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FACTORS INFLUENCING THE ADOPTION OF BUSINESS INTELLIGENCE SYSTEMS AMONG SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs) IN THE SRI LANKAN CONTEXT

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ABSTRACT

This study explores the critical factors influencing the adoption of Business Intelligence (BI) systems in SMEs, including relative advantage, complexity, availability of organizational resources, competitive pressure, and the IT knowledge of managers. Data was collected through a self-administered standardized questionnaire, ensuring adherence to established reliability and validity standards of the original scales. The analysis was conducted using SPSS and Excel, employing frequency analysis, correlation tests, and regression analysis. Adopting a quantitative and cross-sectional approach, the study utilized a snowball sampling technique to reach participants when direct access was challenging. The findings reveal that relative advantage, complexity, organizational resource availability, and competitive pressure significantly impact BI adoption, while managerial IT knowledge plays a moderating role in the relationship between relative advantage and BI adoption but does not moderate the relationship between complexity and adoption. The study provides a theoretical framework that offers a comprehensive understanding of the key determinants of BI adoption, aiding organizations in making informed decisions before implementing BI systems. It emphasizes the importance of selecting determinants based on industry-specific needs to fully leverage the benefits of BI solutions.

Keywords: Business Intelligence Systems, TOE Framework, Small and Medium Enterprises (SMEs)

1. Introduction

Business environments are undergoing rapid transformation in the era of Industry 4.0 and the COVID-19 pandemic, which has impacted nearly every aspect of daily life. Consequently, organizations need advanced technological innovations to quickly adapt to competitive markets (Ahmad & Miskon, 2020). As noted by (Xia & Gong, 2014) the rapid progress of technology and the internet's expansion in the mid-1990s sparked the emergence of BIS. According to Combita Niño et al., (2020) BIS is viewed as a comprehensive set of tools, systems, and processes that assist organizations in collecting and analyzing vast amounts of data to identify their strengths, weaknesses, and opportunities. As an information system (IS), BIS supports decision-making by managing, collecting, and integrating both structured and unstructured data; handling large databases such as big data; facilitating ad-hoc searches, forecasting, monitoring, and analytical solutions; and supporting advanced computing technologies that allow

users to discover new knowledge (Ishaya & Folarin, 2012) through data processing, summarization, filtering, and convergence, Veeramisti et al., (2020).

Business intelligence is a technology-driven approach designed to analyze data and provide actionable insights to assist decision-making by business leaders. According to the Devenport et al., (2010) it includes the tools, applications, and processes used to collect, store, access, and analyze data to enable users to make more informed decisions. Over time, companies have adopted business intelligence tools to enhance productivity, secure a competitive edge, and automate business operations. However, the significant implementation costs continue to pose a major challenge for BI adoption, particularly among small and medium-sized enterprises. Small and medium-sized enterprises (SMEs) are essential players in the economic framework of any country. Due to their large presence, they make substantial contributions to economic growth, job creation, and innovation (Audretsch & Keilbach, 2004). According to (Van Gils, 2005), SMEs are key drivers of economic advancement across various sectors. However, Rodrigues et al. (2012) point out that the growing complexities in the environments where SMEs operate present various social, environmental, and technological challenges that impede their success. Despite these challenges, new demands and opportunities continue to arise for businesses. Entrepreneurs must therefore stay innovative and continually adapt their business models to keep pace with the rapidly changing technological landscape.

In today's highly competitive markets, adopting a Business Intelligence (BI) solution has become essential for businesses aiming to enhance efficiency, flexibility, and proactivity in their decision-making processes. Many entrepreneurs now acknowledge the growing importance of integrating IT solutions to support decision-making and leverage BI tools effectively. According to Lonqvist et al., (2006) BI tools offer several advantages for businesses, including enhanced user interaction, easier access to information, cost reduction, adaptability to the company’s specific needs, and support in the decision-making process. Furthermore, Guarda et al., (2012) highlight that BI connects different systems and users who require access to information, creating an environment where authorized personnel can utilize the data necessary for daily operations, thus allowing organizations to evaluate business performance from various viewpoints. While large organizations have traditionally led in the development and implementation of BI solutions, the rise of globalization, increased competition, and growing information needs have driven small and medium-sized enterprises (SMEs) to consider adopting BI tools (Wong, 2005). These software solutions allow smaller businesses to compete with larger counterparts, enhance their market presence, or uncover insights and patterns that might otherwise remain hidden. (Guarda, Santos, Pinto, Augusto, & Silva, 2012). (Olszak, 2016) conducted a study on SME owners and directors, who emphasized the importance of using technology to analyze large data sets for SMEs. This study aimed to explore the factors that influence the adoption of business intelligence systems among SMEs in Sri Lanka.

