Business Intelligence Success in Selected Organizations in the Energy Sector in India: An Analysis

ABSTRACT

A report by the International Energy Agency (IEA), 2020, has indicated that India should make energy data efforts to ensure its management, monitoring and data reporting to accomplish energy demand and sustainability targets. The energy sector organizations address these concerns using Business Intelligence (BD to gain insight for their various operations and support decision making. However, BI project's low success rate has been raising a question about its adoption; hence, there is a need to relook at the current BI Success model. In this study, we aimed to find the constituents of the Business Intelligence success model under different decision environments in organizations in the energy sector, using a survey of business intelligence users in the managerial positions. The study results found that interaction of systems, quality of data, user access to BI and risk level of the organization have a significant role to place in business intelligence success in organizations. This study's findings will be valuable for managers, policymakers, and researchers in the domain of business intelligence and energy sector and allied organizations.

Key Terms: Business Intelligence, Success, Model, Energy Sector, Organizations

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INTRODUCTION

India is globally third-largest consumers of energy. It imports 80% of crude oil to meet the growing need, Varghese, G., & Eapen, L. M. (2016). In other forms of energy also India needs to upgrade its infrastructure to serve its ever-growing population. The Indian energy sector provides scope for large investment from investor both from India and abroad but several challenges on this front, most important being the inadequate technological infrastructure, defer investors from investing, Varghese, G., & Eapen, L. M. (2016). Public sector companies in India's energy sector are the largest contributor to its Gross Domestic Product (GDP). Still, recent series of disinvestments in several public sector companies has brought profitability of many of these organizations under the scanner. The ever-increasing demand for energy has compelled organizations in the energy sector to heed to the issues surrounding efficient use, production, and distribution of energy. The International Energy Agency (IEA), (2020) stated that India should take measures so far energy data management, monitoring and reporting are concerned with attaining sustainability targets.

Companies in the energy sector using Business Intelligence (BI) to gain awareness for their enterprises to address their business concerns. Using BI, organizations gain a good advantage,

operational efficiency improvement, and profitability through data collaboration and analysis systems found as the intermittent layer between the business process and data collection. Having adequate BI infrastructure in the organization and its utilization in decision-making can give the organization a competitive advantage. Corporations that have implemented business intelligence have shown growth in businesses' revenue.

Nevertheless, incidentally, Gartner's report of 2017 from a survey carried out on enterprises across the globe have been pointing at the low success rate of Business Intelligence project. Though several BI success models proposed still, BI project's low success rate has raised its adoption question. Hence there is a need to relook the current Model to understand the impact of various BI constituents on BI Success.

ENERGY SECTORIN INDIA: AN OVERVIEW

An analysis of the annual reports of the last five years of the nine biggest companies in India's energy sector indicated that companies had allocated a large amount of their budget in deploying or upgrading their technological infrastructure. Upon further analysis of the annual report, we observed that all the organizations under Maharatnas category had implemented BI infrastructure in their premises.

The energy sector in India comprises of both public and private organizations. The public sector organizations also called the PSUs are grouped into Mining, Manufacturing and Electricity. The Government of India established Maharatna status for PSUs corporations with annual profit over three years more than 2500 crores. These groups are further divided into subgroups, Coal and Lignite, Crude Oil, Petroleum, Power generation and power transmission, as shown in Figure 1.

