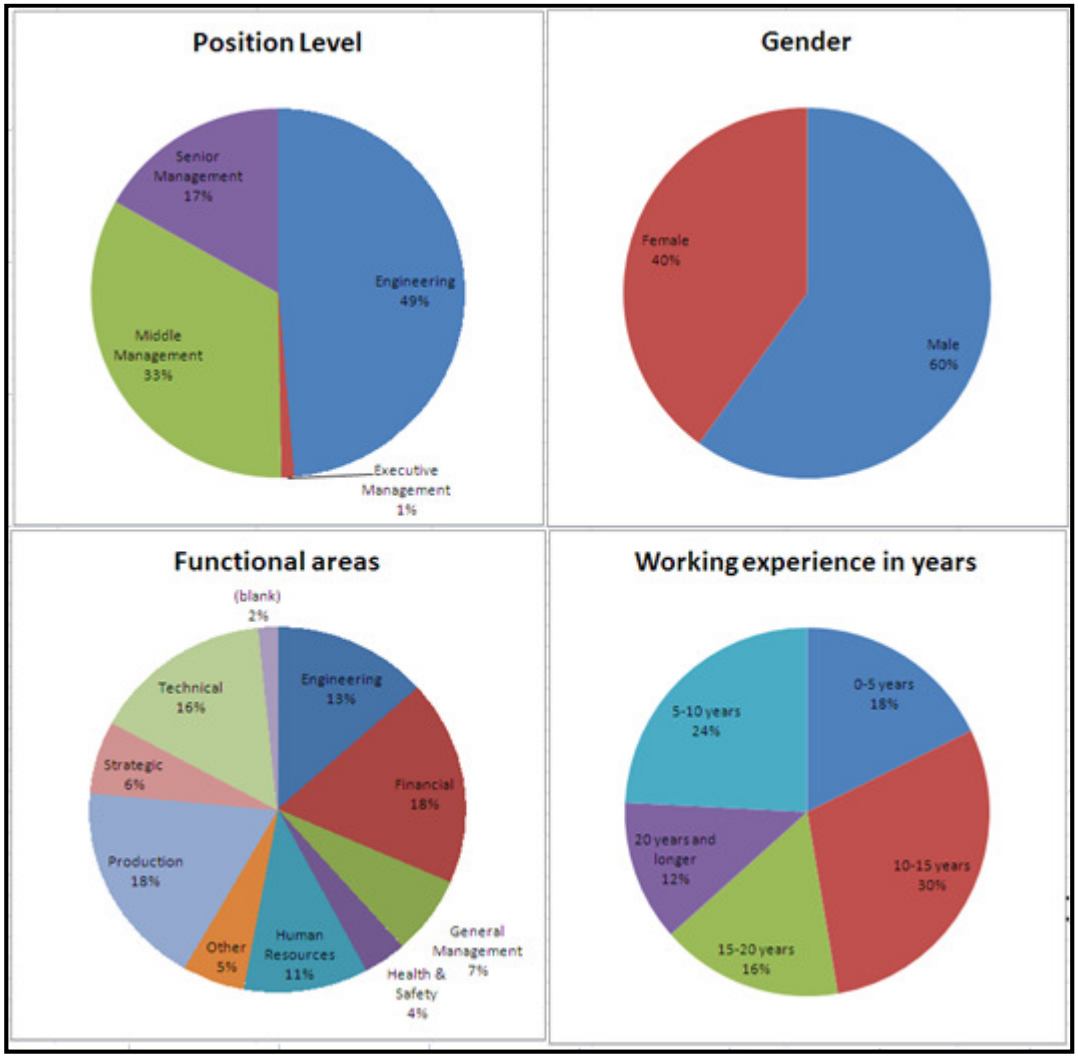
The manganese, coal and aluminium sectors were more responsive 25%, 19% and 19% respectively. Other demographics of the respondents are summarised below in figure 3.2. The position level responded were mostly the engineering level, with a total of 49%, followed by middle management of 33% and senior management on 17%. Executive management contributed 1% of all respondents.

Figure 3.3.3.1: Respondents per Natural Resource



On the gender, the female constituted a 40% of the total. The functional area for representation was widely spread across all functions, with the highest respondents of financial (18%), technical (16%), production (18%) and engineering (13%).
The working experiences of the respondents are also distributed across the categories of years, with a 30% response rate to the 10 – 15 years working experience.

Figure 3.2: Respondents' other demographics



3.5. OVERVIEW OF RESPONSES

There was a relative good response from respondents on questions indicated for correlations. A range of 5 to 14 missing answers were counted on these questions. Question 10R to 15R there was a range of 9 to 35 taken out of the data set, as the questions were re-coded to eliminate irrelevant aspects from the analysis. See annexure C for detail of response.

3.6. FREQUENCY ANALYSIS AND DESCRIPTIVE STATISTICS

We use analytics to get an idea of why we see a variation in the responses. To identify the sources of variation on the data set [questions 10R to 15R, 17, 18, 31, and 33 to 51]; the author looked at statistical significance and practical significance.

The null hypothesis test is done through methods of statistical significance indicating the coincidence of what is being seen in the data set. The question is if the population will also show this difference or correlation which is indicated by the sample. We use the p-value with a value of ≤ 0.05 to state a 95% probability that the correlation or difference will also be reflected in the population.

The practical significance indicates the effect size of this correlation or difference to have an impact in reality, (Steyn, 2002: 10-15).

The tool - Cohen's "d" and the effect size "r" was used to indicate the practical significance. Consideration will be given for r-value to be >= to 0.3 for practically visible and a 0.5 will be considered as a practical significance. See table 3.5.1 for r-value.

Table 3.6.1: Cohen's guideline to effect size

Test	Value	Small	Medium	Large
Compare groups	d	0.2	0.5	0.8
Correlation associations (effect size)	r	0.1	0.3	0.5

Source: adapted from Cohen, 1988:20-27

Parametric and non-parametric tests were conducted on the responses. Parametric tests are more powerful but it requires the data to be normally distributed and groups to have variation. The following tests for normality were conducted: Kolmogorov-Smirnoff (non-parametric), Shapiro-Wilk (parametric) and the (quantile-quantile) QQ-plots were used for assessing this normality.

To conclude, we tested for deviations from assumptions as indicated above. However, no severe deviations were found. Also to be noted, to ensure accurate representation both non-

parametric (Spearman's rho test) and parametric tests were performed against the sample data.

The SPSS software package was used for the frequency analysis and descriptive statistics.

3.7. COMPARISON BETWEEN THE NEW MANAGEMENT LEVELS

The management levels were re-coded into two levels, namely NewManagement and NewEngineers. NewManagement re-code consists of executive management, senior management and middle management. NewEngineers consist of the engineering level. The responses are divided in a half position by these new groups. The NewManagement and NewEngineers groups respectively had 52.4% and 48.6%, see table 3.8.1, of the frequency of 95 and 90 responses. There were 2 responses missing from the total response count.

Table 3.7.1: Managers and Engineers re-coded

		Q2				Q2New			
		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.1	1.1	1.1	95	50.8	51.4	51.4
	2	31	16.6	16.8	17.8	90	48.1	48.6	100.0
	3	62	33.2	33.5	51.4				
	4	90	48.1	48.6	100.0				
	Total	185	98.9	100.0		185	98.9	100.0	
Missing	System	2	1.1			2	1.1		
Total		187	100.0			187	100.0		

To find a more suitable correlation between business performance management and business intelligence, the positive reply on businesses making use of a business intelligence system within the business, were narrowed down, in order to keep only intelligence owners where they have business intelligence totally used in the business or where it is used in 2 or more departments within the business. Table 3.8.2 indicates the distribution of the 96 respondents divided in only 12.5% having business intelligence used totally within the business. The remainder of 87.5% are businesses using business intelligence in 2 or more areas within the business.

Table 3.7.2: Business Intelligence re-coded

		Q20				Q20_1and2			
		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	6.4	6.6	6.6	12	6.4	12.5	12.5
	2	84	44.9	46.4	53.0	84	44.9	87.5	100.0
	3	80	42.8	44.2	97.2				
	4	5	2.7	2.8	100.0				
	Total	181	96.8	100.0		96	51.3	100.0	
Missing	System	6	3.2			91	48.7		
Total		187	100.0			187	100.0		

These applied re-codes and filtered criteria are applied to the responses that will be discussed within the result discussion.

