

BUSINESS INTELLIGENCE IN HEALTHCARE MANAGEMENT: LEVERAGING DATA ANALYTICS TO IMPROVE STRATEGIC PLANNING AND ORGANIZATIONAL PERFORMANCE IN HOSPITALS

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Abstract

This paper discusses the application of business intelligence in healthcare management, and more precisely, the use of data analytics in strategic planning and organizational performance in hospitals. Increasing patient needs, the complexity of the operations of hospitals, and the necessity of evidence-based management has made business intelligence a significant strategic instrument of the healthcare industry. The research intends to measure the level of business intelligence uptake in hospitals, analyze its impact on the strategic planning and the impact of business intelligence on organizational performance.

The quantitative research design was embraced where structured questionnaire data of 100 respondents was used. The research has measured four constructs namely business intelligence adoption, strategic planning, decision-making, and organizational performance. Data were processed in SPSS with descriptive statistics, reliability studies, correlation studies, regression studies, factor studies and normality tests. The internal consistency of all constructs was also found to be high with Cronbach alpha of more than 0.80. Descriptive results revealed that there was moderate agreement between respondents about application and usefulness of business intelligence in a hospital.

The correlation analysis showed that business intelligence adoption and strategic planning, decision-making, and organization performance have strong positive and statistically significant relationships. The regression analysis also revealed that the adoption of business intelligence and strategic planning were significant predictors in organizational performance, whereas decision-making was not a significant predictor of organizational performance when the remaining variables were taken into consideration. The model accounted 60.1 percent of the variance in the performance of organizations, which implies it had good power to explain.

The results are affirmative that business intelligence is useful in enhancing the hospital management by assisting in planning, enhancing the use of information and reinforcing the organization performance. Concluding the study, it is possible to state that hospitals which invest in data analytics and intelligence systems have higher opportunities to attain better strategic and operational results.

INTRODUCTION

The healthcare organizations are very dynamic settings in which managers have to make strategic and operational choices in a climate of doubt, budget limitations, emerging patient demands, and rising performance standards (Jack and Powers, 2009). There are administrative records, patient information systems, planning reports, resource utilization records, and operating dashboards, which result in large volumes of data generated by hospitals. Nevertheless, the true usefulness of such data lies in the possibility to convert it into valuable intelligence that allows planning and performance enhancement. Business intelligence is a significant management skill that has come up to the fore due to its contribution to data gathering, integration, analysis, and interpretation in order to make better decisions. Management in hospitals may find business intelligence helpful in a variety of ways. It is able to enhance access to timely and relevant information, enhance forecasting, enhance resource allocation, minimize uncertainty in management decision-making, and enhance monitoring of performance outcomes. The dataset posted was of four principal constructs, associated with this issue, which are business intelligence adoption, strategic planning, decision-making, and organizational performance (Niu et al., 2021). They were produced out of 15 questionnaire items and were calculated as composite variables in SPSS.

According to the data file, the study has employed 100 valid responses, and there are no missing values among the four major constructs. The descriptive results indicate that the respondents had a favorable but not an exceptionally high opinion about business intelligence. The composite variables had mean scores of 3.3025 in BI adoption, 3.2350 in strategic planning, 3.2533 in decision-making, and 3.3500 in the performance of the organization on a five-point scale. These values demonstrate a moderate extent to which business intelligence tools and analytics are being utilized and are playing a part in managerial procedures in hospitals (IŞIK, 2021). The highest perceived BI in terms of overall organizational performance

improvement was reported as an individual item, with a mean of 3.42, and the lowest perceived BI was reported as better resource allocation through BI, with a mean of 3.17. The research problem discussed in this study is the fact that hospitals are becoming more and more invested in information systems and analytics, but the value of business intelligence to the organization is not always evident. Most medical institutions have electronic applications, yet the efficiency of such applications lies in the proficiency of the administration in utilizing data to plan and improve performance. This gives the necessity to review the question of whether BI adoption is significantly related to strategic planning and organizational results.

