Evaluating the effectiveness of integrated Accounting Information Systems (AIS) in ERP environment of Vietnamese garment companies

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ARTICLE INFO	ABSTRACT
DOI: 10.46223/HCMCOUJS. econ.en.9.1.174.2019	Identifying factors defining the effectiveness of integrated AIS in the Enterprise Resource Planning (ERP) environment is really a challenging task. In our research, the effectiveness of integrated AIS in ERP is presented in the form of a Balanced
Received: November 3 rd , 2018 Revised: January 17 th , 2019 Accepted: March 4 th , 2019	Scorecard (BSC) model. This study analyzes data collected from 178 Vietnamese garment companies with AIS in an ERP environment. Then, Cronbach's Alpha test and exploratory factor analysis (EFA) are conducted to assess the reliability of variables. The result identifies 28 variables from Vietnamese
<i>Keywords:</i> AIS effectiveness, AIS in garment, AIS-ERP in garment	garment companies' managers view grouped into 4-dimensional constructs of the BSC model that define the effectiveness of integrated AIS in an ERP environment. The conclusion on garment companies' AIS evaluation factors paves the way for future research on other Vietnamese industries' AIS evaluation in an ERP environment.

1. Introduction

While the global business environment is more dynamic and complex, the level of competition among companies is becoming fiercer (Chanopas, Krairit, & Khang, 2006). Garment companies in Vietnam are not an exception. In the national development plan for the period between 2020 and 2030, the garment and textile sector is classified as a key sector in Vietnam (VIRAC Vietnam, 2018). Garment companies are currently facing various problems including difficulties in supporting information for decision-making, unreasonable use of economic resources and limited supply of input materials. The difficulties reduce their competitiveness and the ability of international integration. On the non-financial aspect, information system (IS) in IT 4.0 environment is considered a tool to assist in improving the competitiveness of garment companies (S. M. Huang, Lee, & Kao, 2006; Lee, Kao, & Yang, 2014). Unlike the 1990s, companies became more cautious in investing in IS and started to consider the benefits of ISs to their business goals during the 2000s (Carr, 2003). The benefits of these ISs cannot be adequately estimated because they cannot be measured in terms of qualitative and non-financial values generated by such information systems (Farbey, Land, & Targett, 1992). In the context of an integrated information system - the ERP system application for large garment companies, it is necessary to conduct the effectiveness evaluation of integrated AIS in an ERP environment. The AIS effectiveness is one of the indicators for the

added value that the information system contributes to an organization by helping the organization achieves its goals (Greenspan, 2000; Santhanam & Hartono, 2003). Obtaining the evaluation result of AIS effectiveness helps to push the integrated AIS in ERP environment implementation by Vietnamese garment companies' managers.

This article constructs the model for evaluating the effectiveness of integrated AIS in ERP environment based on the Balanced Scorecard (BSC) theory. By 2010, no research in Vietnam has applied the BSC theory to develop a model for evaluating the effectiveness of integrated AIS in an ERP environment among Vietnamese garment companies. This paper has two objectives:

1) Evaluate the effectiveness of integrated AIS in an ERP environment among Vietnamese garment companies; and

2) Identify factors defining the effectiveness of integrated AIS in an ERP environment of Vietnamese garment companies.

The remainder of this paper is organized into four sections. First, the literature review section looks at prior research that informs this study. Next, methodology section shows the research model and measurement design. Then, the third section presents the research findings. Finally, there will be conclusions and some recommendations for future studies.

2. Literature review

2.1. International research

The convergence of financial and management accounting in the computer-based accounting environment is a striking finding discussed by Taipaleenmäki and Ikäheimo (2013). This disclosure has appealed much attention from researchers interested in AIS under the influence of Information Technology (IT). With the increasing impact of technology, the boundaries between technology and empirical behaviors from financial accounting and management accounting could be blurred when assessing the effectiveness of the entire AIS at the organizational level. Gimžauskienė & Klovienė (2014) continued to announce the impact of IT in the post-2010 period on the relevance of AIS and the business environment. In their research, they used qualitative methods to investigate the influences of AIS development from the business environment in the context of IT's assistance. Coyne, Coyne, and Walker (2017) published some skills needed by accountants to be able to handle the ERP-accounting system. The result suggested that accountants should be on the standpoint of the managers to control and exploit accounting data from the ERP environment. One of the reasons cited by Coyne et al. (2017) was that users could pay more attention to exploit strategic accounting data if they have the same viewpoints with the management board. These recently updated research helps the author recognize that the assessment of the effectiveness of integrated AIS in the ERP environment should be carried out at the entire company level and from the perspective of its managers.

