KNOWLEDGE MANAGEMENT AND BUSINESS INTELLIGENCE AS STRATEGIC MANAGEMENT TOOLS TO ENHANCE PERFORMANCE

Key words: Knowledge management, business intelligence, strategy, strategic management, mining industry

Please indicate topic (i.e. Strategic Management)

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ABSTRACT

The main objective of this research study was to investigate the effect of knowledge management and business intelligence on performance in the mining industry. Business intelligence is a management tool used to manage and enhance business information and to produce up-to-date intelligence and knowledge for operative and strategic decision-making. Knowledge management includes the identification and examination of available and required knowledge and the subsequent planning and control of actions to develop knowledge assets to accomplish organizational objectives.

A structured questionnaire was used for the study. A total of 300 mines were randomly selected from a research population of mining organizations in South Africa, Africa and globally. The respondents were all part of senior management. Statistically and practically significant positive relationships with a large effect were found among the dimensions of business intelligence and knowledge management and perceived business performance.

INTRODUCTION

This study focuses on investigating the use of knowledge management and business intelligence as strategic management tools to enhance performance of mining organisations.

Insightful diagnosis of an organisation's external and internal environments is a prerequisite to prosper in crafting and formulating an excellent strategy (Thompson , Peteraf & Gamble, 2012). Barbosa Hattingh and Kloss (2010) argue that strategic decision-makers can challenge conventional wisdom and get ready for uncertainty better through assessing the complex and not-so-obvious ways global trends develop and interact in their industries. Being able to forecast the future is one of the most important tasks facing a strategist and it is also one of the most challenging. One way to tackle the challenge is to thoroughly scrutinize the societal values and lifestyles, population demographics, political, legal, technological, environmental, macroeconomic, and other long-term factors that constantly shape the global business environment. Each of these components has the potential to affect the organisation's immediate industry and competitive environment (Thompson et al., 2012). The information gathered from the scanning of the environment has to be analysed, refined, interpreted and infused with developed implications in order to create intelligence (Igbaekemen, 2015). Analysis is the utilization and application of scientific and non-scientific methods and processes to interpret data or information. Thus analysis produces insightful intelligence findings and actionable recommendations for decision makers.

Knowledge is also one of the most essential assets for organizational success among other assets such as materials, machineries, capital and properties (Ganesh, Mohapatra & Nagarajan, 2014:3). According to Deloitte (2015), managing and sharing knowledge in the organisation leads to competitive advantage and adds real customer value.

The study is carried out in the mining sector which plays a significant role in the economies of many countries including South Africa.

The following section establishes the theoretical base for the construct of knowledge management and business intelligence.

LITERATURE REVIEW

Knowledge Management

Knowledge Management (KM) is defined by Prior (2010) as the organised and systematic process of generating, creating and distributing information, and selecting, distilling, deploying and exploiting explicit and tacit knowledge through the critical pillars such as people, process, and technology to create unique value that can be used to achieve a competitive advantage in the marketplace by an organisation. According to Frost (2011), KM therefore implies a strong connection to organisational goals and strategy, and it involves the management of knowledge that is useful for some purpose and which creates value for the organisation. Expanding upon the previous knowledge management definition, KM involves the understanding of the following:

- where and in what forms knowledge exists;

- what the organisation needs to know;

- how to promote a culture conducive to learning, sharing, and knowledge creation;

- how to make the right knowledge available to the right people at the right time;

- how to best generate or acquire new relevant knowledge, and

- how to manage all of these factors so as to enhance performance in light of the organisation's strategic goals and short-term opportunities and threats

The primary objective behind the knowledge management initiative is to capture the explicit and tacit knowledge about people, skills, processes, markets, competitors, customers, suppliers, organisation, environment, policies, procedures, regulation and legislation that exist and to make it available to all employees (Ganesh, Mohapatra & Nagarajan, 2014:3). The application of knowledge in the workplace is to reuse knowledge to reduce rework, redeploy knowledge to leverage best practices, transfer skills and behaviours, repurpose knowledge to drive innovation and achieve business benefits.