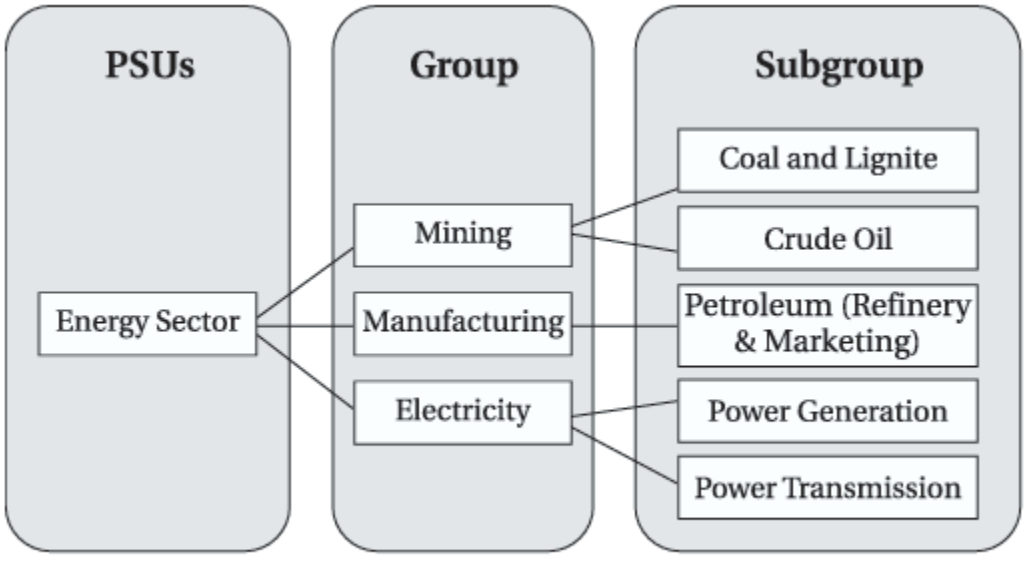

Figure 1: Energy sector in India

Source: As per the information received from the Department of Public Enterprise

Each of these group comprises of several companies. These corporations categorized as Miniratna, Navratna and Maharatna based on their yearly turnover. Among these companies, the Maharatna have the most significant turnover over the previous three years. As of year, 2019, ten companies are part of the Maharatna group. Out of the ten companies, nine companies are in the energy sector.

LITERATURE REVIEW:

Business Intelligence Capabilities and Business Intelligence Success

Howard Dresner (1989), gave the phrase Business Intelligence (BI) and defined BI as a domain to suggest process used to support decision making. Solomon Negash (2004) defined BI applications as mode data gathering, storage and knowledge management to elaborate on crucial business information to business decision-makers and planners. The various BI definitions had a technological perspective as well as an organizational perspective. It indicated that BI, as an approach, uses technology to help the organization achieve its long-term goals by aligning the business with the organization strategy.

Studies have indicated that the concept of Business Intelligence Capability constitutes Technological Capabilities and Organizational Capabilities of organizations. Studies have also shown that different decision environments have a moderating effect on the impact of Technological Capabilities and Organisational Capabilities on Business Intelligence Success in the organization. However, over the last few years, the rapid advancement in technology and shift in business paradigm has created need to redefine what constitutes technological capability and organization capability for today's organization. Watson et al. (2004), defined BI as a tool assisting enterprise in realizing the strategy and advocating in decision-making about organizational processes. Negash (2004), extended this classification and described BI systems as a tool for data gathering, storage, and knowledge management to present complex internal and economic information to planners and decision-makers. The various definitions of BI point that BI helps enterprises utilize the data to gain their business insight. A recent report from Gartner (2019) mentioned that organizations intend to spend trillions of dollars on their BI infrastructure to gain competitive advantage.

Measuring Business Intelligence Success

Business Intelligence success defined in terms of net benefit gained from BI capabilities studied from organizational and technological perspectives Isik (2009). Numerous types of research have characterized BI success in terms of BI capabilities encompassing organizational capabilities (Eckerson, (2003), Watson and Wixom, (2007) and technological capabilities. Interestingly, despite the proposition of various models for achieving BI success, several organizations can still not accomplish BI success, Jourdan et al., (2008). Isik (2009) suggested that this may be because of the influence of the decision environment on BI success. However, the study showed a lot of scales related and various other limitations. Hence re-examining this relationship is appropriate because BI's primary purpose is to support organizations' decision-making, Eckerson, (2003).

Table 1: Variables for Business Intelligence Success

Variable	Sources
Decision Support	OyukIsik (2009)
Precise Information	Petter S., DeLone W. and McLean E.(2008), Søilen, K. S. (2012).
Timely information	Petter S., DeLone W. and McLean E.(2008), OyukIsik (2009), Søilen, K. S. (2012).
Overall satisfaction	Petter S., DeLone W. and McLean E.(2008), OyukIsik (2009), Hou, C. (2012), Søilen, K. S. (2012).

Source: A literature review

Moreover, in the last few years, the rapid advancement in technology and the shift in business paradigm has led to the need to redefine what constitutes technological capability and organization capability for today's organization, Olszak and Ziemba (2003). Furthermore, as discussed before, Gartner (2017) reports that the BI project's success rate is still meagre. In this context, it becomes imperative to re-examine the factors that contribute to BI success in organizations. Business Intelligence success was measured using a construct comprised of five items: information quality, user-friendly and overall satisfaction, Sgilen, K. S. (2012). Hawking, P., & Sellitto, C. (2015) have indicated that although BI is seen as vital for utility companies, achieving success with BI is still an area of exploration. Table 1 shows the various other factors used to measure BI Success.

