Exploring Factors that influence the Knowledge Worker in a Business environment

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Abstract. Much research has focused on the benefits and impacts organizations perceive from the use of business intelligence tools demonstrating how organizations gain a competitive advantage through the use of Business analytics. Advanced visualization tools lead to better decision-making as more advanced visualizations allow managers and executives to make better decisions. However, Big Data presents unprecedented challenges for the knowledge worker and a new as yet untested environment within which to work. Independent success factors have been shown to be critical to gaining overall IS success however, currently there is a lack of focus on what antecedent factors influence the successful usage of BI systems by knowledge workers. Therefore, this research proposes to explore the factors that influence the successful usage of BI systems by Knowledge Workers in a BI and Business Big Data environment.

Keywords. Knowledge Worker, Big Data, Business Intelligence, System Usage, IS Success

Introduction

In today’s cost-conscious environment, Ross (1999) asserts that organizations expect IT to reduce operating costs, show improvements in business processes, standardization

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of processes to ensure quality and reducing cycle times, to show data visibility to help knowledge workers make better business decisions with latest real-time data. The key to thriving in a competitive marketplace is staying ahead of the competition. Making sound business decisions based on accurate and current information takes more than intuition. Data analysis, reporting, and query tools can help business users wade through a sea of data to synthesize valuable information - today these tools collectively fall into a category called "Business Intelligence." Research highlights the impact and relationship of BI capabilities and BI success focusing on how organizations can use BI systems to achieve measurable financial benefit.

BI is used to gain insights that inform business decisions and can be used to automate and optimize business processes. New BI technologies and Big Data present great opportunities for organizations to leverage but also create a new set of usage challenges for the knowledge worker. Big Data i.e., the volume of information, the variety of data and the velocity of data, creates an emerging problem for the knowledge worker given the growing need for diverse analytical skills, needed to gain value from the vast amount of data available. As companies increasingly treat their data as a corporate asset and leverage it for competitive advantage, the need to create value from Big Data and new BI tools has intensified pressure on the knowledge worker to successfully adopt new systems and provide the promised new insights. As a result understanding successful usage in this new context is key to achieving the desired outcomes and benefits of Big Data.

In order to achieve the business benefits from IT tools, Staehr et al (2012) argue that the following conditions need to be achieved for post-implementation success:

- Influence of early phases in the IT cycle on subsequent phases
- Ongoing resourcing for post-implementation phase to develop in-house knowledge
- Establishing metrics
- Effective Change Management processes in-place.
- Education and quality training for in-house resources.
- Software to fit the needs of the business.
- People – Availability of experienced and skilled-staff to meet business benefits.

These factors demonstrate the important role antecedent factors play in the successful outcome of a system implementation and moreover highlight the critical role of the knowledge worker/user of the system; for instance, four of the seven conditions above relate to the knowledge worker. There has been much research focusing on the business benefits achieved through the implementation of BI tools but there is a gap in the research relating to the antecedent factors that determine whether such technologies will be successfully used and deliver the desired benefits. Indeed much prior research in the area of systems usage has demonstrated that simply providing a technology is not sufficient for a successful outcome, the needs and context of the users must be considered.

The primary research question addressed by this study is therefore: What
factors influence the successful usage of BI systems by Knowledge Workers in a BI/Big Data environment? This research will evaluate the success factors of the Knowledge worker and identify what are the important antecedent factors influencing usage success factors from the perspective of the knowledge worker in a relation to Business Intelligence tools. At the time of writing, this PhD research is in the literature review phase. This paper is structured in the following manner. Section 2 is a literature review. Section 3 discusses the research question and objectives. Section 4 discusses the research design and schedule of the research.

1. Literature Review

This literature review develops a framework to guide the research in certain specific contexts. It starts with a background and terminology associated with the knowledge worker and success factors related to the knowledge worker. The following section defines Business Intelligence (BI) and Big Data evaluating the literature then correlates this to the knowledge worker in the changing IT environment. The study then evaluates the area of system usage and what antecedent factors may make system usage successful for the knowledge worker in a Big Data/Business Intelligence environment.

1.1. Knowledge Worker

A knowledge worker is anyone who works for a living at the tasks of developing or using knowledge. This might be someone who works at any of the tasks of planning, acquiring, searching, analyzing, organizing, storing, programming, distributing, marketing, or otherwise contributing to the transformation and commerce of information and those who work at using the knowledge so produced. Research has demonstrated that there are a multitude of factors that can influence the knowledge worker in terms of productivity, job satisfaction, involvement, organizational commitment, and turnover intentions. Various strategies have been developed in recognition of the important impact that these factors have on the outcome of IS implementation initiatives. There were several themes around motivation and employee empowerment around the theme of the knowledge worker in reference to leadership and job assignments. Gardner and Schermerhorn (2004) discuss the need and impact of authentic leaders who arouse willingness to work hard to perform at one’s best. Beneficial employee treatment i.e, fairness, supervisor support, and favorable job conditions can be linked to positive organizational support from employees and knowledge workers. Walumba et al (2011) discuss how knowledge workers can work in remote parts of the world via virtual teams; these workers require little supervision, enjoy being rewarded for ideas that they generate but require an authentic leader who values aligned with company mission. Authentic leaders need to develop deep sense of trust in group members requiring input from team members.