Business Intelligence

Gartner (2013) defines business intelligence (BI) as an umbrella term that comprises the applications, infrastructure, tools and best practices that enable access to and analysis of information to improve and optimize decisions and performance. According to Troy Media (2015), business intelligence (BI) is the analysis of the organization's internal data. BI is about gathering large amounts of raw data concerning all aspects of business, from profits and losses to productivity and converting it into actionable insights. Organizations use business intelligence to make improvements to current processes, products and services as well as identify and develop new opportunities. Coker (2014) views business intelligence as the means by which an organization collects its own information about customers, returning clients, sales or website hits and transforms the numbers into measurable metrics to ascertain that the organization is performing efficiently. BI depends mainly on technology, using applications and processes to analyze the (mostly internal) data. One of the main benefits of BI is that it enables the organizations to contextualize both historical and current data, which enables them to make better and informed predictions.

According to Techopedia (2014), BI technologies provide current, historical and predictive views through functions such as online analytical processing (OLAP), reporting, predictive analytics, data mining, benchmarking and Business Performance Management (BPM)

According to the Polasek (2013), objectives of a BI exercise include better decision-making, enhanced operational efficiency, growth in revenue and competitive advantage as well as enhanced customer service.

This research proposes that the convergence and synergy of Business Intelligence and Knowledge Management can act as a sonar, searching for underlying opportunities and threats that cannot easily be observed (monitoring critical strategic themes) and a radar helping the organisation on its road to the future, supplying intelligence about turning points (promoting a change in direction, forecasting what is ahead, developing scenarios) for the organisation. The organisations should be able to integrate all of their information and intellectual capital into a single database or system which will meet the intelligence requirements of management for strategic planning and decision-making.

PROBLEM INVESTIGATED

The mining sector is under a lot of pressure and there have been several reports of certain mines being forced to downsize their labour force as part of cost cutting strategies. The aging workforce together with the high staff turnover caused by either downsizing efforts to cut costs or others leaving to join other companies lead to a loss of knowledge and experience on an ongoing basis in the sector. Reductions in staffing have created a need to replace informal knowledge with formal methods. There is a need for a re-evaluation of the methods used to retain and develop knowledge within the sector.

Lack of credible information and knowledge of decisions taken by all stakeholders within the mining organizations has led to the weakening and even failure of some of these mines. A great deal of data is produced continuously at a site of the mine. Without a proper and systematic way to organise this data and present it in a timely, simplified, easily accessible and accurate manner, tactical and strategic decisions regarding the operations and long-term sustainability of a mine site becomes very challenging. Some mining organisations are still not capable of reading the competitive trends and forces affecting the industry. Some mines cannot benefit from any form of intelligence because it is not integrated, organised, processed and available to the right people in a format for decision-making. There are isolated pools of data which are mainly influenced by the functional view of the business units rather than a broader, general-management view of the whole mining organization.

There is also a scarcity in empirical literature about the use of knowledge management and business intelligence in the sector. This prompted the researcher to investigate the extent of the use of both business intelligence and knowledge management and how they contribute to business performance in the sector. This study aims to produce findings of practical relevance and value for the mining and other sectors. Therefore, this research seeks to contribute to both management practitioners and academics alike.

The research objectives of the study are outlined below.

RESEARCH OBJECTIVES

The research objectives are divided into primary and secondary objectives.

Primary objective

The primary objective of this study is to investigate effect of the use of knowledge management and business intelligence as strategic management tools to enhance business performance in the mining industry.

Secondary Objectives

To achieve the primary objective, the following secondary objectives include a need:
- to conceptualize knowledge management and business intelligence
- to empirically assess the use of knowledge management using a questionnaire;
- to empirically assess the use of business intelligence using a questionnaire
- to empirically assess the level of perceived business performance;
- to determine the factor structure and internal consistencies of the questionnaires that are used;
- to assess the relationship between business intelligence and knowledge management and business performance
- to compare the findings based on the geographic location of the organisations and
- to make managerial recommendations.

RESEARCH METHOD

A survey design was used in which a selected sample was studied to make inferences about the population. The survey involved selecting a representative and unbiased sample of subjects drawn from senior management in the mining organizations in South Africa, Africa and globally. The researcher used a simple random sampling technique to select participants. Saunders, Lewis and Thornhill (2015) state that simple random sampling involves the selection of a sample at random from the sampling frame using either random number tables or a computer. A total of 300 mines were randomly selected from a population of 850.

The survey questions were developed based on the existing literature with some questions adopted from a questionnaire from a study by Kruger (2010). The structured questionnaire which was used was divided into sections comprising the biographic information, items of business intelligence, knowledge management and perceived business performance which were measured using a 4-point Likert-type scale.

