

A Retrospective Study on Integration of Knowledge Management (KM) and Business Intelligence (BI)

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ABSTRACT: Knowledge undoubtedly considered as the vital organizational asset in today's economic scenario, is expected to provide sustainable competitive advantage. Managing knowledge deals with tacit knowledge residing in the minds of people, whereas the domain of Business Intelligence (BI) is explicit knowledge stored on the physical media. Irrespective of industry sectors, Knowledge Management (KM) practices are playing a critical role for business leading to economic growth. With the rapid growth of abundant data in every organization and advanced techniques, firms have access to extensive pool of knowledge by gathering, analyzing, disseminating and storing of churned data, for decision making. The purpose of this research paper is to retrospect the literature reviews and publications from categories of KM, and BI. This article also highlights the reviewing studies of integration of both KM and BI. Moreover this manuscript is expected to expand the horizon for future research.

Keywords: Tacit Knowledge, Explicit Knowledge, Knowledge Management, Business Intelligence

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1. Introduction

We are living in 21st century, in a global village in an era of “Knowledge Economy”. The technology which is currently reigning the globe is “Information and Communication Technology (ICT)”. Now this is calling as in the name of Internet of Things (IoT). The seed for phenomenal growth of IoT is digitization and physical things connectivity. One single resource which can put any individual or organization miles ahead is knowledge. Knowledge Management (KM) and Business Intelligence (BI) aim to create, extract, store, disseminate and make the requisite knowledge available for the intelligent decision making in competitive environment in the organisations or firms. Like any other promising fields, Knowledge Management and Business Intelligence too are attracting researchers from different backgrounds. Today we can find experts and practitioners from the multiple disciplines of information technology, computer science, management science, organisational science, strategy, psychology, sociology, philosophy, information science, production engineering, and anthropology and so on. Taking keen interest and

working for the development and in turn harnessing the potential of Knowledge Management and Business Intelligence applications. It is expected to improve organisational and managerial as well as the financial aspects of an organisation. Knowledge Management also plays an important supporting function by providing a coordinating mechanism to enhance the conversion of resources into capabilities. In this competitive digital global world, too much of organisational data, is being generated by various smart devices, things, social networks, people and process. In addition, through old methods of company annual reports, white papers, and articles to name a few are also backing huge amount of data. With the good amount of job opportunities in multinational corporations, employees turn-over too, is causing loss of knowledge from experienced employees for a normal organisation. There is a strong need for doing exploratory research work on the essence of KM and BI and their integration practices for better organisational decision making.

2. Methodology



Figure 1. Knowledge Management Relations

The literature review has been carried out systematically on the topic “Integration of Knowledge Management (KM) and Business Intelligence (BI): A Review”. By considering 68 vital research articles, starting from the year 1998 to 2014. The major contributions on this topic are but not limited to Journal of Knowledge Management, Library Systems, Journal of Strategic Information Systems, South Asian Journal of Management and so on. Major work has been done in countries like USA and Canada along with the countries including India, China, Singapore, Japan, Italy, South Africa, Pakistan and Malaysia etc. The databases that are searched for research articles; are google scholar, knimbus and ebsco discovery. For the purpose of conceptualization white papers, online articles and books are also referred. The major keywords used for searching articles are knowledge management, business intelligence, KM, BI, competitive advantage, knowledge creation, critical success factors, and decision making, integration etc. What authors found in this systematic literature review is, that there needs to be work done in knowledge management with organizational performance, integration of KM and BI, and critical success factors for the organizational growth. The literature analysis is carried out by making use of bibliographic software Vantage Point.

3. Knowledge Management

In simplest term, Knowledge Management means exactly that: management of knowledge. It can be extended to management of organisational knowledge for creating business value and generating a competitive advantage. Knowledge Management consists of the processes required to effectively manage knowledge. It is a systematic, explicit and deliberate building, renewal and application of knowledge to maximise a firm’s knowledge-related effectiveness and returns from its knowledge assets (Wiig, 2000). Like any other resource knowledge needs to be managed. This has given rise to the term Knowledge Management. Knowledge Management is an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing and preserving knowledge, relevant to achieving specified objectives. It is a process of creating, structuring and leveraging collective know-how, experience and wisdom of an organisation to improve business performance. Knowledge

