

An Empirical Investigation of Role of Decision Environment in Business Intelligence Process

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Abstract

Business Intelligence (BI) driven businesses have shown high performance and therefore are considered a high priority for many companies across the globe. Incidentally, Gartner (2012) reported that less than 30% of BI projects meet the objectives of the business. BI success has been defined in terms of net benefit gained from BI capabilities which have been studied from organizational and technological perspectives, but still, organizations fail to achieve success. This suggests that there is scope for more research for redefining BI success model in the organization. One factor that has been shown to have a role in BI success but not studied enough is the “decision environment” in the organization. The purpose of this research is to explore the role of decision environment in BI process. Secondary data analysis involving, literature review, case study analysis, and white paper review method spanning over the period, from 2000 to 2016 was adopted to explore what constitutes a decision environment and BI success in today’s business environment. Literature focusing on decision environment and BI success was filtered and analyzed for the views, opinions and variables used to define decision environment constructs, which were chronologically documented in the form of tables. Later an online questionnaire was created based on definition obtained following the review of the literature. This questionnaire was emailed to senior executives who are using BI solutions across industries and the globe to seek their views and opinions. Descriptive statistics were used to analyze the data and interpret the findings. The present findings are gained from secondary data analysis which included author’s previous work on BI success as well and was subsequently supported by primary data analysis. The study found key factors constituting decision environment. The review also presented an updated definition of BI success in today’s business environment following literature analysis; thus, enabling redefining the BI success model for organizations in terms of update constructs and variables. The study provides an insight into the working of managers at various levels in an organization to better understand the decision environment requirements and best practices for attaining BI success and leverage the benefits it provides. The findings also help clarify the definition of BI success according to the current business requirements across the globe. The finding will serve as road map for software development team developing BI solutions for organizations. Exploring the available latest literature on decision environment for BI success provide a knowledge base to the researcher and enable them to conduct empirical research for further analysis and for project managers and BI solution developers, it serves as a guide to formulate an effective and solution development strategy.

Keywords: Business intelligence, decision environment, success, organization

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Introduction

“Without data, you’re just another person with an opinion.”

W. Edwards Deming

It is no wonder that modern-day organizations lay emphasis on data-driven decision-making. Business Intelligence (BI) is one such tool, technology, and a concept that assist businesses in managing massive information to identify and develop new opportunities and enable decision-making (Rud, 2009). BI-driven businesses have also shown high performances and therefore are considered a high priority for many companies across the globe. Incidentally, according to Gartner (2012) report, less than 30% of BI projects meet the objectives of the business (Davenport, 2012). This scenario calls for an analysis of factors impeding BI process in the organizations. BI success is defined in various terms but one commonly agreed upon term is the one studied by Isik (2009). It provides net benefit gained from BI capabilities which have been studied from organizational capability and technological capability perspectives (Mishra & Saini, 2015). Of the several dimensions attributed to the success of BI, one contributor that is yet not explored adequately is the role of the “decision environment.” Business decision environment in an organization is reflective of its structure and flow of information. Understanding the role of decision environment on BI success is important as they vary from organizations to organizations. In certain industries and sector, they have a prime role to play in the final decision-making and hence, there are strategic and operational benefits in understanding the business environment. Some qualitative studies on BI success have suggested that decision environment in the organization have an impact on the BI success but no conclusive empirical studies are available in this context. This suggests that there is scope for more research for redefining BI success model in the organization. This study is an attempt to explore further the role of decision environment in BI process. Going forward this article provides an overview of literature included in this study. It also provides a research framework, discusses the methodology adopted for this study, finding, and discussion and finally the conclusion of this study.

Review of Literature

Decision environment of the organization has been described as the processes, methods employed by an organization to make the decision for its various activities. It also shows the direction of the flow of information in the organization. It thus implies that information quality provided by BI for quality decision-making in the organization is of prime importance. Incidentally, studies have also shown that quality of the information also depends on how much importance organization gives to a decision-making. (Visinescu et al, 2016) Clark (2010) has also shown that BI practitioner perception about decision determines what organization and technological intervention would be used. Kokin & Wang (2013) in their study confirmed that BI capabilities are positively correlated with the success. Isik et. al, (2013) explored how does this success get modified when another factor like decision environment is taken into consideration. They also discussed the impact of decision environment on the utilization of BI capability. A study by Riabacke et al. (2011) and Talukder et al. (2014) have suggested that decision performance is based on the role decision-maker place and on the prior experience of the decision-maker and the uncertainty in the business environment. A study by Liu et. al. (2010) advocates integration to support decision-maker and improve decision-making. Spark & McCann (2015) in their paper concluded that besides the information quality, content, the analytical decision-making culture in an organization determined the use of BI systems in the organization. Also since the nature of decision taken in a different level of organization is distinct there is a need to understand decision support needs of senior executive for BI success. (Arnott, 2010) Shollo & Kautz (2010) in their study have pointed that the very process of decision-making in an organization can impact the success of the BI systems in place due to their complexity.