Presently, the measurement of IT impacts on the performance of enterprises should be considered in financial and non-financial aspects (Petter, DeLone, & McLean, 2012). This paper, therefore, focuses on *evaluating the effectiveness of integrated AIS in an ERP environment under the BSC model* from the perspective of Vietnamese garment companies' managers.



The BSC theory was introduced by Kaplan and Norton (1992) with 4 theoretical constructs comprising of finance, customer, business process and learn and growth (Figure 1).

Figure 1. Balanced Score Card (BSC) theoretical model

BSC theory forms a foundation for building a measurement scale for a good deal of managerial research targeting on business performance. The IS value depends on how IS assists enterprises in achieving their business objectives and implementing their business strategies (Luftman & Brier, 1999). Many IS researchers have applied the BSC model to investigate the impact of IS on business organizations.

Researchers across the globe have conducted several studies on the application of the BSC model to measure the effectiveness of information systems. Grembergen and Haes (2005) proposed specific criteria for the dimensions of the BSC model to measure the effectiveness of Information Systems. Grembergen and Haes' (ibid.) proposal indicated the financial dimension with criteria for increasing business profits, soaring return on equity, growing sales revenue, reducing operating costs and so on. Whilst the non-financial dimension of this model were delivery support, customer-interacting assistance included in customer dimension, or the norms for production capacity boost, working-process restructuring, support for cooperating with the suppliers for business-process dimension, listed as some examples. Some countries employed BSC models to evaluate the information system. For example, Thailand used the BSC model to assess information systems in Thai garment companies (Suanmali, Karabay, & Kurumer, 2011). Morocco also adopted BSC's criteria to evaluate information system effecting on the performance of textile firms (Chriyha, Beidouri, & Bouksour, 2012). Italy used the BSC model to assess the effectiveness of decision support systems in fashion companies (Felice & Petrillo, 2013). For Pakistani garment companies, Maqbool (2015) utilized the four-dimension BSC model to propose an additional supply chain dimension to appraise the impact of an information system on the entire company. Maqbool recommends that the application of the BSC model in assessing the effectiveness of the system should be widely validated in other industries of various countries (Maqbool, 2015).

2.2. Domestic research

Up to 2010, there has been no research on the application of the BSC-theory model for evaluating the effectiveness of information systems on Vietnamese economic organizations at the company level.

However, there are some interesting facts relating to this issue. There were some workshops held in Vietnam introducing and discussing the application of BSC for corporate management in 2005. Since then, some Vietnamese consulting firms such as Vietnam Marketing and Management Institute, BSC consultancy company - Toppion and so on discovered the potential for applying BSC in the company's evaluation system. Therefore, they invested in implementing training and consulting activities using the BSC model. Some Vietnamese companies such as Phu Thai Group, FPT Corporation and Kinh Do Mondelez Company have started applying the BSC model. However, initial survey results showed that the application of the BSC model for assessing ISs was still vague and unpopular in Vietnamese garment companies. Based on the practical factors, the author acknowledges that the assessment of a business's AIS by the BSC model has some limitations. A good deal of relevant research is in the themes of organizing, improving and proposing solutions to enhance the use of accounting software for companies. These include research done by Dao (2002), Tran (2007), D. H. Nguyen (2011), H. D. Nguyen (2012) and a recent study on AIS in the ERP environment conducted by B. L. Nguyen (2013). Most of the previous research has not been specialized in the field of evaluating AIS; particularly, no BSC model has been applied for evaluating AIS in a specific industry yet.