sources may include databases, documents, policies and procedures, as well as the un-captured tacit expertise and experience stored in individual workers' heads. One of the difficulties in knowledge management systems is that knowledge sources are widely distributed and exist in many forms. As diverse sources of knowledge accumulate in the company, it becomes more difficult for the knowledge seeker to locate and access the desired knowledge. The knowledge seeker may be unaware of knowledge sources and may not have the software necessary to access the knowledge. Since knowledge is widespread and varies in type in an organisation, a means of keeping track of the knowledge stored by the organisation and accessing is paramount. There are several examples of KM systems, including: Retrieval engines; Content management; Document and records management; Learning systems; Automatic classification systems such as neural networks, linguistic, or semantic processing systems; Intelligent technologies including, intelligent agents, regression and correlation, expert systems, case-based reasoning, data mining, and rule based systems; Communication systems including email and discussion forums (Rodger J. & Meliha H., 2004). The phrase "Knowledge Management" appeared regularly in the management literature through the 1960s and 1970s, alongside a thriving literature until well into the late 1980s exploring practical and theoretical problems of knowledge transfer, knowledge utilization, and knowledge diffusion. It was in the 1970s that the relationship of data management to information and Knowledge Management first began to be explored. The concepts of data, information and knowledge are generally confused. Data represents facts or observations out of context that are, therefore not directly meaningful (Zack M H., 1999). They are raw material of higher order constructs (Beirly P. E. et al., 2000). Information results from replacing data within some meaningful content, often in the form of a message (Zack M H., 1999). Knowledge is something more than information (Beijers R. Pu (1999). It is closer to action (Davenport T. H. & Prusak L., 1998). It is an organized and transformed combination of information, assimilated with a set of rules, procedures and operations learnt through experience and practice (Bhatt G. D., 2000). Knowledge is increased through interaction with information, typically from other people (Clarke T. & Rollo C., 2001). A commonly held view, stated roughly, is that data are raw numbers and facts, information is processed and organized data, and knowledge is meaningful and authenticated information (Alavi, M. & Leidner D. E., 2001). Knowledge is categorized as explicit and tacit knowledge (Polanyi M., 1966; Nonaka I., 1994). Explicit knowledge is easy to articulate, capture and distribute in different formats. Tacit knowledge is unspoken and hidden. It is difficult to capture, codify, adopt and distribute tacit knowledge; because individuals cannot easily articulate this type of knowledge. It can be thought of as the know-how that is acquired through personal experience (Ipe M., 2003; Perez J. R. & de Pablos P. O., 2003). And it has been evaluated as an inimitable competitive advantage (Lubit Roy, 2001).

Recent work in area of strategic management and economic theory has begun to focus on firm's resources and capabilities. This perspective is referred to as resource-based view of the firm (Prahalad C. K. & Hamel G., 1990; Barney J., 1991; Connor T., 2002). Resource-based view suggests that firms should position themselves strategically based on their unique, valuable and inimitable resources and capabilities (Zack, M.H., 1999b). In this sense, knowledge is considered as the most important strategic resource of the firm (Kogut, B. & Zander, U., 1996; Cohen W. M. & Levinthal D. A., 1990). So, as noted, the ability to acquire, integrate, store, share and apply knowledge becomes the most important capability for building and sustaining competitive advantages. Knowledge-based competitive advantage is sustainable because the more a firm already knows, the more it can learn. Briefly, managing knowledge has become crucial for organizations. KM has come to be regarded as an essential component of good management. Organizations need to manage knowledge both as an object and a process (Ramaswamy R., 2000). Research findings revealed that organizational culture significantly influences knowledge sharing and job satisfaction and that knowledge sharing plays an important mediating role between organizational culture and job satisfaction (Tong, C. et al., 2015). Knowledge Management can be defined as the achievement of the organization's goals by making the knowledge factor productive (Uit Beijerse, 2000). It is the systematic management of knowledge-related activities, practices, programs and policies within the enterprise. Knowledge management activities aim to effectively apply an organization's knowledge to create new knowledge to achieve and maintain competitive advantage (Mason D. & Pauleen D. J., 2003). Gholamreza J. et al., (2014) have studied and ranked knowledge management enablers. "Knowledge Management" is an emerging discipline included in the field of management science (Shariq, S. Z., 1997); Ives W. et al., 1998; Armbrrecht F. et al., 2001; Prusak L, 2001). It deals with utilizing knowledge in organizations. However "Knowledge Management" is also an emergent process in the organization (Gupta A. K. & Govindrajana V. 2000). This process is intrinsically linked to the social and learning processes within the organization. Based on the literature, four key dimensions of organizational knowledge-management process can be identified. These are the dimensions of knowledge construction, embodiment, dissemination, and use (Demarest M., 1997); McAdam R. & Reid R., 2000). The first dimension is the construction of knowledge within the organization. This construction is not limited to scientific inputs; it includes the social construction of knowledge as well. This dimension encompasses knowledge acquisition and new organizational knowledge creation. Second dimension is the embodiment of the constructed knowledge. Embodiment is realized not just through explicit programs but also through a process of social interchange. The third dimension is the dissemination process. Espoused