3.8. DISCUSSION OF RESULTS

3.8.1. Relationship of NewManagers responses

The following statistical- and practical significances, see table 3.8.1, were detected on the responses, with the applied filtered criteria described in §3.7. Table 3.8.1 is a summary of the defined (post hoc t-tests) and the corresponding effect sizes where results met the criteria of table 3.6.1. All effect sizes (correlations) are positive of nature and vary from medium to large. The focus will be placed on the large effect sizes.

Respondents, who indicated to have in use business intelligence systems, were acknowledging business performance management and business intelligence has a correlating association in assisting them in reaching business objectives, ($r = 0.658$). In the literature, figure 2.2.2 indicates the business performance management, with business intelligence as a sub-process supporting it. The correlation coefficient is positive, indicating some relationship between business performance management and business intelligence in support of business objectives.

Table 3.8.1: Managers – BI and BPM correlations

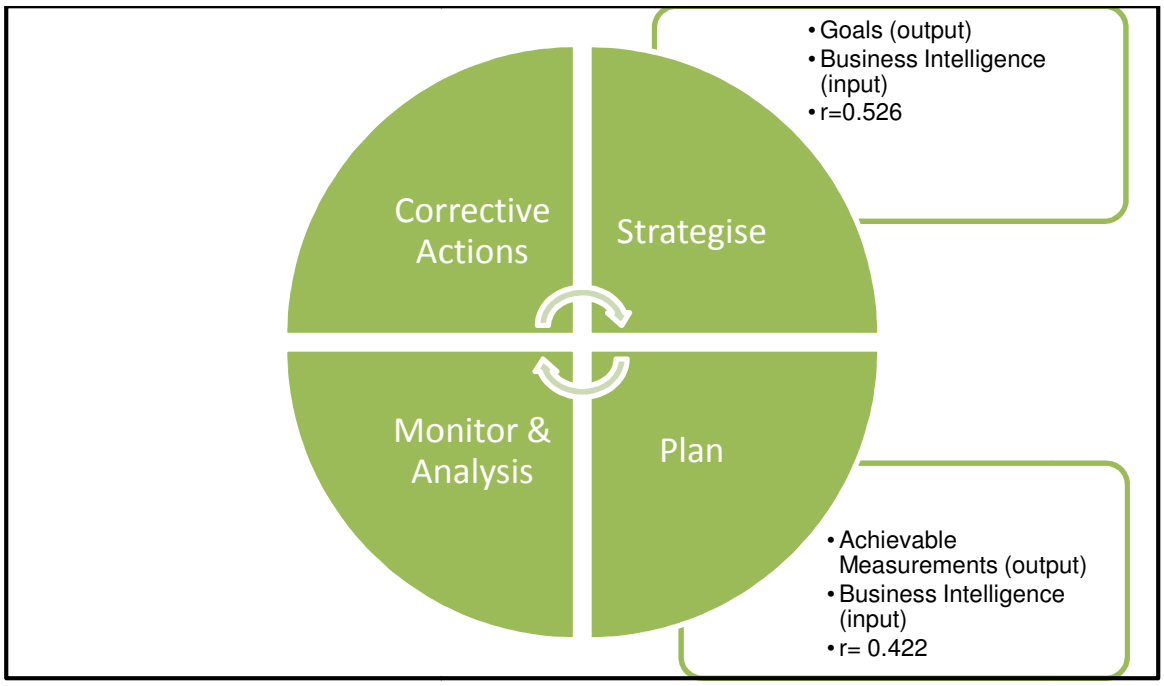
Questions relationship	Correlation Coefficient (r)	Significance (p)	N
Business performance management assist in business goals - > Business intelligence assist in reaching the business goals	0.658	0.0000001	54
Business intelligence assist in corrective actions taken -> Business intelligence assist in strategizing processes	0.363	0.0075427	53
Business intelligence assist in identifying strategies -> Business intelligence assist in identifying actions	0.555	0.0000158	53
Business intelligence assist in creating plans -> Business intelligence assist in reaching the business goals	0.526	0.0000527	53
Business intelligence assist in creating plans -> Business performance management assist in business goals	0.422	0.0016512	53
Business performance management assist in managing objectives -> Business intelligence assist in reaching the business goals	0.417	0.0020989	52
Business performance management assist in managing objectives -> Business performance management assist in business goals	0.355	0.0097780	52
Business performance management assist in managing plans -> Business intelligence assist in identifying actions	0.53	0.0000448	53
Business performance management assist in managing plans -> Business intelligence assist in identifying strategies	0.429	0.0013570	53
Business performance management assist in managing plans -> Business performance management assist in managing objectives	0.359	0.0090116	52

The identification of strategies and corrective actions has however have a high correlation association. This could be seen somewhat controversial to the above paragraph on a lower correlation association between using business intelligence in these processes. With an r-value of 0.555, it seems that the business intelligence is used for some data mining activities, to explore identification of corrective actions and strategies.

Business goals defined in this perspective are as follow: it is time-based measurements that are a resultant of the strategy that will be implemented, (PlanWare, 2011). From the

correlation coefficient on the questions posed to the respondents, if business intelligence is assisting in planning and the business goals; as well as business performance management, the 0.526 indicates a high level of correlation. From the executive blue-sky ideas to formalising the strategy of a business, less emphasis is on internal business status, with more focus where you want to be. This is creating a cavity to the norm that exists on performance. The setting of goals creates the bridge to leap from the norm to the new competitive level. Goals are measurable and in order to define it with the current level performance, a tool is needed to supply the data. To indicate this crisper, figure 3.8.1 highlights the business performance management process (strategise, plan, monitor & analyse and corrective actions) with two blocks indicating an in/out put perspective to the questionnaire results from the respondents. In the top right, goals are an output of the function strategy and business intelligence is an input to the process. Moving to the plan function (right bottom), indicates the achievable measurements as an output, supportive of business intelligence to the process.

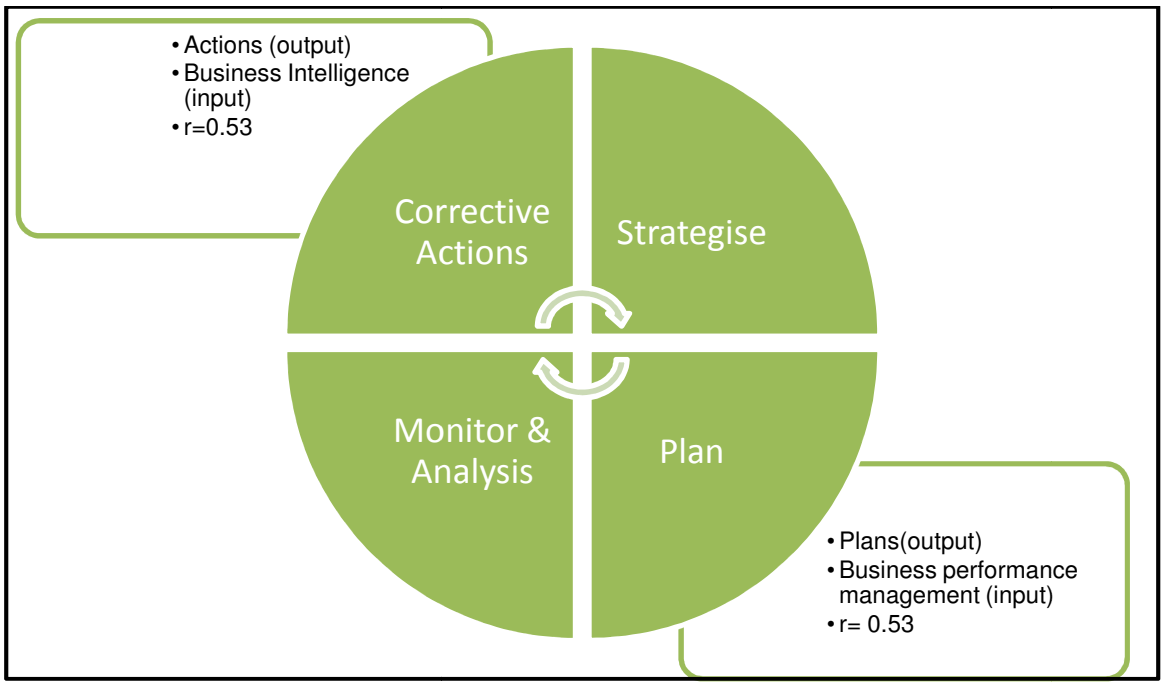
Figure 3.8.1.1: Strategise versus Plan



From figure 3.8.2 there is a high correlation association between business performance management supporting the planning function and business intelligence supporting the actions to be identified, (r = 0.53).

