

Competitive Advantage: A Study of Saudi SMEs to Adopt Data Mining for Effective Decision Making

Tariq Saeed Mian , Fahad Ghabban

Department of IS, College of Computer Science and Engineering, Taibah University, Madinah Almunwarah, Saudi Arabia
Email: tmian@taibahu.edu.sa, fghaban@taibahu.edu.sa

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Abstract

It is very important for organizations to develop a competitive advantage for long-term survival in the market. For this purpose, the main objective of the study was to assess the role of data mining and employee training & Development to gain a competitive advantage. Moreover, the mediating role of personnel role and knowledge management is also assessed in the present study. The data in the present study were collected from the employees of SMEs in KSA using convenient sampling. The response rate of the study was 58.36%. For the analysis of the collected data, the study used PLS 3.2.9. The findings of the study reveal that data mining and training and development plays an important role for organizations to gain a competitive advantage through Knowledge management and personnel role. The findings of the study fill the gap of limited studies conducted regarding SMEs of KSA to gain a competitive advantage. The findings of the study are helpful for the policy-makers of SMEs around the globe.

Keywords

Data Mining, Employee Training and Development, Personnel Selection, Knowledge Management, Competitive Advantage

1. Introduction

The performance of an organization is boosted in any organization because of technology. Organizations can add more time to their decision making because of their automatic handling of the data. Data mining has provided power for seal making to the managers. Data meaning provides insightful understandings of the data; therefore, it is a very reliable technology. A lot of significance is given

to data mining. It has applications in several different fields, including customer relationship healthcare manufacturing, technology, and communication [1].

Managers in organizations face several problems, including personal selection. Optimizations can achieve organizing goals and optimize their production cost by selecting the person accurately. To solve this problem, there is a need to apply analytical methods. In past studies, researchers have given attention to the selection of suitable as well as eligible candidates among the available options. The problem of person selection is the most complex problem which is being encountered in real life. The selection of employees is a very complex issue, and it is a very complex decision-making process by which an organization can select and place the right candidate in the right position. To solve this problem, many techniques and tools are proposed by the researchers [2].

The performance of the employee can be increased through the process of training and development. Additionally, it is a building block for the organization, which increases the success and growth in the market. If organizations can win the heart and minds of the employees, they can get benefit from the training and development process. In this way, employees get better recognition by the organization and they exert extra efforts to achieve goals. Training and development are a new way to invest in the employees, so they get the necessary skills to do additional jobs. It is also part of the management approach with an aim to get Xbox motivational employees to achieve organizational goals [3].

In business, special interest is given to management knowledge but also known as management of knowledge. This concept is given importance because it has the capability to impact capacity enhancement, and competitiveness, bring strategic results, and reach organizational goals. For this organization, the management of knowledge is a very important factor. It helps to maintain competition throughout the business. Researchers pointed out that the application of knowledge management is not restricted only to knowledge-intensive firms. It has the same applicability in all kinds of forms all around the globe. In essence, knowledge management is important for all sectors, including public sectors, manufacturing, production, telecommunication, banking, and education [4].

Organizations are facing intense pressure and competition in business nowadays. It is because several foreign and national drivers have entered the market. Additionally, market share is lost by the organizations which have not worked and adapted to the changes in the overall market. For long-term profitability, it is important for organizations to find a suitable place. It is key for the survival of the business as well. It should be the goal of the organization to keep and create a competitive advantage. There can be several ways to develop a competitive advantage, including creating product differentiation and centralization [5]. So, the purpose of the study is to assess the role of data mining and employee training and development to gain a competitive advantage for the SMEs of KSA. Moreover, the mediating role of personnel role and knowledge management is also proposed.

The findings of the study reveal that data mining and training and develop-

ment plays an important role for organizations to gain a competitive advantage through Knowledge management and personnel role.

2. Literature Review

2.1. Data Mining

The process of extracting useful data from knowledge is known as data mining. A combination of the knowledge base is utilized along with analytical skills that are sophisticated and use specific knowledge, which can play a vital role in uncovering hidden patterns and trends. A number of different data mining algorithms can be used to abstract this data. In order to redefine the industry, data mining is a big revolution. It plays a very important role in integrating technology and research. Association rules are identified through classifications. The introduction is used by categorization, which handles a number of outcomes like poor, average, and good.