2. Literature Review and Hypotheses development

2.1. Business Intelligence System

Implementing the BI system requires the project team to possess appropriate knowledge and skills. A competent project team, comprising managers, employees, and IT specialists, must be present (Olszak & Ziemba, 2012). Further, Mahmudin et al., (2023) identified Business intelligence serves as a cohesive system of software, applications, and technologies designed to help organizations gather, process, and convert extensive raw data into valuable and actionable information. Implementing business intelligence allows businesses to make informed decisions, recognize market trends, and secure a competitive edge in a fast-paced and fiercely competitive business environment. (Mahmudin, Mohsin, & Rajak, 2023). The previous study sought to explore the views and perspectives of businesses utilizing enterprise resource planning (ERP) systems and their business intelligence capabilities in the Western Macedonia region of Greece. The new adoption of ERP systems holds strategic significance for SMEs, particularly in the context of increasing competition in globalized business and economic growth. According to Antoniadis et al., (2015) in the environment, prioritizing cost efficiency and addressing customer requirements are paramount for SMEs to remain competitive. (Antoniadis, Tsiakiris, & Tsopogloy, 2015). Small and medium-sized enterprises (SMEs) constitute approximately 90 percent of all businesses and contribute to over 50 percent of global employment, as reported by the International Finance Corporation. Wong et al., (2020) identified these enterprises play a significant economic and societal role, serving as catalysts for economic growth and development. (Wong, Tan, & Mahmud, 2020).

According to the (Llave, 2017) "Business intelligence (BI) encompasses a range of methodologies, processes, frameworks, and technologies designed to convert raw data into actionable insights. This enables users to make informed business decisions based on real-time information".(Llave, 2017) (Tatić, et al., 2018). Furthermore, Becerra-Godínez et al., (2020) identified the adoption of business intelligence technologies in SMEs remains largely untapped, primarily because of the limited understanding and strategic capability of SMEs in harnessing technological innovations. Consequently, there is considerable progress to be made for this technology to genuinely improve the decision- making process. (Becerra-Godínez, Serralde-Coloapa, Ulloa-Márquez, Gordillo-Mejía, & Acosta-Gonzaga, 2020). Business intelligence systems are dynamic, and their systems in an organization have changed over time. Initially, BI systems were simple, static, and analytical programs that were used to handle specific programs in an organization (Kfouri & Skyrius, 2016). Relative advantage is defined as the social importance, economic value, and other useful characteristics of a new technology, as well as a measure of decision-makers' motivation to adopt it because it is perceived to be an improvement over current technology (Malak, 2016). As per the Salisu et al., (2021) it is the level to which an idea is considered to be greater than the idea it replaces. (Salisu, Sappri, & Omar, 2021). Previous researchers suggest explanatory structure includes of four characteristics. They are technology characteristics (perceived compatibility, relative advantage, complexity), organizational characteristics (organizational resource availability, presence of champion), environment characteristics, and CEO’s characteristics. The aim of the category framework

is to establish a conceptual model of BIS acceptance with a succinct forecast and a simple interpretation of the key constructs and determinants.

Past studies said that higher levels of BI application relative advantage are positively related to BI System adoption (beta value = 0.122), and the perceived complexity of so many innovations has been reported as a barrier to BI adoption, Owusu at al., (2017). The next research hypothesis was to predict the effect of organizational resources on business intelligence implementation, which could inspire the continuous use of business intelligence in different SMEs. However, based on the path analysis, it was found that organizational resources have an insignificant effect on the business intelligence implementation in SMEs (Lateef & Keikhosrokiani, 2022).