After reviewing international and local studies on the issue, we feel the need for researching on an evaluation of Information System effectiveness in specific ERP-AIS context. This study, therefore, presents the BSC-based model and the results of new factors defining the effectiveness of integrated AIS in an ERP environment in Vietnamese garment companies.

3. Research methodology

Many researchers have proposed guidelines for building a research model including a measurement scale for the model (Churchill, 1979; Dunn, Seaker, & Waller, 1994; MacKenzie, Podsakoff, & Jarvis, 2005). Referring to previous guidelines; the author defines step-by-step directions to implement this research (Table 1).

Table 1

Research direction summary

Step 1. AIS evaluation in the garment companies	Synthesizing studies in relevant to AIS assessment in companies around the world and in Vietnam; mainly garment companies.
Step 2. Research model and observed variables	Cementing the research model based on the BSC theory in assessing AIS in an ERP environment for garment companies. Notice: Select measurement criteria under the dimensions of the BSC model from previous studies.

Step 3. Conduct an in-depth interview	Conducting in-depth inquiry with some ERP-AIS
	experts to develop the survey: assessing the
	effectiveness of AIS in an ERP environment.
Step 4. Conduct a pilot test	Reviewing the questionnaire constructed on the small
	sample and completing the whole questionnaire.
Step 5. Implement mass survey	Conducting extensive quantitative surveys with
	garment companies to assess the effectiveness of AIS
	in the ERP environment.
Step 6. Summarize and analyze data	Aiming to reach two (02) research objectives:
(descriptive study, Cronbach's Alpha	1. Reporting on the evaluation status of effectiveness
testing and EFA analysis)	of integrated AIS in an ERP environment among
	Vietnamese garment companies.
	2. Identifying factors defining the effectiveness of
	integrated AIS in an ERP environment of Vietnamese
	garment companies.

Source: The researcher's data analysis

The following subsections present in detail the step-by-step implementation of this research.

3.1. AIS evaluation in garment companies

Business managers desire to measure the effectiveness of the organization in achieving the goals set by the company. For example, Palvia, Perkins, and Zeltmann (1992) studied the impact of strategic information systems on the effectiveness of the organization - the Federal Express Corporation.

A survey conducted by Silk (1998) in the United States reported that up to 60% of US companies performed an evaluation of the effectiveness of the information system through the following criteria: quality of information, satisfaction from the users and use of the system. Hoque and Wendy (2000) studied the influence of a company's size on the assessment of information systems supporting decision-making. Factors such as total revenue, total assets and the number of employees represent the size of business. Larger-scale companies tend to implement assessment of information systems clearly. In New Zealand, Blundell, Sayers, and Shanahan (2003) carried out a survey on 40 large-scale companies to discover how they evaluated the efficiency of computer-based accounting systems. The study applied finance and

learn and growth criteria to evaluate the effectiveness of the computer-based accounting system. In the garment field, the evaluation of information system was conducted to assess the supply chain management system of Thailand garment companies (Suanmali et al., 2011), evaluate how information systems affect the performance of Morocco garment companies (Chriyha et al., 2012) and measure the effectiveness of decision support systems for Italian fashion companies (Felice & Petrillo, 2013). Besides, another study also assessed the impact of comprehensive information systems in Pakistan garment companies (Maqbool, 2015).

So far, there has been no consensus in measuring the effectiveness of ISs at the organizational level in a specific industry like a garment. The choice of scales for this concept in previous research lacks of judgment from a theoretical foundation. Financial and accounting scales were widely applied to reflect the performance of an organization. However, the financial scale was not the sole measure due to the complex nature of the effectiveness of information systems in the ERP environment. The use of a financial scale could merely result in the inadequacy of the research model's conclusion (Hitt, 1988). The effectiveness of AIS at the organizational level is at stake if being separated from the ERP environment. The proposal for applying the BSC model to measure the effectiveness of information systems in the ERP environment in studies by Grembergen and Haes (2005), and Grembergen and Haes (2017). For the garment industry, the application of the BSC model for evaluating information systems has been initially applied in the world. In this article, the author proposes the BSC model to assess the effectiveness of AIS in an ERP environment in the Vietnamese context.