In the past, the data mining concept was first introduced in 1980 allowed a lot of important developments what made in the 1990s and this process continued till now. In order to discover the pattern of structural data and internal relations, data mining is used. In fact, data mining is very important to discover valuable and unexpected construction from big data and to use this data for analysis and statistic purposes. Researchers are of the view the data search will also have a revolution in the next ten years. This technology is that of the superior technologies developed by humans [6].

2.2. Personal Selection

The systematic way to make decisions is known as personnel selection. These decisions are made regarding employees to be hired for opposition within an organization. The basic purpose of selection is to find out the employees who have the required abilities, skills, and knowledge required for the job. Basically, a person selection is the metrological placement of the employees in a job. Its importance for the organization is realized when the employee spent decades in the service of the employer. The selection process starts with collecting information regarding an employee with the purpose of whom to hire. The method to hire should not be against the laws designed for personal selection [7].

Personal selection is one of the most complex and critical processes regarding human work behaviour because it helps in the determination of efficacy regarding a number of human resource management. Organizations are using parcel selection with the purpose of hiring applicants for the position which was advertised. in this sense, it is a process of this year, making regarding which candidate is suitable. From this point of view, versus election is a way of decision making with the objective to predict potential employee future. To achieve this objective process selection, find out the requirement of individuals regarding job performance and a number of assessment processes are used like reference check, bio-data, assessment career, work sample test, job experience, situational judgment

test, job knowledge test, interviews, personality and inventories, and cognitive ability test. If the combination is used correctly, it will help in enhancing the performance by 60% [8].

2.3. Employee Training and Development

Researchers believe that the primary focus of training is to tell the employees of the organization the way to perform a current job. Moreover, it helps the employees to get the required skills and knowledge, which is important to improve their effectiveness and efficiency. It is a planned process of learning with the aim to develop important skills, attitudes, or knowledge in an individual. At the same time, the focus of development is on building skills and knowledge of organization member with the aim that they can tackle the problems and challenges in a better way. The orientation is true broader the skills of the employees [9].

Training and development can be explained as the educational process, which involves sharpening knowledge, attitude, concept, add skills to enhance employee performance. Human resource management treats training and development as the functional concern with the purpose to create an activity happy organization-level and improve job performance of the individual or a whole group. It is the attempt by the organization to improve future or current employee performance by increasing the ability of the employee to perform by learning. There are a number of factors upon which the performance of the employee is dependent like management, knowledge, and job satisfaction. it shows the performance of the organization is associated with the performance of employee and training and development is important for the employee we improve the performance. Despite there is great role of training and development in this success and growth of an organization, a number of organizations do not have basic skills that will encourage success and growth of the organization through training and development of the workers. Training and development of employees is a very complex matter; therefore, it was the part of a number of past literatures regarding training [3].

2.4. Knowledge and Management

Knowledge management is the strategy to get the right knowledge at the right time to the right person. Moreover, it is used to help employees sharing knowledge so the organizational performance can be improved. Knowledge management is the way often enabling organizations by which they can improve decision making, learning, and shared understanding. Knowledge and management of knowledge is a very important feature for this survival organization. Identification of resources is the key to the failure or success of awesome knowledge management. This identification regarding resources allows the firm to distribute, transform, create, and recognize knowledge. Organizations that can effectively be transferred and manage the knowledge have improved their performance in a lot of ways [10].

2.5. Competitive Advantage

The term competitive advantage is referred as set-off capabilities that can permanently enable the performance of the business over its competitor. The base of competitive advantage is in distribution earned value creation. When the value is created, the organization enjoys a competitive advantage [11].

When an organization outperforms the competitor at that point, comparative advantage is achieved [12]. Organizations achieve competitive advantage from their pool of resources. The resources of firms can be the assets of the firm, which can be intangible or tangible, their constant and the position of the firm, or they can weaken the position as well. The competitive advantage of the firm can be staff expertise, IT system, marketing team iron manufacturing capacity [13].

3. Hypothesis Building

3.1. Data Mining and Personnel Selection

Organizations can use data mining for the solution of problems related to HRM. Past studies have mentioned the application of data mining in the management of the human resource in a number of different firms. It plays a very important role in the identification of employees who play a critical role and handle long-distance work from home. If the employees get the opportunity to work close to their homes, they will quit the job. It also helps in the identification of employees who take benefit from the bonuses of employee and their programs of healthcare. In the end, this system also helps in the identifications of employees who perform better than others [14].