The aim of this study is to examine how business intelligence in healthcare management leverages data analytics to improve strategic planning and organizational performance in hospitals.

The objectives of the study are:

- To evaluate the extent of business intelligence adoption in hospitals.
- To examine the influence of business intelligence on strategic planning in hospitals.
- To assess the effect of business intelligence on organizational performance in hospitals.

The research questions are:

- To what extent is business intelligence adopted in hospitals?
- How does business intelligence influence strategic planning in hospitals?
- What effect does business intelligence have on organizational performance in hospitals?

This study is important because it provides evidence that can help hospital administrators understand whether BI investments create strategic value. It also contributes academically by linking BI adoption with measurable organizational variables using quantitative analysis. The report is structured into five chapters: introduction, literature review,

methodology, findings and discussion, and conclusion with recommendations.

Literature Review

Business intelligence simply means the technologies, processes and practices by which organizations use raw data to create valuable information that can be used in managerial decision-making. BI in the hospital setting generally comprises, however is not limited to, dashboards, reporting systems, data integration tools, decision support systems, and performance analytics (Adeshina, 2021). BI is not merely about data storage, which is its essence. This is particularly essential to healthcare institutions since leaders of hospitals have to determine clinical performance, financial stability, patient results, and operational management.

One of the main points made by the literature is that data-driven management enhances the effectiveness of organizations. Hospitals have the challenge of poor interdepartmental visibility,

slow reporting and disjointed information (Abraham and Reddy, 2010). Business intelligence is designed to combat these limitations and make information timely, accessible, and relevant. Managers are more likely to make strategic decisions when they are able to observe trends in service utilization, staffing requirements, patient outcomes, and operationalists.

The theoretical perspective of the Resource-Based View can be of use in this study. The school of thought argues that the better performance of organizations is, the more valuable and utilized internal capabilities it has (Bell, Whitwell and Lukas, 2002). BI may be viewed as one of such capabilities as it unites technology, data, human interpretation and organizational processes. A hospital capable of collecting and interpreting data can enhance both planning and performance better than a hospital whose primary data collection and analysis is based on intuition or haphazard reports.



Figure 1: Resource-Based View

A second theory of interest is the theory of data-driven decision-making. According to this theory, organizations are doing well when systematic evidence is used to make decisions as opposed to relying on personal judgment (Baba and

HakemZadeh, 2012). In hospital management, it is the application of analytics in future demand planning, resource allocation, service issues identification and results tracking. There is more

rational, transparent and responsive decision-making mechanism.

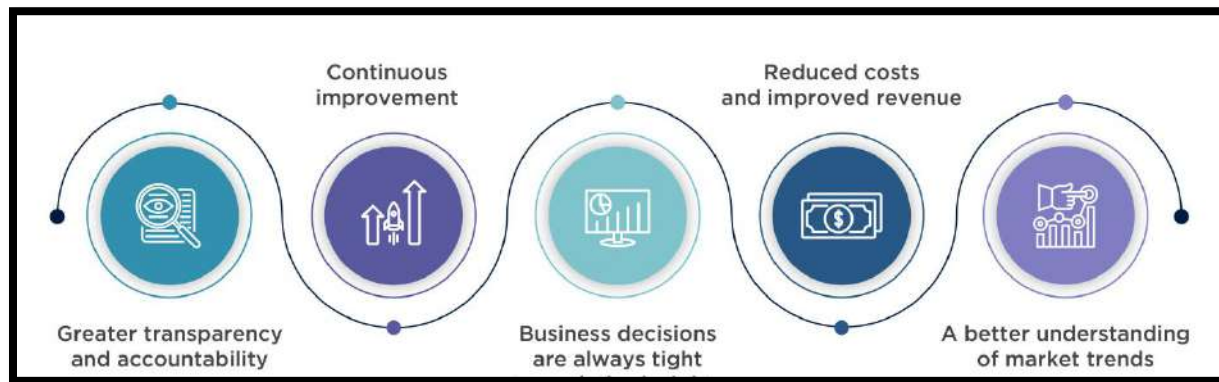


Figure 2: Data Driven Decision Making Theory Benefits

BI and strategic planning have a good conceptual relation as demonstrated in the literature. Strategic planning involves managers to review their present performance, future trends, manageable objectives, and to make effective allocation of resources. BI is applied to all of these activities. With the availability of the correct dashboards and predictive information to hospital managers, the planning process becomes evidence-based. The measurement items used in strategic planning in this research capture these notions, and they are identification of trends, better quality of planning, promote better resource allocation, and realistic strategic

objectives.

