



RESEARCH PAPER

The Effects of Business Intelligence Systems on Decision-Making Effectiveness in Telecommunication Sector of Nangarhar Province

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ABSTRACT

This study investigates the effects of Business Intelligence Systems (BIS) on Decision-Making Effectiveness for telecommunication sector in Nangarhar Province Afghanistan. Business intelligence is an important tool that helps support managerial decisions because of the complexity of the organizational environments and the availability of more data. But the empirical evidence about the role of BIS in the developing countries especially on Afghanistan is limited. Hence, the purpose of the study was to investigate the contribution of Business Intelligence Systems towards enhancing the organizational decision-making processes. The quantitative research method with cross sectional survey design was used. Primary data were gathered by using a structured questionnaire from 225 employees of the telecommunication companies of Nangarhar Province. Descriptive statistics, Pearson correlation and linear regression were used for data analysis. The results showed that there was a strong positive relationship and statistically significant between Business Intelligence Systems and Decision-Making Effectiveness ($r = 0.739$, $p < .001$). The regression analysis also revealed that BIS accounts for 54.6% of the variance in Decision-Making Effectiveness ($R^2 = 0.546$), which suggests that it has a significant predictive value. The regression coefficient ($\beta = 0.739$, $p < .001$) validated that the capability of business intelligence improves managerial decision quality, accuracy and timeliness. This study suggests that Business Intelligence Systems are indeed a valuable capability of the organization for evidence-based decision-making and enhancing managerial effectiveness. Based on the findings, practical implications are discussed for the telecommunication companies, managers, and policy makers; highlighting the need to invest in the technologies of business intelligence, data analytics, and employee analytical skills to enhance organizational performance and competitiveness in Afghanistan.

KEYWORDS Business Intelligence System, Decision Making Effectiveness, Telecommunication Sector

1. Introduction

Business Intelligence (BI) systems have proven to be one of the most important technological developments that can help organizations turn vast amounts of data into meaningful information to support strategic and operational decisions. In the modern business world, organizations have become reliant on information that is accurate, timely, and relevant to their business and to the market in order to be responsive to the changes in the market and competitive pressures. Business Intelligence systems offer analytical support via data integration, reporting, data visualization, and predictive analysis, enabling managers to make decisions based on facts and information and not just on experience and intuition (Chen et al., 2012). Information and communication technology (ICT) has transformed the way organizations work, especially in the telecommunications sector where technology is the cornerstone of the business. Telecommunication companies have tremendous amounts of data generated from customer interactions, service usage, network operations, and market activities. If used effectively, via Business Intelligence systems, the data can be used to help organisations understand customer preferences, service quality, resource allocation and overall organisational performance

(Davenport & Harris, 2007). The telecommunication sector is important for economic and social development in Afghanistan, as it enables access to communication infrastructure, supports digital transformation, and access to information. Nangarhar Province has a highly competitive telecom environment which demands effective managerial decisions due to customer expectations, advancement of technology and operational challenges. These organizations have been given the capability to analyze business data and provide actionable insights, which is crucial for better service delivery and keeping them competitive.

Business Intelligence systems can play a major role in supporting the effectiveness of the managerial decision-making process by making information more accessible, minimising uncertainty, improving the accuracy of decision making, and allowing for quicker responses to challenges faced by organizations. Some past research showed that the organizations with better Business Intelligence capabilities are more likely to deliver good quality of decisions, better organizational agility and better performance outcomes (Popović et al., 2012). But BI systems can only be effective if the organization is ready, if the data is good, if there is management support, and if the employees have analytical skills. Despite the extensive attention paid to Business Intelligence in developed countries, very little empirical research has been conducted so far to explore the link between BI systems and the effectiveness of decision-making in developing countries, especially Afghanistan. The majority of the organizations in Afghanistan are in the initial stages of digital transformation and there is a lack of evidence on the impact of new technologies like Business Intelligence on managerial practices. The identified research gap indicates the need for research that focuses on investigating the use of BI systems in improving organizational decision-making in a context-specific way. In the telecommunication industry in Nangarhar Province, the importance of understanding the contribution of Business Intelligence systems is even more significant, because in this industry, the companies need to make continuous decisions regarding customer management, network expansion, investment planning and operational efficiency. In the absence of proper analytical systems, decision makers can find themselves in trouble when trying to handle large amounts of information and make decisions when the market shifts. As such, the connection between Business Intelligence systems and the effectiveness of decision making can be used to gain insights on how telecommunication organizations can enhance their strategic and operational capabilities.