In a constantly evolving business environment where competition intensifies, organizations are increasingly driven to seek viable competitive advantages through innovative new technologies. Business entities closely observe the actions of their competitors to gain an edge. According to Khayer et al., (2021) adopting new information technology (IT) is widely recognized as a strategic necessity for organizational survival in today's highly competitive and perpetually changing business environment. (Khayer, Jahan, Hossain, & Hossain, 2021). Previous researchers found that low levels of competitive pressure is positively related to BI systems adoption. (Owusu, Agbemabiese, Abdurrahaman, & Soladoye, 2017). Impact of knowledge management culture on BI implementation in SMEs in Nigeria. Based on the path analysis, knowledge management has an impact on the use of BI. The outcome from earlier studies shows that knowledge management has a positive effect on BI usage and organizational efficiency (Lateef & Keikhosrokiani, 2022). The experience of Company X shows that strong backing from top-level management is a crucial factor for the successful implementation of BIS. Recognize the benefits the system would offer; top management wholeheartedly supported the adoption of BIS successfully. Additionally, Stjepić et al., (2019) identified the company's proactive efforts significantly minimized the risk of project non-completion. (Stjepić, Sušac, & Vugec, 2019).

2.2. Technology-organization-environment framework (TOE framework)

The TOE Framework, which stands for Technological, Organizational, and Environmental Framework, is a theoretical model used to understand the factors influencing the adoption and assimilation of information technology (IT) within organizations.

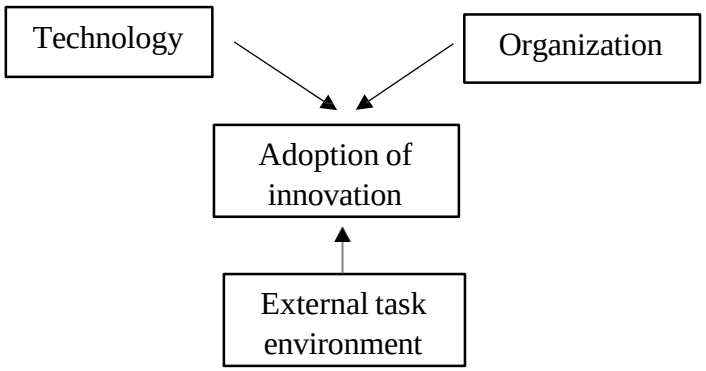

Figure 01: The TOE Innovation Adoption Framework

Source: Dunne, 2016

Business intelligence (BI) is a highly researched topic about the population of Asian countries. However, despite being a developing nation, research on this topic has not been conducted in Sri Lanka. Although BI is a popular research topic among SMEs, it lacks traction within the Sri Lankan SME context, particularly in the Kandy district. Furthermore, previous None of the research studies have selected SMEs in Kandy district for sampling purposes. Many researchers have not given sufficient attention to the factors affecting the adoption of business intelligence systems in SMEs. Some studies have employed various theories to forecast adoption. This study, however, adopts the TOE framework to analyze the adoption of business intelligence systems. While previous research often utilized a decomposed or constructive model, this study similarly applies a constructive TOE framework.

