Business Intelligence Success Model: A Conceptual Analysis

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Abstract

Business Intelligence (BI), driven businesses have shown high performance and are considered a high priority for many companies worldwide. Unfortunately, according to the Gartner report, the BI project's success rate is meagre, suggesting that the existing Model fails to serve the purpose. As reviewed from the latest available literature, there is a lack of consensus on the BI Success Model. BI Success Model studied from a technological and organisational capabilities perspective. Having the right organisational and technological capabilities is essential for an organisation to realise maximum benefits from its BI investment. This research explores the various constructs used in literature to define organisational and technological capabilities impacting Business Intelligence's success in an organisation. The study presents findings drawn from the review of the latest secondary data to identify BI success factors. For BI researchers, it provides a knowledge base from where they can take up further empirical research for analysis and project managers and BI solution developers. It serves as a guide to devise an effective and solution development strategy.

Keywords: Organisational, Technological Capabilities, Business Intelligence, The Success Model

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1. INTRODUCTION

Business Intelligence (BI) is tools, technology, and concepts that help businesses manage large amounts of information to identify and develop new opportunities and enable decision-making. BI is an approach that uses technology to support the Organisation in achieving its long-term goals by aligning the business with the organisation strategy. Rud (2009) gave a wholesome definition for Business Intelligence that highlights this blend of technological and organisational perspective. They defined BI as a set of theories, methodologies, processes, architectures, and technologies that transform raw data into meaningful and valuable business information. BI can handle large amounts of information to help identify and develop new opportunities. Using new opportunities and implementing an effective strategy can provide a competitive market advantage and long-term stability.

Unfortunately, the BI project's success rate is meagre, according to Gartner (2017) report, suggesting that the existing Model fails to serve the purpose. As reviewed from the latest available literature, there is a lack of consensus on the BI Success Model. BI Success Model is studied from a technological and organisational capabilities perspective.

This research develops an updated instrument to assess how technological capabilities and organisational capabilities impact Business Intelligence's success in an organisation. Having the right technological and organisational capabilities is essential for an organisation to realise maximum benefits from its BI investment.

1.1 Business Intelligence in the Energy Sector

Increasing concerns regarding dwindling natural resources and the impact of their usage on the environment have propelled organisations to review their energy footprints.

It becomes imperative to investigate the efforts made by these organisations in ensuring the sustainability of their businesses and the environment. Moreover, considering the size of the business's Organisation and complexity, this task is challenging and calls for the deployment of sophisticated information technology systems that can help process a vast amount of data to draw insight for business reporting and decision-making.

The business intelligence drawn from BI systems in an organisation can go a long way in assisting the Organisation in achieving success in its Global Reporting Initiative (GRI) efforts. In other words, BI's success in the Organisation can be instrumental in achieving success with its GRI efforts.

However, as discussed above, the BI initiatives' low success rate defers the adoption of BI infrastructure in the Organisation, though studies have indicated that the BI adoption by organisations has led to a marked increase in their output and profit Gartner (2009). This call for reanalysis of the BI model's constituents used to deploy BI systems in the Organisation to identify the missing factor for BI success.

2. LITERATURE REVIEW

This literature review initially defined the term Business Intelligence (BI), BI Capabilities and BI Success. In the subsequent sections of the literature review, studies from the latest available literature from peer-reviewed journals and creditable online databases reviewed using the keywords to explore the constituents of Technological Capabilities, Organisational Capabilities, decision environment, and impact on business intelligence success. Thus, a funnel approach to writing a review of the literature adopted. Initially, the latest available literature on Business Intelligence reviewed for a general overview. Later, literature focusing on BI capabilities and BI success was filtered and analysed for the views, opinions, and variables They are used to define Organisational Capabilities constructs and BI success. The findings of the literature are chronologically arranged in the form of tables.

2.1 Business Intelligence (BI) and BI Success

Dresner (1989) coined the term Business Intelligence (BI) and defined BI as an umbrella term to describe a set of concept methods used to support decision making. Negash (2004) described BI systems as a tool for data gathering, data storage, and knowledge management to

present complex internal and Competitive information to planners and decision-makers. Olszak & Ziemba (2003) and Watson et al. (2004) define BI as a tool assisting enterprise in realising the strategy and supporting decision-making about Organisational processes. The first two authors' definition had a technological perspective, whereas the last two authors' BI definition had an organisational perspective. This indicates that BI, as an approach, uses technology to assist the Organisation in achieving its long-term goals by aligning the business with the organisation strategy.