Nevertheless, the focus of BI research has been more on data and information and is less on knowledge and decisions-making, which otherwise forms a part of modern day BI definition. (Shollo & Kautz, 2010) (Table 1).

Table1. Decision Environment Construct

Variable	Source
Decision types and information processing needs	Isik, O. (2009)
Decision-maker role	Riabacke, A., Larsson, A., & Danielson, M. (2011); Talukder (2014)
Decision processes	Shollo, A., & Kautz, K. (2010)

Source: Literature Review

As seen from this discussion the main job of BI is to assist in efficient decision-making in the organization. BI alone cannot accomplish this task as several other factors come into play for achieving the success that otherwise is solely expected from BI in the organization. One such factor is the role of the decision environment of the organization. There is less literature available on the role of decision environment on BI process. This suggests that there are gaps in the research to be filled, and that previous researchers have perhaps overlooked one or more key constructs for a BI success model. As seen from the review of the literature the decision environment construct has been variedly defined and the impact of decision environment on BI process, in the organization today has not been adequately studied.

Business intelligence success, on the other hand, has been redefined over the time as user satisfaction, system quality, information quality, service quality, and user friendliness as shown in Table 2. (Mishra & Saini, 2015)

Table 2. Business Intelligence Success Construct

Variable	Sources
Decision support	Isik, O. (2009)
End User Computing Satisfaction (EUCS)	Hou, C. (2012)
system quality, information quality, service quality, use, user satisfaction, and net benefits	Petter S., DeLone W. & McLean E. (2008)
Information quality, user-friendly, overall satisfaction	Søilen, K. S. (2012)

Source: Mishra R., & Saini A.K. (2015). Organizational capabilities impacting business intelligence success in organizations today, competing through operations excellence. New Delhi, Bloomsbury Publishing India Pvt. Ltd.

Following the review of the latest literature, those constructs which pointed as the fundamental for the success of BI systems in the researches done till date were identified but perhaps not put together or grouped and explored simultaneously to understand their impact on system success, as presented in Table 1. This study has adopted decision environment definition given by Isik, O. (2009). It comprises decision types which constitute a measure of repetition in decision-making, the involvement of senior management, and the extent of dependence on data for decision-making. The other variable constituting this construct is information processing needs which evaluate the granularity of information required, the extent of qualitative or quantitative

analysis undertaken, the accuracy of information required, and currency of the information. BI success was measured using Sørensen, K. S. (2012) work. The construct comprised five items that are user satisfaction, system quality, information quality, service quality, and user friendliness. This is shown in Table 5. Figure 1 illustrates the structural diagram based on the definition operationalized for decision environment following review of the literature.

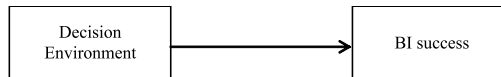


Figure 1. Decision Environment and Business Intelligence Success
Source: Literature Review 2017

Following hypotheses have been formulated to test the impact of decision environment in achieving BI success in an organization:

H1a: There is no relationship between the decision type and BI success in an organization.

H1b: There is no relationship between the information processing needs and BI success in an organization.

H1c: There is no relationship between the decision-maker's role and BI success in an organization.

H1d: There is no relationship between the decision processes role and BI success in an organization.

Theoretical Framework

Following are views on the literature. Decision environment has a role to play in BI success. (Isik, 2009) This assumption is shown in Figure 1.

Research Methodology

To identify the items contributing to decision environment and BI success a Likert scale based online survey was created using Google forms. The survey respondents were the end users and solution developer for BI systems from middle and executive management and having experience varying from 5 years to less than 25 years. They were from a different educational background and hailing from different industries. These respondents were selected by using author's contacts list on LinkedIn. A list of 450 people who fit the earlier-mentioned criteria was drawn from the contact list. The online questionnaire was emailed to these people to collect data.

The respondents were asked to indicate their organization type, work experience, education, level in management, and type of industry. Information was also sought on various technological capabilities they thought impacted BI success in their organization. Information was also sought on their definition of BI success. A five-point Likert scale based questionnaire was developed following literature review for conducting the survey. The literature suggests that five-point scale appears to be less confusing and to increase response rate also with a five-point scale; it is quite simple for the interviewer to read the complete list of scale descriptors. (Dawes, 2008)

For simplification, this study assumed the role and impact of other capabilities and dimensions to be standard while exploring the role of decision environment in BI success. Another limitation is that respondents were selected from authors contact list on LinkedIn and these respondents came from diverse industries and background. Perhaps a larger sample size and respondents from one industry or sector would have provided a more accurate assessment of the situation. Also, considering other dimensions impacting BI success into account would give a more holistic picture of the factors influencing BI success in organizations today.