Measuring Technological Capabilities

OyuklIsik (2013)'s research provided an improved understanding of BI success by proposing a framework that explores technological capabilities that comprise data source quality, data type, systems interaction, reliability of data, and ease of user access to BI in the organization. A study by Popovic, A., Hackney, R., Coelho, P. S., & Jaklic, J. (2012) emphasized understanding how Business Intelligence System (BIS) dimensions are interrelated and how they affect BIS use. Nevertheless, information content quality is more significant as compared to information access quality. Pretorius A. and Wijk J. (2009), article proposed that while creating information visualization techniques, one needs to focus on the data. A new awareness acquired about end-user needs and simultaneously, more recent requirements known with this approach. Ramakrishnan, T., Jones, M. C., & Sidorova, A. (2012), the paper explores the factor that governs organization BI goals and their data collection strategy. It also provides them with a model to support decision making. SangarA., A.lahad N. (2013), the study pointed out that many BIS implementations are not successful because they are time-consuming and expensive. They also proposed a framework for critical success factor for BI success based on project implementation life cycle. Radenkovic, M., Lukic, et al. (2018), the study

found current literature fails to inform about methodologies and best practices for designing BI solutions, incorporating all the specifics of rapidly evolving energy markets. Table 2 indicates the various constructs used to measure Technological Capabilities.

Table 2: Constructs for Technological Capabilities

Constructs	Sources
Data source	Isik, O. (2009)
Data reliability	Isik, O. (2009), Popoviè, A., Hackney, R., Coelho, P. S., &Jakliè, J. (2012).
Quality of Data	Hostmann et al. (2007), Isik, O. (2009), Ramakrishnan, T., Jones, M. C., & Sidorova, A. (2012)
Information system interaction	Abdinnour-Helm, S., Lengnick-Hall, M. L. and Lengnick-Hall, C. A. (2003), Hostmann et al. (2007), Isik, O. (2009), Deng, X., & Chi, L. (2012)
User access (2007), Isik, O. (2009)	Eckerson (2003), Hostmann et al.

Source: A literature review

Measuring Organizational Capabilities

Yeoh, W., Koronios, A., & Gao, J. (2009), study developed a critical success factor framework that consists of essential factors for BI system success. This framework's unique aspects emphasized the need to have a business-focused overall satisfaction, Sgilen, K. S. (2012). Hawking, P., &Sellitto, C. (2015) have indicated that although BI is seen as vital for utility companies, achieving success with BI is still an area of exploration. Table 1 shows the various other factors used to measure BI Success. Measuring Technological Capabilities OyuklIsik (2013)'s research provided an improved understanding of BI success by proposing a framework that explores technological capabilities that comprise data source quality, data type, systems interaction, reliability of data, and ease of user access to BI in the organization. A study by Popovic, A., Hackney, R., Coelho, P. S., & Jaklic, J. (2012) emphasized understanding how Business Intelligence System 20 championship and balanced project team composition. It also emphasized the strategic and extensible technical requirements and sustainable data quality and governance in the framework. Their idea was further extended by incorporation of issues like employee resistance and change management because of the lack of success in the BI system and hence call for adequate attention and review as discussed in the study by Seah, M., Hsieh, M. H., & Weng, P. (2010). Ghazanfari, M., Jafari, M., & Rouhani, S. (2011), the paper also proposed a tool that comprises six factors for evaluating BI system competitiveness. This

tool's distinctive features focused on the need to have Integration with Environmental Information and Stakeholder Satisfaction. Adamala S. and Cidrin L. (2011) showed that the non-technological matters in BI systems success were more challenging to solve than technological problems. It also appraised the need to keep the end-user in mind while devising a BI system success system. Farrokhi V. and Pokoradi L. (2013), research discussed the concept for assessing 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, C. M. (2014), work explores the social factor: the organization's employees at the operational level and have the precious intelligence assets they possess early and interpret information about the business environment. This information should effectively be utilized in the BI process to integrate into strategic management smoothly. A study by Harison, E. (2012) emphasized the need to understand various organizational capabilities in the energy sector to achieve success with BI. Oyuklsik (2009), emphasized the role of organizational flexibility and risk-taking capability as a contributing factor in overall BI success. Table 3 indicates the various organization capabilities used in this study.