2.3. Conceptual model and hypothesis

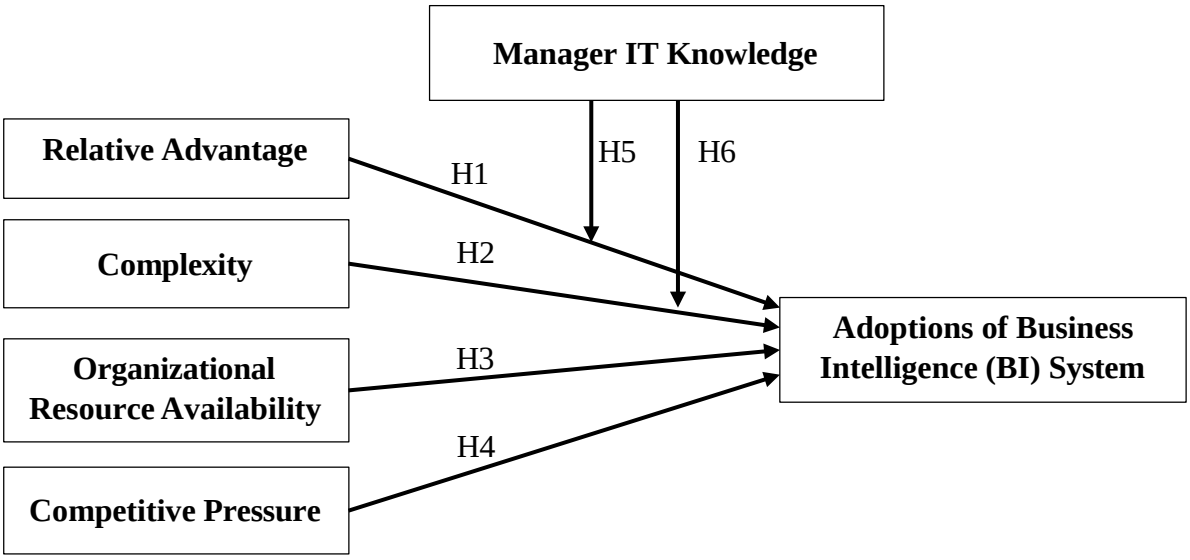

Figure 02: Conceptual Framework of the study

Source: Developed by Researcher

The adoption of Business Intelligence systems is influenced by several technological and organizational factors. Relative advantage, which refers to the perceived benefits of BI systems compared to existing solutions, plays a crucial role in adoption decisions, as organizations are more likely to implement BI systems when they offer significant improvements in efficiency, decision-making, and competitive positioning (Lateef & Keikhosrokiani, 2022). Conversely, complexity can act as a barrier to adoption, as systems perceived as difficult to understand and integrate may deter organizations from fully leveraging their potential. Additionally, Salisu et al., (2021) identified the availability of organizational resources, including financial, technical, and human capital, is a critical enabler, ensuring that firms have the necessary infrastructure and expertise to support BI system implementation. (Salisu, Sappri, & Omar, 2021). Moreover, competitive pressure can drive BI adoption, as organizations seek to maintain or enhance their market position by leveraging data- driven insights to improve strategic decision-making and operational efficiency (Malak, 2016).

Furthermore, the role of managerial IT knowledge is crucial in shaping BI adoption outcomes, particularly in moderating the effects of relative advantage and complexity. Managers with strong IT expertise are better equipped to assess and communicate the benefits of BI systems, thereby strengthening the positive influence of relative advantage on adoption (Lateef & Keikhosrokiani, 2022). Their understanding of system functionalities and integration processes also helps mitigate the negative impact of complexity, enabling smoother implementation and higher acceptance rates within the organization. By bridging the gap between technical capabilities and strategic business needs, IT-savvy managers facilitate a more informed and proactive approach to BI adoption, ensuring that organizations can fully capitalize on the system's potential for enhanced decision- making and competitive advantage. Based on the above facts, we formulate the following hypotheses:

H1: There is an impact of relative advantage on adoptions of business intelligence system. H2: There is an impact of complexity on adoptions of business intelligence system.

H3: There is an impact of organizational resource availability on adoptions of business intelligence system.

H4: There is an impact of competitive pressure on adoptions of business intelligence system.

H5: Manager IT knowledge moderates the association between relative advantage and the adoption of business intelligence system.

H6: Manager IT knowledge moderates the association between complexity and the adoption of business intelligence system.

3. Methodology

Research design refers to the "specification of the most suitable operations to be performed in order to test hypotheses under given conditions" (Beri, 2005). It aids the researcher in determining the appropriate decisions necessary to ensure the validity of the results. It is crucial that the research design be aligned with the nature of the subject being studied (Beri, 2005). This study follows a quantitative approach aimed at addressing the research problem. Given that the study seeks to test hypotheses and the established relationships within the research model, it is categorized as explanatory research. According to Sekaram (2013), as this study explains the relationships between variables, it also holds a descriptive nature. Additionally, the study explores causal relationships, positioning it as a causal study focused on understanding cause-and-effect links. Moreover, this is a cross-sectional study where the researcher's interference is minimal, and it is a field study since it examines the situation as it exists without manipulating any variables.