Due to the re-coding of the management levels, it seems that the relationship can be described on basis of putting plans into actions. As business performance management drives the process from strategising to corrective actions, it seems the planning to corrective actions is dictated by this process. On the other hand business intelligence is used to formalise a view of what the current status quo is and what could be the problem area where action is required. Once again this is not a daily action of tasks but more focused on strategic actions.

Figure 3.8.1.2: Plan versus Actions



3.8.2. Relationship of NewEngineers responses

The following statistical- and practical significances, see table 3.8.2, were detected on the responses, with the applied filtered criteria described in §3.7. Table 3.8.2 is a summary of the defined (post hoc t-tests) and the corresponding effect sizes where results met the criteria of table 3.6.1. One finding of effect size (correlations) is negative of nature and areas of note vary from medium to mid-large positions.

Table 3.8.2: Engineers – BI and BPM correlations

Questions relationship	Correlation Coefficient (r)	Significance (p)	N
Business performance management assist in business goals - > Business intelligence assist in reaching the business goals	0.395	0.0128487	39
Business intelligence assist in corrective actions taken -> Business intelligence assist in reaching the business goals	0.317	0.0492333	39
Business intelligence assist in identifying strategies -> Business intelligence assist in identifying actions	0.418	0.0080459	39
Business performance management assist in managing objectives -> Business intelligence assist in reaching the business goals	-0.371	0.0200606	39
Business performance management assist in managing objectives -> Business intelligence assist in identifying actions	0.328	0.0413856	39
Business performance management assist in managing plans -> Business intelligence assist in monitor & analysis processes	0.379	0.0173969	39
Business performance management assist in managing plans -> Business intelligence assist in creating plans	0.32	0.0473781	39
Business performance management assist in analyse & monitoring -> Business intelligence assist in reaching the business goals	-0.30345731	0.0603828	39
Business performance management assist in analyse & monitoring -> Business intelligence assist in planning processes	-0.333	0.0380095	39

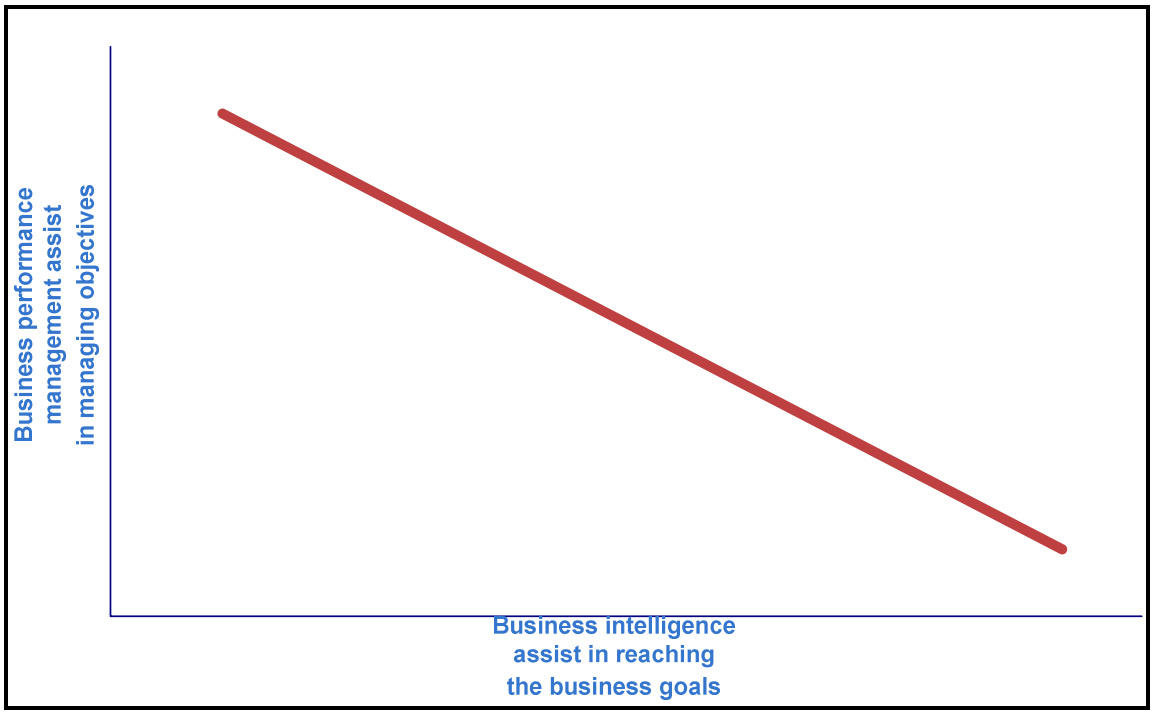
Respondents from the NewEngineering level also indicate a medium correlation association between business performance management and business intelligence as the NewManagers level. This point will not be laboured more.

Respondents from the NewEngineering level also indicate a correlation association of medium to large between business intelligence identifying strategies and actions as the NewManagers level. This point will not be laboured more.

A negative correlation, figure 3.8.2.1, between business performance management assisting in managing objectives towards business intelligence assisting business goals, (r = -0.371). In the NewManagement group, the management level indicated a positive correlation

association. This phenomenon raises other questions. Is the engineering level exposed to generating business goals? Are they the receiving end of goals to be met? Is it an indication of workforce acting upon goals set and achievement of actions is measured through key performance indicators?

Figure 3.8.2.1: Business Performance Management objectives versus Business Intelligence supporting goals



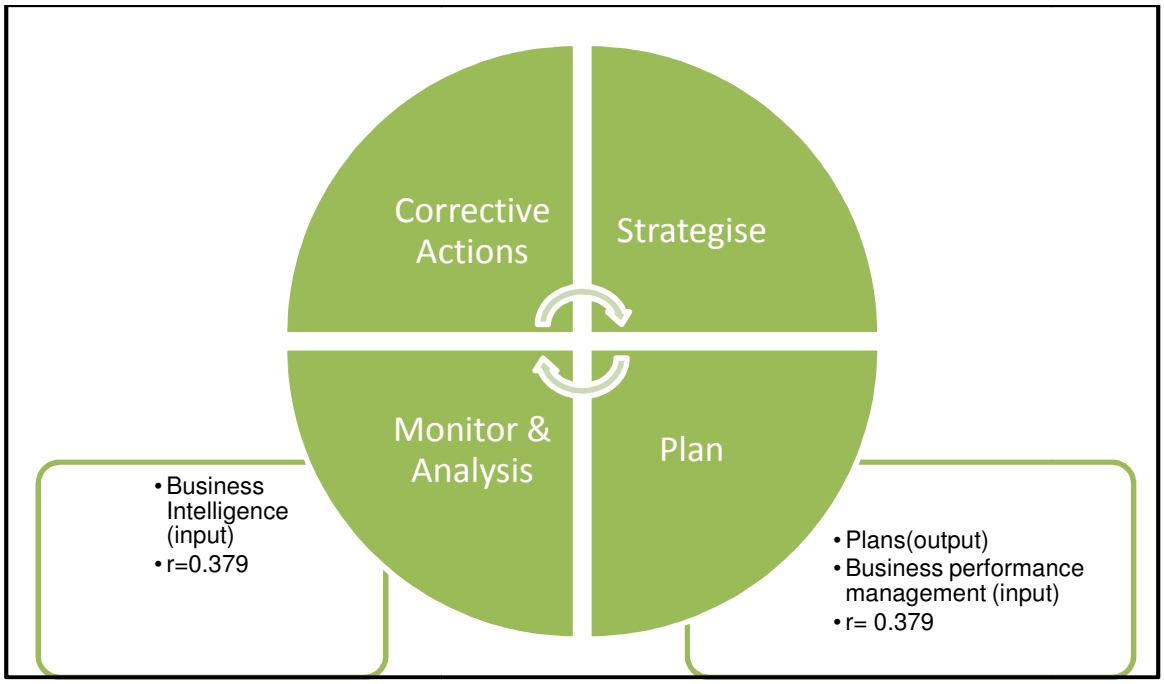
There was a strategic significance between business performance management supporting the planning function and business intelligence assisting the monitor & analysis processes, ($p = 0.0173969$).