Olivia (2009) came out with a more wholesome definition for Business Intelligence that highlights this blend of Technological and Organisational perspective. She defined BI as a set of theories, methodologies, processes, architectures, and technologies that transform raw data into meaningful and valuable business information. BI can handle large amounts of information to help identify and develop new opportunities. Using new opportunities and implementing an effective strategy can provide a competitive market advantage and long-term stability.

Business Intelligence success has been defined in terms of net benefit gained from BI capabilities studied from organisational and Technological perspectives.

Various construct has been identified from the literature review to operationalise Business Intelligence Success.

BI success was defined using the following constructs, decision making, information timeliness, information precision, user friendly and overall satisfaction drawn from Soilen (2012) scale.

2.2.1 Technological Capabilities

When it comes to Technological factors impacting BI success, most of the literature has focused on data and content quality. In some recent studies like the example by Abdinnour-Helm, Lengnick-Hall & Lengnick-Hall (2003), the research emphasised the need for Interaction among subsystems example, Integrating Business Intelligence and Knowledge Management to deal with challenges of the modern-day systems. Hostmann (2007) discussed the need to have timely access to the relevant, reliable information to the business manager to enable them to make every day's decisions since access, consistency, and quality of information must be for information system success. Chung, Chen, & Nunamaker (2005).

Work explored the visual framework's role to ease information overload and offers practical implications to information system users. Deng & Chi (2012) developed a comprehensive and dynamic view of the system to solve problems in organisations regarding system use by using seven emergent constructs of system use, as follows: issues in reporting, data, workflow, and role authorisation, users' lack of knowledge, system error, and user-system interaction. Isik, (2009) research provided a better understanding of BI success by proposing a framework that examines the impact of Technological capabilities on BI success in the presence of Different decision environments. McKeen, Smith, & Singh (2005) provided insight into identifying and implementing functional IT capabilities. The result is a 5-step framework for enhancing IT capabilities. Mircea, Ghilic-Micu & Stoica (2011), the paper presents aspects of BI and Cloud Computing's mix, emphasising integrating a Cloud BI solution within organisations. An ROI indicator also used to assess the advantage of Cloud BI over non-cloud BI. Popovič, Coelho & Jaklič (2009) proposed a model of the relationship between business intelligence systems and information quality and investigated the impact of business intelligence systems' maturity on the quality of content and media quality. Popovič, Hackney, Coelho, & Jaklič (2012) emphasised understanding how Business Intelligence System (BIS) dimensions are interrelated affect BIS use.

BIS maturity is a determinant of information access quality and information content quality. However, information content quality is more significant compared to information access quality. Pretorius & Wijk (2009) proposed that while designing information visualisation techniques, one should focus on the data. A new awareness is acquired about end-user requirements, and simultaneously, the end-users unique needs are known with this approach.

Ramakrishnan, Jones & Sidorova (2012), the paper explores the factor that governs Organisation BI goals and their data collection strategy. It also provides them with a model to support decision making. Sanga & Iahad (2013) study pointed out that many BIS implementations are unsuccessful because they are time-consuming and expensive. They also proposed a framework for a critical success factor for BI success based on the project implementation life cycle. Watson (2009) paper discussed four significant BI trends that affect BI success. These trends were scalability, pervasive BI, operational BI, and the BI based Organisation. From the literature reviewed so far, we identified those constructs mentioned as the fundamental for BI systems' success in the research until now but perhaps not put together or grouped and explored simultaneously to understand their impact on system success.

For this study, the technological capabilities defined using Isik (2009) scale. The Technological capabilities contributing to BI success studied in the research suggest that it can redefine the grouping of the constructs used to define BI success models.

2.1.2 Organisational Capabilities

Olszak & Ziemba (2003) study put forth an integrated approach to implement business intelligence systems. The BI systems comprise several dimensions that call for proper handling from people who have expertise in handling those dimensions. In other words, they emphasised the need to have personnel with the right skill sets to ensure the BI system's success. They also stressed the need to develop models for process and organisation structure to provide a robust BI system.

Imhoff (2005), in his study, talked about the capabilities of the Organisation to manage risk by monitoring the financial and operational health of the Organisation and by regulating the operations of the Organisation through key performance indicators (KPIs), alerts and dashboards go a long way in achieving BI success in the Organisation. Gonzales (2005) discussed the role Intuition, in the context of analysis, can be described as rapid decision making with a low level of cognitive control and high confidence in the recommendation.

Although BI has improved significantly with the developing technology, its core processes have rarely changed. Polites (2006) emphasised the need to consider the latency components' antecedents that influence organisations' capabilities to perceive and respond to real-time events. They further extolled that this could impact the firm's ability to benefit and optimise BI systems. Simultaneously, Butler & Gray (2006) discussed the need for mindfulness among BI system users to ensure the quality and reliability of the information in the BI system.