For sampling, a virtual snowball sampling method was employed, particularly useful in cases where it was difficult to access subjects with the desired characteristics. In this approach, participants within existing networks recruit others, and the process continues until data saturation is achieved (Kumar, 2011). Data collection was conducted through email, WhatsApp, LinkedIn, and other virtual platforms. The sample for this study consisted of 100 SME owners from the Kandy district. Data were collected using a self-administered, standardized questionnaire that meets established criteria for reliability and validity. The data were analyzed using SPSS, including frequency analysis, correlation testing, and regression analysis was applied to test the hypotheses.

4. Data analysis

4.1. Sample distribution

According to the findings of the demographic analysis, most of the respondents were male and it is 64%. Also, this study confirms that highly focused on the middle generation whose age is between the range of 31-30 years. It is 44% as a percentage. And also, most of the respondents are married it is 68.2%. Furthermore, considering about the education qualifications out of a total of 100 respondents, 40 (40%), 25 (25%), 26 (26%) and 9 (9%) are included in the high school or equivalent, vocational or diploma, bachelor degree and master degree or higher respectively. And also, most of the 84% respondents were owner manager of the organization. And also considering industry sector, 32 (32%), 34 (34%), 19 (19%), and 15 (15%) fall into the categories of manufacturing, service, wholesale and retail respectively. Out of a total of 100 respondents, 38 (38%), 36 (36%), 23 (23%), and 3 (3%) are included in the 2–9, 10–49, 50–100, 101–200 respectively. Most of the companies has been business for 6-10 years. It is 36% as a percentage. Most of the organizations were used financial accounting computer software to support business activities.

4.2. Analysis of validity

The results show that the Kaiser-Meyer-Olkin (KMO) values for relative advantages, complexity, organizational resource availability, competitive pressure, owner-managers' IT knowledge, and the adoption of BIS all exceed 0.5. Moreover, the Bartlett's Tests of Sphericity indicate significance at the 5% level, with P-values of 0.000 for all variables, which are below 0.05. This suggests that the sample size is sufficient for each variable, and there is a significant correlation between the items within each variable.

Table 01: Results of validity test

Variable	No of Attributes	KMO	Bartlett's Test Sig	Decision
Relative advantages	5	0.762	0.000	Acceptable
Complexity	4	0.602	0.000	Acceptable
Organizational resource availability	4	0.726	0.000	Acceptable
Competitive pressure	3	0.571	0.000	Acceptable
Owner-managers' IT knowledge	4	0.651	0.000	Acceptable
Adoption of BIS	6	0.828	0.000	Acceptable

Source: Survey Data

4.3 Analysis of reliability

The Cronbach's alpha coefficient for relative advantages is reported as 0.793, complexity as 0.766, organizational resource availability as 0.846, competitive pressure as 0.727, and owner-managers' IT knowledge as 0.749. For the dependent variable, the adoption of BIS, the Cronbach's alpha coefficient is 0.851. An instrument is considered reliable when its Cronbach's alpha coefficient is greater than 0.70. Since the Cronbach's alpha values for all variables in this study exceed this threshold, it confirms that the items are reliable and that the internal consistency of each measure is adequate.

Table 02: Reliability Analysis for Overall Variables

Variable	Cronbach's Alpha Value	Number of Question Items
Relative advantages	0.793	5
Complexity	0.766	4
Organizational resource availability	0.846	4
Competitive pressure	0.727	3
Owner-managers' IT knowledge	0.749	4
Adoption of BIS	0.851	6

Source: Survey Data

4.4. Correlation Analysis

A bivariate correlation analysis was conducted to examine the existence of a linear relationship between relative advantages, complexity, organizational resource availability, competitive pressure, manager IT knowledge, and the adoption of BIS. The results reveal a statistically significant positive correlation between relative advantages and the adoption of BIS ($r = 0.625$, $p < 0.01$), complexity and adoption of BIS ($r = 0.700$, $p < 0.01$), organizational resource availability and adoption of BIS ($r = 0.490$, $p < 0.01$), competitive pressure and adoption of BIS ($r = 0.659$, $p < 0.01$), and manager IT knowledge and adoption of BIS ($r = 0.716$, $p < 0.01$).