We also found a practical significance correlation between business performance management supporting the planning function and business intelligence assisting the monitor & analysis processes, ($r = 0.379$).

From figure 3.8.2.2 this medium correlation association between business performance management supporting the planning function and business intelligence assisting the monitor & analysis processes is indicated. Respondents who are grouped in the NewEngineers group seems to have the same agreement of business performance management to assist the plan function, however the business intelligence was more prominent to be supporting in the

monitor & analysis function. It might be assumed that these two functions are more pertinent in their daily activities in the business.

Figure 3.8.2.2: Plan versus Monitor & Analysis



3.8.3. Information Relationships

From ad hoc t-tests we found that businesses who were satisfied with their business performance management system, that is used to steer the business, showed a positive practical significance (r = 0.325 - medium) towards information relationships needed when defining it within the monitor & analysis process, table 3.8.3 indicates significance.

Here is could be argued that the business has some level of business intelligence process within the business and using business performance management to support certain key performance metrics/indicators. They are also in some sense agile to business situation in the milieu it performs.

Table 3.8.3: Information relationships

Questions relationship	Correlation Coefficient (r)	Significance (p)	N	Missing
Defining monitor and analysis to support the plans, information relationships needed -> Satisfaction of the business with business performance management's agility in steering the business	0.325	0.0000536	149	38

3.9. CONCLUSION

From the above analysis we tried to establish some relationship between business intelligence and business performance management. From the analysis the following aspects seems to appear:

- Senior management level of usage of business intelligence do differ from the lower levels within a business
- Business intelligence is used in a more identification role, to explore possibilities and to determine the unknown for senior management levels
- Business intelligence is used by lower levels in the business to monitor and analyse key performance indicators, the goals that were set, and try to define reasoning to it
- It seems there is a relationship for the use of the business performance management and business intelligence between the strategising and planning function of business performance management for senior managers
- It seems there is a relationship for the use of the business performance management and business intelligence between the planning and monitor & analysis function of business performance management of lower levels in the business
- There was an indication that senior management uses business intelligence for some sense of guidance to corrective actions, most probably for long term direction
- There is a supporting relationship between business performance management and business intelligence, which is some cases are very closely interlinked and might pose a hinder if one of two is not present.

We can thus conclude that businesses that do have both frameworks established within the business, shows supporting relationships between business intelligence and business performance management and that the level of management has different needs in using it.

3.10. SUMMARY

Chapter 3 was dedicated to the statistical analysis of the questionnaire that was based on the literature study in chapter 2.

Firstly we looked at the natural resources sector within South Africa. The contribution it has to our countries GDP and the diversity of natural resources available in South Africa. We highlighted the external pressures on the mining and manufacturing environment and appreciate the complexity of the value chain these businesses have. We realised that the external pressures are not temporarily and that more are to come. The image in managing these businesses we reflect impacts the investment done in the country.

The second area, we discussed the quantitative research and survey instruments that can be used in gathering response from the population. The questionnaire was used for this empirical study and the questionnaire's layout was grouped with a short description. The sample group and size were discussed. The response of the sample was detailed in function perspective and level of management.

The third area, we looked at the demographics of the responses. 49% of the responses were from engineering level, 33% for middle management, 17% for senior management and 1% for executive management. The size of the sample group was 467 and a response of 187 questionnaires was received.

The fourth area covered the descriptive statistics and the frequency analysis. The method of statistical significance was used to test the null hypothesis, indicating the coincidence of the data reflection. The Cohen's "d" and the effect size "r" tool were used for indication of practical significance. Normality and variation tests (parametric and non-parametric) were conducted on the responses.

The fifth area, we discussed the re-coding of the management levels in the response. The t-tests indicated a substantial correlation when the management levels were grouped. Executive to middle management was grouped as a new variable and the Engineers variable was kept the same. It was also found that the businesses that do have business intelligence systems show correlations with business performance management aspects. Therefore new variables were created for those who have.

The sixth area, the findings of the analysis was discussed. Some similarities and differences were found between the NewManagement and NewEngineers variables. The NewManagement variable indicated a correlation association between business intelligence and business performance management between the strategising and planning function of business performance management. For the NewEngineers variable a correlation association between business intelligence and business performance management between the planning and monitor & analysis function of business performance management was detected.

The last part, the correlation of businesses that were satisfied with their business performance management systems showed a positive association towards the relationship of information used in the analysis & monitor function of it.

The final conclusions were derived from the findings and to build some sense of the relationships that were found between the NewManagers and NewEngineers variables in the natural resource sector.

Chapter 4 will be discussing the conclusions and recommendations of the empirical study.

CHAPTER 4
CONCLUSION AND RECOMMENDATIONS

4.1. INTRODUCTION

The primary objective of this study was to assess a relationship between business performance management and business intelligence. During the literature research, the function of both business performance management and business intelligence was discussed. The relationship between business intelligence and business performance management in the mining and manufacturing sector was researched through a literature study which was discussed in chapter 2. The empirical study was discussed in relations to the literature study in chapter 3.

As stated in §1.6, chapter 4 is devoted to draw conclusion from the survey and putting forward recommendations for the establishment of business performance management and business intelligence within the mining and manufacturing sector to catapult performance of this industry in South Africa. The relationships between business performance management and business intelligence in businesses in this sector were analysed. A practical approach for the successful implementation of business performance management and business intelligence is proposed to be used by the South African mining and manufacturing sector to establish a competitive position in the natural resource market by utilising these spheres to unlock potential in the businesses.

4.2. BUSINESS PERFORMANCE MANAGEMENT AND BUSINESS INTELLIGENCE

The literature and empirical research done in chapter 2 and 3 indicated relationships between business intelligence and business performance management and the use of it to promote synchronised efforts in the business to reach the goals. Business performance management and business intelligence are both needed and it would be very difficult to have only one and not the other to establish a competitive position in the market.

In figure 4.2.1 the input from business intelligence is indicated in each of the business performance management processes. The empirical research confirmed relationships between business intelligence and business performance management; however the executive to middle management has a different need for use of business intelligence to the engineering level of the businesses.