Hostmann et al. (2007) examined Intuition's role in the final decision making based on BI system output. Elbashir, Collier & Davern (2008), in their study, highlighted the need to have a robust method to calibrate the business value of the BI systems by observing and exploring the finding of the prior attempts on BI projects. This study also emphasised the need to reflect on the context of use while designing performance measurement for IT-intensive systems and exploring the contextual moderators that help realise those benefits. Yeoh, Koronios, & Gao (2009) study developed a critical success factor framework that consists of essential BI system success factors. This framework's unique characteristics emphasised the need to have a focused business championship and balanced project team composition. It also highlighted the strategic and extensible technical requirements and sustainable data quality and governance in the framework. Their idea further extended by the incorporation of the fact in the Model that issues like employee resistance. Change management can cause a lack of success in the BI system and hence call for adequate attention and review, as discussed in the study by Seah, Hsieh & Weng (2010). Ghazanfari, Jafari & Rouhani (2011). The paper also proposed a tool that comprises six factors for evaluating BI system competitiveness. This tool's unique feature focused on the need to have Integration with Environmental Information and Stakeholder Satisfaction. Adamala & Cidrin (2011) revealed that non-technological issues in BI system success were more challenging to resolve than technological issues. It also extolled the need to keep the end-user in mind while

designing a BI system success system. Althuizen, Reichel & Wierenga (2012) article brought to light the observation that there may be a vast disconnect between user evaluations and actual performance DSSs.

Moreover, if DSSs are optimally utilised, the user evaluation should be as accurate as possible. Farrokhi & Pokoradi (2013) research discussed evaluating BI readiness for achieving BI system success. This concept revealed the gaps in areas where the company is not ready to proceed with its BI effort. Olszak (2014) explores the human factor: the Organisation's frontline employees, who are valuable intelligence assets, as they possess and interpret information about the business environment.

2.1.3 Decision Environment

The Organisation's decision environment described as the processes and methods employed by an organisation to decide its various activities Isik (2009). Several studies have extolled the importance of information the quality provided by BI for quality decision making in the Organisation.

Visinescu (2016) highlighted that the quality of the information in an organisation is directly proportional to the value it gave to decision-making based on its information. For this study, the decision environment defined using Isik (2009) scale.

A study by Clark (2010) also strengthened the argument, in which he concluded that BI practitioners' perception about the decision determines what Organisation and Technological intervention used. In another research, Kokin (2013) verified that BI capabilities positively correlated with BI success. However, Isik et al. (2013) showed how this BI success was modified when another factor like decision environment explored. Their study discussed the effect of the decision environment on the utilisation of BI capabilities. Following the literature review following constructs and variables were extracted for studying Business Intelligence Success, as shown in Table 1.

Table 1: Variable and their Sources for Business Intelligence Success

Concept Name	Construct Name	Item Name	Source Name
Business Intelligence Success	Business Intelligence Success	supports for decision making	Isik (2009)
		precise information	Petter, DeLone and McLean (2008), Søilen (2012).
		timely information	Petter, DeLone and McLean (2008), Isik (2009), Søilen (2012).
		user friendly	Petter, DeLone, and McLean (2008), Isik (2009), Hou (2012), Søilen (2012).
Decision Environ-ment	Information processing needs	granularity	Isik (2009), Clark (2010)
		Accuracy	Isik (2009), Clark (2010)
		scope	Isik (2009), Clark (2010)
		Type of information	Isik (2009), Clark (2010)
		routine, repetitive decisions	Eckerson (2003), Isik (2009), Visinescu (2016)
	Decision type	higher-level manager involvement	Eckerson (2003), Isik (2009), Visinescu (2016)
		automation	Eckerson (2003), Isik (2009), Visinescu (2016)
Technologi-cal capabilities	Data Source	availability of internal data sources	Isik (2009), Olszak (2014), Grublješič and Jaklič (2015),Yeoh and Popovič, (2016)
		usability of internal data sources	Isik (2009), Olszak (2014), Grublješič and Jaklič (2015), Yeoh and Popovič, (2016)