Statistical Analysis

The data gathered from the received questionnaires was captured and analysed using the statistical software programs.
Effect sizes and descriptive statistics were used to decide on the significance of the findings. The mean and standard deviations are used to describe and compare the results. The mean is used to measure the central tendency of the results. The standard deviation presents the average distance of the individual scores from the mean.
The factor structure was confirmed. Cronbach Alpha was calculated to check the reliability of the measuring instrument. Pearson product-moment correlation coefficients were computed to find the relationships between the variables. The statistical significance level was set at a 95% confidence interval ($p \leq 0.05$). The cut-off point of 0.30 is used to determine practical significance of a medium effect.

RESULTS AND FINDINGS

Biographical information was reported for a number of employees in the organization, level of employment, type of metal mined or processed, number of years the organization has been operating and the geographic location.

A total of 193 questionnaires were received. The majority of the respondents were working for the mines with more than 1000 employees (66%) followed by those in smaller operations

with less than 499 employees (18%). The respondents from medium-sized mines with 500 to 999 employees were about 16%. The majority of respondents were managers (57%) followed by directors (34%) and CEOs (9%). About 51% of the respondents were from the mines producing precious metals such as gold and platinum group metals. A number (17%) of the respondents were from coal mining organizations while about 11% were from the steel industry. About 12% were from the mines producing non-ferrous metals such as copper and only 8% were in the industrial metal mines. The majority of the respondents were from the mines with more than 20 years in operation (87%) which serves as a confirmation that most of the mines in the world have been operating for decades. Most of the respondents were from the South African mining operations (55%), other respondents were from the rest of Africa (23%) while the respondents from other continents such as USA and Australia formed about 21% of all the respondents.

The results of descriptive statistics are presented in the next section.

Descriptive Statistics

Knowledge Management

One of the main objectives of this study was to measure the extent of the use of Knowledge Management by the mining organizations. The questionnaire was designed to help critique the knowledge management process used by the mining organizations. The results of the survey are presented in Table 1.

Table 1: Results of the questionnaire on Knowledge Management

		Strongly disagree	Slightly Disagree	Slightly agree	Strongly Agree	Mean	Std Deviation
I1	Knowledge Management assists in creating value out of the intangible assets.	0	9.8	58.0	32.1	3.23	0.61
I2	The company values knowledge as a strategic asset, critical for success.	.5	5.2	52.8	41.5	3.35	0.61
I3	The culture in the organization is conducive to the sharing of knowledge.	8.3	17.6	56.5	17.6	2.84	0.82
I4	The organization benefits from the processes created to contribute knowledge.	4.2	25.5	54.7	15.6	2.82	0.74
I5	There is a general culture in the company where people respect knowledge.	3.6	9.4	67.2	19.8	3.04	0.65
I6	Employees are responsible for the transfer of knowledge in their areas of responsibility.	3.1	13.0	53.4	30.6	3.11	0.74
I7	Knowledge is accessed by employees by means of a central intelligence repository.	22.5	20.9	37.2	19.4	2.53	1.04
I8	The organization has the technical infrastructure to enable knowledge sharing.	13.0	19.2	48.7	19.2	2.73	0.91
I9	There is transfer of knowledge about best practices among employees in order to improve operational efficiency	16.6	18.1	36.8	28.5	2.78	1.05
I10	There is a document management system in place	14.1	15.1	54.2	16.7	2.75	0.90
I11	The organization stores Intellectual Capital.	4.7	13.5	67.4	14.5	2.94	0.65

(Source: Compiled by author from survey results)

The mean score for question I1 is 3.23 with low standard deviation of 0.609. About 90% of the participants responded positively and agreed that knowledge management assists in creating value out of the intangible assets in their own organizations. The mean score for question I2 was also high (3.35) with a low standard deviation because about 94% of the respondents agreed that their organizations value knowledge as a strategic asset which is critical for success.

About 26% of the participants responded negatively to question I3 indicating that the culture in their organizations is not conducive to the sharing of knowledge. Almost 30% of the respondents do not believe that their organizations are currently benefitting from the processes created to contribute knowledge. About 32% of the participants indicated that their organizations do not have the technical infrastructure to enable knowledge sharing and 35% believe that there is no transfer of knowledge within their organizations about the best practices among the employees in order to improve operational efficiencies. About 29% also indicated that their organizations do not have document management systems in place. Question I7 had the lowest mean score because 47% of the participants responded negatively to this question. This means that almost half of the respondents do not agree that knowledge is accessed by means of a central intelligence repository in their organizations.