Figure 3.8.3.1: Inputs of Business Intelligence

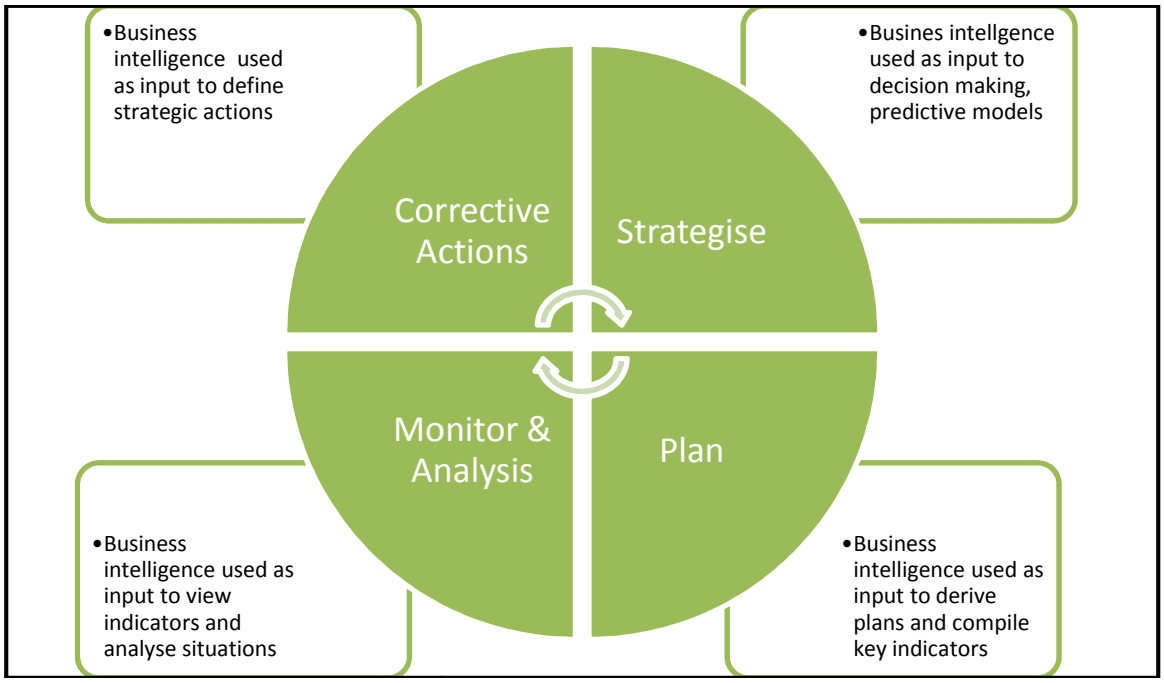


Figure 3.8.3.2: Relationships of Use by Organisational Level

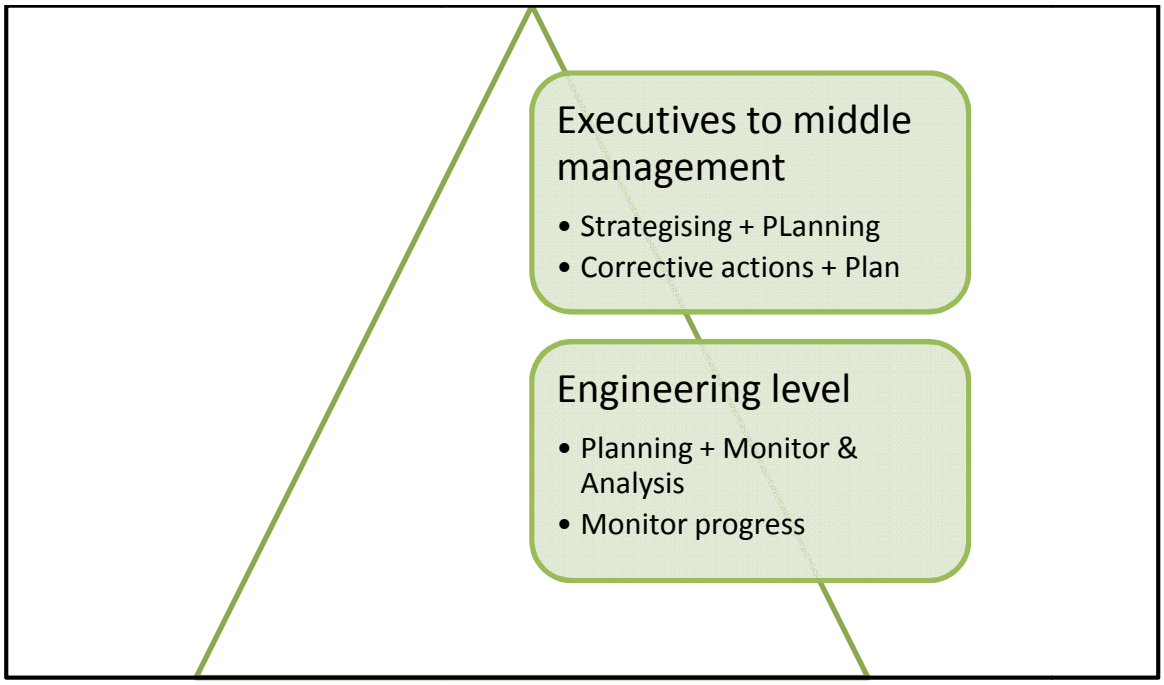


Figure 4.2.2 indicates the use of business intelligence by the organisation level in the businesses, based on responses of the questionnaire.

The findings are summarized as followed:

- When moving upwards in the level of management the usage of business intelligence changes and this would be agreed that the focus of levels do differ over the planning horizon
- Business intelligence has the capability to open up the unknown and give a sense of "what does this mean", "where are we", "what can we do" questions
- Business intelligence has got the capability to create the one place to host all information needs
- Business intelligence on its own will not synchronise all business efforts into reaching business goals. A formal structured approach is needed to facilitate direction.
- Business intelligence span of use is from short to long term. Real-time business intelligence is a new addition to the business intelligence space and is more widely promoted.

- Business intelligence and business performance management are both dependent on each other to deliver a total performance package to a business.

Based on the above findings, it could be stated that business intelligence and business performance management are a necessity for businesses and it would be rocky roads ahead to establish the one could do without the other.

4.3. PRACTICAL DESIGN PRINCIPLES FOR A BUSINESS PERFORMANCE MANAGEMENT AND BUSINESS INTELLIGENCE PROCESS

In the market there are numerous consulting firms that can assist in the deployment of business performance management and business intelligence systems and processes. Some will indicate a preference to a technology supplier, some will not indicate a preference and will leave it to the business and some will not use a technology to base the processes on.

It might be worthwhile to explore these possibilities and to construct interviews with the relevant consultants. Arrange current customer visits and try to establish some sense of project success and effort. The approach discussed in this chapter is based on the author's experience of a non-technology approach. Business intelligence was not part of the scope, deliberately. The approach was to embed the business performance management process within the business by utilizing excel spreadsheets as predominant technology. This approach was shot down by many business intelligence vendors. The advantage of this is to ensure you understand your business' value chain (value driver tree), information availability and data structures. The added benefit of this approach, was the development time that were minimised when the business intelligence project initiated.

Upfront -

1) Corporate objectives signed and agreed upon up front on delivery of the business performance management solution
2) Establish a roadmap. Indicate the current state of the business and indicate the end state. Plot down the approach to be taken, i.e. technology specific, any technology or no technology.

3) Establish how the business performance management process will fit on the current business structure. Are there any natural teams that build the hierarchy to the top?
4) Select proven consulting (if outsourcing) vendors to assist in the project.
5) Select the best personnel in the business, from different levels, to assist in the project.

A manufacturing business in Gauteng has partnered with a company from Australia, which implement business performance management on top of the natural teams that existed on the safety behaviour philosophy in the business. The project included defining the correct value driver trees (VDT's), improvement pipeline and a sustainable review process (business performance management) to identify, monitor and control satisfying performance levels constantly.

A mixed approach was decided upon, where the most impact could be derived on the demarcated area of the business. A long-term plan was developed to indicate the growth of the deployment. Approaching from a bottom up will create performance silos and putting the project at risk. To avoid this, corporate objectives were created, with milestones and priorities.

The business performance management system consists of:

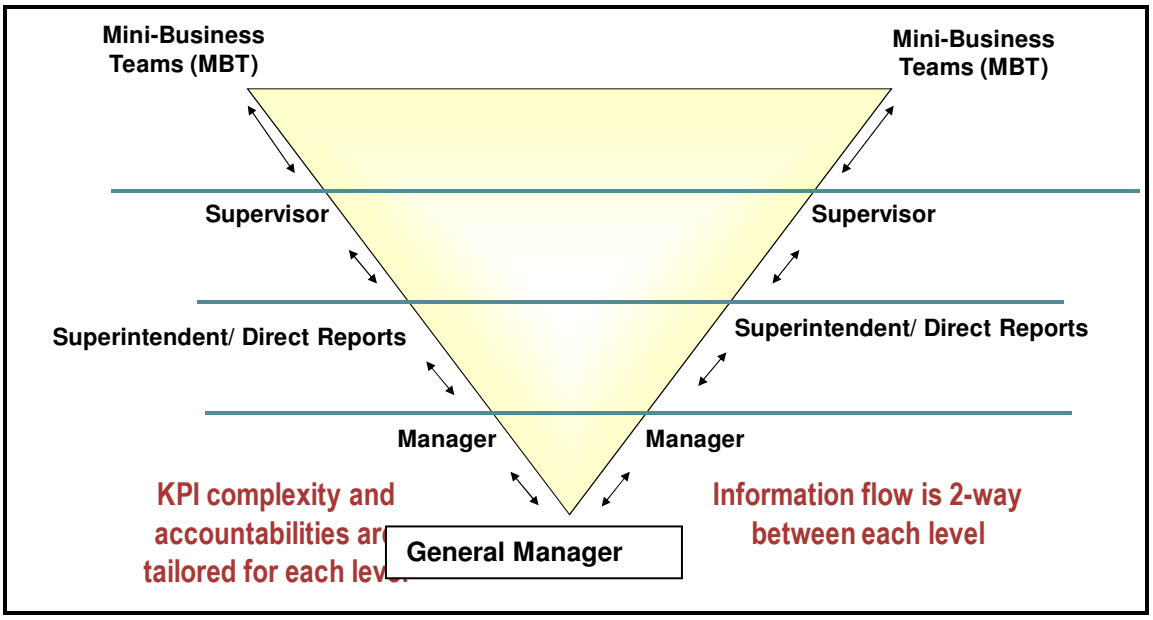
- Dashboards
- Business intelligence reports to drill down into specific information relevant to the level in which the employee is accountable for
- Task management
- Idea pipeline
- Review and performance meetings