Table 3: Construct: Organizational Capabilities

Constructs	Sources
Intuition Involved	Hostmann et al. (2007), OyukIsik (2009)
Flexibility	Imhoff (2005), OyukIsik (2009)
Risk Level	Gonzales (2005), OyukIsik (2009)

Source: A literature review

Measuring Decision Environment

The organization's decision environment described as the processes and methods employed by an organization to decide its various activities Isik (2009). Several studies have extolled the importance of information quality provided by BI for quality decision making in the organisation. Visinescu (2016) highlighted that the quality of the information in an organization is directly proportional to the value it gave to decision-making based on its information. Table 4 indicates the various constructs used for defining Decision Environment.

Table 4: Decision Environment Construct

Constructs	Sources
Decision Types	Isik, O. (2009), Clark (2010)
Information Processing, Needs	Eckerson, (2003), Isik, O. (2009), Visinescu (2016)

Source: A literature review

A study of Clark, (2010) also strengthened the argument, wherein he concluded that BI practitioners' perception about 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 capability.

HEORETICAL FRAMEWORK

Following the review of the literature, the following model adopted for further investigation.

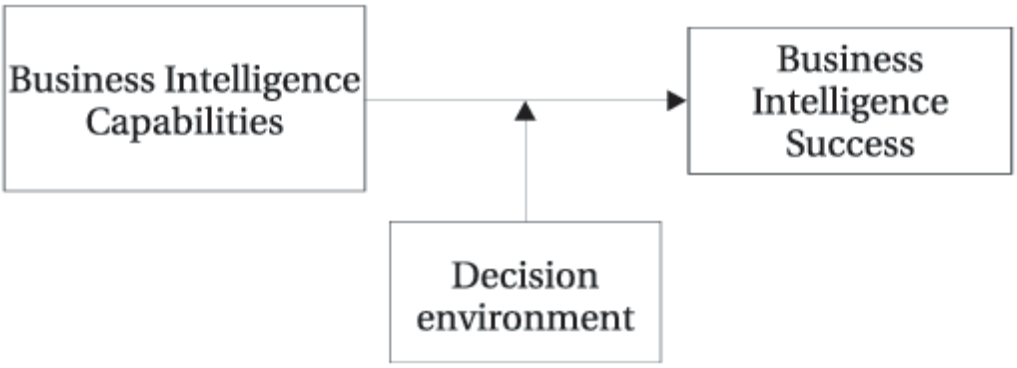

Figure 2: Business Intelligence Success Model

Source: Oyuklsik, 2009

We have adopted a Business Intelligence Success model given by OyuklIski, (2009), for our study in the Energy sector, as mentioned in the paper. The study aimed to find the constituents of technological capabilities and organizational capabilities and analyze their influence on Business Intelligence success under different decision environments in organizations.

Objectives

- To identify the different constructs of Business Intelligence capabilities and the impact on Business Intelligence Success in Energy Sector
- To identify the different constructs of Decision Environment and the impact of Business Intelligence capabilities in the presence of different types of Decision Environment on Business Intelligence Success in Energy Sector
- To develop BI Success model for public sector enterprises in the Energy Sector.

RESEARCH METHODOLOGY:

The study has used a mixed-method, involving qualitative and quantitative methods to investigate and understand the topic. The questionnaire's face or content validity conducted through the literature review and expert's judgment from various PSUs in the energy sector. They had some comments on the length and the clarity of each question. Their suggestions incorporated into the final version of the questionnaire. Questionnaire's reliability ensured using a pilot test done on a sample of seventy-five BI users in managerial positions from three organizations in the energy sector. Following the pilot study, the scale revised in terms of final constructs used and rephrasing the statements and retested for validity and reliability. Following constructs were dropped from the survey as they had the same response from all the users: Data source, Data reliability, and Intuition. The final survey resulted in Cronbach's « estimated to be 0.83 (greater than 0.7), which implies the instrument's good reliability. Reliability of the various construct of the revised survey was checked using SPSS software and found to be over 0.80, indicating that constructs developed, and data received from the respondent are reliable enough to go for factor analysis and the Model's fitness. Construct reliability above 0.6 means convergent fitness of the Model Bagozzi and Yi, (1988). The Levene's Test for Equality of Variance reveals F value over 0.5, based on which validity is assured.