knowledge is disseminated throughout the organization and its environment. The last dimension is the use of knowledge. Knowledge is seen as being of economic use in regard to organizational outputs. It is used, and then the outcomes of the usage and efficiency of the overall knowledge-management process is evaluated (McAdamR & McCreedy, 1999).

The process of Knowledge Management cannot be regarded as a simple sequential process. Rather it represents an ongoing cycle including recursive relationships and complex interactions (Buckley P. J. & Carter M. J., 2002). There are two main approaches to Knowledge Management. One focuses on the deployment and use of appropriate technology to utilize knowledge, while the other focuses on the capture and transformation of knowledge into a corporate asset (Guah M. W. & Currie W. L., 2004). The first approach emphasizes Information Technology (IT) and focuses on it as the mechanism for managing knowledge (Hansen M. T. et al., 1999). The second emphasizes people and processes. It attaches greater importance to human relations and the elicitation of tacit knowledge (Allee V., 1999; Holsapple, C. W. & Joshi K. D., 2000; Gold A. H. et al., 2001). As a matter of fact, Knowledge Management is essentially a deeply social process which must take into account the human and social factors primarily. Advanced information technologies will not necessarily make Knowledge Management (KM) initiatives work. The most common theoretical and practical pitfall in the field of Knowledge Management (KM) is to perceive and/or evaluate knowledge as information and treat Knowledge Management as Information Management (McDermott R, 1999; Handzic M. & Agahari D., 2004). Advanced systems improving technical capabilities are important in fact, but they become useless and meaningless for the organizational Knowledge-Management process unless accompanied by cultural, structural and strategic progress. One study carried out by Karkoulin et al., (2013) says that managers should seek to implement formal and informal Knowledge Management processes into their organizational culture to enable a dynamic learning environment. Ooi, K. B. (2014), examined the multi-dimensional relationship of Total Quality Management (TQM) and KM in both service and manufacturing firms in Malaysia. The loss of knowledge due to departing employees poses a great threat to profitability and prosperity of organizations. Beazley et al., (2002) caution about above threat in their article on knowledge continuity in information age and as a recommendation to counter this, suggest transfer of knowledge into a capital asset. Relate to the concept of knowledge half-life, from which it is found that knowledge reaches obsolescence, on average, in 500 days, but can be much quicker in some areas (1) Lost knowledge obviously has a cost, estimated that \$115 billion sits idle in lost knowledge affiliated with production technologies. (2) An astounding example of this is the loss of the original computer source code, written in the 1950's, that spawned the Y2K software crisis, has cost businesses worldwide an estimated \$1 trillion (Petch, Geof, 1998).

4. Business Intelligence

Originally Business Intelligence (BI) term coined by the Gartner Group in 1993, is a broad range of software and solutions aimed at collection, consolidation, analysis and providing access to information that allows users across the business to make better decisions. The technology includes software for database query and analysis, multidimensional databases or OLAP tools, data warehousing and data mining, and web enabled reporting capabilities, applied across disciplines but especially in Customer Relationship Management (CRM), Supply Chain Management (SCM), Enterprise Resource Planning (ERP), provide better, faster and more accessible reports. The objective of Business Intelligence is to augment the employees' knowledge with information thereby enabling them to make better decisions. Business intelligence refers to the use of technology to collect and effectively use information to improve business effectiveness. An ideal Business Intelligence system gives an organisation's employees, partners and suppliers easy access to the information they need to effectively do their jobs, and the ability to analyse and easily share this information with others. Business Intelligence should be used as a Knowledge Management tool by financial community consultants (Muhammad, G. et al., 2014). Business Intelligence is the process of gathering high-quality and meaningful information about the subject matter being researched that will help the individual(s) analysing the information, draws conclusions or make assumptions (Jonathan, W., 2000). Business Intelligence is the conscious, methodical transformation of data from any and all data sources into new forms to provide information that is business-driven and results-oriented (Ranjan, J., 2008). Business Intelligence (BI) is defined in different ways. The Data-Warehousing Institute has defined BI as "the tools, technologies and processes required to data into information and information into knowledge and plans that optimize business actions" (Eckerson W., 2007). Another definition given by Turban is "a broad category of applications and techniques for gathering, storing analysing and providing access to data to help enterprise user make better business and strategic decisions", (Turban E. et al., 2006). Various researchers academicians and practitioners have identified following Critical Success Factors (CSF) of Business Intelligence (BI).