The next section presents how we identify observed variables for measurement constructs.

3.2. Research model and observed variables

Based on results from previous research, we believe that to fully evaluate the effectiveness of integrated AIS in an ERP environment; we need to build a model with both financial and non-financial factors (Grembergen & Haes, 2005; Hitt, 1988). In this paper, we propose the research model using BSC approach.



Figure 2. Proposed research model

The research model illustrates *the main measured concept - The effectiveness of AIS in ERP environment -* which is a second-order construct defined by 4 first-order constructs including *finance, customer, business process* and *learn and growth* (Figure 2). Although the second-order construct is a multi-dimensional construct, the observed variables of each first-order construct need to be uni-dimensional.

Observational factors in finance construct used in past studies are in different forms. Bryant, Jones, and Widener (2004) proposed a group of financial factors for evaluating organizational performance including the increases in revenue and return on investment. As proposed by Bhagwat and Sharma (2007), financial ratios include Return on cash flow, Revenue increase, Return on equity (ROE), Return on Sale (ROS), Return on Asset (ROA) and so on. In addition, ratios such as revenue to cost, number of e-transactions in total revenue, expansion of market share, employee redundancy and deduction in cost of wages are also added to the financial measures by L. Huang (2008).

The studies used some factors to determine customer construct including improvement in customer service and accuracy in order delivery (Velcu, 2007). Market share, customer retention, and customer satisfaction are found in studies by Chia, Goh, and Hum (2009) when identifying the definition of customer concept. Customer concept is also defined by capacities for obtaining contracts, market share, customer satisfaction, and corporate reputation in providing quality services (Chen & Mohamed, 2008). Applying integrated AIS is one of the great ways to achieve customer goals.

There are several determinants of business process construct found in past studies. For example, flexibility in delivery, responsiveness to emergency orders, accuracy in forecasting, and timely delivery of new products (Park, Lee, & Yoo, 2005). Throughout the business process, time is regulated for accounting tasks, access to information and process management (Velcu, 2007). In addition, L. Huang (2008) also introduced measure factors such as transaction processing means, transaction processing procedures, order processing quality, problem-

solving, production capacity improvement, better provision of production management, product quality improvement, facilitation of e-commerce development, etc. Chia et al. (2009) study identified factors to measure business process concept including working process restriction, improvement of decision making, quality of service, support in working with suppliers, supporting good control, timely delivery and reduction of operating costs.

Although the determinants of learning and growth construct are less commonly recognized, the author also notes several measuring factors from past studies. For example, L. Huang (2008) suggested group coordination factors-coordination in working among departments and facilitating good coordination among businesses, which motivates employees to work with responsibility and participate in managing and improving self-capacity. In addition, other found determinants include employee satisfaction, productivity, staff skills, etc. (Chen & Mohamed, 2008), employee satisfaction, job change, and staff training (Chia et al., 2009).

3.3. Conduct an in-depth interview

We review articles, case-study in garment companies context to collect relevant observed variables for the first-order constructs in the research model. After data collection, we obtain the list of 65 related variables. According to Churchill (1979), the list of variables needs to be sorted by discussing with ERP-AIS experts to check the content of variables and group them into a suitable measurement construct. There are 6 ERP-AIS experts invited to assist us in reviewing the variable list and put them into a suitable construct. The variables should meet at least 3 expert expectations. This results in a shortlist of 27 variables. The experts also suggest an additions list of variables to measure each construct. Then, similar-meaning variables suggested by at least 3 experts are selected to make 14 extra variables. After that, we work with ERP-AIS experts in modifying descriptions for each observed variable to improve clarification (Table 2).

Table 2

Variables list after conducting item purification

Research construct	Number of observed variables
Finance (FINx)	9 variables
Customer (CUSx)	7 variables
Business Process (BUSx)	14 variables
Learn and Growth (LEAx)	11 variables

Source: The researcher's data analysis

The objective of conducting intensive interviews with AIS-ERP experts is to develop a survey assessing the effectiveness of the integrated AIS in an ERP environment.