Discriminant validity assessed examining the correlations among factors using Pearson's correlation coefficient. None of the correlations exceeds the .50 threshold, which suggests adequate discriminant validity of the measures. The final survey instrument is available in the annexure section of this paper.

The study used a proportionate random sampling method and selected BI system users in the organisations. The investigator divides a finite population into subpopulations in the proportional sampling method and then applies random sampling techniques to each subpopulation. A sample size of 270 individuals occupying different managerial roles from different energy sectors asked to participate in this study by answering a questionnaire. The respondents' opinions were measured using a five-point Likert scale, also known as a summated scale. Confirmatory factor analysis and descriptive techniques used to analysis the data.

DATAANALYSIS, FINDING AND DISCUSSION:

As shown in Table 5, the respondent profile analysis showed that the sample chosen for the study comprises 68 per cent of the male respondent and 32 per cent female respondent. Work experience wise categorization of the sample shows that 23.3 per cent of the employees had greater than 20

years of work experience and around 23 per cent of the employees had 8 to 10 years of work experience. Also, around 11 percent of employees were having 16 to 18 years of work.

Table 5: Respondent Profile

S.No.	Topic	Category	Frequency	Per cent	Cumulative Percent
1	Gender	Male	184	68.1	68.1
		Female	86	31.9	100.0
2	Work Experience	4-6 years	19	7.0	7.0
		6-8 years	28	10.4	17.4
		8-10 years	62	23.0	40.4
		10-12 years	22	8.1	48.5
		12-14 years	21	7.8	56.3
		14-16 years	11	4.1	60.4
		16-18 years	29	10.7	71.1
		18-20 years	15	5.6	76.7
		Greater than 20 years	63	23.3	100.0
3	Area	General management	72	26.7	26.7
		Human resource management	110	40.7	67.4
		Finance	28	10.4	77.8
		IT	36	13.3	91.1
		Marketings & Sales	15	5.6	96.7
		Others	9	3.3	100.0
4	Level	Executive management	119	44.1	44.1
		Middle management	106	39.3	83.3
		Junior management	45	16.7	100.0
5	Education	Graduate	54	20.0	20.0
		Postgraduate	86	31.9	51.9
		Professional courses	106	39.3	91.1
		PhD	24	8.9	100.0
6	Industry	Manufacturing	120	44.4	44.4
		Mining	60	22.2	66.7
		Electricity	90	33.3	100.0
7	Company	CIL	30	11.1	11.1
		GAIL	30	11.1	22.2
		NTPC	30	11.1	33.7
		IOCL	30	11.1	44.4
		ONGC	30	11.1	55.6
		BPCL	30	11.1	66.7
		HPCL	30	11.1	77.8
		BHEL	30	11.1	88.9
		PGI	30	11.1	100.0

Source: Primary data analysis

Experience and around 10.4 per cent employees found to be having 6 to 8 years of work experience. Around 8.1 per cent of employees found to be having 10 to 12 years of work experience. Around 7.8 per cent of employees found to be having 12 to 14 years of work experience, those having 4 to 6 years of work experience form around 7 per cent of the total employed surveyed.

Area wise classification of respondents showed that around 40.7 per cent of employees were from the human resource department, and around 26.7 per cent were from general management. Also, 13.3 per cent of the employees formed the IT department and around 10.4 per cent were from the finance department. Only 5.6 per cent of the employees found to form the Marketing and Sales department, and the remaining 3.3 per cent of the employees were from other departments in the organization.

Management level-wise categorization of employees showed that 44 per cent of the employees were form executive or senior management, as expected since business intelligence services are maximally utilized by senior management for decision- making purposes. Middle management level employees formed around 39.3 per cent of the total employees surveyed. Also indicating that

business intelligence utilized for tactical decision making. The remaining 16.7 per cent of the employees formed junior management, indicating that Business Intelligence services are not much employed in the day-to-day operational task, the reason may be because last- mile analytics were still not used in organizations.

The educational categorization of employees showed that around 39.3 per cent of the employees had professional level qualifications like MBA and 32 per cent of the employees had postgraduate level qualification hence were well-versed in BI usage in decision making. Only 9 per cent of the employees found to be having PhD qualification. Moreover, around 20 percent of the employees found to be having graduate-level qualification.

