A Conceptual MIS Framework for Business Intelligence

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Abstract

The prime objective of the present study was to examine the relationship between compatibility, top management support, competitive pressure and organizational performance with the mediation of business intelligence. The data in the present study were collected from the employees of Madina grocery store by purposive sampling. The response rate of the study was 69%. The collected data was analysed through smart PLS 3.3.2. The results of the study revealed that competitive pressure, top management support and compatibility have a positive effect on business intelligence and organizational performance. Additionally, the mediation result of business intelligence is also confirmed by the results of the present research. This research fills the gap between limited studies regarding business intelligence and organizational performance. This study is helpful for the decision-makers of management of different organizations.

Keywords: Business intelligence, Organizational performance, Top management support, Competitive pressure, Saudia, KSA

1. Introduction

The method of organizational decision processes is typically characterized through ill-structured and non-routine tasks as well as decisions (Jaklič, Grublješič, & Popovič, 2018). As a result, requirements of analytics and data can change very rapidly, calling a high degree of flexibility and adaptability in these procedures. Therefore, there is a high chance of discrepancies among requirements of users or business intelligence capabilities such as task technology fit (that IT is more likely to have a positive impact on individual performance and be used if the capabilities of the IT match the tasks that the user must perform (Goodhue & Thompson, 1995)). Thus, the compatibility of the users come to the fore. In the same way, business intelligence is another aspect of compatibility (Kowalczyk & Buxmann, 2014).

Support of top management is one of the basic factors to achieve the success of projects. If the top management does not support the project, it has a higher chance of failure, despite the employees and team working on the project having a high level of skills. Despite the importance of the support of top management in the organizational activities, much importance was not given in the past to the activities related to top management support. Researchers pointed out that the support of top management can help the organization in several different ways including encouraging the subordinates, showing commitment to the work, helping different teams in difficult situations and many others (Kandelousi, Ooi, & Abdollahi, 2011). Additionally, the support of top management results in the availability of some different resources including physical, human and financial resources which are required for the successful project execution. Moreover, the delegation of power to the project team from the project leader is exhibited in it as well. Therefore, for the success of the project, the support of top management is very important and critical. Without it, the success of any project is almost impossible (Iqbal, Long, Fei, & Bukhari, 2015).

Organizations focus on competitive actions so they can save themselves from their competitors. These actions may include observable competitive moves, specific moves and externally directed moves that are initiated by firms so they can enhance the competitive position of the organization. Competitive pressure is referred to as internal pressure and wishes of the firm to gain competitive advantage which drives the organizations to opt for innovative technologies as they are facing pressure from downstream and upstream players in the supply chain (Wong, Leong, Hew, Tan, & Ooi, 2020).

Researchers pointed out important factors play an important role to adopt business innovation. In these factors, competitive pressure is perceived as a basic investment to derive decision support to develop effective operational insights (Shah, 2012). Competitive advantage is needed or derives to alter to keep in pace with the strategies of competitors. Organizations face pressure to adopt practices related to the environment so they can develop a competitive advantage over direct competitors. Because of competitive pressure, organizations tend to view the firms from a different perspective by enhancing efficiency and increasing productivity of the organizational output (Ramakrishnan, Jones, & Sidorova, 2012).

For the success of organizations in the current competitive market and to sustain the market share, it is very important to adopt business intelligence. Moreover, the adoption of business

intelligence will help organizations to get high quality of information and reengineering the overall business process. On the other hand, the decision making capability of the organization is improved because of the adoption of the BI system. The effectivity of the organizational operations will also be improved because of BI adoption as well. Organizations can also redevelop operations and explore new possibilities also. Thus, it's been pointed out by researchers that success is achieved by organizations after the adoption of BI. Therefore, organizations opt to improve as well as upgrade their BI systems on regular basis (Nazri, Ashaari, Iskandar, & Bakri, 2020).

Evaluation of the performance of the business is the key agendas of business performance of every kind of organization. Assessing the performance of the business is key for continuous improvement in the progress of organizations. Same is the importance for firms to understand the evaluation of organizational performance. Several organizations like Madinah Grocery Stores have understood the importance of governing the performance of an organization on regular basis. Therefore, they have adopted different business intelligence systems in their operations. Business intelligence systems are systems that consist of a broad category of processes, applications and technologies which are mostly used to gather, store, access and analyse data into actionable information. This information is later used to help the business to make decisions to improve the performance of the business (Hou, 2016).