3.4. Conduct a pilot test

After conducting item purification, a draft version of the survey was sent to 27 garment companies' managers which have implemented integrated AIS in an ERP environment. After collecting data in the pilot test, we perform Explore Factor Analysis (EFA) to verify variables

for each research construct (D. T. Nguyen, 2013). Using EFA with Principles Components Analysis to evaluate measurement scale, we first ensure the scale items satisfy Bartlett's test of sphericity with p ratio < 5% and KMO checking with KMO indicator > 0.5. Then, we follow the criteria to delete scale items for items loaded < 0.5 or item loaded > 0.5 (Hair, Black, Babin, Anderson, & Tatham, 2005).

In summary, there are 33 variables presented in the form of questions in the final survey (Table 3). The final survey is proven by the content validity and measurement reliability.

Table 3

Variables list after conducting the pilot test

Research construct	Number of observed variables
Finance (FINx)	9 variables
Customer (CUSx)	6 variables
Business Process (BUSx)	11 variables
Learn and Growth (LEAx)	7 variables

Source: The researcher's data analysis

3.3. Implement mass survey

Once completing the final questionnaire survey, we conduct quantitative research with a mass survey distribution to 178 Vietnamese garment companies implemented integrated AIS in an ERP environment. The garment companies' managers are the target of survey respondents comprising of CEOs, CFOs, chief accountants, department managers, etc. The data collection process lasts 2 years from 2017 to 2018. Finally, we collect a sample of 91 valid responding (equivalent to 51% of sent surveys).

Using the collected data, we analyze processed data to answer the research questions. The research findings are presented in the following section.

4. Findings

4.1. Report on the evaluation status of the effectiveness of integrated AIS in an ERP environment among Vietnamese garment companies

In past AIS studies, there have been some evaluating the company's AIS in the period of ex-ante and ex-post. However, there is no specific evaluation of the value of integrated AIS in an ERP environment in garment companies in Vietnam. The evaluation of the AIS value is inspired by the question "Does the company carry out the evaluation of the integrated AIS in the ERP environment after implementation?". The results show that only 38% of companies implemented the evaluation while the rest 62% did not. In terms of the evaluation of ISs, the results of this paper is similar to those of the study conducted by Sohal and Ng (1998) (41% carried out evaluation and 59% did not). However, the results differed from those reported by Lin and Pervan (2003) (77% had the evaluation and 23% didn't) and the study by Seddon, Graeser, and Willcocks (2002) (50% implemented it and 50% did not).

On examining the evaluation of integrated AIS in an ERP environment in garment companies in Vietnam, the author collected data in the period when the company conducted its first evaluation. Results showed that around 38% carried out the first evaluation after 6 months, approximately 30% carried out the first evaluation from 6 to 12 months and about 17% conducted the evaluation in 3 years. In terms of the evaluation of AIS in an ERP environment, this has never been mentioned before in international research.

Sohal and Ng (1998) also mentioned the frequency of AIS evaluation in companies but they did not specify the number of subsequent evaluations from the first. This paper did the same. However, this study also mentioned the frequency of evaluation conducted by the company after the first and the awareness of the IS's value for the integrated AIS in an ERP environment.

In addition, the evaluation of integrated AIS's value in the ERP environment is also inspired by previous studies of Ballantine, Galliers, and Stray (1996), and Sohal and Ng (ibid.) on company senior managers and department heads. Due to a more specific context of integrated AIS, the number of managers of financial and accounting departments are different from those in of Sohal and Ng's study with about 72%; this study get responses from all 91 managers of financial and accounting departments (100%) evaluating the integrated AIS participated in the survey.

4.2. Factors defining the effectiveness of integrated AIS in ERP environment of Vietnamese garment companies

4.2.1. Cronbach's Alpha test

The author evaluates the reliability of the scale by determining Cronbach's Alpha for each research construct: financial, customer, business process and learn and grow.