The organizations mainly rely on their human resource to gain a competitive advantage in order to extract the rules that are useful for data mining from the relationship between work behaviours and personnel profile data. Additionally, useful strategies are developed through experts in data mining. These suggestions are implemented within the firm by the top management. Through an effective strategy of personnel selection, organizations can find the employees that are suitable and talented with the aim to improve the rate of retention and improve performance. In order to assist the human resource management of the organization, mined data is used. The HRM activities that can be improved by data mining is career path development, mentoring, job rotation, and job redesign [15]. Hence, it is empirically proven that data mining and personnel selection are associated with each other.

H1: Data mining and Personnel selection are positively related to each other

3.2. Personnel Selection and Competitive Advantage

One of the key resources for the success of any organization is the selection of qualified employees. The selection of skilled and talented employees can be the

critical success factor for organizational success, and it can play a vital role in the organization to gain a competitive advantage in the era of globalization. Personnel selection is the way to choose the employees who have the required qualification to achieve organizational goals. Its aim is to select the best available employee to fill the vacancy of the organization. The personnel selection of employees is the basic process that may have an impact on the quality of staff available in the organization. The quality of staff plays a very important role for the organization to gain a competitive advantage in the market [16].

Obtaining a good of candidates is especially interesting when the human resource management is oriented to organize, manage, and lead a work team instead of selecting a single candidate; it contributes to the success of the project and creates a competitive advantage for the organization. Developing the work team improves the people's skills, technical competencies, and, as a whole, the team environment and project performance, which is a critical factor for the success of the project [17].

H2: Personnel selection affects competitive advantage positively.

H3: Personnel selection mediates the relationship between data mining and competitive advantage.

3.3. Employee Training & Development and Knowledge Management

Training and development are a key consideration for the success of knowledge management. Basically, it is important for the members of the organization the way to manage the knowledge and recognize it. For the knowledge of employees, regular training and development are needed. These training programs play a vital role in sharing the experience and expertise that play a vital role in enhancing and utilize new knowledge that they learned with the passage of time. Moreover, knowledge capacity is also affected by the training of employees. Thus, when organizational employees know that firm has given the opportunity to them to gain personal competency, enhance the value and human capital specificity, employees try to manage their skills and knowledge with the needs of the organization. Training of employees is very important for the process of knowledge management of the organization [18].

Researchers mentioned that Knowledge management of an organization plays a vital role in knowledge management in the banking sector [19]. Moreover, the findings of [20] mentioned that knowledge management programs are affected by eleven different programs, including employee training. These results showing the recruitment and selection process positively affect knowledge sharing. Additionally, training and development have the same role in generating knowledge management. Therefore, we propose the following hypothesis:

H4. Training and development have a positive impact on knowledge management.

3.4. Knowledge Management and Competitive Advantage

In order to gain a competitive advantage and sustain it for a longer period of time, knowledge management plays a very vital role. Moreover, the core competencies of the organization become stronger because of knowledge management. Therefore, a competitive advantage has become very sustainable. Moreover, the importance of KM is obvious as it is a key intangible asset for the organization. Researchers perceive knowledge management as a key intangible asset of the organization [21].

Human capital is the factor upon which the functions of business have relied. In order to build relational activities and develop infrastructure, this knowledge management is used by the employees, which later develop a sustainable competitive advantage. Researchers suggested that it is possible to generate knowledge from a number of different resources and disciplines. The organizations that have the capability to develop such knowledge can better attain a competitive advantage. Studies in the past explored the knowledge management role to develop competitive advantage and found a positive relationship [22]. In order to use varied and vast knowledge effectively, sophisticated tools and the communication process of the organization plays a very important role. When these tools are implemented, companies increase their ability to eliminate departmentalization, spur innovation, and respond to the changing business world quickly [23].

H5: Knowledge management has a positive impact on CA.

H6: Knowledge management mediates the relationship between Training & development and competitive advantage.

Based on above literature review, following framework (Figure 1) is developed.