Several studies in past have highlighted the importance of technology acceptance by the users. The concept of compatibility involves both operational as well as normative compatibility consideration. Both of these results from the discussion, accounting for the issues like change of high frequency in non-routine decision processes (Karahanna & Angst, 2006). Therefore, the main purpose to conduct this study is to examine the relationship between compatibility, top management support, competitive pressure with business intelligence and organizational performance. Moreover, the present study also evaluated the mediating role of business intelligence as well.

2. Literature Review

2.1 Organizational Performance

Researchers have pointed out several different ways to assess organizational performance. Most organizations use financial measures to assess the financial performance of an organization, such as return on assets (ROA) and Return on investment (ROI). Most of the researchers are of the view that both these measures are very short term oriented and too narrow as well. This is a very significant constraint because knowledge management is a very long-term goal. Therefore, different approaches are mentioned by researchers to measure the organizational performance of the organization. One of these categories is a balanced scorecard report having four aspects, namely learning and growth, internal process, customers and finance (Lee & Choi, 2003).

In this aspect, scholars are of the view that it is key for organizations to determine the competencies and processes that are most important. Moreover, they also specify the measures to track the productivity, employee skills, quality and cycle time that can play an

important role to assess the internal process of the business. To do this, organizations need to develop strategic priorities for some business process with the purpose to create satisfaction for the business, stakeholders and customers (Liang, Chiu, Wu, & Straub, 2011). In this aspect, it is pointed out that internal processes of the organization create, as well as provide, processes for the stakeholders, including customers. In this aspect, researchers pointed out that the operations of organizations are strongly linked with the effectiveness and quality of customer relations. Therefore, the Business Intelligence system plays an important role to improve the internal process and impact organisational performance (Owusu, 2017).

Adoption of Business intelligence is critical to improve organizational performance, growth and learning of employees, improve processes internally and management of different customers as well. Overall, it impacts the financial performance of organizations indirectly. If organizations can adopt a high level of business intelligence systems, it will lead to improving the performance of business indirectly through enhancement of internal process.

2.2 Business Intelligence Systems Adoption (BI)

In the past, researchers did not justify the definition of business intelligence. Whereas, some researchers said that there must be two common characteristics of the definition of BI. Firstly, there must be some basic aspects of business intelligence including conveying information, analysing and accumulating which is available for the organization for collaboration. Secondly, the usage of business intelligence to support the process of strategic decision making (Hatta, Miskon, Ali, Abdullah, Ahmad, Hashim, & Maarof, 2015).

There is a need to do a big investment to set up a business intelligence system to support the organization to strengthen the efficiency and operations of the organization. By using a business intelligence system organizations have reached the point where the strategic decision-making process becomes very important (Puklavec, Oliveira, & Popovič, 2014). The business information system is the response to perception regarding the need to grow to access the relevant information. This information is later used to gain a competitive advantage over the competitors. From the point of view of knowledge creation and utilizing that knowledge on the business information system, organizations can create differentiation from other companies. Such capabilities of business information system play a very important role in the performance of the organization. Moreover, the decision-making process of the organization is also affected by the business information system which is an important part of strategic management (Shollo & Galliers, 2016). The area of business intelligence is still evolving. Most of the past studies have used qualitative studies to explore the in-depth analysis of the factors affected by the business intelligence system.

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2.4 Compatibility

Perceived innovation characteristics are identified as compatibility which is often used to predict the behaviour of technology. On the other hand, compatibility is the level of innovation that customers perceived as being consistent with experience, existing needs and values Kanchanatanee, Suwanno, and Jarernvongrayab (2014). Researchers have also treated compatibility as a multidimensional construct. This multidimensionality includes cognitive or normative compatibility and operational compatibility. Normative compatibility is referred to as compatibility in which people think or feel regarding innovation. Whereas, operational compatibility is referred to as compatibility with what the employees or customers do. Intentions of the individuals are directly impacted by the compatibility (Ahmad, Ahmad, & Hashim, 2016).