Findings and Discussion

For confirming survey's validity and reliability, a pilot study was conducted. To find questionnaire reliability the internal consistency, which are the most popular methods of estimating reliability was measured. Cronbach's alpha test was used. (Nunnally & Bernstein, 1994). Cronbach's alpha value was found to be 0.81 which is good since a minimum alpha of 0.6 sufficed for the early stage of research.

A total of 35 responses were received and usable. The respondent was mainly from IT/ITeS, banking, and retail industry, as these are also the industries where BI systems are maximally being used. There were 80% respondents who were a private organization, 17% were from the government, and 3% were self-employed. This shows that when it comes to public sector and other government organizations, there is a need to pick the pace on implementation of BI projects. There were 60% respondents who were from the middle management, while 40% were from executive management, indicating that BI is being used more for operational and tactical decision-making than strategic decision-making. The demographic profile of the respondents is shown in Table 3.

Table 3. Respondents Profile

Demographic Characteristics		Percentage
Organization Type		
	Private	80
	Government	17
	Self-Employed	3
Work Experience		
	5 years to less than 10 years	10
	10 years to less than 15 years	14
	15 years to less than 20 years	14
	20 years to less than 25 years	10

Educational Level		
	Graduation	10
	Post-graduation	45
	Professional	40
	PhD	5
Level in Management		
	Executive Management	40
	Middle Management	60
Type of Industry		
	IT/ITeS	60
	Retail	5
	Finance	30
	Others	5

Source: Primary Data Analysis

Likert-type scales are useful when you are measuring latent constructs like characteristics of people such as attitudes, feelings, opinions, etc. Latent constructs are generally thought of as unobservable individual characteristics that are believed to exist and cause variations in behavior. A single item with this scoring is ordinal, but not a good choice for the kind of statistical analyses that require a numerical or interval level variable. Likert Scale is summing together several Likert-type variables to create a scale that can produce an interval-level variable. Since there are a series of Likert-type questions that when combined describe a trait or attitude, means, and standard deviations are used to describe the scale and assess respondent opinions.

As seen from Table 4 for decision environment construct, the mean for all items for decision type variable (DT) is 3.36 which shows a neutral or undecided view regarding decision type in the organization of the respondents in the sample. This situation is expected. The organization collects a lot of data but hardly make efficient use of it for BI, thus BI success remains a distant dream. Hence, the following should be encouraged in the organization to get positive Return on Investment (ROI) from BI investments.

1. Repetitive and routine decisions should be based on the BI generated. Also, such decision which is repetitive should be considered as a candidate for automation.
2. Higher management involvement in final decision-making should be minimized to give a free hand to managers as this would encourage them to make more use of BI for their decision-making.

- Increasingly decision-making in an organization should be data driven and evidence based, to encourage good utilization of BI and would also be a first step in ensuring BI success.

It thus becomes imperative that organization reassess their decision environment so that it plays a constructive role in their BI initiatives.

The mean for all items in information processing variable needs (IP) is 3.93 which tends toward higher side of expectations for information processing; be it for need for high granularity of the information, high accuracy expected from information, emphasis is currently on more of quantitative analysis and less qualitative information analysis for BI, which need to be reassess for full utilization of information in organization and thus be able to serve current or update information.

From the discussion mentioned earlier, it can be said that decision type and information processing need is a good qualifier for decision environment construct.



Figure 2. Structural Diagram of Decision Environment
Source: Primary Data Analysis

Table 4. Decision Environment

Item Code	Mean	Standard Deviation	Sample Variance
DT1	3.3	0.7	0.5
DT2	3.6	0.9	0.8
DT3	2.4	1.0	1.0
DT4	4.2	0.7	0.5
DT5	3.3	1.1	1.3
IP1	4.1	0.9	0.8

IP2	4.2	0.8	0.6
IP3	3.1	1.2	1.5
IP4	4.0	0.8	0.6
IP5	4.1	0.9	0.8
IP6	4.1	0.9	0.7

Source: Primary Data Analysis

As shown in Table 5, BI success is measured using the Likert-type scale. The median for all items is found to be 3.7 which corresponds to overall satisfaction with BI. This is in consistent with the results of the previous studies. BI success is dependent on various factors which are specific or peculiar to the industry, BI maturity, and management level in an organization. Hence, BI success cannot be generalized. Overall satisfaction seems to be the better measure of BI success.