4. Methodology

Structural Equation Modelling (SEM) is adopted in the present study for several reasons. SEM has the ability with linear and multiple regression analysis according to which evaluation of variable is done with no errors [24]. Moreover, it becomes easy to analyze the data through SEM because it provides CFA for the

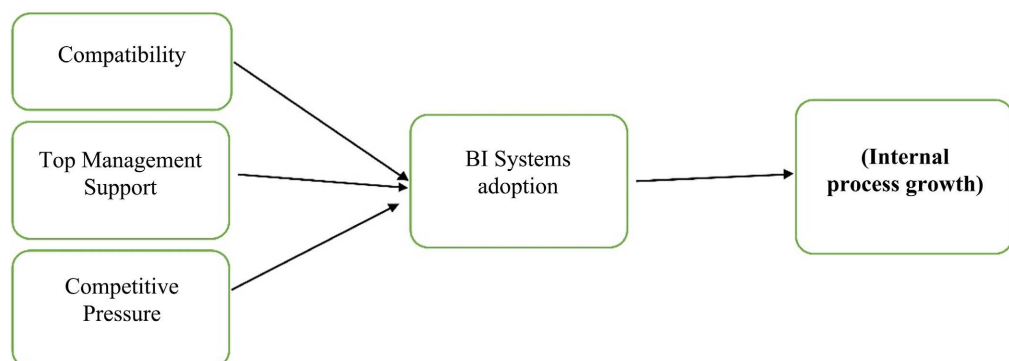


Figure 1. Research framework.

initial testing of the data. In the present study, there are indirect and direct relationships for which SEM is more suitable.

This study is primary in nature and quantitative by design for which questionnaires were designed to collect the data. This research adopted positive research paradigm as social world can understand this study in very objective way. The questionnaire was adapted from past studies and was designed using a 7-point Likert scale. The data was collected from the employees of SMEs of KSA using convenience sampling. The data was distributed among 522 employees, using a self-administered survey methodology. From the received questionnaires, 306 were usable, which were used for the analysis of data. The response rate of this study was 58.62%.

5. Results and Analysis

The collected data was analyzed using two tools, namely Smart PLS 3.2.9 and SPSS 25. Researchers mentioned that SPSS is the short form of statistical package for the social science. In order to conduct different type of complex analysis, researchers recommended using this tool. On the other hand, PLS is also known as partial least square used to conduct analysis through structural equation modeling (SEM). In order to test the proposed model that is very complex, PLS is most suitable tool. For the analysis having reflective model, PLS is very suitable tool.

In this study, the data analysis started by using SPSS 25 [25]. The first test performed was removing missing values and detection of outliers. After removing the outliers, the remaining cases were 306. This information was also used for the descriptive analysis of the data and demographic analysis. **Table 1** shows the demographic features of the respondents.

Table 1 reflects the demographic information including in terms of their age, gender, marital status and education. Later study used the data in smart pls for further analysis. The analysis from PLS is divided in two steps. First step is known as measurement model whereas, later step is called structural model. In measurement model, first stage is to assess the content validity of the data is developed whether the correlations of the items utilizing in the examination of data have the high-quality load. At this stage factor loading, discriminant validity and reliability are assessed. After the assessment of measurement model, later stage is the structural model that is used to examine the proposed hypothesis.

In this assessment of measurement, the first stage is the factor loading. The loading of the items as recommended by [26] must be more than 0.60. On the other hand, composite reliability and Cronbach Alpha is used to evaluate the internal consistency of the items.

The Values mention in **Table 2** reflects the internal consistency and factor loading of the items. Besides, convergent validity uncovers to what degree an item with respect to a particular factor loaded to different components where

Table 1. Demographics.

Demographic variables	Category	Frequency	Percentage
Gender	Female	170	55.55%
	Male	136	45.45%
Marital status	Married	232	75.81%
	Single	64	24.19%
Age	Below 20	0	0%
	20 - 30	83	27.12%
	31 - 40	123	40.19%
	Above 40	70	22.87%
Highest education	Diploma	14	4.57%
	Masters	192	62.74%
	Bachelors	100	32.67%

Table 2. Outer loading & internal consistency.