2.5 Top Management Support

IT adoption is best supported by the support of top management. In a few studies, it's been revealed that the support of top management affects the adoption of new technologies. In this aspect, Bueno and Gallego (2017) also pointed out that to implement SCM technology, the support of top management is very important. Researchers further pointed out that the support of top management is also critical to implement the system in different stages. The emphasis of the top management is on the need of the organization to use financial resources and state of the organization, therefore the positive effect is exerted on the overall organizational process. The degree of usage is also increased by it and decreases the resistance of the organization. As a result, a culture within the organization is supported which enhances the usage of IT (Liang, Saraf, Hu, & Xue, 2007). Conversely, if managers are not supportive regarding the usage of IT, it becomes very difficult to produce outcomes that are positive for the organization. Therefore, the factor of the top management support is the decisive factor in the IT innovation usage (Mamary & Shamsuddin, 2015).

Past studies have mentioned support of management as active as well as explicit support of the management is important for the implementation of the IT innovation system within the firm. In every organization, the top management team is involved in the decision-making process of the organization. Therefore, they should support actively and explicitly the adoption of IT support within the firm. Several past studies have mentioned that the support of top management has a positive relationship with IT adoption within the firm (Hameed, Counsell, & Swift, 2012). These past studies have also pointed out that the support of top management is the key factor that affects the adoption of IT system within the firm. It is because the commitment of the management ensures crucial resources for the implementation of technology within the firm (Puklavec, Oliveira, & Popovič, 2018).

2.6 Competitive Pressure

The pressure exerted by the competition is one of the main driving forces which push the organization to gain a competitive advantage. In this essence, researchers have pointed out that the competitive pressure of the organization directly affects IT adoption within the firm. Organizations that can get the technology first are also able to gain a competitive advantage over the other competing firms. In this context Ahmad, Miskon, Alkanhal and Tlili (2020) reported that Small businesses which adopt a business intelligence system, easily gain a competitive advantage over others.

Because of competitive pressure, organizations tend to adopt new approaches to do business, enhance efficiency and increase organizational productivity for their survival (Themistocleous, Irani, Kuljis, & Love, 2004). Trading partners or competitor can exert such pressure on the organization. As a result, organizations adopt new technologies which may be used by competitors. Moreover, some organizations also adopt the new technology because they do not want to be labelled as incompatible and less receptive to change (Boonsiritomachai, McGrath, & Burgess, 2016).

Competitive pressure is referred to as the level of stress which the organization perceive from the competitors which are operating in the same industry. Researchers pointed out that make these organizations to use their resources more efficiently to maximize their productivity. As a result, they gain a competitive advantage. Furthermore, it's also been emphasized by the researchers and also the organizations tend to bring innovation in their processes due to competitive pressure. On the other hand, environmental uncertainty can also be caused because of competitive pressure (Owusu, Agbemabiasie, Abdurrahaman, & Soladoye, 2017).

2.7 Hypothesis Development

Past studies have pointed out that there exists a strong relationship between organizational compatibility and BI system. It is because compatibility is referred to as the level of innovation within the organization. Researchers noted that technological innovation is freely spread within the organization. They also can easily match the processes of adopters. Several past studies have pointed out a positive relationship between technology and compatibility in several different industries. On the other hand, compatibility has also proved to be a significant predictor of IT adoption system within the organization (Shah, 2012).

The role of top management is also very critical in the implementation of the Business information system, or in other words, adoption of the BI system. Some of the researchers have pointed out that the top management of the organizations is also perceived as a change agent of the organizations. Many past studies have pointed out that support from the top management plays a significant role to use technology within the firm to get better organizational performance. Managers also enable the implementation of innovation. On the other hand, some of the studies reported as top managers do not support the implementation of innovation (Kuo & Lee, 2011; Owusu, Agbemabiasie, Abdurrahaman, & Soladoye, 2017).

Researchers mentioned that pressure from the competitors pushes the organizations to work efficiently and enhance their productivity. Therefore, they aim to gain a competitive advantage over competitors. Moreover, to mitigate this pressure, organizations often adopt innovation. Several studies have pointed out that the adoption of innovation is also enhanced because of pressure from competitors. On the other hand, few of the studies have reported converse results as well (Owusu, Agbemabiasie, Abdurrahaman, & Soladoye, 2017).

