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ASSESSING THE LEVELS OF BENEFITS OF ENTERPRISE RESOURCE PLANNING SYSTEM BY BALANCED SCORECARD METHOD

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ABSTRACT

Although implementing an enterprise resource planning system can bring about significant outcomes for an organization, it is frequently accompanied by prohibitive expenses. In terms of the managerial point of view, it is necessary to investigate whether the corresponding benefits outweigh the cost or not. In this regard, assessing the effectiveness of the implemented system through a comprehensive yet workable method is of paramount importance. This study intends to reflect the application of the balanced scorecard (BSC) method in evaluating the performance of an ERP system. It contributively provides a generalized guideline for the certain levels of ERP's benefits that can be coped with through the potential perspectives of BSC. In that respect, typical key performance indicators are recommended for a given manufacturing organization. Our study shows how one could employ the required techniques for the assessment of an integrated system when comparing the working condition of an organization before running an ERP and after that.

KEYWORDS: Enterprise resource planning, Balanced scorecard, Performance Measurement, Business process.

1. INTRODUCTION

Many companies use ERP in reaching their strategic objectives and also reengineering the old processes and some companies redesign the practices using templates embedded in modules. ERP stands for Enterprise Resource Planning and means large effects on business functionality, data items quantity in the database, and the ability to generate different operational reports. ERP deployment in any organization is an opportunity to eliminate old and less effective procedures and renew processes for being a more flexible business enterprise in modern markets. Managers and stakeholders need to able to know how much these changes have been implemented from top levels to operational parts. It is not expected that all the changes will develop the status of the objectives and make the business more flexible than before. Thus, it is required to measure the status of the business before ERP deployment and after its deployment to evaluate how much ERP has been useful and how much the organization has used ERP capabilities in solving issues and improving operational and strategic indexes. A comparison of these two stages needed a uniform approach and measurement tools to get a creditable result. Enterprise Resource Planning has proved its benefits in many organizations as a cost and cycle time reducer, and also a productivity and quality improver. ERP plays a main role in raising customer service and finally, it assists the organization's management to optimize resource usage, planning, or decision-making. The ERP can improve the performance of the system to be more flexible in dealing with all organizational processes. The platform of ERP empowers the organization to embed beneficial technologies, such as cloud service,

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blockchain, and the internet of things, into routine business processes (Carlsson-Wall et al., 2022; Sislian & Jaegler, 2022; Tavana et al., 2020).

But at first, all these benefits need to be measured through monitoring the status of processes affecting strategic business objectives concerning ERP. In the meantime, Chand (2005) indicated that the performance of ERP Systems can be evaluated by the balanced scorecard (BSC) approach. The BSC is, in fact, a specific tool for measuring the performance of an organization to provide managerial insights for the underlying key participants (Tawse & Tabesh, 2022). Kaplan and Norton (1992) introduced the Balanced Scorecard and this concept started to be used in association with the performance measurement in several companies during the next years (Kaplan & Norton, 2005). Furthermore, BSC is a management tool for measuring the efficacy of the implemented strategy. The BSC has four aspects including the customer, finance, internal business processes, and learning and growth that can be an assessment framework for strategic objectives in the organization. On the other hand, the ERP is an information and technology-oriented solution whose performance measurement is of paramount importance. However, it is no mean feat to deploy an ERP system and it entails a huge amount of cost and time-oriented efforts (Ungureanu et al., 2022). In this regard, dealing with the nature of an ERP system under the assessment procedure of the BSC tool could highlight the level of effectiveness of the conducted efforts (Shang & Seddon 2000; Fang & Lin 2006). BSC would tend to put strategic objectives in the framework of the major mission of an information technology system like ERP. The application of BSC in assessing the performance of an ERP can substantially signal how well one of the ongoing processes of an organization is improved to the deployed new system (Zaitar, 2022). To capture the challenges of implementing an ERP and to suggest the significant components of the deployment, Momani et al. (2022) stated that BSC would not lead to a promising result unless in the presence of a large volume of data. Considering findings related to the main European ports, Mio et al. (2022) implied the relationship between BSC and ERP implementation. Soobrayen et al. (2019) focused on the joint consideration of ERP and BSC to extract the key performance indicators for scoring the quality of the implemented system.