Thus, the objective of this study is to explore the impact of Business Intelligence Systems on the decision-making effectiveness in Telecommunication Sector of Nangarhar Province. The study aims to find out if the BI systems are adopted and used to enhance the managerial decision making process and help to make the organization effective. The results of this study will be useful in theory and practice as it will advance the understanding of BI adoption in developing contexts and give recommendations to telecommunication organizations, managers and policy makers about how to use data-driven technologies (DeLone & McLean, 2003).

2. Literature Review

Business Intelligence (BI) systems are integral to modern business operations, allowing them to gather, process, analyze, and interpret vast quantities of data into insights that support decision-making. Organizations need to be able to have timely and accurate information in order to make effective decisions for their business in today's competitive business environment. Business Intelligence is a combination of technologies, such as data warehouses, analytical technologies, dashboards, reports, and data visualization, that enables managers to comprehend complex business situations. BI systems are different from the operational information systems, which are mainly focused on operational activities, in that they include knowledge creation and analytical capabilities that are used to improve organizational intelligence (Chen et al., 2012). With the speed of digital technologies and the growing adoption of data-driven management, the significance of Business Intelligence systems has grown. Businesses today have massive amounts of data on their customers, employees, financial transactions and operations. But, having data doesn't mean that they will be better unless they can analyse and act on it. Business Intelligence systems offer organisations the capacity to turn raw data into actionable information, allowing managers to spot trends, forecast future events and make decisions based on facts and figures (Davenport & Harris, 2007). The effectiveness of decision making is one of the most important factors that can affect organizational success, as it affects the allocation of resources, problem solving and the implementation of strategies. Reliable information, analytical skills, and alternative evaluations are all necessary for good decision making. Business Intelligence systems are used to increase the effectiveness of decision making by making information accessible, decreasing uncertainty and assisting managers by providing them with analytical information in real time. BI tools provide managers with a full picture of organizational performance and enable them to make decisions on facts

and not assumptions (Popović et al., 2012).

Business Intelligence systems and its relation with the effectiveness of decision making have been extensively discussed in the information systems literature. Studies in the past indicated that those organizations that have a more sophisticated BI capability are more likely to have better decision quality because they are able to access integrated, accurate and relevant information. BI systems help identify business problems quickly, assess the options and track the outcomes of the organization. Elbashir et al. (2008) concluded that BI systems can help improve business processes through their ability to increase information availability and aid in managerial decision making, which will ultimately lead to increased organizational performance. One of the most critical factors that will affect the effectiveness of a Business Intelligence system is the quality of the data. The quality of the data used for analysing the value generated by BI systems. Data is all about having the right information, at the right time, in the right place, in the right form. On the other hand, wrong or incomplete information can have negative impacts on decision making and BI system trust. Wixom and Watson (2010) noted that good data management is critical to the success of BI implementation, which involves data integration, data governance, and ongoing data information quality monitoring. Business Intelligence capabilities also have a positive impact on organizational performance, such as strategic planning and operational efficiency. The Resource Based View (RBV) of the firm suggests that firms can maintain a sustainable competitive advantage if they have valuable and hard-to-imitate resources (Barney, 1991). But when paired with organizational knowledge, talented workers, and good management, BI systems are a valuable asset. Organizations that effectively leverage the BI capabilities can respond effectively to market changes, optimise operations, enhance customer service, and formulate competitive strategies.