Mak and Sockel (1999) assert job satisfaction is a key factor for IT employee motivation, which otherwise threatens productivity of IT operations. IT professionals are motivated by job assignments, appropriate job training workshops and seminars for learning new technologies. Coelho et al. (2011) believe when managers promote creativity and innovation in the work environment this creates...
increased employee satisfaction\textsuperscript{10}. Organizations such as PepsiCo use digital innovation to deliver more effective merchandising making simpler and cutting business processes making easier for knowledge worker\textsuperscript{11}.

Even if there is strong commitment and motivation from the knowledge worker, Chatzimouratidis et al. (2011) assert output or results from decision support systems are meaningless unless methods to analyze the data have been invested via web-based learning, job rotations, mentorship, case studies, and so forth\textsuperscript{6}. Such research is critical to ensure that the benefits of decision support systems are not lost. In summary, there are a multitude of factors that can potentially impact how effectively the knowledge workers function within the organization and indeed in relation to their interactions with new technologies. The area of decision support has been shown to require a particular focus in the past, however further research needs to be done to evaluate what factors impact the successful usage and results of decision support systems within the context of new business intelligence technologies such as Big Data.

1.2. Business Intelligence

Business intelligence (BI) has been defined as both a process and a product. Jourdan et al (2006) asserts that the process is composed of methods that organizations use to develop useful information, or intelligence, that can help organizations survive and thrive in the global economy\textsuperscript{12}. The broad category of applications and technologies for gathering, storing, analyzing, and providing access to data to help knowledge workers make better business decisions by predicting behavior of their competitors, suppliers, customers, technologies, acquisitions, markets, and products. Business analytics (BA) is the practice of iterative, methodical exploration of an organization’s data with emphasis on statistical analysis. Business analytics are used by companies committed to data-driven decision making. BA is used to gain insights that inform business decisions and can be used to automate and optimize business processes. Data-driven companies treat their data as a corporate asset and leverage it for competitive advantage. Successful business analytics depends on data quality, skilled knowledge workers who understand the technologies and the business and an organizational commitment to data-driven decision making\textsuperscript{2}.

Tooling the knowledge worker to fully utilize the BI tools for advanced capabilities is key for organizations to achieve maximum gain from BI and to enable knowledge workers to function productively\textsuperscript{13}. ERP software companies are empowering knowledge workers by offering more flexibility in the tools with less reliance on technical teams, which is seemingly cost-effective to the business. Knowledge workers are becoming more advanced super-users through increased exposure and experience in ERP applications. The number of programmers and dependency on IT is decreasing gradually as systems develop with training of power users for example instead of report developers which reduces the costs of IT consultants while also adding diversity to the roles of the business users. Decentralizing BI support skills and shifting them to the business is cost-effective but then a need for skills development and training exists.

Rowe and White (2012) suggest that powerful Business Intelligence (BI) analytics tools are given to managers to have access to decision-making so a need
for BI tools that are interactive and visual emerge. Quality training and education of these managers will need to take place so managers understand the concepts of analytics, interpreting the data, and the capabilities of the tools. There is clearly a shift in these BI tools to tailoring to the business audience. In addition, issues such as data collection, storage, and processing specific to Big Data analytics are becoming more important factors and have critical implications for the knowledge worker.

Stoica and Dragos (2010) highlights that there is a relationship between the needs of the knowledge worker and accessibility and usability of analytic tools to enable more educated analytical business decisions. Studies analyze how the BI strategy impacts the BI benefits by analyzing dimensions such as strategic alignment, governance, people, organizational culture and data and technology infrastructure. Shanks and Bekmamedova (2012) argue that BA systems contribute to competitive advantage but only when dynamic capabilities enabled by business analytics technology lead to improved firm performance. There is a gap however between the needs and context of the knowledge worker in the new Big Data environment and the accessibility and usability of the current tools.

Grabski et al (2011) note further research is needed into benefits arising from use and integration of Business Analytics as BI&A has emerged as an area of study for researchers and practitioners. The challenges and opportunities associated with successfully implementing BI& Analytics therefore require additional research in this area.

1.3. Big Data

Big Data is an important contemporary challenge as organizations are experiencing exponential growth of data with large pools that can be captured, communicated, stored, aggregated, and analyzed but there are endless business and economic possibilities with big data that could have huge value. Making quicker and easier decisions with better data reporting is the ultimate goal of BI. Data analysis can be argued to be the core of decision-making in business applications. ERP systems are not bringing business benefit if executives cannot make accurate decisions based on data in the systems. With mobile connectivity, social media, geo-sensors, cheap data storage, we are in an era of information explosion which leads to the next frontier in innovation, competition, and productivity. Big Data is an important issue today and will continue to be a growing concern as 90% of the data in the world today has been created in the last two years alone.