The other objective of this study was to measure the extent of the use of Business Intelligence by the mining organizations. The results are presented and discussed below

Business Intelligence

The results are presented in Table 2. The mean score for item F1 is above 3 indicating that about 75% of the mining organizations systematically collect information to assist in strategic decision making. The standard deviation for the question was relatively high indicating a high spread in terms of the responses. A significant number (25%) responded negatively to this question.

Table 2: Results of the questionnaire on Business Intelligence

		Strongly disagree	Slightly Disagree	Slightly agree	Strongly Agree	Mean	Std Deviation
F1	Information is systematically collected to assist in strategic decision making.	13.5	11.9	32.1	42.5	3.04	1.04
F2	The availability of Business Intelligence has increased the effectiveness of managerial decision making.	8.8	19.2	25.9	46.1	3.09	1.00
F3	Business Intelligence tools are used to manipulate data, e.g. operational or/and historical data.	9.3	14.0	47.7	29.0	2.96	.89
F4	The Business Intelligence tools have forecasting capabilities.	7.3	10.4	59.1	23.3	2.98	.79
F5	Data gathered from Business Intelligence deployment is reliable.	7.8	1.6	70.5	20.2	3.03	.73
F6	Knowledge generated from successful Business Intelligence deployment can be used to sustain competitive advantage.	3.1	10.4	57.5	29.0	3.12	.71

(Source: Compiled by author from survey results)

The mean score for responses to item F2 was also above 3 indicating that the majority (72%) of the participants agree that the availability of business intelligence has to a certain extent increased the effectiveness of decision-making by the managers. A high standard deviation is also found for this item indicating a relatively large spread in terms of the responses. 28% of the participants responded negatively to this question. The mean scores for questions F3 and F4 are 2.96 and 2.98 respectively. These mean scores are close to 3 and also indicate that most of the participants responded positively to these questions. Thus the majority of the mining organizations have business intelligence tools which are used to manipulate data and also have some form of forecasting capabilities. About 20% of the organizations do not have such business intelligence tools or use them for these specific functions. About 91% of the respondents agree that the data they gathered from BI deployment is reliable. However about 9% completely disagrees and believe that the data is not reliable. The mean score of 3.12 for the last question indicate that most (87%) of the participants agree that the knowledge generated from the deployment of BI systems can be used to sustain competitive advantage.

In general, a large proportion of the participants responded positively to the questions about business intelligence. This indicates that most of the mining organizations are using some form of business intelligence in their strategic decision-making.

The perceived business performance of the organizations is discussed below.

Perceived Business Performance

The results for the overall business performance are shown in Figure 1.

Figure 1: Mean scores in ranking order for perceived business performance
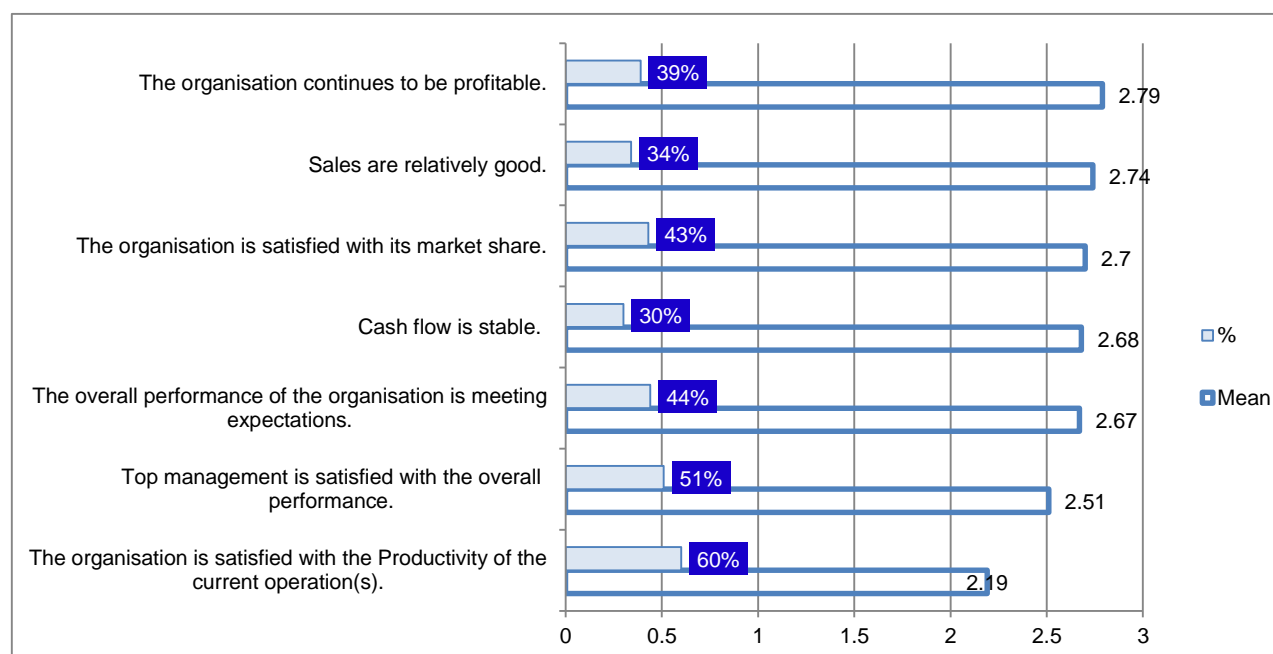
(Source: Compiled by author from survey results)