So, it is necessary to assume this framework as a basic methodology in this study. Zuboff (1985) pointed out that the major mission of the ERP system can be defined in three levels. Automate level which leads operations in a faster and more cost-effective manner is at first. The second level called the informate level has been noticed less than automating. Informate level is about the ability to use data for tactical decision-making on the level of operational managers and even top managers and automating level makes it possible for an organization to achieve informate level benefits. And the third level is the transformate level which is about strategic decisions.

In other words, the initial expectation of an organization after running an ERP system is to automate its business processes as well as its operational machinery. This can be considered as the automate level. After a while, the organization besides other related businesses in the corresponding supply chain network would realize that the ERP system can make them constantly updated on the production/ inventory status. In this regard, all parties within the supply chain are informed in advance on the relevant tasks that should be done which exemplifies the role of the informate level. This means that the informate level deals with technical decisions. The additional aspect is associated with the efficiency of the ERP and its applicability in terms of strategic decision-making which maps onto the transformate level (Dehning et al. 2003; Joshi et al. 2022). What happens in the organization is that the level of some parts is automate, informate, or transformate level. This depends on the nature and capability of each part in that specific period. Moreover, it is suggested that the informating potential of intelligent technology is an option for organizations to decide by emphasizing and exploiting.

Therefore, in this article, the concepts of automate, informate, and transformate levels have been considered to contribute to the BSC. Particularly, the assessment of an ERP system using the interactions of the corresponding three levels is explored to guide the key influencers toward measuring the performance of the given system. Thus, the primary purpose of this research is to propose a creditable and clear guideline for assessing the performance of an ERP system. In this respect, the subject of ERP is selected to be evaluated using BSC, since it involves a complex framework with different possible outcomes that need to be measured by a workable tool. In the rest of the paper, different dimensions of BSC are first described. Then, the levels of ERP

that can be measured under the BSC are signaled. Finally, the study is concluded, and possible future research is implied.

2. BSC

The Balanced Score Card is a tool for measuring, evaluating, and motivating organizational performance. It has been established on four dimensions which cover all main parts of an enterprise and make the strategic objectives clear and translate for each level of the organizational structure. So, it is expected that all of the objectives have been broken and translated from the top manager at the head of the system down to the foreman on the floor of the system. BSC can push the organization toward its strategic objectives if anybody in the organization has understood his or her role in this structure. But in this article, the purpose is not about BSC implementation in an organization but it's about using this tool for measuring the status of the organization before and after ERP deployment. Finding the gap between these two stages can clarify the role of ERP on strategic objectives status. There are four perspectives in BSC every one of which has the main role in chain value and objective integration. When a new solution is employed within the organization, the objectives, measurements, targets, and initiatives should be determined in terms of financial, customer-based, internal business process-oriented, and learning and growth-led aspects. Such aspects facilitate the way of construction visions and strategies for running the organization under the new changes. Fig. 1 summarizes these aspects while they are clarified in the following subsections.

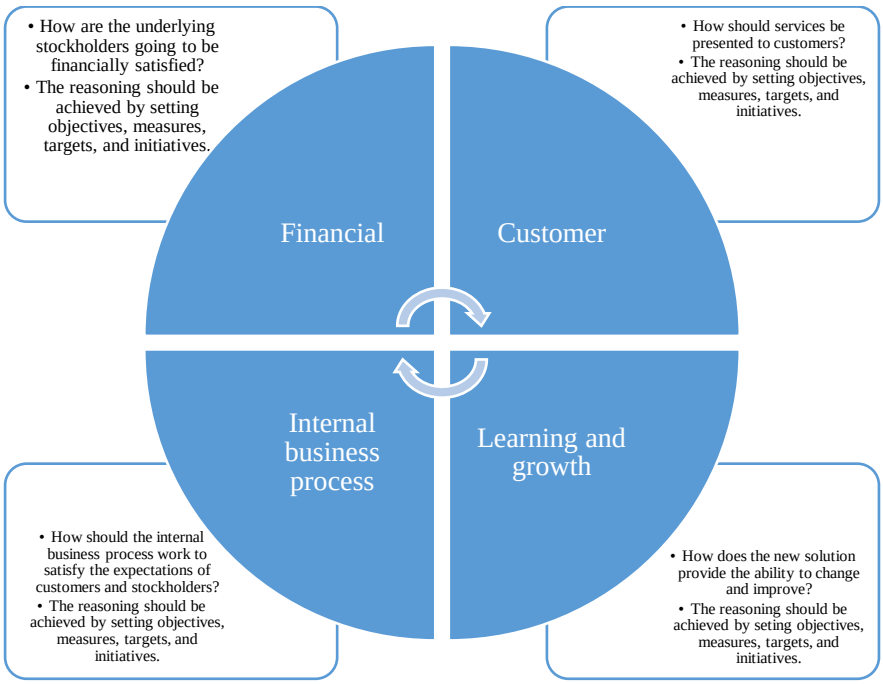

Fig. 1. Deriving vision out of the perspectives of BSC.