Table 03: Pearson's Correlation Analysis

Variable		Relative Advantages	Complexity	Organizational resource availability	Competitive Pressure	Manager IT Knowledge
ABIS	**Pearson Correlation**	.625**	.700**	.490**	.659**	.716**
	Sig. (2- tailed)	.000	.000	.000	.000	.000

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

Source: Survey Data

4.5. Regression Analysis

The model summary identifies relative advantages, complexity, organizational resource availability, and competitive pressure as independent variables, with BIS adoption as the dependent variable. As presented in Table 4, the R^2 value reveals that these independent variables collectively explain approximately 68% of the variance in BIS adoption.

Table 04: Model Summary for Multiple Regression Analysis

Model	R	R Square	Adjusted R Square	Std. error of the Estimate
1	.825[a]	.680	.666	.47249

a. Predictors: (Constant), Relative Advantages, Complexity, Organizational Resource Availability, Competitive Pressure
b. Dependent Variable: Adoption of BIS

Source: Survey Data

According to the ANOVA Table 5, the regression model was found to be significant ($F = 50.439$, $p = 0.000$). The F statistic ($F = 50.439$) was significant at the 5% level, indicating that the proposed model is appropriate. The "R Square" statistic reveals that relative advantages, complexity, organizational resource availability, and competitive pressure explain 68% of the variation in the adoption of BIS.

Table 05: ANOVA Table

	Model	Sum of Squares	Df	Mean Square	F	Sig
1	Regression	45.041	4	11.260	50.439	.000[b]
	Residual	21.209	95	.223		
	Total	66.250	99			

a. Predictors: (Constant), Relative Advantages, Complexity, Organizational Resource Availability, Competitive Pressure
b. Dependent Variable: Adoption of BIS

Source: Survey Data

The results in Table 6 indicate that relative advantage ($p < 0.05$; $\beta = 0.242$), complexity

($p < 0.05$; $\beta = 0.295$), organizational resource availability ($p < 0.05$; $\beta = 0.184$), and competitive pressure ($p < 0.05$; $\beta = 0.241$) significantly influence the adoption of BIS. Thus, H1, H2, H3 and H4 are accepted.

Table 06: Coefficient of Multiple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.231	.341		.677	.500
	RA	.242	.062	.274	3.925	.000
	C	.295	.082	.294	3.576	.001
	ORA	.184	.088	.144	2.085	.040
	CP	.241	.048	.352	5.060	.000

a. Dependent Variable: Adoption of BIS

Source: Survey Data

4.6. Moderation Analysis

4.6.1. Moderating Analysis of Manager's IT Knowledge on the Relationship Between relative advantage and the Adoption of Business Intelligence Systems

According to Table 7, the model summary of the moderation regression analysis indicates that the regression model is significant ($F = 53.186$, $p < 0.05$).

Table 07: Model Summary

R	R-square	MSE	F	Df1	Df2	P
.790	.624	.259	53.186	3.000	96.000	.000

Source: Survey Data

Table 08: Coefficient Values

	Coeff	Se	T	p	LLCT	ULCIU
Constant	-.419	.645	-.649	.518	-1.699	.862
RA	.871	.243	3.586	.001	.389	1.354
MITK	.893	.184	4.862	.000	.529	1.258
Int_1	-.154	.064	-2.413	.018	-.281	-.027

Source: Survey Data

According to Table 8, the following decisions can be made: Relative Advantage significantly influence Adoptions of BI System ($b = .871$, $t = -.649$, $p = 0.000 < 0.05$). One unit increase in Relative Advantage will lead to 0.871 units increase in Adoptions of BI System. Manager IT Knowledge significantly influences Adoptions of BI System. ($b = .893$, $t = 4.862$, $p = 0.000 < 0.05$).