	CA	Cronbach Alpha	CR	AVE
CA1	0.743			
CA2	0.866			
CA3	0.901	0.932	0.946	0.746
CA4	0.906			
CA5	0.874			
CA6	0.881			
DM1	0.851			
DM2	0.877	0.891	0.924	0.753
DM3	0.851			
DM4	0.891			
ETD1	0.793			
ETD2	0.854			
ETD3	0.839	0.896	0.924	0.707
ETD4	0.859			
ETD5	0.858			
KM1	0.864			
KM2	0.825	0.874	0.913	0.725
KM3	0.858			
KM4	0.859			
PS1	0.679			
PS2	0.835			
PS3	0.787	0.843	0.889	0.616
PS4	0.823			
PS5	0.791			

Note: CA = competitive advantage, DM = data mining, ETD = employee training and development, KM = Knowledge management, PS = personnel Selection.

they expected to be loaded. Moreover, in this study, AVE is also assessed which is important to show the convergent validity of the data [27]. Researchers mentioned that the benchmark to reach the convergent validity through AVE is the value of AVE must be more than 0.50. The values of AVE are mentioned in **Table 2**.

In next phase, study examined the discriminant validity of the data to show the novelty of the items used in the study [28]. In this aspect [27] Fornell and Larcker (1981), mentioned that discriminant validity of the data is established if the AVE square root parameter is more than the pair-wise relationship of the unidentified factor. From the highlighted values mentioned in **Table 3**, its evident that these criteria is fulfilled in present study.

This study also employed discriminant validity by using Hetro Trait and Mono Trait parameter. This is the new technique to assess discriminant validity used to overcome the deficiencies of methods [27] [29]. The benchmark value for the assessment of HTMT is the value must be less than 0.90. From the values mentioned in **Table 4**, it is evident that these criteria are fulfilled.

After establishment of measurement model, this study used structural model in order to test the proposed relationships. This was tested by using Beta values and t-values. Bootstrapping procedure was adopted as recommended by [30] by using subsamples of 5000. **Table 5** mentions the direct results of the proposed hypothesis.

The structural model (**Figure 2**) was conducted by using the procedure of

Table 3. Discriminant validity.

	CA	DM	ETD	KM	PS
CA	0.864				
DM	0.469	0.868			
ETD	0.682	0.520	0.841		
KM	0.643	0.610	0.706	0.852	
PS	0.411	0.762	0.414	0.505	0.785

Note: CA = competitive advantage, DM = data mining, ETD = employee training and development, KM = Knowledge management, PS = personnel Selection.

Table 4. Discriminant validity (HTMT).

	CA	DM	ETD	KM	PS
CA					
DM	0.514				
ETD	0.744	0.581			
KM	0.710	0.692	0.797		
PS	0.457	0.868	0.474	0.585	

Note: CA = competitive advantage, DM = data mining, ETD = employee training and development, KM = Knowledge management, PS = personnel Selection.

Table 5. Direct relationships.

		Beta	SD	T-value	P Values	Decision
H1	DM -> PS	0.762	0.039	19.392	0.000	Supported
H2	PS -> CA	0.115	0.052	2.207	0.014	Supported
H4	ETD -> KM	0.706	0.031	22.492	0.000	Supported
H5	KM -> CA	0.585	0.046	12.633	0.000	Supported

Note: CA = competitive advantage, DM = data mining, ETD = employee training and development, KM = Knowledge management, PS = personnel Selection.