4.3.1. Review and Performance Meeting

The business' review and performance meeting (RPM), as indicated by figure 4.2.3, is a process whereby alignment of people to business goals are done through key performance indicators, task management and idea generation sessions. The measurable targets was

developed from the strategic goals and disseminated unto the lowest level within the business and reviewed periodically (weekly to monthly) for deviations. This process is linked to the cycle of business performance management for continuous performance.

Figure 3.8.3.1: Review Performance Management with accountability



Source: PIP International - Adapted from wiring process

4.3.2. Wiring

Wiring is referred to as the formation of natural teams within the business, where the teams can be grouped together to facilitate and report upwards the next layer of business key indicators. The wiring also limits the information available to the team or individual based on the position held. With this process the goals are broken up in lower levels in the business, dictated by the value chain of the business and the accountability the position of an individual are holding, and assigned to the position. This process is linked to the monitoring & analysing and corrective actions sub-process of business performance management. The process ensures the teams understand the lower objectives of the business, expectations and deliverables of actionable tasks to accomplish goals (key performance indicators). The teams monitor and execute accordingly to obtain good performance levels by guidance from the dashboards and business intelligence reports.

4.3.3. Key Performance Indicator Management

When the natural teams were formed, key performance indicators were assigned to them in accordance to the level in which they are based in the business. These key performance indicators have targets and are reviewed in the periodic review sessions. The targets are broken down, just as the actual contribution of the indicator is represented. This section is referred to the planning sub-process of the business performance management. Informed actions are assigned to unfavourable outcomes. In figure 4.3.1.1, indicates the teams that are on the lowest level within the business. The complexity of the key performance indicators enlarge when moved upwards to higher levels in the business. Teams and individuals are accountable for the key performance indicator level to which they are assigned to.

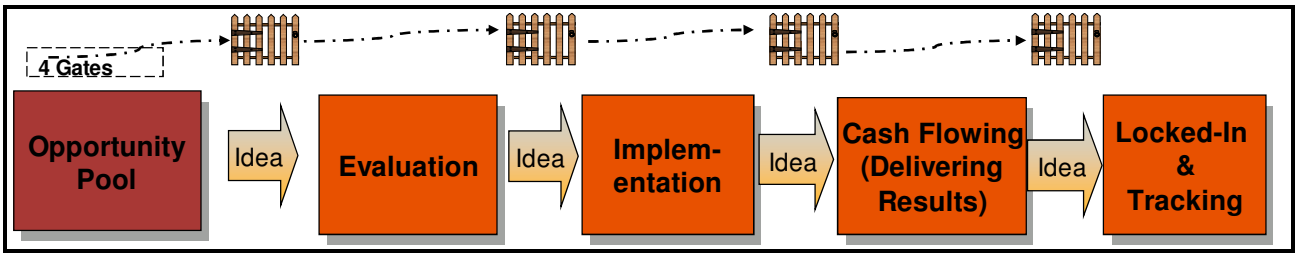
4.3.4. Task management

Collaboration between employees follows a structured approach for assignment of tasks to one another. Actions are tracked within a system and linked to key performance indicators. This is referred in the business performance management sub-process as corrective actions. Predefined rule are applicable to allocating tasks to individuals and the re-assignment of it. The process keeps track of the tasks and notifications of it to the originator, to view progress.

4.3.5. Idea Management

The “turbo” button that was indicated in §2.2.2, called business improvement, is facilitated through the idea management process. The improvement process is a culture change, due to the willingness of improvement contributions (ideas) that are needed from employees. The process has got a “bucket” to receive these improvements, see figure 4.3.5.1 – opportunity pool. The improvement process needs a continuous feed of ideas that will be reviewed and prioritised for implementation. The business improvement process will also follow a structured approach to maintain discipline and consistent measurable outcomes according to a set standard.

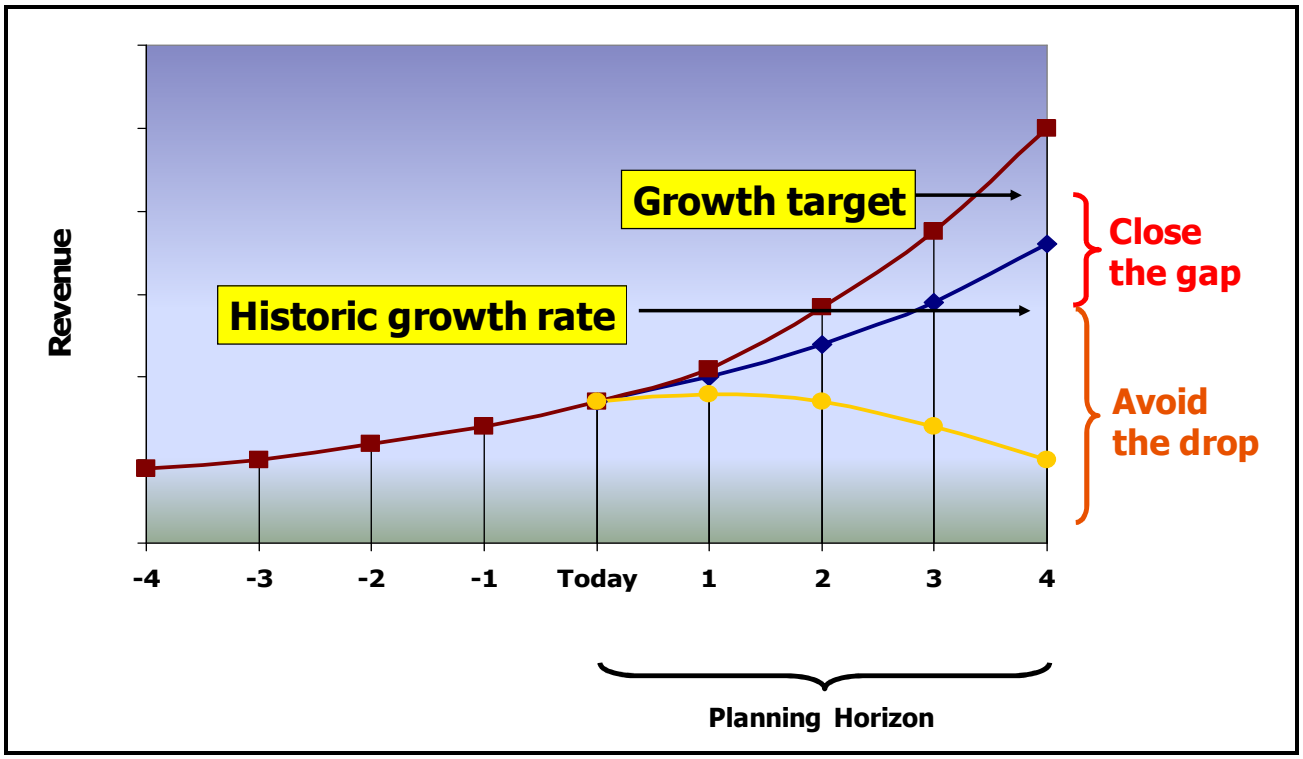
Figure 3.8.3.1: Idea pipeline



Source: Adapted from operational company

Figure 3.8.3.2 indicates a decline in time if the improvement process is not sustained. This could be translated into loss of competitiveness. It also indicates the future possibility of improvement that could be realised if all ideas are taken through to execution or implementation. A healthy graph will always point in the upwards tendency. This is only possible if there is an adequate pool of ideas being generated within the business.