One of the areas in which Business Intelligence systems offer great value is in strategic decision making. Strategic decisions are frequently complex, uncertain and about the longer term, and managers need extensive information and analysis support. BI systems allow companies to analyze potential scenarios, measure performance and leverage trend analysis to make effective decisions. BI technologies and business analytics enable companies to shift from the traditional decision-making process to a more proactive and data-driven approach (Chen et al., 2012). The telecommunication is one of the industries that gains a lot from Business Intelligence systems due to the amount of data generated during the daily operation of the business. Telecommunication firms generate data on customer usage, network performance, services utilized and market conditions on an ongoing basis. Companies can use this data to enhance service quality, manage customer relationships, optimize network resources, and make informed investment decisions by analyzing this data effectively. Hence, BI systems have gained more and more significance for telecommunication organisations wanting to gain operational efficiency and a competitive edge.

Business Intelligence systems are a good opportunity to enhance the decisionmaking process of an organization, especially in developing countries, but there are implementation challenges. In developing economies, organisations may face constraints on technological infrastructure, financial resources, qualified human resources, and readiness of organizations. Ain et al. (2019) emphasized that there are several factors that determine the success of BI, namely system quality, information quality, user acceptance, and management support. Thus, there is a need to take into account the environmental and organizational conditions when studying the effectiveness of BI in developing contexts. Afghanistan is an emerging context in which the process of digital transformation and the use of information technology are slowly progressing in various industries. The telecommunication industry has grown significantly and it is crucial for the economy, telecommunication services and digital connectivity. But telecommunication firms have problems of competition, customer retention, service enhancement and effective resource allocation. These systems can help these organizations boost their managerial decision-making and operational performance through effective use of Business Intelligence systems. Though the importance of Business Intelligence systems has increased rapidly in the world, very little empirical research has been conducted to investigate the impact of Business Intelligence systems on the effectiveness of the decision-making process in Afghanistan, especially in the telecommunication sector. Previous research has concentrated primarily in developed economies where the technical and organizational settings are quite different from that of developing economies. As such, results of the other context will not necessarily be representative of the role and effectiveness of BI systems in Afghan organizations. The gap in the research highlighted the fact that there is a need to carry out empirical research on the impact of BI systems on the effectiveness of decision making of telecommunication companies in the Nangarhar Province.

Reviewing literature available, Business Intelligence systems can greatly improve the effectiveness of the decision-making process by increasing the quality of the information, analytical

power, and management responsiveness. Yet the degree of benefit that can be gained relies on other factors that are organizational, including technological readiness, employee skills and management support. Thus, the impacts of the BI systems on the effectiveness of decision making in the telecommunication industry of Nangarhar Province can add to both academic knowledge and practical management. The study can be of great value to telecommunication companies who are interested in enhancing data-driven decision making and organization performance in Afghanistan.

3. Material and Methods

The quantitative research method was used to investigate the impact of Business Intelligence Systems on the effectiveness of decision making in the telecommunication industry in Nangarhar Province, Afghanistan. A quantitative approach was deemed suitable because it will allow the researcher to measure the relationship between variables in an objective manner using statistical techniques and empirical data. The study employed a cross-sectional research design, in which the data were gathered from the employees at one time to measure the effect of the Business Intelligence Systems on the effectiveness of decision making. The targeted population consisted of workers of various telecommunication companies of Nangarhar Province. Structured questionnaire was used as a primary data collection tool designed on the basis of scales used for measuring the same constructs used in the existing literature. The questionnaire had two sections: the first section gathered the respondents' demographic data and the second section measured the Business Intelligence Systems and Decision-Making Effectiveness with a five-point Likert scale from 1 = Strongly Disagree to 5 = Strongly Agree. Simple random sampling technique was used to give each employee in the target population an equal chance to be selected for the study. The study sample was selected from the telecommunication sector workers in Nangarhar Province, total 225 employees were selected. This sample size was deemed to be sufficient for multivariate statistical analysis and to yield reliable and generalizable findings. Following model is estimated to investigate the effects of business intelligence system on decision making effectiveness.