		understandability of internal data sources	Isik (2009), Olszak (2014), Grublješič and Jaklič (2015), Yeoh and Popovič, (2016)
		availability of external data sources	Isik (2009), Olszak (2014), Grublješič and Jaklič (2015), Yeoh and Popovič, (2016)
		usability of external data sources	Isik (2009), Olszak (2014), Grublješič and Jaklič (2015), Yeoh and Popovič, (2016)
		understandability of external data sources	Isik (2009), Olszak (2014), Grublješič and Jaklič (2015), Yeoh and Popovič, (2016)
	Data Reliability	reliability of internal data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		consistency in internal data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		accuracy of internal data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		update in internal data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		reliability in external data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		consistencies external data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		accuracy in external data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
		update in external data	Isik (2009), Popovič, Hackney, Coelho & Jaklič (2012).
	Quality of Data	accurate quantitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		comprehensive quantitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		consistent quantitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		high-quality quantitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		high-quality qualitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		accurate qualitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		comprehensive qualitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
		consistent qualitative data	Hostmann et al. (2007), Isik (2009), Ramakrishnan, Jones & Sidorova (2012)
	User Access	quality access	Eckerson (2003), Hostmann et al. (2007), Isik (2009)
		access authorisation	Eckerson (2003), Hostmann et al. (2007), Isik (2009)
		access for all decision types	Eckerson (2003), Hostmann et al. (2007), Isik (2009)
	Interaction with systems	a unified view of business data and processes	Abdinnour-Helm, Lengnick-Hall, and Lengnick-Hall (2003), Hostmann et al. (2007), Isik (2009), Deng & Chi (2012)

Organisational Capabilities	Intuition Involved	links among multiple business applications	Abdinnour-Helm, Lengnick-Hall, and Lengnick-Hall (2003), Hostmann et al. (2007), Isik (2009), Deng & Chi (2012)
		enterprise information resource information	Abdinnour-Helm, Lengnick-Hall, and Lengnick-Hall (2003), Hostmann et al. (2007), Isik (2009), Deng & Chi (2012)
		decisions based on facts and numbers	Hostmann et al. (2007), Isik (2009)
	Flexibility	involve your gut feeling for the decisions you make	Hostmann et al. (2007), Isik (2009)
		use your Intuition to make better-informed decisions	Hostmann et al. (2007), Isik (2009)
		the decision requires a high level of thought	Hostmann et al. (2007), Isik (2009)
		emphasis on your past experiences for the decisions you make	Hostmann et al. (2007), Isik (2009)
		compatible with other tools that you use	Imhoff (2005), Isik (2009)
		accommodate changes in business requirements quickly	Imhoff (2005), Isik (2009)
		makes it easier to deal with exceptional situations	Imhoff (2005), Isik (2009)
		highly scalable concerning transactions	Imhoff (2005), Isik (2009)
	Risk level	supports decisions associated with a high level of risk	Gonzales (2005), Isik (2009)
		accommodate changes in business requirements quickly	Gonzales (2005), Isik (2009)
		minimise uncertainties in your decision-making process	Gonzales (2005), Isik (2009)
		manage risk by monitoring and regulating the operations	Gonzales (2005), Isik (2009)

3. RESEARCH METHODOLOGY

The study has used secondary data analysis involving literature review, case study analysis, and white paper review method spanning over the last ten years (2008-2018) was adopted to explore a BI success model's constituent.

4. FINDINGS AND DISCUSSION

The IS and BI literature spanning over the last ten years from several creditable journal databases like Scopus (Elsevier), Web of Science (ISI), EBSCOhost, ABI/INFORM Complete (ProQuest), and the ACM Digital Library was used for paper search on Business Intelligence general overview. Later BI Success measurement was reviewed by searching papers using the keywords and focusing on BI capabilities. The study found the most used factors to describe Business Intelligence Success. Business Intelligence Success is defined in terms of business intelligence capabilities. The business intelligence capabilities are further discussed in terms of technological capabilities and organisational capabilities. Various factors are used to describe these two capabilities. The study explored the different constructs used under these two capabilities and discussed the decision environment's role and the element constituting the decision environment as shown in Table 1.

5. MANAGERIAL IMPLICATION

This study provides managers with a valuable list of factors to assess their companies' strengths and weaknesses regarding Business Intelligence Success.

The proposed measures make it possible to compare a firm Business Intelligence Success to those of other enterprises, providing a basis for determining where additional investments should be made to upgrade and improve Business Intelligence. Managers can creatively gear finances through organisational and technological capabilities by conceiving and exploring various dimensions.

6. FUTURE WORK

This study provided factors for assessing Business Intelligence Success in the organisation. Further, full-scale empirical research will be undertaken with more companies in the energy sector to understand the various business intelligence capabilities impacting business intelligence success initially in the energy sector and subsequently across other industries.

7. CONCLUSION

The study provides an insight to all managers at various levels in the Organisation to understand better the Technological and Organisational Capabilities requirements and best practices for attaining BI success and gaining its benefits. The findings also help clarify BI success according to the current business requirements across the globe.

The finding will serve as a road map for the software development team developing BI solutions for organisations. It provides a knowledge base for BI researcher from where it can take up further empirical research for analysis and project managers and BI solution developers. It serves as a guide to devise an effective and solution development strategy.

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