- Committed management support and sponsorship.
- Business user-oriented change management.

- Clear business vision and well-established business case.
- Business-driven methodology and project management.
- Business-centric championship and balanced project team composition.
- Strategic and extensible technical framework.
- Sustainable data quality and governance framework.

Seeley Charles P. & Davenport Thomas H. (Jan/Feb, 2006) call for merging knowledge and information. They say, that it is time for business intelligence and knowledge management to have a reapproachment, and perhaps even a complete merger. There are many attributes which are common in both these movements. Business Intelligence (BI) structure is depicted as a loop by Giovinazzo W., (2000) which includes Data Warehouse, On-Line Analytical Processing (OLAP) and Data Mining. All types of data whether transactional, master or reference enter the Business Intelligence loop through the operative environment. These data has to be error free, clean and transformed before storage in the Data Warehouse. Specific techniques are applied for this purpose to ensure that it meets the defined norms related to data quality and format. Once the data is extracted, transformed and refined, they are stored in the central depository which may be a data warehouse or data mart. This central depository may be a relational or multidimensional database, and is referred as data cube. Due to the huge amount of data and the need for fast response to queries, Data Warehouse database is mostly designed as a multidimensional database. Decision Support system is the next in the BI loop. OLAP and other data mining techniques are used to make simple or complex reports for decision support. A significant convenience is that decision support can also be achieved directly from the operative environment. Decision support is provided by returning all this information obtained by iterating process to Operative environment.

5. KM and BI Integration

The multi-faceted research fields of Business Intelligence (BI) and Knowledge Management (KM) comprise a wide range of strategies and practices supporting the identification, creation, distribution, and utilization of organizational insight. In organizational context, BI and KM increasingly penetrate the daily life by leveraging business models and applications that are based on the innovative use of extensive data sources. New opportunities result from mobile data, sensor data, web data, social media data, and network data, and require according data gathering, data preparation and, in particular, data analysis techniques.