The industry-wise categorization of employees from the sample analyzed showed that 44.4 per cent were from companies in the Manufacturing group organization in the energy sector, because four companies that are HPCL, BPCL, IOCL and GAIL form the manufacturing group organization in the energy sector. 22.2 per cent of employees formed Mining group companies that were ONGC and Coal India. The remaining 33.3 per cent of employees were from the Electricity group of NTPC, Power Grid Corporation, and BHEL in the energy sector.

Table 6: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.856
Bartlett's Test of Sphericity	Approx. Chi-Square	11742.361
	df	528
	Sig.	.000

Source: Primary data analysis

The Confirmatory factor analysis results using principal component analysis with varimax rotation of the sample collected showed KMO test to assess data adequacy value 0.856, which is over a value of .6, a suggested minimum as shown in Table 6. Bartlett's Test of Sphericity's chi-square value found to be significant (chi sq.= 11742.361, p=. 000), which means the factor analysis is acceptable. The confirmatory factor analysis generated nine components with eigenvalues above 1 with total variance explained 86.13%. The varimax rotation clubbed the items on nine components, as shown in Table 7. Cronbach alpha corresponding to each identified factor found to be high as shown in Table 7

Table 7: Rotated Component Matrix and Cronbach Alpha

Factors obtained		Component									Cronbach alpha
		1	2	3	4	5	6	7	8	9	
Business Intelligence Success (BIS)	BIS1				0.785						0.922
	BIS2				0.764						
	BIS3				0.758						
	BIS4				0.843						
Information Processing needs (Info Proc)	IP1		0.828								0.943
	IP2		0.881								
	IP3		0.89								
	IP4		0.888								
Decision Type (Decision Type)	DT1									0.835	0.820
	DT2									0.803	
	DT3									0.886	
Quality of Quantitative data (Quality Quant Data)	DTy1						0.832				0.912
	DTy2						0.729				
	DTy3						0.735				
	DTy4						0.820				
Quality of Qualitative data (Quality Quant Data)	DTy5			0.791							0.952
	DTy6			0.872							
	DTy7			0.861							
	DTy8			0.897							
User Access (User Access)	UA1							0.885			0.994
	UA2							0.882			
	UA3							0.878			
Interaction with systems (Interation Systems)	IS1								0.807		0.94
	IS2								0.852		
	IS3								0.586		
Flexibility (Flexibility)	F1	0.878									0.975
	F2	0.868									
	F3	0.871									
	F4	0.858									
Risk level (Risk Level)	RL1					0.919					0.914
	RL2					0.791					
	RL3					0.909					
	RL4					0.909					

Source: Primary data analysis

The following factors have drawn: Business Intelligence Success, Quality Quantitative Data, Quality Qualitative Data, User Access, Risk Level, Decision type and Information Processing Needs. The construct Quality of Data, Isik, O. (2009) separated into two different factors. It hence was named as Quality of Quantitative Data and Quality of Qualitative data following their constituent analysis.

Based on exploratory factor analysis, a diagram depicting the preliminary measurement model designed, as shown in Figure 3

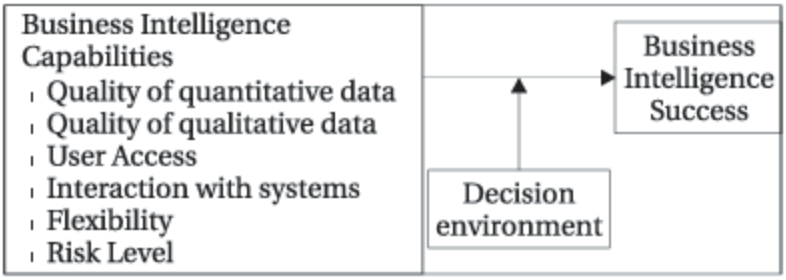

Figure 3: Proposed Business Intelligence Success Model for Energy Sector

Source: Primary data analysis

The impact of various factors on Business Intelligence Success in different decision environment types was analyzed using Linear Regression Technique using hierarchical regression. More variables added to the Model in separate steps called "plocks". The blocks enable to statistically control specific variables' effect to check whether adding a variable impact the Model's predict strength and explores its moderating effect.