2.1. Learning and growth

The learning and growth perspective focuses on organizational culture and employee awareness about their business trends. The possibility of access to organizational knowledge and having an equal chance to use the training opportunities in case of learning new methods and functional courses are main in learning and growth. Also, technology has been noted as a key factor in the case of company competition. Therefore, upgrading and implementing modern technologies have been seen in this perspective as the basis of growth and business improvement. The ability to surge an organization towards capturing the changes and putting the lessons learned into practice is a crucial perspective to develop a meaningful vision. It mainly focuses on the intangible assets that would contribute to advancing the internal business processes. A typical template of the learning and growth-oriented perspective can be in Fig. 2 in which the capitals on the way of ensuring the accomplishment of a vision are pinpointed. Based on the specific case study and target, human, information, and organizational

capital can be filled up in the BSC. This may demand carrying out semi-structured interviews with the main participants within the target scope (Narayanamma & Lalitha, 2016).

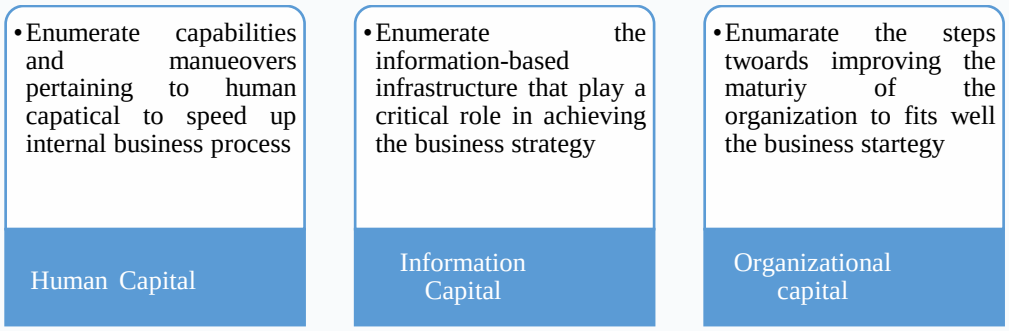

Fig 2. Template of monitoring learning and growth perspective

2.2. *Internal Business Process*

Another chain of perspectives of BSC that works in close coordination with the previous one (i.e., learning and growth) is the internal business perspective. The Internal Business Process perspective includes business efficiency concerns, such as waste and rework reduction and business agility. It is important to have conformity between customer needs and the products or services that can be provided by our processes. The way of boosting the internal business process under the new solution is a major criterion for involving the BSC tool in measuring the performance of deployed phenomena. All the organizational goals are indeed the outcome of running a set of business processes which exemplifies the importance of such a perspective. The role of the new solution in smoothing the working flow of conducting business processes and the degree of covering the maximum number of them can be extracted as the key performance indicators within a given case study. Providing the required value that will satisfy the customers' signals how internal business processes are effectively taken into consideration. It adds value to the customer requirements that can also be accompanied by cost-effective outcomes in light of the financial perspective. Fig. 3 illustrates typical areas that could engage the presence and usefulness of the internal process in activating potential activities which improve organizational performance. Concentrating on the ordinary operations of an organization needs to be explored in case of evaluating the performance of a new solution. Proactively dealing with customer affairs could justify the proper functionality of the proposed new solution, too. The level of state-of-the-art maneuvers to save an organization in the current fierce competition is extremely critical in assessing the applicability of internal business processes. Further, it should be notified that the approach in terms of aligning the internal business process with the stockholders and regulating their requirements is also captured in this perspective.