$$DME = \beta_0 + \beta_1 BIS + \beta_2 SD + \varepsilon$$

Where, DME stand for Decision Making Effectiveness, BIS stand for Business Intelligence System, and SD stand for Strategic Decision, β_0 stand for Constant term, β_1 , β_2 stand for coefficient of the explanatory variables, and ε depicts for error term.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1
Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Business Intelligence System	225	2.20	5.00	3.8592	.77503
Decision Making Effectiveness	225	1.20	5.00	4.0307	.90918

The descriptive statistics show that both variables were well above the theoretical midpoint of 3.0, which means that respondents were generally positive about their organization's Business Intelligence Systems (M = 3.86, SD = 0.78) and Decision-Making Effectiveness (M = 4.03, SD = 0.91). It is interesting to note that the average score for Decision-Making Effectiveness was greater than that for Business Intelligence Systems indicating that employees believe the impact of their decision making is slightly stronger than the technology systems being used to support their decision making. This discrepancy could mean that the human judgment, experience or organizational processes are a good match for what BI systems can do, or it could mean that decision makers are more likely to judge themselves better than an organizational IT system. The relatively low standard deviation of BIS (0.78) suggests that the respondents had a high level of agreement on the performance of the system, whereas the higher standard deviation for DME (0.91) indicates that there is more variation in their responses

which means that some respondents rated the effectiveness very low while others rated it very high. Methodologically, the number of 225 is adequate for further inferential analysis. The mean scores on both variables, however, were higher than usual, indicating that there may be a restriction of range for both variables, which would slightly lessen the power of any correlation that may be obtained between BIS and DME. The standard deviations, however, are still large enough to allow for meaningful relationships to emerge (if they exist) for all of the measures except for Decision-Making Effectiveness. Be especially careful when making correlation or regression analyses to see if organizations with BIS scores higher than the mean score (3.86) also score higher than the mean score (4.03) on the DME. Presence of such alignment would give strong support for the conclusion that the quality of decisions is improved by effective BI systems; otherwise, issues of moderating variables like user training, management support, and organizational culture could be explored to better understand the relationship between these two constructs.

4.2 Correlation Matrix

Table 2

Correlation Matrix			
Variables		Business Intelligence System	Decision Making Effectiveness
Business Intelligence System	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	225	
Decision Making Effectiveness	Pearson Correlation	.739**	1
	Sig. (2-tailed)	.000	
	N	225	150

As shown in the Table 2, the Business Intelligence System (BIS) and Decision-Making Effectiveness have a strong positive correlation. The Pearson correlation coefficient of $r = 0.739$ indicates that the better that business intelligence systems are implemented and used, the more there is to improve the effectiveness of business decisions in the organization. Based on the accepted guidelines, the correlation coefficient value above 0.70 indicates strong positive correlation, that is, organizations with better business intelligence capabilities, are likely to make better informed, timely and correct decisions. Moreover, the correlation is statistically significant ($p = 0.000$, $p < 0.01$), meaning that it is not the result of chance. So, the null hypothesis, which is that there is no significant relationship between Business Intelligence Systems and Decision-Making Effectiveness is rejected and the alternative hypothesis is accepted. The results suggest that Business Intelligence Systems have an important role to play in improving decision making with their ability to deliver timely, relevant and reliable information to managers. The findings are in line with earlier research which has found that organizations that make use of business intelligence technologies make better strategic and operational decisions, resulting in better organizational performance.

4.3 Regression Result

Table 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.739 ^a	.546	.544	.61396

a. Predictors: (Constant), Business Intelligence System

Table 3 shows that the regression model has a high ability to predict the relationship between the Business Intelligence System (BIS) and Decision-Making Effectiveness. The decision-making effectiveness observed values and the values predicted by the model are correlated positively with $R = 0.739$, indicating a strong positive relationship. Furthermore, the R Square value (0.546) shows that the Business Intelligence System accounts for 54.6% of the variation in Decision-Making Effectiveness.