Figure 3.8.3.2: Value creation of ideas



Source: Adapted from an operational company.

Ideas are generated through idea sessions. The idea generation supplies a healthy pipeline, whereby a pool of ideas could be evaluated to determine the best ROI ideas to be put

forward for execution in the pipeline. Ideas are evaluated through a matrix, in the evaluation process, and prioritised, see figure 3.8.3.1. Ideas put forward are implemented and then moved on when implementation was completed. The specific value driver tree where the idea is impacting the business is monitored for quality insurance of the executed work being done, in the cash flowing stage, see figure 3.8.3.1. When the value of the idea is reaching a certain milestone, it indicates the idea realised into a culture change and the business has accepted the new way of performing in the new process. The idea is moved to the next stage of locked-in and tracking. This stage enforces the value that was forecasted on the idea, to be evaluated against actuals. All key performance indicators influenced by the idea are changed and targets are updated to reflect the new standard.

The complete process of idea generation, evaluation, selection, execution, locked-in, and close are the basic steps for an idea to go through the ranks of imbedding the improvement into the business.

4.3.6. Impacts

How does this impact the business having a business performance management process embedded? Transparency of performance is much higher up in the business, available on a frequent time schedule. Closer relationships are established of moving actions forward. Closer relationships are established between the business improvement departments and the information management department.

4.4. RECOMMENDATIONS

It is recommended that all mining and manufacturing businesses to understand the differences between business performance management and business intelligence as two different processes and the output each process supply. There are relationships as the two processes interact. Don’t expect delivery of a business intelligence system to deliver business performance management, visa versa for expecting data mining capabilities out of a business performance management process.

Understand the value chain of the business, quality of the data, as both business intelligence and business performance management are information dependent.

The recommended approach if one needs to decide between the two for implementation, the business performance management would be the author's first choice. This gives way of organising the data to information relationships and structures.

4.5. RECOMMENDED FURTHER STUDIES

Further research to be conducted in the field of real-time business intelligence in supporting the business performance management process. Operational processing is based on immediate actions to be taken. This makes the normal cycle of costing, normal monthly, to be too slow for responding to the variability.

Secondly, the predictability of value chain impacts in business intelligence, set by goals defined for the mining and manufacturing industry. The total value chain as an input to the predictive model to analyse decisions made on longer horizons.

4.6. CONCLUSION

The aim of the study was to indicate if there are any relationships between business intelligence and business performance management and the effect the two processes have on each other within the natural resource sector. The responses were compared against others in the industry to see if there are similarities to how other businesses perceive the two processes.
A survey was conducted to determine the affect the two processes (business intelligence and business performance management) do have on each other. The result indicated that the two processes are dependent on each other through decisions that need to take place. Different levels within the organisation have different usage for the processes.

Executive to middle management levels are more dominantly relying on business intelligence to formalise strategies and converting it into solid plans. There was also a positive correlation

between the use of business intelligence in the planning and corrective action processes of business performance management.

In the engineering level there was a negative correlation between business performance management assisting in managing objectives towards business intelligence assisting business goals.

The combination of the two spheres being deployed at an organisation will result in quicker turn around on reaching goals in the business. Embedment of these processes result in improved and organised contributions towards the goals in the business.

4.7. SUMMARY

The first part of the chapter was dedicated to discuss the reason why the empirical study was conducted and drawing the conclusion from the findings in chapter 3. The relationships of the two systems on each other were highlighted and the use of it by different levels in the business was indicated.

Secondly, a practical approach of such processes being embedded within a business as elaborated on. The upfront activities that need to be checked before entering into a project might save some unnecessary pit fall along the way.

A typical business performance management process was highlighted and gives a clearer view to how the process and system could look and work. Indication of the improvement process that's like a "turbo" button on the business performance management process was explained.
High level impacts were raised and would differ from organisation to organisation. Most cases people feel intimidated by the exposure of information being rolled up into higher levels (Big Brother-effect). Recommendation into the real-time environments was given for further studies.

Finally it was concluded that the research objectives as set out in §1.6 were met and possible future research was recommended.

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ANNEXURE A

Geographical Information

No business can effectively be managed without the proper management and information that reflects and creates the milieu it operates in. Business performance management creates the framework in which a structured approach can be followed in setting the scene for a predictive and controllable environment. Business intelligence creates the information structures; information relationships and a reflection of the value chain of the business. By combining the two methodologies it creates a total business solution that harmonises all aspects of value creation in an objective manner.

1 In which mineral sector are you based?

<Please select>

2 On what level of management are you based in the business?

<Please select>

3 Please select one of the options that best describe your professional background?

<Please select>

4 Gender

- Male
- Female

Reset

5 Years of service with the current company?

- ○ 0 - 5 years
- ○ 5 - 10 years
- ○ 10 years and longer

Reset

6 Years of service in the operations/mining industry?

- ○ 0 - 5 years
- ○ 5 - 10 years
- ○ 10 - 15 years
- ○ 15 - 20 years
- ○ 20 years and longer

Reset

Business Performance Management

The management methodology that orchestrates the business strategy into desirable actions that support the business in reaching the goals set.

7 How is the theme of Business Performance Management situated on your business's radar?

<Please select>

8 Which functional area in your business is giving top priority to Business Performance Management?

<Please select>

9 Which executive manager is driving your business's Business Performance Management?

<Please select>

10 How satisfy is your business with its Business Performance Management efforts contributing to the following:

Management on the basis of evidence

○ Exceeds expectation ○ Meet expectations ○ Below expectations ○ Don't know

Reset

11 How satisfied is your business with its Business Performance Management efforts contributing to the following:

Management of a comprehensive set of performance indicators

○ Exceeds expectations ○ Meets expectations ○ Below expectations ○ Don't know

Reset

12 How satisfy is your business with its Business Performance Management efforts contributing to the following:

Integration of business processes

○ Exceeds expectations ○ Meets expectations ○ Below expectations ○ Don't know

Reset

13 How satisfy is your business with its Business Performance Management efforts contributing to the following:

Agility in steering the business

○ Exceeds expectations ○ Meets expectations ○ Below expectations ○ Don't know

Reset

14 How satisfy is your business with its Business Performance Management efforts contributing to the following:

Alignment of strategy formulation and execution

○ Exceeds expectations ○ Meets expectations ○ Below expectations ○ Don't know

Reset

15 How satisfy is your business with its Business Performance Management efforts contributing to the following:

Learning organisation

○ Exceeds expectations ○ Meets expectations ○ Below expectations ○ Don't know

Reset

16 What do you believe to be the five most important challenges to achieve Business Performance Management success?

Select only 5 items in the list below.

- ☐ Business rules analysis
- ☐ Education and training
- ☐ Understanding and managing user expectation
- ☐ Data quality
- ☐ Data integration
- ☐ Vendor collaboration and support
- ☐ ROI justification
- ☐ Budget constraints
- ☐ Culture change
- ☐ Management sponsorship
- ☐ Time required implementing
- ☐ Analytical skills
- ☐ Tool capability
- ☐ Technical skills
- ☐ Computing power
- ☐ Collaboration between Business and IT/IM

Reset

17 Value of Business Performance Management:

To which extent does....the **BUSINESS SIDE** of your business value **Business Performance Management** as a corporate asset?

○ Completely ○ In most of the cases ○ Very low value ○ No value at all

Reset

18 Value of Business Performance Management:

To which extent does....the **INFORMATION TECHNOLOGY / INFORMATION MANAGEMENT SIDE** of your business value Business Performance Management as a corporate asset?

○ Completely ○ In most of the cases ○ Very low value ○ No value at all

Reset

19 What are your business's solution priorities for Business Performance Management?

Select only 5 items in the list below.