The other key theme of the literature is the connection that exists between BI and the quality of the decision-making. Business intelligence is likely to minimize uncertainty, accelerate managerial reaction and enhance problem solving. Such advantages are especially considerable in hospitals, where a misjudgment can influence the provision of services, customer satisfaction, and the sustainability of the institution (Shan et al., 2016). The operationalized decision-making experienced by the uploaded data was in the form of increased decision speed, minimized uncertainty, and effectiveness in problem solving.

Lastly, BI is associated with the performance of the organization in the literature. In hospitals, the performance of the organization may involve the operational efficiency, quality of services, patient outcomes, general institutional performance and

ongoing monitoring. BI helps these areas to be better seen and accountable. This perspective is present in the current study as it assesses the performance of the organization based on the operational efficiency, patient service outcome, overall performance improvement, and constant monitoring (Ilangakoon et al., 2021). According to this review, the study is premised on the assumption that with a more robust BI adoption, hospitals have a higher chance of having improved strategic planning and superior organizational performance. Conceptual relevance of decision-making is also important as it can form a viable path on which BI can generate value.

Research Methodology

The research design that was adopted in this study was quantitative research design since the aim of the study was to quantify the connection between business intelligence and hospital management results through numerical data. The responses concerning a five-point Likert scale (strongly disagree, strongly agree) were obtained

with the help of a structured questionnaire. According to the SPSS output, a total of 15 items were utilized which were grouped into four constructs, namely, BI adoption, strategic planning, decision-making, and organizational performance (Kulkarni, Robles-Flores and Popovič, 2017). The mean of the items in each construct was used to compute composite scores. Four items form BI adoption, four items form strategic planning, three items form decision-making, and four items form organizational performance.

This study had a sample of 100 respondents. According to the summary of case processing all responses (100) were valid and no excluded cases were shown in the analysis of reliability and descriptive analysis. This implies that the dataset was complete and fit to be tested statistically.

Descriptive statistics were used to analyze the first stage of analysis to get the general trend of the responses. All items and constructs were mean and standard deviation. The second phase consisted of reliability tests in terms of Cronbach alpha. BI adoption, strategic planning, decision-making, and organizational performance received the reliability scores of .819, .862, .833, and .865. All of these values exceed the generally accepted level of good internal consistency of .70, suggesting that there is good internal consistency and that the items that compose each construct were also measuring what they were intended to. The third phase was correlation analysis that was aimed to test the association between the four constructs. The Pearson correlation was employed due to the purpose of the research to identify the strength and direction of the relationship between the variables. The fourth step entailed the multiple regression analysis whereby the organizational performance was taken as the dependent variable and the predictors included BI adoption, strategic planning, and decision-making. This was to evaluate the individual effect of the independent variables on performance.

Factor analysis was also used to determine construct validity in the study. KMO measure of sampling adequacy was .929 and test of sphericity of Bartlett was significant at $p = .000$. It means that the data were suitable to factor analysis and that the corresponding correlation structure among the items was powerful enough to warrant consideration of underlying dimensions. The cumulative variance was explained by the rotated solution at 62.181%, which is considered an acceptable explanation of the measurement model.

The Kolmogorov-Smirnov test and Shapiro-Wilk test were also used to test normality. Most of the significance values were less than .05, which means that there was a bit of non-normality (Liang and Yang, 2014). Nevertheless, skewness values were small $-.349$ $-.225$ and the histograms or Q-Q plots were reasonably satisfactory. Since the sample size was 100 and the distributions were relatively even, it was not unreasonable to use parametric analysis in this study. Methodology used is suitable as it enables objective testing of whether BI adoption is related to improved hospital management results. The study is a well-designed and plausible quantitative analysis using a blend of descriptive, reliability, validity, correlation, and regression.