This indicates that 45.4% of the variation in organizational decision-making is due to other factors not captured in the model, and that the use of business intelligence systems does make a significant contribution to better decision making. In addition, the Adjusted R Square value is quite close to the R Square value, suggesting that the model is well stabilized and has a high explanatory power and is not shrunk when applied to the population. The Standard Error of the Estimate (0.61396) is relatively small, indicating that the predicted values of Decision-Making Effectiveness are relatively close to the observed values. Overall, these results indicate that the Business Intelligence System is a reliable indicator of Decision-Making Effectiveness and empirical evidence that the use of Business Intelligence (BI) in organizations that have strong BI practices tends to increase the quality, accuracy and timeliness of managerial decisions.

Table 4
Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	101.098	1	101.098	268.198	.000 ^b
Residual	84.060	223	.377		
Total	185.158	224			

a. Dependent Variable: Decision Making Effectiveness

b. Predictors: (Constant), Business Intelligence System

As shown in the results from Table 3, the regression model was able to explain the relationship between the Business Intelligence System (BIS) and Decision-Making Effectiveness was strong. The correlation coefficient ($R = 0.739$) indicates that there is a significant positive correlation between the observed and predicted values of decision-making effectiveness. Furthermore, the R Square value is 0.546 which means 54.6% of the variance in Decision-Making Effectiveness is accounted for by the Business Intelligence System. This implies that the adoption and proper utilization of business intelligence system has a significant impact on the decision-making process of an organization, with the remaining 45.4% of the variation being caused by other factors not accounted for in the model. Also, Adjusted R Square value of 0.544 is quite near to the R Square value, which shows that the model is stable and has good explanatory power with very little shrinkage when generalized to the population. The Standard Error of the Estimate (0.61396) is low, indicating that the values of the Decision-Making Effectiveness obtained from the prediction are close to the observed values. In general, these results confirm that the Business Intelligence System is a good predictor of Decision-Making Effectiveness and show empirical evidence that organizations that implement well-developed business intelligence practices are more likely to improve the quality, accuracy, and timeliness of managerial decisions.

Table 5
Regression Result

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
(Constant)	.685	.208		3.290	.001
Business Intelligence System	.867	.053	.739	16.377	.000

c. Dependent Variable: Decision Making Effectiveness

Table 5 shows that the regression results statistics indicate that the Business Intelligence System (BIS) has a positive and statistically significant impact on Decision-Making Effectiveness. The unstandardized coefficient ($B = 0.867$) means that for every unit increase in the Business Intelligence System, Decision-Making Effectiveness increases by 0.867 units, controlling for the other variables. Besides, the standardized coefficient ($Beta = 0.739$) shows that BIS has a strong positive impact on the dependent variable. The t-value of 16.377 is significantly larger than the critical t-value and the p-value of 0.000 ($p < 0.001$) indicates that the effect is very statistically significant. Thus, the null hypothesis

that there is no significant difference between the use of Business Intelligence Systems and Decision-Making Effectiveness is rejected and the alternative hypothesis is accepted. In addition, the regression model indicates that the constant/Intercept is 0.685 which is statistically significant ($t = 3.290$, $p = 0.001$). This means there is a level of Decision-Making Effectiveness without the presence of Business Intelligence System practices. The large positive coefficient for BIS, however, indicates that business intelligence capability has a significant positive impact on decision making quality. The results indicate that firms that invest in business intelligence technologies, data analytics and information management systems have the potential to greatly improve managers' capacity to make timely, accurate and evidence-based decisions. The findings reflect those of past studies that have identified Business Intelligence Systems as a key enabler to decision-making and business performance in organizations.