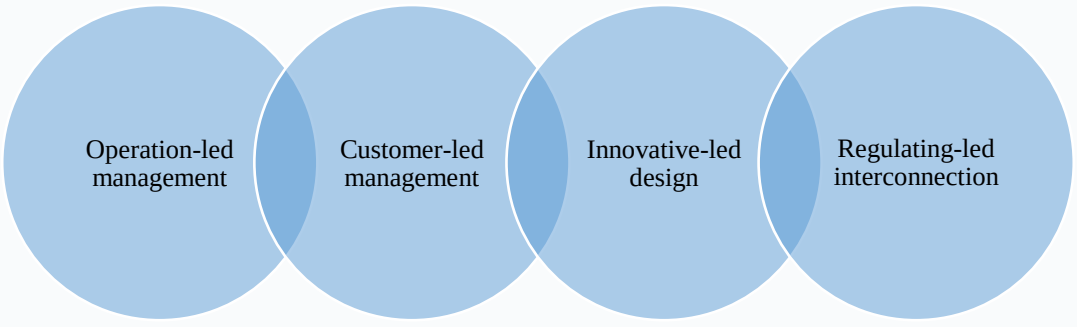

Fig. 3. Typical dimensions of the internal business process

2.3. *Customer*

The customer perspective looks at buyers of products and services. Customer loyalty, Customer satisfaction, and market share growth are the main indicators in this perspective that can support business success in

nowadays turbulent markets. It concentrates on adding value to customers and the market that is the result of utilizing the new solution. The influence of the new solution on promoting the brand, acquiring a significant share of the market, and assessing the postponing rate of accomplishing the services of customers should be converted to the related metrics. According to Fig. 4, detecting the real requirement of customers is one of the major steps for deriving key performance indicators in the market-oriented condition. This means that extracting the requirements is not a simple task and requires a thorough analysis of identifying the customers' desired services. Then, it comes to strategy and vision-making using specific indicators to figure out the objectives that are essential to be controlled. Finally, in addition to identifying the current requirements of customers, future ones have to be predicted by analyzing their consuming behavior. This could help the successful performance of the new solution in case of both present and upcoming requirements.

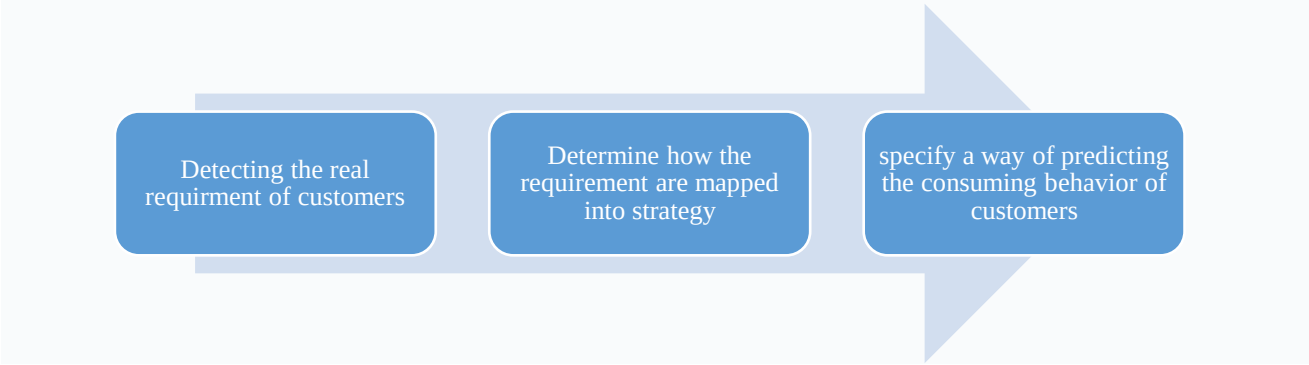

Fig. 4. Devising the way of extracting key performance indicators from a Customer perspective

2.4. Financial

The financial perspective is where the stockholder's satisfaction and business income get measured and the indicators in this perspective can show us the health of our system and the result of past decisions. In this regard, the basis of saving in the expenses, adding new outlets of income, and profit margins should be carefully monitored to be capable of capturing the level of good performance of the new solution. It needs to be guaranteed that the initial investment in the proposed new solution will be returned at a particular rate. Such a return can be ensured by fulfilling the expectations of customers, stockholders, and other involved parties like suppliers. The adopted approach of managing funds to be allocated to different segments of industrial accounting should turn into key performance indicators to truly reflect the performance of the new solution. In the meantime, Table 1 elucidates a sample of the BSC's perspectives that can be filled up at times of the necessity for evaluating the influence of a new solution on the routine working environment of an organization.