The Model Summary provides information about each step/block of the analysis, as shown in Table 8. The Block 1 (i.e., Model 1) has an R Square value of .489 which implies that Technological factors like interaction with systems, User Access, Quality of quantitative data and Quality of qualitative data scores account for 48.9 % of the variance in Business Intelligence Success. Following the addition of the two Organizational factors like Flexibility and Risk level scores in Model 2, R Square's value increased to .500 (50% of the variance in Business Intelligence success scores accounted for by the Model's six variables). Furthermore, the Decision environment factors that are Decision type and Information processing need lead to R square's value increased to .560. To ascertain whether this is a statistically meaningful increase, Sig. F change value was analyzed using a cut-off of $p < .05$; it noted that the first step/block was statistically significant (p is less than .001). However, the additional variable(s) did not account for a statistically significantly increased amount of variance in Business Intelligence Success. Upon the inclusion of the interaction term for Decision type and Information processing needs in the third step/block does lead to the value of R square increased to .560 and was statistically significant (p is less than .001), implies that the inclusion of the additional variable(s) produces a statistically significant increase in variance accounted for in the outcome/criterion variable (i.e., Business Intelligence success which supports that a moderating effect of Decision Environment is present in the Model.

Table 8: Hierarchical Linear Regression Analysis: Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.699[a]	.489	.482	.53191	.489	63.454	4	265	.000
2	.707[b]	.500	.488	.52850	.010	2.714	2	263	.068
3	.748[c]	.560	.547	.49741	.061	17.955	2	261	.000

a. Predictors: (Constant), Quality Quali Data, Interaction Systems, Quality Quant Data, User Access
b. Predictors: (Constant), Quality Quali Data, Interaction Systems, Quality QuantData, User Access, Risk Level, Flexibility
c. Predictors: (Constant), Quality Quali Data, Interaction Systems, Quality Quant Data, User Access, Risk Level, Flexibility, Decision Type, Info Proc
d. Dependent Variable: BIS

Source: Primary Data Analysis

Table 9:Unstandardized Coefficients and Standardized Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.900	.186		4.834	.000
	User Access	.083	.045	.108	1.853	.065
	Interaction Systems	.372	.044	.464	8.434	.000
	Quality Quant Data	.150	.060	.146	2.514	.013
	Quality Quali Data	.141	.053	.138	2.637	.009
2	(Constant)	.597	.226		2.643	.009
	User Access	.074	.045	.096	1.642	.102
	Interaction Systems	.347	.045	.433	7.680	.000
	Quality Quant Data	.133	.061	.129	2.166	.031
	Quality Quali Data	.113	.057	.111	1.997	.047
	Flexibility	.026	.056	.027	.472	.638
	Risk Level	.136	.061	.111	2.231	.027
3	(Constant)	1.854	.466		3.974	.000
	User Access	.087	.042	.113	2.048	.042
	Interaction Systems	.296	.045	.370	6.604	.000
	Quality Quant Data	.107	.058	.104	1.830	.068
	Quality Quali Data	.117	.053	.115	2.191	.029
	Flexibility	-.012	.054	-.012	-.228	.820
	Risk Level	.140	.057	.114	2.441	.015
	Info Proc	.228	.053	.208	4.281	.000
	Decision Type	-.420	.098	-.178	-4.294	.000

Source: Primary Data Analysis

The significance value for Technological factors like the interaction of systems with other systems, Quality of Qualitative and BI User Access is less than 0.05. Hence, in the organization Interaction of systems with other systems, Quality of Qualitative and the extent of the BI User access to various Business Intelligence systems significantly impact its Business Intelligence Success. From Organizational factors, Risk Level found to be significant. Risk happens in every type of business, but it noticed that organizations that have specific and well-defined problems to solve may have a low tolerance for risk and may have a more successful BI with a risk-averse system (Hostmann et al., 2007). On the other hand, different options for user access, via desktop, mobile or web-enabled, to various BI systems, impact BI usage in the system. Hence, more are the access methods more to BI's utilization in the organization, Isik, (2009).

The Decision Environment factors found to be statistically significant, implying that the impact of Technological capabilities and Organizational capabilities get moderated in the presence of different decision environments. The model for Business Intelligence Success in the energy sector, thus shown in Figure 4.