Based on the above discussion, we, therefore, hypothesized that

H1: BI Systems adoption (BISA) has a positive relationship with organizational performance.

H2: Compatibility (COMP) has a positive relationship with BI Systems adoption.

H3: Competitive Pressure (CP) has a positive relationship with BI Systems adoption.

H4: Top Management Support (TMS) has a positive relationship with BI Systems adoption.

H5: BI Systems adoption mediates the relationship between Compatibility and Organizational performance

H6: BI Systems adoption mediates the relationship between Top Management Support and Organizational performance.

H7: BI Systems adoption mediates the relationship between Competitive Pressure and Organizational performance

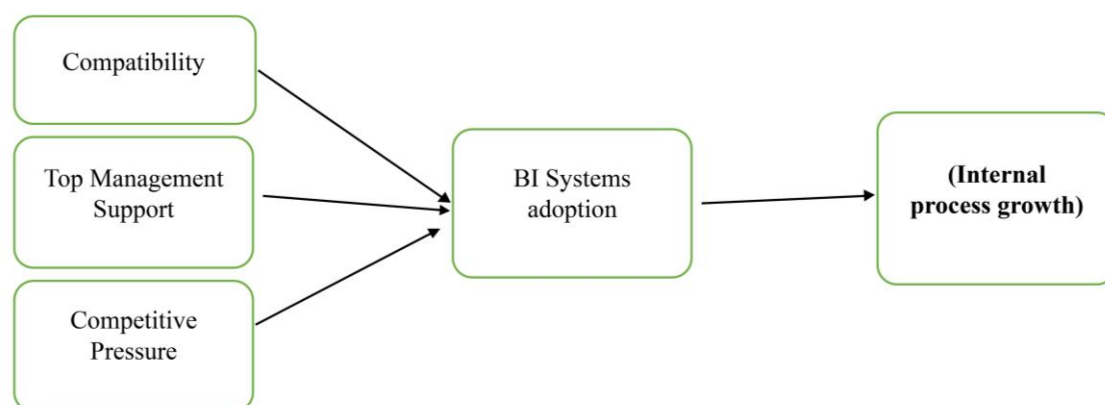The following framework is developed from the above hypotheses

Figure 1. Framework.

3. Methodology

To examine the integral process growth of the Madinah Grocery Stores from KSA, the data was collected from the employees working in different Madinah Grocery Stores. For this purpose, a survey-based approach was adopted, and a five-point Likert scale was developed. The questionnaire had two parts, one containing demographic information regarding the respondents, and the second part having items related to variables involved in the study. The items of the variables were adopted from past studies. For this study, a convenient sampling approach was adopted. Moreover, for the determination of sample size, Krejcie and Morgan (1970) table was followed. Before data collection, researchers conducted the pilot test. In the present research, 400 questionnaires were distributed, and usable questionnaires received back were 285. Therefore, the response rate of the present study was 71.25%. the collected data was analyzed used SPSS and PLS 3.3.2.

4. Results and Analysis

As already mentioned, the collected data was assessed using PLS 3.3.2 and SPSS 25. Initial screening of the data was performed through SPSS. Moreover, the demographics of the respondents were also measured using SPSS. Table 1 below shows the demographics of the respondents.

Table 1. Demographics

Demographic variables	Category	Frequency	Percentage
Gender	Male	190	65.97%
	Female	98	34.03%
Marital Status	Married	245	85.06%
	Single	43	14.96%
Age	Below 20	0	0%
	20-30	123	42.70%
	31-40	112	38.88%
	Above 40	53	18.40%
Highest Education	Diploma	0	0%
	Masters	192	66.66%
	Bachelors	96	33.34%

Table 1 above shows the demographic information of the respondents. The information available in table 1 depicts that most of the respondents had a master's level degree. Also more than 40% of the respondents were between 20 to 30 years of age. Additionally, 85% of the respondents were married and more than 65% of the respondents were male. This data was examined using PLS- 3.3.2.