Table 1. A typical registration of BSC's perspectives

Perspectives	Objectives	Goals	Indicators	Initiatives
Learning and growth	To utilize the lessons learned for the upcoming projects/tasks	To capture worthy experiences within the whole project	The rate of mapping lessons learned into practice by the employees	Developing collection lessons learned system
Internal business process	To be capable of pervasively monitoring the working flow	Having a real-time report of the internal business process	The time to achieve a daily business report	Providing an integrated framework
Customer	Constantly capturing and applying their idea in the final products	Reducing their dissatisfaction rate	The makespan of accomplishing customer requirements	Employing an agile methodology-oriented framework
Financial	To reduce the prime cost of final products	30% spike in the production rate	Prime cost	Compromise with stockholders

3. MAPPING THE LEVEL OF ERP'S BENEFITS INTO BSC

To map BSC onto the new solution that is built up by deploying an ERP, one should focus on the resulting levels of benefits. In other words, the way of influencing an organization after the ERP implementation should be specified. As briefly discussed earlier, the benefits of an ERP can be summarized into automate level, informate level, and transformate level which are going to be discussed here one by one. In what follows, we explain how automate, informate, and transformate levels are looking for easing the business processes at operational aspects, tactical decision-making, and strategic influences, respectively. Fig. 5 provides a schematic representation of the connection between ERP and BSC.

3.1. Automate Level

For most organizations, automating the working condition is the prime intention of running an integrated ERP system. Information and technology costs reduction, productivity rise, and worker efficiency improvement lead to the success and effectiveness of ERP in this stage. This is the automate level that following the terminology of the BSC should provide a balanced influence on customer, financial, business process, and learning and growth features within an organization.

First, the goal of the ERP system in the automate level of the internal business process is to make the business processes efficient. (Chand et al. 2004). In this cell, one of the major indicators for process efficiency measurement is the throughput of the process. For instance, in a given manufacturing company, the average number of maintenance work orders that are completed each month is an indicator. Thus, in the ERP balanced scorecard, the thorough-up of work orders that have passed their steps through an ERP is a potential success measure of the corresponding integrated system. Another efficiency indicator in a process is the consumption of inputs which lessens the number of useful resources in the same process through average that can influence increasing process efficiency. Reduction of waste in maintenance and repairing systems in a manufacturing company can translate into reducing stoppage times each month. So, in the BSC perspective of the relevant ERP system availability is the main measurement key. Notably, when the system is down, a stoppage is implied from the ERP system or information and technology department. Totally, in this cell, two key measures can monitor the ERP effects on the process efficiency, including process thorough up and process stoppage rate. It should be notified that there are some other indicators in case of accelerating the process and rework reduction that can be useful and applicable in this cell, too.