Table 09: Test(s) of highest order unconditional interaction(s)

	R2-chang	F	Df1	Df2	P
X*W	.023	5.824	1.000	96.000	.018

Source: Survey Data

According to Table 9, the inclusion of interaction 1 in the model results in an R^2 change of 0.023, which is statistically significant with $p = 0.018 < 0.05$ ($F = 5.824$). These findings indicate that Manager IT Knowledge has a moderating effect on the relationship between relative advantage and the adoption of BI Systems. Thus, H5 is accepted.

4.6.2. Moderating Analysis of Manager's IT Knowledge on the Relationship Between Complexity and the Adoption of Business Intelligence Systems

Table 10: Model Summary

R	R-square	MSE	F	Df1	Df2	P
.771	.594	.280	46.901	3.000	96.000	.000

Source: Survey Data

According to Table 10, the model summary of the moderation regression analysis indicates that the regression model is significant ($F = 46.901$, $p < 0.05$).

Table 11: Coefficient Values

	Coeff	se	T	p	LLCT	ULCIU
Constant	.938	1.109	.846	.399	-1.263	3.139
C	.351	.314	1.120	.266	-.271	.974
MITK	.351	.342	1.025	.308	-.328	1.030
Int_1	.013	.089	.142	.888	-.164	.189

Source: Survey Data

According to Table 11, the following decisions can be made: Complexity significantly influence Adoptions of BI System ($b = .351$, $t = .846$, $p = 0.000 < 0.05$). One unit increase in Relative Advantage will lead to 0.351 units increase in Adoptions of BI System. Manager IT Knowledge significantly influences Adoptions of BI System. ($b = .351$, $t = 1.025$, $p = 0.000 < 0.05$).

Table 12: Test(s) of highest order unconditional interaction(s)

	R2-chang	F	Df1	Df2	P
X*W	.000	.020	1.000	96.000	.888

Source: Survey Data

It is shown in Table 12, that the addition of the interaction 2 in the model changes the R^2 by .000 and it is a significant change as $p = 0.888 < 0.05$ ($F = .020$). These results showed, there is no Manager IT Knowledge on relationship between complexity and adoptions of BI System (P=.888). Thus, H6 is rejected.

5. Discussions and findings

Relative advantage is a critical driver of innovation adoption, defined by the extent to which an innovation is perceived as superior to existing systems (Roger & Johnson, 1988). Previous studies highlight the numerous benefits that BI technology can bring to organizations, Khan et al., (2014). Gutierrez et al., (2015), identified relative advantage as a core factor in adopting new information innovations, describing it as the degree to which organizational factors are perceived to provide significant benefits. Their research confirmed that relative advantage plays a crucial role in the decision to adopt BI. Similarly, Jeon et al., (2006), found relative advantage to be one of the strongest predictors of an innovation's adoption rate. (Tehrani, 2013), also demonstrated that relative advantage has a positive impact on BI adoption. (Abdullah, 2016), emphasized that the perceived benefits of BI adoption, such as those offered by cloud technology, are significant contributors to the decision-making process regarding BI adoption.

In addition to relative advantage, complexity is another key factor influencing adoption decisions. Gutierrez et al., (2015), found that complexity significantly affects adoption choices, differing from other characteristics of innovation. Tehrani (2013), noted that complexity plays a crucial role in the decision-making process for BIS adoption. (Rogers, 2003), described complexity as the extent to which an innovation is perceived as challenging to understand and use. Several researchers, including (Chang, 2001), have identified complexity as a barrier to innovation adoption. Ramamurthy, (Sen, 1999) concluded that technologies with lower complexity led to more favorable outcomes in adopting data warehousing solutions. Organizational resource availability is another significant determinant identified in numerous studies as influencing innovation adoption (Adler-Milstein & Bates, 2010). Managers are more likely to support new technology adoption when sufficient resources, such as capital, equipment, human skills, and time, are available (Chong & Nizam, 2018). For example, (Scupola, 2003) found that resource constraints hindered SMEs in Taiwan from investing in ERP systems. In the context of BI, implementation often requires substantial financial resources and skilled personnel due to its complexity and cost (Sahay & Ranjan, 2008).