Big Data presents a new set of challenges for both executives and knowledge workers as the data is available but how do we extract value from this data through analysis? Currently, executives are unable get a global view of the data as everyone not on same software and some regions do not have same IT maturity. Data integrated from multiple sources is usually complex and costs usually under-estimated. Executives are cautious of making investments into analytics tools as convinced the organizations are not ready as they don’t understand the data they currently have with the current tools but they know there is value in the data they currently have.
There is a shortage of talent necessary in organizations to take advantage of Big Data by knowledge workers with sophisticated statistical and analytical skills to accommodate the volume, velocity, and variety of data as well as privacy, security, and data governance issues. This study will further analyze the impact the successful usage of the BI tools in the Big Data environment by the knowledge workers i.e., empowered through training and developing analytical skills.

2.4. System Usage and IS Success

Information Systems research provides solid theoretical frameworks with which to represent the important aspects of BI use and its antecedents. “Use” is a much researched construct and provides a basis for exploring usage perceptions of the Knowledge Worker in a Big Data context. Use is further a core component of the D&M IS Success Model, which provides a well-established framework with which to explore the impact of antecedent factors on success dimensions.

Recently, Petter et al. (2013) reviewed the important independent variables that impact IS Success and provided four specific determinants within which to theoretically examine success.

![Figure 1: Determinants of IS Success](image)

The strongest determinants for Use include organizational competence, extrinsic motivation, and IT infrastructure. The approach and results of this
investigation and including previous studies suggest new directions for research into the nature of system usage, its antecedents and consequences, which can be usefully applied to understanding success in the new domain on BI/Big Data. Both studies for example encourage further research for interactions among antecedents (how interactions among task, user, and structure contribute to a higher or lower user success), antecedents of specific IS dimensions (how the relationship between task, project and organizational variables impact the ‘Intention to Use’, and specific association among antecedents such as the relationship between technology experience and individual impact.

Burton-Jones and Gallivan (2007) suggest the multi-level approach appears to be a promising way to obtain rich insights into the nature and use of information systems in organizations (and in higher levels of collectives, such as industries or societies), increase the accuracy of the languages we use to describe system usage in research and practice, and increase the rigor and relevance of research on its emergence and change and its antecedents and consequences.

2. Research question and objectives

Much research has focused on the benefits and impacts organizations perceive from the use of business intelligence tools demonstrating how organizations gain a competitive advantage through the use of Business analytics. Advanced visualization tools lead to better decision-making as more advanced visualizations allow managers and executives to make better decisions. However, Big Data presents unprecedented challenges for the knowledge worker and a new as yet untested environment within which to work. Independent success factors have been shown to be critical to gaining overall IS success however, currently there is a lack of focus on what antecedent factors influence the successful usage of BI systems by knowledge workers. Therefore, this research proposes to explore the factors that influence the successful usage of BI systems by Knowledge Workers in a BI and Business Big Data environment. The following research questions are proposed as a result:

1. What are the important antecedent Success factors for BI/Big Data systems, from the perspective of the knowledge worker?
2. How do antecedent success factors impact successful usage of BI/Big Data systems, from the perspective of the knowledge worker?
3. What elements characterize “successful usage” of BI/Big Data systems, from the perspective of the knowledge worker?

If the D&M IS Success Model is a reasonably robust description of the dependent variable of IS research, then what are the independent variables that “cause” IS success or influences IS Success in a BI/Big Data context? What determinants have been shown to relate positively to IS success? Are there factors, particularly those that are under the control of management, that can act as levers to improve the chances of success of their investments in the area of Big Data (Petter et al., 2013)? The theoretical framework of this study is based on Figure 1 – Determinants of IS Success – and intends to identify antecedents of Project and Organizational characteristics -
Management Support, Task Characteristics - Task difficulty, and Users and Social Characteristics – Enjoyment and measure the impact on successful usage factors in a BI environment in relation to the knowledge worker in a BI/Big Data environment.

3. Research Design and Proposed Schedule

This research intends to follow a positivist methodology in identifying and measuring the influence of independent and dependent constructs representing success. The design intends to include a structured literature review in order to identify relevant variables and then iteratively develop the list with sample participants prior to a main survey study. The following stages present a brief outline of stages.

- Stage 1: Develop a comprehensive list of antecedent dimensions in line with the Petter et al (2013) model and the Usage concept from the existing literature.
  - April – June 2014
- Stage 2: Conduct exploratory studies with knowledge workers to identify any missing dimensions and confirm an overall set of factors.
  - July – September 2014
- Stage 3: Develop a final research model containing antecedent dimensions and propose hypotheses.
  - October 2014 – May 2015
- Stage 4: Conduct case studies with selected organizations e.g., PepsiCo, TekLink, Epsilon, SAP, Northwestern Hospital, and Accenture via face-to-face, semi-structured, in-depth interviews, surveys, focus groups in order to study the proposed model and test hypotheses.
  - June – December 2015
- Stage 5: Analysis of data and Discussion.
  - January – April 2016
- Stage 6: Final Review and Submission.
  - May – October 2016

References


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