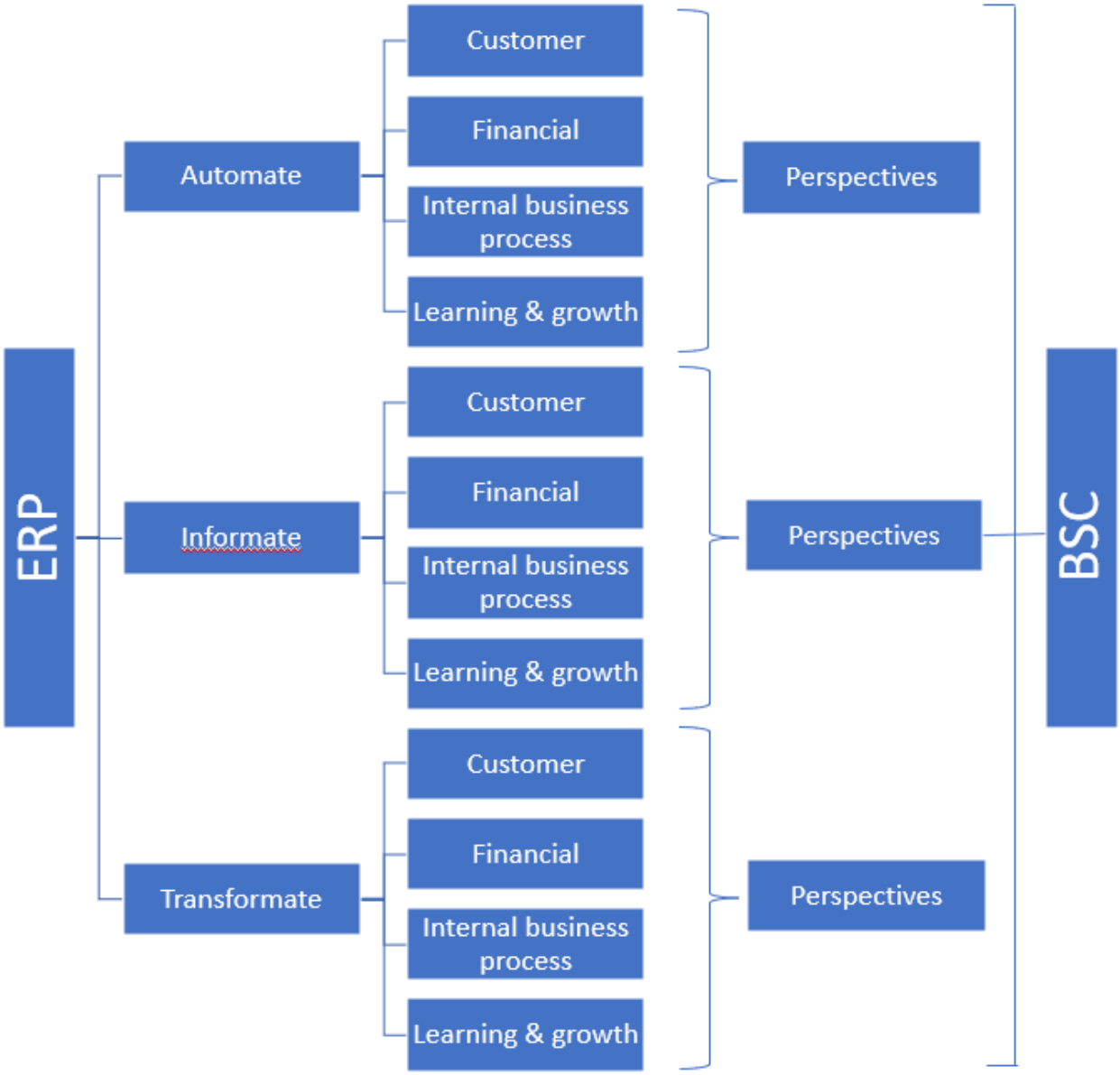

Fig. 5. Connection between ERP and BSC

Second, the goal of the customer cell is to identify current customer expectations effectively. Before anything, it is very important to find and understand the customer needs to be influenced directly by the automation of the process. Faster processes for customer need fulfillment, reduction of errors, and response time can be key measures in this cell. It is also crucial to consider the waiting time for processing a customer's request that may change under the deployment of the new ERP solution. Notice that, these customers not only involve final users of products but also include the suppliers of the input materials within a supply chain network. In other words, all parties associated with the upstream and downstream activities of an organization under the body of supply chain management are bound to play roles as customers. When an ERP system is deployed, the reorder points can be regularly signaled to the suppliers so they can prepare themselves for the new order as well. This will reduce the bullwhip effect through the supply chain resulting in significant benefits for the suppliers as one of the main category customers of an organization.

Third, the target of an ERP system in the automate finance cell is to decrease expenses and improve the rate of return (Chand et al. 2004). Comparison between the costs of process execution before and after ERP implementation can be a useful measurable element in this cell. It is expected that the ERP system influence the

reduction of costs by holding an item in inventory and tying up the capital in inventory because of the economic order quantity (EOQ) model and clarity in process of item request confirmation and item reserving policy. Further, the fluctuation in the primary cost of the products is regarded as a considerable criterion to measure the quality of performance from the financial perspective after running an ERP system. Fourth, in the automated learning and growth cell, the capability of ERP users is the main output of the training process that should be evaluated. The underlying results of such an evaluation will show the effectiveness of the training system. The way of motivating the employees to adapt their previous working style to the new one under the proposed ERP system should be an objective associated with measuring the learning and growth cell. The number of complaints the employee has within a given period after running the new ERP system can show how well they could understand its working mechanism. The low number of complaints would be an indicator that the new system truly contributes to the learning culture of the organization and brings about substantial growth.