☐ Strategic Management solutions (e.g. Balanced Scorecard, internal process management
☐ Financial management (e.g. budgeting and planning, consolidated reporting, activity base
☐ Sales intelligence (e.g. sales forecasting)
☐ Innovation management (e.g. R&D management, manufacturing and process innovation)
☐ Supply chain intelligence (e.g. improve forecasting accuracy)
☐ HR value management (e.g. competency development, HR administration)
☐ IT/IM value management (e.g. service level agreements, capacity planning, IT cost manag
☐ Service management (e.g. after market, expertise, recycling management)
☐ Customer intelligence (e.g. customer analytics, marketing automation)
☐ Risk management (e.g. fraud, security)
☐ Procurement (e.g. improve procurement function)
☐ Operational intelligence (manufacturing, producing, mining quality)

Reset

Business Intelligence

20 Does your specific business/operation make use of a Business Intelligence system?

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all

Reset

21 To which extent do you use the following:

Collaboration and workflow
Enables users to both share and discuss information and collaborate in the context of a business process or activity.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all

Reset

22 To which extent do you use the following:

Data integration and data warehousing
Used as an integrated data household on top of which monitoring, analysis and reporting applications run.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all

Reset

23 To which extent do you use the following:

Advance analytics and data mining tools
Allow business analysts to create predictive models of business activity.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all

Reset

24 To which extent do you use the following:

OLAP tools
Online analytical processing tools allow end users to "slice and dice" data dimensionally to explore data from different perspectives and time periods.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all
Reset

25 To which extent do you use the following:

Dashboards/Scorecards tools
Allow end users to view critical performance data at a glance and drill down to analyse detailed data and reports is desired.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all
Reset

26 To which extent do you use the following:

Standard reporting tools
Used by professional developers to create standard reports for group, departments, or the enterprise.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all
Reset

27 To which extent do you use the following:

End-User query and reporting tools
Used by end users to create reports for themselves or other, requires no programming.

○ Completely ○ In 2 or more areas of the business ○ Only in 1 of the areas ○ Not at all
Reset

Relationship between Business Intelligence and Business Performance Management

28 What information do you use to take action in the following topics? Select all that apply.

Planning

- ☐ Business Intelligence Reports
- ☐ Application Reports
- ☐ External Reports
- ☐ Self-derived reports, like excel

Reset

29 What information do you use to take action in the following topics? Select all that apply.

Strategizing

- ☐ Business Intelligence Reports
- ☐ Application Reports
- ☐ External Reports
- ☐ Self-derived reports, like excel

Reset

30 What information do you use to take action in the following topics? Select all that apply.

Monitor and Control

- ☐ Business Intelligence Reports
- ☐ Application Reports
- ☐ External Reports
- ☐ Self-derived reports, like excel

Reset

31 Do you think that having business intelligence to your expose will assist you in making better business decisions?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

32 What information do you use to take action in the following topics? Select all that apply.

Corrective Actions

- ☐ Business Intelligence Reports
- ☐ Application Reports
- ☐ External Reports
- ☐ Self-derived reports, like excel

Reset

33 Do you think that having business intelligence to your expose will assist you in planning tasks better?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

34 How much does business intelligence assist you in reaching the business goals?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

35 How much does business performance management assist you in reaching the business goals?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

Business performance management is a process consisting of 4 facets: Strategizing, Planning, Monitor & analyse and Corrective Actions

36 How much would business intelligence assist you in your strategizing processes?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

37 How much would business intelligence assist you in your planning processes?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

38 How much would business intelligence assist you in your monitor & analyse processes?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

39 How much would business intelligence assist you in your corrective actions to be taken?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

Business Intelligence has the capability to build relationships with information.

40 Does business intelligence assist you in identifying opportunities in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

41 Does business intelligence assist you in identifying actions in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

42 Does business intelligence assist you in identifying strategies in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

43 Does business intelligence assist you in creating plans in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

Business Performance Management is process driven.

44 Does business performance management assist you in managing objectives in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

45 Does business performance management assist you in managing plans in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

46 Does business performance management assist you in analysing & monitoring in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

47 Does business performance management assist you in taking corrective actions in your line of duty?

○ Very relevant ○ Relevant ○ Less relevant ○ Irrelevant

Reset

48 When defining the business strategy, is it clear what information relationships you would need to deliver on the objectives?

○ Always ○ Mostly always ○ Less than always ○ Never

Reset

49 When defining the plans to support the strategy, do you know the information relationships that will build the plan?

○ Always ○ Mostly always ○ Less than always ○ Never

Reset

50 When defining the monitor and analyse to support the plans, do you know the information relationships that will be needed?

○ Always ○ Mostly always ○ Less than always ○ Never

Reset

51 When defining the corrective actions to address out of control processes, do you know the information relationships that will be needed?

○ Always ○ Mostly always ○ Less than always ○ Never

Reset

52 Please supply an email address in order to receive the complete study:

53 **General comments:**

Is there any information not available that could assist you in your duties?

ANNEXURE B

		Old Variables				New Variables				
	Missing	1	2	3	4	1	2	3	Missing	
Q10	2	20.5	60.0	15.7	3.8	21.3	62.4	16.3	9	Q10R
Q11	3	32.1	45.7	18.5	3.8	33.3	47.5	19.2	10	Q11R
Q12	5	23.1	44.5	18.7	13.7	26.8	51.6	21.7	30	Q12R
Q13	5	19.2	44.0	23.1	13.7	22.3	51.0	26.8	30	Q13R
Q14	5	16.5	52.2	17.0	14.3	19.2	60.9	19.9	31	Q14R
Q15	5	13.7	48.9	20.9	16.5	16.4	58.6	25.0	35	Q15R

ANNEXURE C

Question Number	Question Description	Valid % (Frequency)				Mean	Std. Deviation	Number Missing
		Very Relevant	Relevant	Almost Relevant	Irrelevant			
Q10R	Business BPM satisfied - Evidence	21.35	62.36	16.29		1.95	.61316	9
Q11R	Business BPM satisfied - KPI's	33.33	47.46	19.21		1.86	.71298	10
Q12R	Business BPM satisfied - Integration business processes	26.75	51.59	21.66		1.95	.69611	30
Q13R	Business BPM satisfied - Agility to steer business	22.29	50.96	26.75		2.04	.70113	30
Q14R	Business BPM satisfied - Align strategy and execution	19.23	60.90	19.87		2.01	.62730	31
Q15R	Business BPM satisfied - Learning organisation	16.45	58.55	25.00		2.09	.64020	35
Q17	Buisness value BPM in business	16.57	49.17	25.41	8.84	2.27	.841	6
Q18	IM value BPM in business	19.78	41.21	31.87	7.14	2.26	.858	5
Q31	BI will help you with decisions?	30.73	33.52	19.55	16.20	2.21	1.055	8
Q33	BI will help you plan tasks?	25.28	36.52	16.85	21.35	2.34	1.079	9
Q34	BI will help you reach business goals?	23.16	35.59	25.99	15.25	2.33	.998	10
Q35	BPM will help you reach business goals?	25.84	37.08	19.66	17.42	2.29	1.037	9
Q36	BI help in strategy?	24.29	38.42	19.77	17.51	2.31	1.027	10
Q37	BI help in planning?	26.40	38.76	14.61	20.22	2.29	1.069	9
Q38	BI help in monitor and analysis?	28.09	34.27	20.22	17.42	2.27	1.055	9
Q39	BI help in corrective actions?	23.60	32.58	24.72	19.10	2.39	1.048	9
Q40	BI help with id of opportunities?	25.71	34.29	17.14	22.86	2.37	1.101	12
Q41	BI help in id of actions?	21.71	37.71	22.86	17.71	2.37	1.013	12
Q42	BI help in creating strategies?	27.43	31.43	22.86	18.29	2.32	1.067	12
Q43	BI help in creating plans?	24.71	32.18	22.99	20.11	2.39	1.068	13
Q44	BPM assist you in managing business objectives?	24.28	34.68	22.54	18.50	2.35	1.044	14
Q45	BPM manage plans?	20.00	32.57	28.57	18.86	2.46	1.016	12
Q46	BPM help in monitor and analysis?	12.07	28.16	36.21	23.56	2.71	.961	13
Q47	BPM assist in taking corrective actions?	25.14	34.86	23.43	16.57	2.31	1.028	12
Q48	Define business startegy - info for strategy?	25.14	38.86	20.57	15.43	2.26	1.005	12
Q49	Define business plan - info for plan?	28.74	31.03	19.54	20.69	2.32	1.102	13
Q50	Define monitor and analysis - info for it?	29.31	29.31	21.84	19.54	2.32	1.095	13
Q51	Corrective actions - have information relationship?	25.29	35.06	21.26	18.39	2.33	1.049	13