Analysis through PLS is comprised of two steps. Step one is the measurement model which

leads to the structural model. Table 2 of the present study shows the factor loading of the present study. Table 2 shows the factor loading of all items is more than 0.60 as recommended by Hair, Ringle and Sarstedt (2011). Two items not meeting these criteria were deleted whereas the rest were retained. Table 3 of the present research depicts the reliability as well as validity. The values of table 3 depict that all values of composite reliability and Cronbach alpha are above the threshold level of 0.70. In this regard, Hair, Matthews, Matthews, and Sarstedt (2017) mentioned that values of composite reliability should be more than 0.7 to be considered satisfactory.

Table 2. Factor loading

	BISA	COMP	CP	IPG	TMS
BISA1	0.808				
BISA2	0.804				
BISA3	0.804				
BISA4	0.829				
BISA5	0.708				
COMP1		0.827			
COMP2		0.820			
COMP3		0.811			
COMP4		0.834			
CP1			0.768		
CP2			0.750		
CP4			0.667		
CP5			0.686		
IPG1				0.829	
IPG2				0.827	
IPG3				0.843	
IPG4				0.820	
IPG5				0.630	
TMS1					0.860
TMS2					0.827
TMS3					0.840
TMS4					0.865

BISA= business information system adoption, COMP= compatibility, CP= competitive pressure, IPG= Internal Process Growth, TMS= Top management support

Furthermore, Table 3 of the present study also shows that values of AVE as well. According to Hair et al. (2017), the values of the items are retained if the AVE value is more than 0.50. Table 3 shows all values are above 0.50.
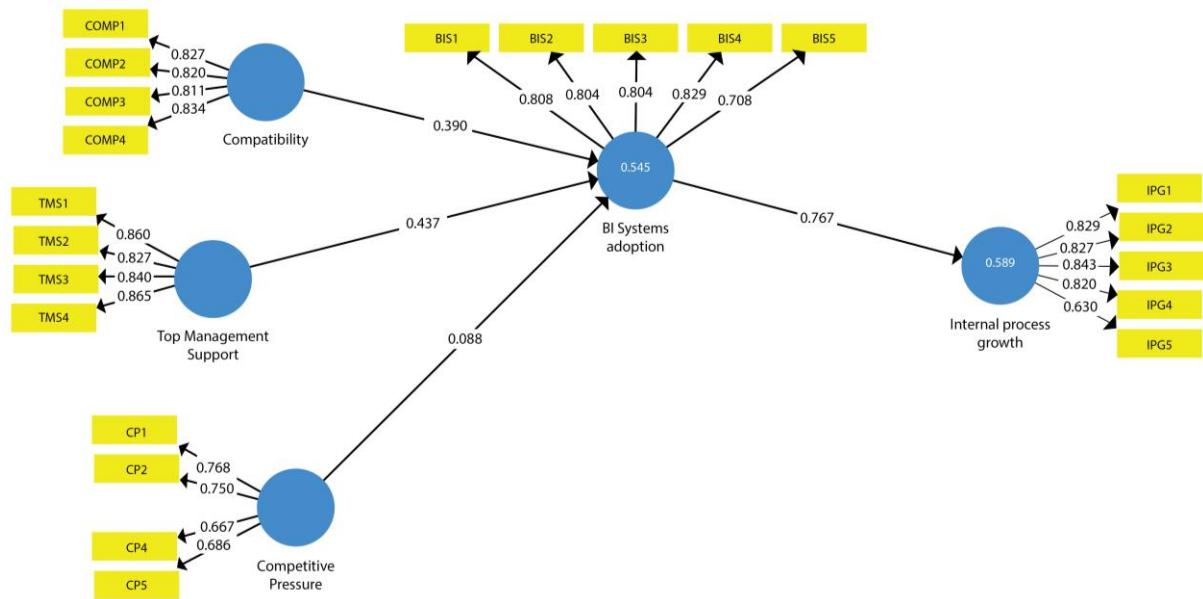
Figure 2. Measurement model

Table 3. Reliability and validity

	Cronbach's Alpha	rho_A	CR	AVE
BISA	0.851	0.858	0.893	0.627
COMP	0.841	0.842	0.894	0.677
CP	0.703	0.703	0.810	0.517
IPG	0.850	0.859	0.894	0.630
TMS	0.870	0.875	0.911	0.719

BISA= business information system adoption, COMP= compatibility, CP= competitive pressure, IPG= Internal Process Growth, TMS= Top management support.