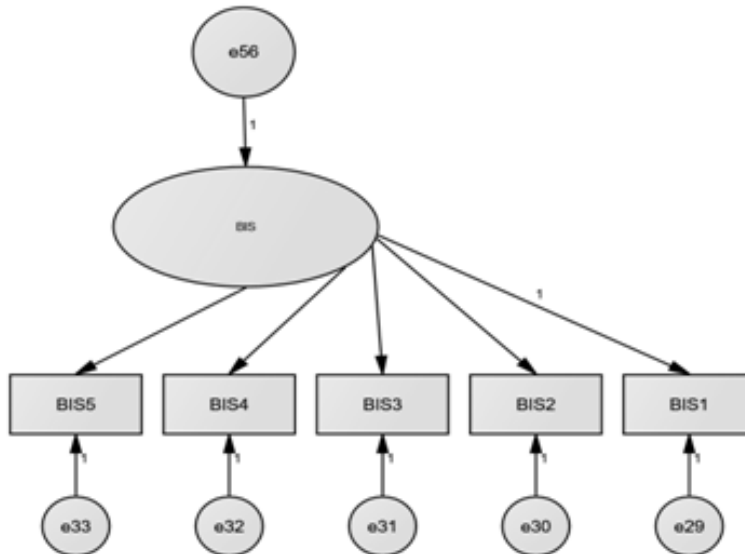


Figure 3. Structural Diagram of Business Intelligence Success
Source: Primary Data Analysis

Table 5. Business Intelligence Success

Item Code	Mean	Standard Deviation	Sample Variance
BIS1	3.9	0.5	0.3
BIS2	3.9	0.9	0.8
BIS3	3.7	0.7	0.5
BIS4	3.2	1.1	1.2
BIS5	3.7	0.8	0.7

Source: Primary Data Analysis

Hence, it can be said that whenever organization will have a supportive decision environment, overall satisfaction would be achieved from their BI initiatives.

As seen from the data in various tables mentioned earlier there is very little variance, with all responses at either 3 or 4 is observed, implying standard OLS regression would not be an appropriate analysis method. More complex techniques, such as logistic regression, would be better but due to small sample size, it is not feasible to conduct this analysis. So, in the present case, the data from a survey are analyzed with the objective of explaining the association in a dependent variable which is BI success. It is also relevant to find what other variables might be strongly related to higher or lower scores on the dependent variable. The Likert Scale based survey data was found to be not normally distributed. To measure the association among variables, Spearman Correlation Coefficient analysis was chosen. The results are presented in Table 6. Spearman Correlation evaluates both linear and non-linear relationships between two variables. When there are no repeated data values, a perfect Spearman correlation of +1 or -1 occurs when each of the variables is a perfect linear and non-linear function of the other.

At 0.05 level, the Spearman Correlation coefficient for DT5 and IP1 which correspond to computational complexity requirement for decision-making and granularity of information respectively were found to have a significant role in overall satisfaction with BI in an organization. This implies that there is a relationship between the computational complexity requirement for decision-making and BI success in an organization and there is also relationship between the information granularity and BI success in an organization.

At 0.01 level, the Spearman Correlation coefficient for DT2, DT4, and IP2 which correspond to decision making without higher management involvement and need for intuition and judgment for decision-making and finally accuracy of information respectively was found to have a significant role in overall satisfaction with BI in an organization. This implies that there is a relationship between the decision-maker's role and BI success in an organization. And there is a relationship between the accuracy of the information and BI success in an organization.

Table 6. Spearman Correlation Coefficient

Dependent Variable		Independent Variables											
		DT1	DT2	DT3	DT4	DT5	IP1	IP2	IP3	IP4	IP5	IP6	
BIS	3	Correlation											
		n	0.21	-	-	0.533*	0.415	0.338	0.445*	0.03	0.24	0.08	-
		Coefficient	5	0.474*	0.25	*	*	*	*	4	2	3	0.01
				1								5	
		Sig.	0.21	0.14	0.001	0.013	0.047	0.007	0.84	0.16	0.63	0.93	
		(2-tailed)	5	0.004	6				7	1	8	1	

Note. *Correlation is significant at the 0.05 level (2-tailed)

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

Source: Primary data analysis

Conclusion

This research found key constituents of decision environment, impacting BI process in various organizations. The research provides an insight into the working of managers at various levels in an organization to better understand the decision environment requirements and best practices for attaining BI success and leverage the benefits it provides. The findings also help clarify the definition of BI success according to the current business requirements across the globe and thus simplifying the expectation of BI system. The finding will serve as a road map for software development team developing BI solutions for organizations by elucidating the requirement for BI success. Also exploring the available latest literature on decision environment for BI success provide a knowledge base to the researcher to enable them to conduct empirical research for further analysis and project managers and BI solution developers. It serves as a guide to formulate an effective and solution development strategy. Finally, going forward studies can be taken to understand the impact of several other dimensions on BI process for its success.

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