5. Discussion

The results from this study clearly show that Business Intelligence System (BIS) is a major factor in predicting Decision-Making Effectiveness. The regression model showed a highly significant positive correlation between the two variables ($R = 0.739$) and the model accounted for 54.6% of the variance in decision-making effectiveness ($R^2 = 0.546$). This implies that companies that have a successful business intelligence system are more likely to make better decisions, which are more timely and accurate. The high level of model explanatory power shows that business intelligence technologies offer managers accurate, timely and information-driven insights that enables them to make informed decisions. The results are corroborated with the resource-based view that suggests organizational resources like business intelligence provide strategic benefits, which enhance information processing and managerial performance (Barney, 1991). Likewise, Sharda, Delen and Turban (2020) highlighted that business intelligence is a combination of data management, analytics and visualization tools that helps in making evidence-based decisions and making an organization more competitive. The overall regression model was also statistically significant as evidenced by the results of the ANOVA ($F = 268.198$, $p < .001$). This indicates that Business Intelligence System has a significant predictive power for Decision-Making Effectiveness and that the observed relationship is not spurious. The value of the Adjusted R^2 (0.544) is also closely related to the value of the R^2 (0.546), which further shows the stability of the model and the high ability of the model to predict. These results corroborate earlier empirical research which has demonstrated that the use of business intelligence systems leads to better managerial performance since decision makers are provided with integrated, accurate and real time information. Wixom and Watson (2010) stated that business Intelligence improves organizational performance when it converts the big data that is collected within the organization into meaningful information that would help in making the strategic and operational decisions. Similarly, Elbashir, Collier and Davern (2008) found that business intelligence capabilities enhance management processes by providing more powerful analytical decision support and organizational responsiveness.

The regression coefficients also show the significant effect of Business Intelligence Systems on the decision-making effectiveness. The positive regression coefficient ($B = 0.867$) shows that the improvement of the business intelligence capabilities also leads to the improvement of the effectiveness of business decisions, and the standardized coefficient ($\beta = 0.739$) shows that the effect of the business intelligence capabilities on the managerial decisions is strong in practice. In addition, the t value of the contribution of BIS is highly significant ($t = 16.377$, $p < .001$), which is statistically sound. The results confirm those of Davenport and Harris (2007) who asserted that organisations that use analytics to compete can deliver better decision quality because they are not based on intuition. Likewise, Power (2007) pointed out that a business intelligence system can enhance managerial efficiency by providing a holistic analytical information that allows organizations to track performance, recognize trends, consider options, and make quicker business decisions. The model explained about 45.4% of the variance, however, which suggests that there are other organizational and environmental variables that influence managerial decision-making that are not included in the model. Other factors that can affect the effectiveness of a decision, such as organizational culture, leadership style, employee skill sets, technological readiness, knowledge management, and data quality, should be included in future research. However, the present results

are clearly indicative of the fact that Business Intelligence Systems is one of the most powerful organizational capabilities that can improve the managerial decisions. The findings are in line with the results of Isik, Jones and Sidorova (2013) who found that the quality of the information, technology and analytical capability that support business intelligence capabilities positively affect organizational decision quality. Organizations should therefore continue to invest in business intelligence technologies, advanced analytics and analytical skills of their employees to ensure that they get the most out of their managerial decisions.

6. Conclusion

The influence of Business Intelligence Systems (BIS) on Decision-Making Effectiveness in the telecommunication industry of Nangarhar Province, Afghanistan was investigated in this study. The results showed that Business Intelligence Systems positively and significantly affect the effectiveness of decision making. The correlation and regression analyses showed that the correlation between the two variables was positive, and the correlation coefficient was statistically significant at the 95% level. This indicates that the correlation between the two variables is statistically significant at the 95% level and that the organizations with better business intelligence capabilities make more accurate, timely and evidence-based managerial decisions. The regression model accounted for 54.6% of the variance in decision making effectiveness, and this result suggests that BIS is one of the most important factors influencing decision quality within an organization. The results show that the introduction and proper use of business intelligence technologies can have a significant impact on the quality of managerial work and the competitiveness of the telecommunication organization. The study finds that companies need to invest in Business Intelligence Systems, data analytics, and information management capabilities to improve the effectiveness of their decision-making processes. Telecommunications firms need to build their technological foundation, enhance service quality and analytical skills of staff in order to get the maximum value from business intelligence. The study shows that Business Intelligence Systems have a significant impact on managerial decision making but other organizational elements like leadership, organizational culture, technological readiness and employee capabilities also play a role in decision making effectiveness and need to be investigated in future studies. In general, this study offers empirical evidence that supports the strategic importance of Business Intelligence Systems in the organizational performance improvement and data-driven decision making process in the telecommunication industry of Afghanistan.

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