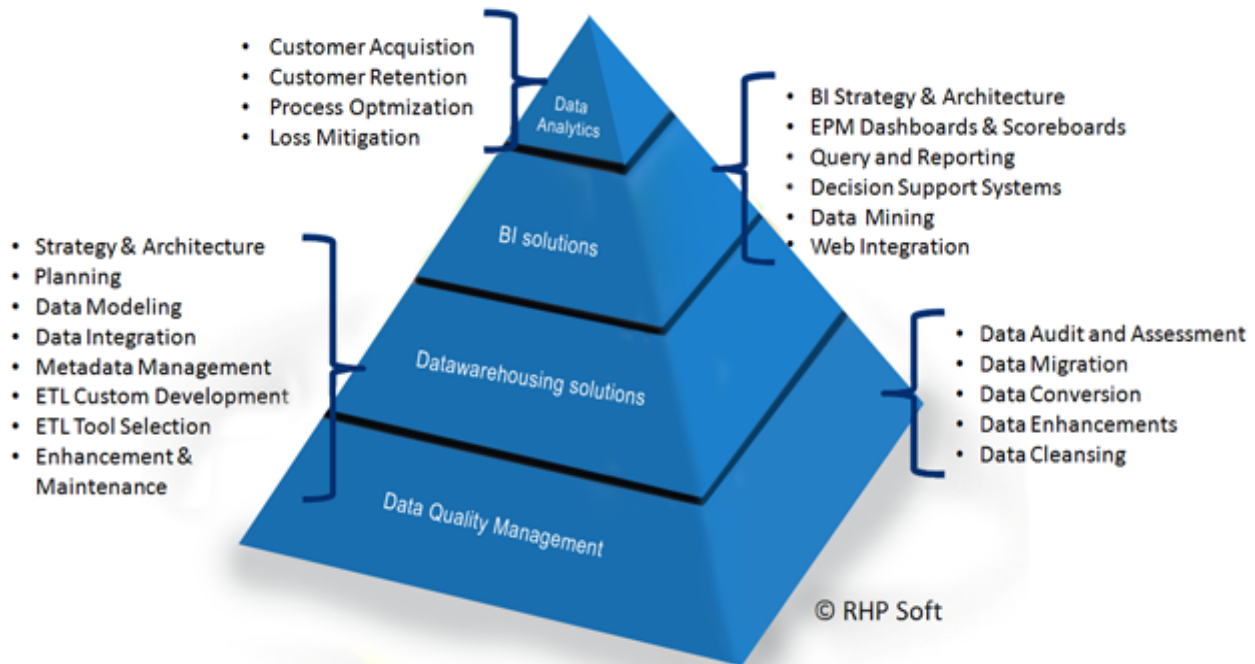


Figure 2. Business Intelligence Loop Source: Giovinazzo, 2000

BI and KM if used alone have not been able to meet the stated objectives. In 2002, sensing the need of the integration and commenting on BI and KM as two central technologies available to decision makers to improve the quantitative and qualitative value of the knowledge; Cody et al., (2002) expressed their belief that over time the techniques from both BI and KM will blend. “BI focuses on explicit knowledge, while KM encompasses both tacit and explicit knowledge”, stating this in their findings Herschel R. T. and Jones N. E. explained the nature of the integration between BI and KM and made it clear that BI should be treated as a subset of KM (Herschel R. T. & Jones N. E., 2005). BI and KM differ from each other but are interconnected in terms of synergy, common foundation and complementariness (Weidong Z. et al., 2010). Therefore, the relationship between KM and BI and the ways they differ from each other need to be explored. An insight into KM and BI integration reveals that BI transforms data into Knowledge and Information. KM helps share knowledge to create new knowledge and provides BI with an understanding of business perspectives as well as estimation and outcome analysis. Therefore, if KM and BI are aligned together, they can result in more effectual solutions. Surbakti H. argues that the integration of Knowledge Management and Business Intelligence processes will result in the empowerment of Government Business organizations (Surbakti, H., 2015). Cheng and Peng (2011) analyse BI and KM, and explain their pros and cons followed by proposing a framework named the KMBI framework that integrates KM and BI. The KMBI is built on three layers: data integration, function integration and presentation integration. KM and BI have different features and the integration of both can maximize organizational efficiency and provide the best services to the customers. Taking clue from the above papers many other researchers are now advocating the need for integration of both BI and KM. Knowledge, information and intelligence are not new terms and have been in use since ages. To be used in the perspective of BI and KM (Vinekar V. et al., 2009), have carried out a detailed study and have made following statements: (1) Intelligence is customised information that is focused on identifying specific problems and opportunities (2) The probability that traditional MIS will provide specific information is low, as most MIS focus on producing generalized reports (3) BI systems provide focused information (4) To turn information into intelligence, knowledge is required (5) To use intelligence to make a decisions. Historically these two fields KM and BI have been dealt with separately. Many researchers are of the view that there is a genuine need now to merge or integrate the two so as to meet the expectations of the industry. Some of the similarities of BI and KM are: (1) The underlying technology for both BI and KM is Information and Communication Technology. BI and KM both rely on the Internet, computer hardware, software, database storage and network communication technology (2) Their application in business processes both includes collecting, collating, sharing and the use of information and knowledge, and they both achieve their functions depending on information and knowledge. KM and BI interact with one another and supplement or complement (3) Subjectiveness of man is both emphasized in the application of them. KM’s object is knowledge, and it particularly concerned about humans who master knowledge, their culture and behaviour. It emphasizes the importance of the knowledge innovation and whether it is used effectively. BI initially focused on technology and data, the applied effect of which in fact is closely related to users’ skills as people normally use quantitative analysis of technical expertise to solve business problems with the aid of business intelligence systems.

Conclusions

The fields of Knowledge Management and Business Intelligence have evolved at different times and there is significant difference between the practitioners, academicians and researchers with respect to their academic background, experience and age. The underlying technology in both fields is Information and Communication Technology (ICT). The processes involved are different but input in both fields is data, information and explicit or tacit knowledge, which has many commonalities. The output generated is actionable information which leads to intelligence, insight or knowledge. The right knowledge disseminated at right time to the right person at right place will enable him to make right decisions thereby organisations attaining their objectives. Hence this paper advocates to look into the perspective of exploring the field of Knowledge Management and Business Intelligence as an integrated one by the generations of current and future researchers.

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