Results and Discussion

The descriptive analysis shows that respondents tended to support the idea that business intelligence is the reality and that it is applicable in their hospital, but they were not extremely high but only moderate. The mean of BI adoption was 3.3025, strategic planning was 3.2350, decision-making was 3.2533 and organization performance was the highest with mean of 3.3500. It implies that hospitals represented in the sample use business intelligence to a certain extent and respondents report a positive impact on the business intelligence, particularly with regards to performance.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Our hospital uses business intelligence tools to support managerial decision-making	100	1	5	3.33	1.173
Data analytics systems in our hospital provide timely information for planning and operations	100	1	5	3.41	1.147
Hospital managers regularly rely on data dashboards, reports, or analytics when making strategic decisions	100	1	5	3.19	1.269
The business intelligence systems used in our hospital improve access to accurate and relevant information	100	1	5	3.28	1.207
Business intelligence helps our hospital identify future trends and challenges more effectively	100	1	5	3.19	1.308
Data analytics improves the quality of strategic planning in our hospital	100	1	5	3.37	1.212
The use of business intelligence supports better resource allocation in our hospital	100	1	5	3.17	1.231
Data-driven insights help our hospital set realistic and achievable strategic goals	100	1	5	3.21	1.209
Business intelligence enables faster decision-making in our hospital	100	1	5	3.23	1.196
Data analytics reduces uncertainty in managerial decision-making	100	1	5	3.30	1.219

Figure 3: Descriptive Statistics

Source: SPSS

The strongest agreement in the respondents was at the item level when it came to the topic of business intelligence having improved overall organizational performance in their hospital, with a mean of 3.42, then came the message about data analytics systems supplying a necessary information in time to plan and run the business, with a mean of 3.41. Managers used dashboards

and analytics regularly when making strategic decisions had lower mean values at 3.19 and had a lower mean value of BI assisting them to make resource allocation decisions, at 3.17. These findings suggest that it is possible that hospitals have acknowledged the overall importance of BI, but it is possible that routine use by managers in some planning processes is still in its infancy.

Reliability

[DataSet0]

Scale: BI Adoption**Case Processing Summary**

		N	%
Cases	Valid	100	100.0
	Excluded ^a	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.819	4

Figure 4: BI Adoption, Reliability Analysis

The reliability test validates that the measuring tool was good. The alpha values of the four constructs were all more than .80 with the highest alpha of organizational performance and the lowest alpha of BI adoption standing at .865

and .819 respectively which remains high. This means that the items in the questionnaire always reported the desired concepts and the scores on constructs are reliable to be further analyzed.

Correlations				
		BI_Adoption	Strategic_Planning	Decision_Making
BI_Adoption	Pearson Correlation	1	.727	.667
	Sig. (2-tailed)		.000	.000
	N	100	100	100
Strategic_Planning	Pearson Correlation	.727	1	.731
	Sig. (2-tailed)	.000		.000
	N	100	100	100
Decision_Making	Pearson Correlation	.667	.731	1
	Sig. (2-tailed)	.000	.000	
	N	100	100	100
Org_Performance	Pearson Correlation	.730	.696	.638
	Sig. (2-tailed)	.000	.000	.000
	N	100	100	100

Correlations		
		Org_Performance
BI_Adoption	Pearson Correlation	.730
	Sig. (2-tailed)	.000
	N	100
Strategic_Planning	Pearson Correlation	.696
	Sig. (2-tailed)	.000
	N	100
Decision_Making	Pearson Correlation	.638
	Sig. (2-tailed)	.000
	N	100
Org_Performance	Pearson Correlation	1
	Sig. (2-tailed)	
	N	100

Figure 5: Correlations

Source: SPSS

The assumptions in the study are well supported by the correlation analysis. The positive correlation between BI adoption and strategic planning was found to be very strong at $r = .727$, decision-making at $r = .667$ and with organizational performance at $r = .730$. All these relationships were found to be significant at $p = .000$. The correlation between strategic planning and decision-making were also at $r = .731$ and between strategic planning and organizational performance at $r = .696$ and the correlation between decision-making and organizational performance at $r = .638$ was positive. The results suggest that these four constructs are

correlated and move together. Practically, the data indicate that hospitals further improved in BI adoption also have a better strategic planning, decision-making, and organizational performance.