3.2. Informate Level

As the users of the ERP system learned to work with the new system and found out new or modified business operations, the access to clear data related to the business process created the opportunity for decision-makers to take decisions with higher reliability. Thus, automating the business processes is turned into the informating level. This feature should be followed by internal business process, customer, financial, and learning and growth perspectives. These are implied below to show the application of BSC in measuring the performance of an ERP related to the informate level.

First, the process cell focuses on the quality of decisions at the employee and management levels of the organization. The decisions can be operational, and tactical. The essential indicators can be created based on organizational preferences .For instance, the percentage of delays in product delivery caused by weak planning or defective resource assignment can be measured and its reduction shows the ERP system effect. On the other hand, improvement in time delivery by better control and good integration can also be considered. The number of integrated modules that could ease the cooperation between working departments of an organization is another workable performance-oriented criterion in this scope. The working hours that employees may spend doing data entry in non-integrated software such as Microsoft Excel is also a key indicator. The promising result occurs when the integrated business processes hedge against spending even a negligible time for data entry in non-relevant software about the deployed ERP system.

Second, the informate cell is also formed based on customer satisfaction improvement. This improvement shows itself in the number of loyal customers and the average customer satisfaction based on the questionnaire. The growth of selling and increasing the share market are indirect measures, too. The tendency of customers in ordering customized products that entail non-routine processes indicates the flexibility of the newly deployed solution in terms of attracting a positive attitude from the contributors. Third, the goal of the ERP system in the informate/ finance cell is to improve the revenues of the involved parties. Implementing an ERP is accompanied by prohibitive expenses that should be gradually recovered by its underlying advantages. Now, the financial-oriented terms after deploying the ERP should be carefully taken into consideration. For instance, comparing the overhead cost before and after the ERP implementation and points of this type must be explored. Fourth, in the cell of learning and growth perspective, the ability of users in exploiting data and preparing needed and filtered reports for decision-making is very considerable to be evaluated. This reveals the effectiveness of the training system in the case of data extraction.

3.3. Transformate Level

The transformate level of benefit impacts strategic decisions which top managers can make based on tactical decisions at the past level. In the same vein as previous levels, the involvement of the transformate one into internal business process, customer, financial, and learning and growth is implied. First, in terms of the business processes perspective, it needs to be designed in an agile manner. The ERP system can change the routine procedures to a new setting which could be delicately handled within an organization through agile approaches. Neglecting an agile mindset can create severe threats for the organization that is constantly subject to different changes as a result of deploying a new integrated system. Hence, measuring the agile maturity of working teams

and organizational departments is a comprehensive indicator to assess the internal business process perspective at the transformate level. Second, in the case of the customer perspective at this level, the goal is to have a proactive approach based on understanding and meeting customer needs. It covers the management and identification of new needs of customers and also the needs of new customers and anticipating customers' expectations. Sharing risks and rewards can convince customers to invest in the business. New markets and the volume of capitalization can be key measures in this perspective. Third, the purpose of the financial perspective in the transformate level of an ERP is to enhance market awareness and develop new opportunities under different promising options of the deployed system. Fourth, the learning and growth perspective within the transformate is a major one for knowledge sharing and increasing the chance of finding new opportunities around the business atmosphere. The way of using the previous lesson learned and applying them in the new atmosphere can lead to a significant reduction in wasting time and costs.

4. CONCLUSION

Enterprise resource planning (ERP) is one of the ultimate goals of modern industrial applications whose accuracy could not be easily achieved. It emphasizes the necessity of constantly monitoring the developed and customized systems for the corresponding target organizations. This paper addressed the utilization of the balanced scorecard (BSC) method which is widely viable for assessment purposes. In this regard, the paper described the substantial perspectives of BSC, including customer, financial, internal business process, and learning and growth-oriented. The findings showed how BSC could be employed to assess the performance of a given company for determining a set of objectives, goals, indicators, and initiatives. Then, the way of mapping the levels of ERP's benefits is explained in the case of three categories. The three categories include atomate, informate, and transformate levels that embody the operational, tactical, and strategic benefits of an ERP system, respectively. In terms of each level, how the key performance indicators associated with per perspective could be obtained was implied. Future studies can contribute to the literature by exploring the proposed facets of involving the BSC in ERP assessment within a real case study. In that respect, the role of different modules of the given ERP system should be measured to truly justify its functionality for the corresponding organization.

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