The majority of the organizations (60%) were not satisfied with the productivity of their current operations. There was also a large number (51%) of respondents who indicated that their top management was not satisfied with the overall performance of the organizations. The overall performance of a significant number (44%) of the mines was not meeting expectations. About 39% indicated that they were not profitable while about 43% were not

satisfied with their current market share. A significant number (30%) of the mines indicated that their cash flows were not stable.

The other objective was to confirm the factor reliability of the dimensions which were used. The results are shown in the following section.

Factor Analysis

Factor reliability of the identified dimensions is presented in Table 3. All the factors display satisfactory levels of reliability with alpha coefficients ranging from 0.87 to 0.95.

Table 3: Results of factor reliability

Factor	Cronbach Alpha	Cronbach Alpha Based on Standardized Items	N of Items	Mean	Minimum	Maximum	Range	Variance
Business Intelligence	0.900	0.908	6	3.039	2.964	3.124	0.161	0.004
Knowledge Management	0.876	0.873	11	2.921	2.534	3.354	0.820	0.059
Business Performance	0.946	0.946	7	2.613	2.192	2.788	0.596	0.042

(Source: Compiled by author from survey results)

The other main objective was to determine if there are any positive relationships among the different constructs of strategic intelligence, other types of intelligence, strategic planning and implementation and the performance of those organizations. The results of those correlations are shown and discussed below.

Correlations

The results of the product-moment correlation coefficients between the constructs are reported in Table 4.

Table 4: Correlation coefficients between the dimensions

	Business Performance	Business Intelligence	Knowledge Management
Business Performance	1.000	.796[**]	.705[**]
Business Intelligence	.796[**]	1.000	.798[**]
Knowledge Management	.705[**]	.798[**]	1.000

[**]. Correlation is significant at the 0.01 level (2-tailed).

(Source: Compiled by author from survey results)

The table shows that business intelligence dimensions are positively correlated to perceived business performance (practically significant, large effect). The table also shows that knowledge management dimension is positively correlated to perceived business performance (practically significant, large effect).

The other objective of this study was to compare the findings based on the demographic differences. This was achieved by using the ANOVA tools to establish if there were any significant differences in the responses based on the biographical information of the participants.

The data indicated that mines in other continents have relatively higher means implying that they use the business intelligence and knowledge management tools more than those in SA and the rest of Africa. Lowest means were observed for mining organization in Africa.

CONCLUSION AND RECOMMENDATIONS

The results confirmed that statistically and practically significant positive relationships with a large effect exist between business intelligence, knowledge management dimensions and business performance. The mining industry, like other organizations, uses information to expand and maintain competitive advantage in the current information age in which knowledge is power.

Collecting information and transforming this raw data into intelligence is an essential aspect of business. Organizations need to systematically and continuously collect information from their own internal business operations, the competitive environment, the competitors and the markets to assist in operational, tactical and strategic decision-making.

Knowledge management is essential for the successful management of mining operations and a complement to the other business activities of these organizations. Knowledge is indeed one of the most vital assets for organizational success. With the successful collection, distribution and creation of valuable knowledge, the mining organizations can enhance the process of organizational learning to improve performance and create more possibilities to gain competitive advantages. Integration of knowledge management processes such as acquisition, creation, sharing, utilization and transfer into the essential activities of the organization should be carried out by the managers. Participants in different geographic areas responded differently to the questions. Possible reasons for this can be determined by further research.

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