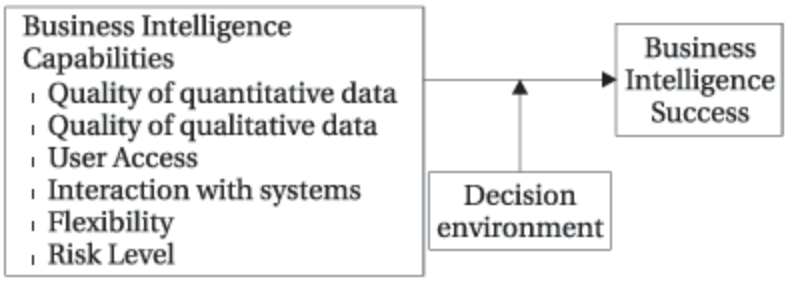

Figure 4: Business Intelligence Success Model for Energy Sector

Source: Primary data analysis

CONCLUSION:

The present study reveals the influence of various business intelligence capabilities on business intelligence success in energy sector organizations. The study found that the interaction of systems, quality of data, user access to BI and risk level of the organization has a significant role in placing in Business Intelligence Success in organizations in the energy sector. The findings will also help elucidate BI success based on business requirements across similar and allied sectors and industries. Moreover, the finding will assist as a road map for the BI solution development team developing BI solutions for organizations. It provides a knowledge base from whereon to an BI researchers. They can take up further empirical research for analysis and project managers and BI solution developers. It serves as a guide to formulate an operative and software development strategy.

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Annexure

SURVEY INSTRUMENT

Please share an opinion based on anyone BI system used in your organisation.

Part I- BI Success **Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking a tick in only one box against each question.**	**Strongly dissatisfied**	**Dissatisfied**	**Neutral**	**Satisfied**	**Strongly satisfied**
1 Business Intelligence (BI) system in your organisation supports your decision making.					
2 Business Intelligence (BI) system in your organisation provide precise information for use					
3 Business Intelligence (BI) system in your organisation provide the required information on time					
4 Overall you are satisfied with the Business Intelligence (BI) available in your organisation.					

Part II- Information Processing **Please indicate your opinion with regards to the nature of the information required for the decisions you make**	**Low 1**	**2**	**3**	**4**	**High 5**
1 Information granularity requirement is					
2 Information accuracy requirement is					
3 Frequency of the use of the information is					
4 The currency of the information is					

Part II-Decision Type Please indicate your opinion with regards to the nature of the information required for the decisions you make						
1 The nature of the decision I make is	Unstructured	Somewhat unstructured	Both	Somewhat structured	Structured	
	Low 1	Somewhat low2	Neither3	Somewhat high4	High5	
2 My role in decision-making id						
	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied	
3 The decision I make requires judgement and Intuition						

Part III A-Data Type Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 Your BI system provides accurate quantitative data					
2 Your BI system provides comprehensive quantitative data					
3 Your BI system provides consistent quantitative data					
4 Your BI system provides high-quality quantitative data					
5 Your BI system provides high-quality qualitative data					
6 Your BI system provides accurate qualitative data					
7 Your BI system provides comprehensive qualitative data					
8 Your BI system provides consistent qualitative data					

Part III B-User Access Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 Access to BI in your organisation is easy					
2 You are authorised to access the information you need from BI in your organisation					
3 You can access BI for all types of decision you make in your organisation					

Part III C-Interaction with other systems **Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.**	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 BI in your organisation provide a unified view of business data and processes 2 BI in your organisation provides a comprehensive electronic catalogue of the various enterprise information resources in the organisation 3 BI in your organisation provide easy and seamless access to data from other applications and systems					

Part IV A-Flexibility **Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.**	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 BI in your organisation is compatible with another tool that you use (e.g. Microsoft Suite, security infrastructure, portal technology or databases) 2 BI in your organisation can accommodate changes in business requirements quickly 3 BI in your organisation make it easier to deal with exceptional situations 4 BI in your organisation is organised and integrated to allow for rapid changes					

Part IV B-Risk Level **Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.**	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 BI in your organisation support decision associated with a high level of risk (e.g., entering a new market, hiring a new manager) 2 BI in your organisation helps minimise uncertainties in your decision-making process 3 BI in your organisation helps manage risk by monitoring and regulating the operations (e.g., monitoring key performance indicators (KPIs), customising alerts or creating dashboards) 4 BI in your organisation integrates with other e-governance applications (ERP/Customized IT Solution/SCADA/GIS etc.)					

Part V

Please share the information asked below by marking only in one option against each question.

1	Gender: Male	Female
2	A number of years of experience in the current organisation: 0-2 years 2-4 years 4-6 years 6-8 years	8-10 years 10-12 years 12-14 years 14-16 years 16-18 years 18-20 years Greater than 20 years