According to Hwang et al., (2004), the dynamic nature of modern business environments has driven many organizations to adopt innovative technologies to reduce uncertainties and gain a competitive edge. (Hwang, Ku, Yen, & Cheng, 2004). Further, Curko et al., (2007) noted as the environment influences technology adoption decisions, firms are compelled to adapt their strategies, processes, and technological implementations to remain competitive. (Curko, Bach, & Radonic, 2007). Studies have consistently found a strong relationship between competitive pressure and technology adoption, Alshamaila, et al., (2013). For instance, (Lu & Mazouz, 2000) studied data warehousing technology in medical device manufacturers and observed that IT adoption was directly related to the level of competitive pressure faced by firms. Another important factor is the IT knowledge and experience of owner-managers, which significantly affects IT adoption in SMEs (Boonsiritomachai, 2014). Thong et al., (1996) suggested that owner-managers with greater IT knowledge are more inclined to adopt innovations, as their expertise reduces uncertainties associated with IT investments. This increased confidence subsequently

lowers the risks of implementing IT solutions. Similarly, a study by (Palvia & Palvia, 1999) observed that owner-managers with advanced computer skills were more satisfied with IT implementation, whereas those with limited IT skills experienced lower satisfaction. A recent study, such as Chao and Chandra (2012) have corroborated these findings. Their survey of 217 small manufacturers and financial service organizations in the USA identified the IT knowledge of owner-managers as a key predictor of IT adoption and strategic alignment. However, they also found that advanced IT applications, including BI, face lower adoption rates among smaller firms due to critical resource constraints.

6. Theoretical implications

The theoretical framework developed for Business Intelligence Systems (BIS) is designed to accurately represent the key factors influencing BIS adoption and predict its successful implementation within organizations. This framework has the potential to assist practitioners in making well-informed decisions prior to integrating BIS into their operations. Ahmad et al., (2020) identified it represents a notable advancement in the theory of BIS acceptance and adoption, an area that remains relatively underexplored in current research. (Ahmad, Miskon, Alkanhal et al., 2020). Although various models and theories have been proposed for BIS adoption at the organizational level and acceptance at the individual level, this framework is among the first to integrate both individual-level acceptance and the Technology-Organization-Environment (TOE) framework to facilitate BIS adoption at the organizational level. While previous studies have thoroughly examined these factors separately, there has been limited research on how user acceptance contributes to BIS adoption across the entire enterprise. This conceptual framework not only enhances the understanding of BIS adoption but also creates new avenues for future research. Furthermore, it is adaptable, allowing for further refinement or generalization, which could lead to the development of new models or theories.

7. Practical implications

The findings reveal several crucial factors that impact the adoption and recognition of Business Intelligence Systems (BIS) within organizations. These factors may hold varying levels of significance based on the unique circumstances and context of each organization. It is essential to adapt the selection of these factors to align with the organization's specific needs and industry trends in order to fully capitalize on the benefits of BIS initiatives. Research indicates that BIS can improve market value across various industries, such as education, telecommunications, insurance, research, supply chain, and retail. This analysis offers valuable insights for decision-making prior to BIS implementation, benefiting market analysts and policymakers. It emphasizes the importance of strategic elements like managerial innovation and executive support to ensure successful BIS adoption. Managers must fully comprehend the essential steps for effective implementation to maximize these insights. Moreover, organizations must consider external factors while addressing the challenges and uncertainties tied to BIS adoption. This study is especially valuable for

Business Intelligence vendors and cloud service providers, assisting them in overcoming issues related to complexity and compatibility in BIS investments. This is particularly important for small and medium-sized enterprises in developing economies,

where such challenges are often more significant.

8. Conclusion

This research examines the factors influencing the adoption of business intelligence systems among SMEs within the Sri Lankan context. A review of existing literature highlights a notable gap, as only a small number of studies have investigated these factors. Moreover, most prior research has been conducted in international settings, underscoring the scarcity of studies focused specifically on Sri Lanka. To address this gap, the study seeks to achieve its objectives by developing a conceptual model. Relationships between the factors affecting the adoption of business intelligence systems were analyzed using demographic analysis, descriptive analysis, correlation analysis, and regression analysis. Primary data for the study was gathered through a structured questionnaire.

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