These correlation findings provide the direct answer to the second research question. The relationship between strategic planning and the adoption of business intelligence seems to be positive since the correlation between BI adoption and strategic planning is statistically significant (Zheng and Khalid, 2022). This implies that the more a hospital uses business intelligence tools, the higher the chances of enhancing the quality of planning, resources assignment, goal setting, and future trend discovery.

Regression

[DataSet0]

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Decision_Making, BI_Adoption, Strategic_Planning ^b		Enter

a. Dependent Variable: Org_Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.775 ^a	.601	.588	.66128

a. Predictors: (Constant), Decision_Making, BI_Adoption, Strategic_Planning

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.145	3	21.048	48.134	.000 ^b
	Residual	41.980	96	.437		
	Total	105.125	99			

a. Dependent Variable: Org_Performance

b. Predictors: (Constant), Decision_Making, BI_Adoption, Strategic_Planning

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.145	3	21.048	48.134	.000 ^b
	Residual	41.980	96	.437		
	Total	105.125	99			

a. Dependent Variable: Org_Performance

b. Predictors: (Constant), Decision_Making, BI_Adoption, Strategic_Planning

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.480	.249		1.928	.057
	BI_Adoption	.461	.105	.432	4.398	.000
	Strategic_Planning	.266	.106	.269	2.513	.014
	Decision_Making	.150	.096	.154	1.558	.123

a. Dependent Variable: Org_Performance

Figure 6: Regression Analysis

Source: SPSS

The regression analysis can be used to give a better understanding of the third research question by illustrating the extent to which an organization performance can be explained by the combination of both BI adoption, strategic planning, and decision-making. The regression model, the $R = .775$ and $R^2 = .601$, and the adjusted $R^2 = .588$. This implies that the combination of the three predictor variables can explain 60.1 percent of the variation in the performance of the organization. The output of ANOVA was significant and it was $F = 48.134$, $p = .000$ and it proves that the general model is statistically significant one.

Examining the individual regression coefficients, BI adoption, in terms of standardization of its effect on organizational performance, exhibited the largest effect of $\beta = .432$ and $p = .000$. Another positive impact was also significant, $\beta = .269$ and $p = .014$. Decision-making however, was not statistically significant in the model with $\beta = .154$ and $p = .123$. This does not imply that decision-making is irrelevant. Instead, it proposes that when BI adoption and strategic planning are introduced into the model at the same time, decision-making fails to account or explain any further unique variance than was already accounted for by the two more powerful predictors.

This is a significant discovery because it suggests that business intelligence has both direct and indirect impacts on the performance of organizations by providing superior planning frameworks (Mouhib Alnougari, 2017). The positive relationship between decision-making and performance still exists at the correlation level, but its distinct predictive ability becomes less significant when BI adoption and strategic planning are held. The first reason could be that improved decision making is already inherent to the effective BI systems and planning processes. That is, it could be that the reason BI might lead to an improved organization performance is in part because it leads to the improvement of the quality of strategic planning, and the practical advantages of the decision are recaptured in the broader relationship.