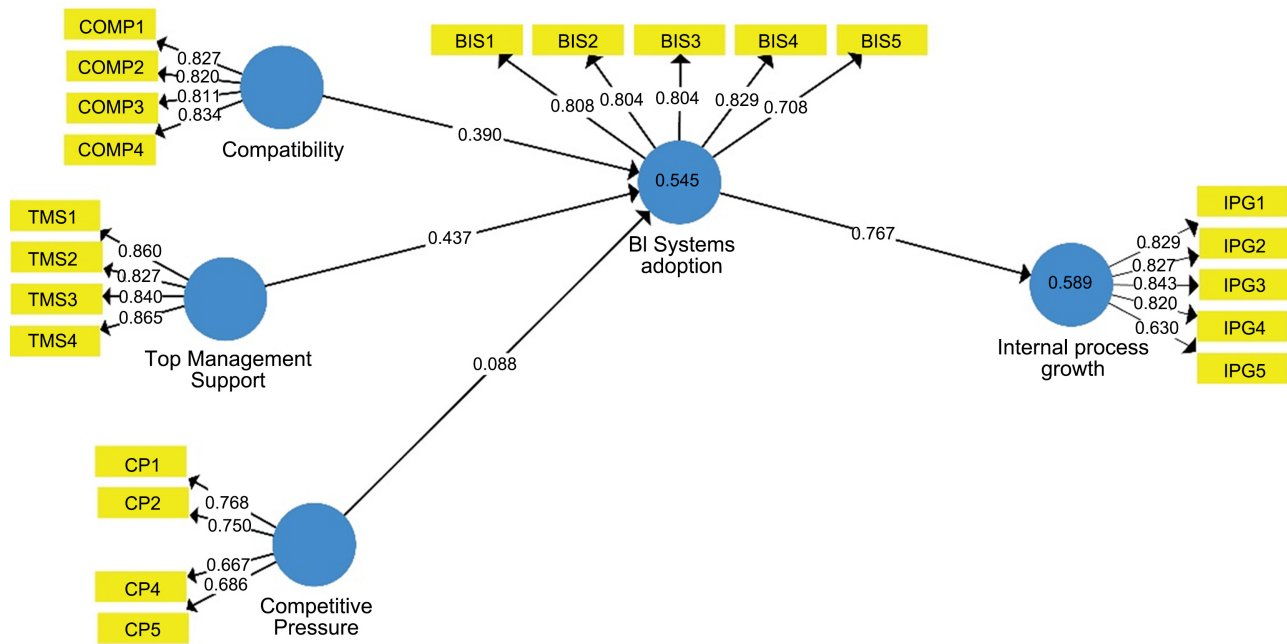


Figure 2. Structural model.

bootstrapping. In order to reject or support the hypothesis, t values are used as reference. Scholars mentioned that the t value must be more than 1.645 for the acceptance of any proposed hypothesis. Therefore, from the above table, it is evident that DM and PS are positively associated to each other (Beta = 0.762, t = 19.392). Thus, H1 is supported. On the other hand, H2 is also supported (beta = 0.115, t = 2.207) showing PC and CA are positively linked to each other. Moreover, ETD and Km are positively linked to each other proving H4 (Beta = 0.706, t = 22.492). In the end, KM and CA are associated positively (Beta = 0.585, t = 12.633) supporting H4.

Later this study used Bootstrapping for the evaluation of mediation hypothesis. The results are mentioned in **Table 6**. From the results, it is evident that KM mediates the relationship among ETD and CA, Supporting H3 (Beta = 0.413, t = 9.191). Moreover, PS also mediates the relationship between DM and CA, supporting H5 (Beta = 0.088, t = 2.165).

Later this study assessed the Coefficient of determination (R2). According to [31], the value of R2 equal to 0.02 is considered as weak, 0.13 as moderate, and

Table 6. In-direct relationships.

		Beta	SD	T-value	P-value
H3	ETD -> KM -> CA	0.413	0.045	9.191	0.000
H5	DM -> PS -> CA	0.088	0.041	2.165	0.015

Note: CA = competitive advantage, DM = data mining, ETD = employee training and development, KM = Knowledge management, PS = personnel Selection.

Table 7. R-square & Q-square.

	R Square	Q square
CA	0.423	0.309
KM	0.499	0.358
PS	0.581	0.340

Note: PS = personnel Selection, KM = Knowledge management, CA = competitive advantage.

0.26 as substantial. The R square values of this study are mentioned in **Table 7** below. In the end, study assessed predictive relevance (Q²) of the model by using [32] criteria according to which the value of Q square must be above zero. According to **Table 7**, predictive relevance of the model is established in the present study.

6. Conclusion and Recommendations

This is the era of globalization, and organizations all around the globe are suffering because of the Covid-19 situation. In this scenario, it is very difficult for organizations to sustain their market competitiveness. Employees are leaving their jobs, or they do not tend to come to the workplace during the pandemic situation. In this scenario, it has become very difficult for the firms to develop and sustain a competitive advantage. In this regard, this study reveals that SMEs of the KSA must focus on personnel selection. By choosing the right employee, they can develop a pool of talented employees who can play an important role in achieving a competitive advantage. In this regard, SMEs must use technology like data mining. Organizations can better select employees using data mining. Eventually, organizations will develop a competitive advantage. Furthermore, Knowledge management within the firm is also necessary. If SMEs adopt proper KM strategies, they can use this knowledge to develop a competitive advantage. For the development of knowledge, training, and development of employees play a very important role.

This study has a few limitations as well. Researchers should apply this model in other sectors such as education and higher education, etc. Moreover, the moderation of employee trust can be an interesting addition to the current model. The findings of the study are helpful for the policymakers to SMEs to develop a strategy by which they can use employees to gain a competitive advantage.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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