Moreover, the present study also assessed the discriminant validity of the data to show the level to which constructs of the present research are different from other constructs of the study. For this purpose, Fornell and Larker (1981) technique was adopted along with HTMT as recommended by Henseler, Ringle and Sarstedt (2015). The results of discriminant validity as mentioned in table 4 and table 5 of the study. According to the values of table 4, all values in the diagonal are larger than the remaining values showing the criteria proposed by Fornell and Larker (1982) is fulfilled. Furthermore, the values of table 6 showing all values are less than 0.90 meetings the criteria mentioned by Gold, Malhotra, and Segars (2001).

Table 4. Reliability and validity

	BISA	COMP	CP	IPG	TMS
BISA	**0.792**				
COMP	0.623	**0.823**			
CP	0.172	0.037	**0.719**		
IPG	0.767	0.659	0.122	**0.794**	
TMS	0.656	0.526	0.159	0.679	**0.848**

Table 5. HTMT

	BISA	COMP	CP	IPG	TMS
BISA					
COMP	0.729				
CP	0.200	0.078			
IPG	0.899	0.771	0.160		
TMS	0.755	0.612	0.198	0.784	

BISA= business information system adoption, COMP= compatibility, CP= competitive pressure, IPG= Internal Process Growth, TMS= Top management support.

In the next stage after confirming the measurement model of the present study, the structural model was calculated to confirm the proposed relationship in the hypothesis of this research. For this purpose, a bootstrapping procedure was used through 5000 subsamples. Table 6 shows the direct results of the present study.

Table 6. HTMT

HYP	Relationship	Beta	STD	T- Value	P Values	Decision
H1	BISA -> IPG	0.767	0.025	31.144	0.000	Supported
H2	COMP -> BISA	0.390	0.050	7.750	0.000	Supported
H3	CP -> BISA	0.088	0.041	2.156	0.016	Supported
H4	TMS -> BISA	0.437	0.054	8.102	0.000	Supported

BISA= business information system adoption, COMP= compatibility, CP= competitive pressure, IPG= Internal Process Growth, TMS= Top management support.

The direct results mentioned in table 6 shows that all four proposed hypotheses were supported. The results show that BISA and IPG are positively associated with each other having Beta = 0.767 and T- value 31.44, Thus H1 is supported. On the other hand, the relationship between COMP and BISA is also positive and significant (B= 0.390, T= 7.750). Additionally, relationship of CP and BISA is also positive (Beta=0.088, T= 0.016). In the end, TMS and BISA are also positively related to each other (Beta= 0.437, T= 8.102).

Table 7. Mediation results

HYP	Relationship	Beta	STD	T-Value	P Values	Decision
H5	COMP -> BISA -> IPG	0.299	0.040	7.538	0.000	Supported
H6	TMS -> BISA -> IPG	0.335	0.045	7.487	0.000	Supported
H7	CP -> BISA -> IPG	0.068	0.032	2.145	0.016	Supported

BISA= business information system adoption, COMP= compatibility, CP= competitive pressure, IPG= Internal Process Growth, TMS= Top management support.

The structural model was also used in this study to evaluate the indirect results of the present study. Table 7 shows that BISA mediates significantly between COMP, TMS, CP and IPG respectively. Thus H5, H6 and H7 of the study are supported. In the end, the researcher assessed the R Square of the present model showing the effect of predicting variable on the outcome variable.

Table 8. R-Squared

	R-Square
BISA	0.545
IPG	0.589

BISA= business information system adoption, IPG= Internal Process Growth.

5. Discussion and Conclusion

This is the era where businesses are competing and using many different ways to improve their performance. Most organizations focus on internal process growth. Several different measures are taken by organizations to enhance their internal business growth. Therefore, this study was conducted to assess the effect of competitive pressure, business information system adoption, compatibility, Top management support on internal business growth along the mediating role of business information system adoption. The findings of the study show that businesses must focus on top management support and compatibility within the organization to adopt a business information system in their processes. This business information system is critical to gain a competitive advantage for the business. As a result of this business information system, the internal growth of the business is positively affected.

This study bridges the gap of limited studies that have analyzed the effect of business information system on the growth of the business. The findings of the study are also helpful for the policymakers and practitioners of the management studies to develop strategy by which they can enhance their internal growth.

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