The instrument also has a reliable factor analysis. KMO of .929 indicates good sampling adequacy and Bartlett was significant (Goni et al., 2020). Cumulative variance was explained by the extracted solution at 62.181%. The same also applied to communalities, as the extraction values tend to be over .55 with some being as high as .727 on the item of operational efficiency. This indicates that the extracted factor structure was found to be meaningful in terms of the questionnaire items. Despite the output claiming that the estimated extraction required over 25 iterations to terminate, the rotated factor matrix converged in 7 iterations and generated understandable loadings, which is an indication that the construct structure was generally acceptable. Normality tests revealed that there was certain statistical non-conformity to normality, as most Shapiro-Wilk significance values were found to be lower than .05. Nevertheless, the skew values were quite low and even negative and the Q-Q plots were fairly close to the diagonal line. This represents light non-normality and not extreme distortion. The analysis can be interpreted with a population of 100 cases. In general, the results indicate that business intelligence can play an important purpose in the management of a hospital (Shen et al., 2017). It helps to plan, is related to more robust managerial procedures, and is associated with a great positive impact on the performance of the organization. The biggest support in the report has been that BI adoption is the strongest variable in predicting the performance of the hospitals. Thus, the research confirms the opinion that hospitals might enhance the strategic and organizational results through enhancing data analytics and business intelligence.

Conclusion and Recommendations

The paper has explored business intelligence in healthcare management with a particular focus on strategic planning and organizational performance in hospitals. Using the results of the analysis of 100 respondents, the researchers discovered that the adoption of BI, strategic planning, and decision-making are positively

linked to the performance of an organization. The descriptive results revealed a reasonable consensus that BI is being implemented in hospitals and that it is positively involved in the planning and management. The analysis of reliability ensured that the study constructs were measured in the same way, whereas the factor analysis demonstrated the sufficiency of the measurement model.

The outcome of the correlation showed strong positive relationships between all major variables. Above all, there were close and highly significant associations between BI adoption and strategic planning as well as organizational performance. The regression analysis also indicated that BI adoption, strategic planning, predict organizational performance significantly, and the decision-making, despite a positive correlation, had no significant unique predictors of organizational performance in the combination model. The evidence thus indicates that business intelligence is a directly and strategically significant role in enhancing the hospital performance.

In the first study, the research question was regarding the level of BI adoption in hospitals. The results indicate that the adoption of BI is moderate, which means that hospitals are applying analytics and intelligence systems, yet can further integrate them. The second question was how BI impacts on strategic planning. The high positive correlation between the implementation of BI and the strategic planning indicates that the hospitals that implement BI have greater capacity to plan, allocate resources and find out future trends. The third question enquired on the impact of BI on the performance of an organization. The findings of regression validate that there is statistically significant positive influence of BI on performance.

It comes out that business intelligence is not just a technical instrument but a management instrument in the hospitals. Hospitals that invest in analytics systems and use them well have a higher chance of enhancing planning quality and the overall performance of the organization. BI provides an excellent avenue to evidence-based management within the healthcare setting that

requires efficiency, accountability, and responsiveness.

Recommendation

A number of suggestions arise out of the findings, First, the management of the hospitals need to reinforce BI adoption by investing in integrated dashboards, reporting system, and analytical tools that offer timely and correct information as also discussed by (Akter and Kudapa, 2024). Second, the connection between BI and strategic planning procedures (particularly resource allocation, goal setting, and forecasting) in the hospitals should also be more direct as also elaborated by (Noor Alam Siddiqui, 2025). Third, employees and supervisors must be trained on how to interpret the data in such a way that BI will become an inseparable part of everyday practice of managers instead of a mere technical process. Fourth, hospitals are recommended to set up performance monitoring systems which are in a constant tracking of efficiency, service quality and planning outcomes using BI platforms. Lastly, future research must consider large samples and perhaps incorporate other variables as organizational culture, leadership support, or digital readiness.

One of the weaknesses of this report is the sample used in the data collection is very small (100 respondents) and the data is in the form of the questionnaires, which are perception based. The tests of normality also indicate some slight departure of normal distribution, and the notes of the factor extraction indicate some complexity of measurement structure. However, the general statistical outcomes are high enough to justify the conclusions of the study.

Overall, as indicated in the report, business intelligence has the potential to help hospitals to plan and perform significantly better. The more actively the business intelligence tools and data analytics are embraced, the higher the chances that the hospitals will be able to make an informed strategic decision and record improved organizational performance.

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