Assessment on scale reliability for Finance construct (FIN)

From the results of the scale evaluation, the authors exclude variables with a correlation coefficient < 0.3 (Hackman, Gundergan, Wang, & Daniel, 2006; Sundin, Hochwälder, & Bildt, 2008), which are *market share expanding variables* (with a correlation coefficient of 0.216) and staff reductions (with a correlation coefficient of 0.197). After excluding variables with small-sum coefficient correlates, the author continues to run Cronbach's Alpha again to assess the reliability. The second testing result shows the reliability of the Finance construct scale through the observation variables with the Cronbach's Alpha coefficient of 0.922 (satisfactory) and the correlation coefficient of the observational variables > 0.5 (Table 4).

Table 4

Cronbach's Alpha 2nd test result - Finance construct

Reliability Statistics

Cronbach's Alpha	No. of variables
0.922	7

		Scale Mean if Item deleted	Scale Variance if Item deleted	Corrected Item-Total Correlation
FIN1	Increase business profits	50.4652	66.669	0.631
FIN2	Increase Return on Equity (ROE)	50.5130	66.714	0.782
FIN3	Increase sales revenue	50.3696	67.435	0.669
FIN4	Minimize operating costs	50.3348	65.001	0.793
FIN5	Increase Return on Investment (ROI)	50.2826	72.728	0.532
FIN6	Increase Return on Assets (ROA)	50.5001	69.491	0.657
FIN7	Minimize labor costs	50.2783	67.643	0.524

Item-Total Statistics

Source: Data analysis result of the research

Assessment on scale reliability for Customer construct (CUS)

With invalid variables of correlation coefficient < 0.3, all Customer construct variables are considered to be reliable and not be removed. Cronbach's Alpha test results are shown in Table 5.

Table 5

Cronbach's Alpha test result - Customer construct

Reliability	Statistics
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Cronbach's Alpha	No. of variables
0.911	6

		Scale Mean if Item deleted	Scale Variance if Item deleted	Corrected Item-Total Correlation
CUS1	Support order delivery	18.8490	1.321	0.865
CUS2	Create better transaction value for customers	18.8824	1.206	0.781
CUS3	Support interactive services with customers	18.8470	1.307	0.813
CUS4	Improve customer satisfaction	18.7542	1.201	0.765
CUS5	Establish relationships with customers	18.8419	1.303	0.810
CUS6	Improve the quality of customer service	18.6324	1.108	0.741

Source: Data analysis result of the research

Assessment on scale reliability for Business Process construct (BUS)

From the results of the scale evaluation, the authors exclude variables with a sum correlation coefficient of <0.3 (Hackman et al., 2006; Sundin et al., 2008), which are support of the introduction of new products (with a correlation coefficient of 0.118). After excluding variables with small sum correlation coefficient, the author continues to conduct Cronbach's Alpha again to assess the reliability. The second test result demonstrates the reliability of the Business Process construct scale through the observational variables with the Cronbach's Alpha coefficient of 0.901 (Table 6).

Table 6

Cronbach's Alpha 2nd test results - Business Process construct

Cronbach's Alpha	No. of variables
0.901	10

Relia	bility	Statistics

Item-Total Statistics						
		Scale Mean if Item deleted	Scale Variance if Item deleted	Corrected Item-Total Correlation		
BUS1	Improve productivity	28.7088	13.157	0.626		
BUS2	Restructure the working process	28.8349	12.884	0.715		
BUS3	Make changes in the working process	28.8175	13.056	0.706		
BUS4	Improve the quality of decision making	28.8218	12.861	0.690		
BUS5	Provide better production management	28.8349	12.352	0.775		
BUS6	Support for introducing new services	28.8215	13.116	0.673		
BUS7	Support inventory management	28.7301	12.650	0.708		
BUS8	Improve management productivity	28.7608	12.749	0.636		
BUS9	Assist in working with suppliers	28.7143	12.736	0.701		
BUS10	Support for better control	28.8226	13.043	0.732		

Source: Data analysis result of the research

Assessment on scale reliability for Learn and Growth construct (LEA)

For variables with a total correlation coefficient <0.3, the variables under *the Learn and Growth construct* are creditable and not be eliminated. Cronbach's Alpha test results are shown in Table 7.

Table 7

Cronbach's Alpha test result - Learn and Growth construct

Reliability Statistics				
Cronbach's Alpha	No. of variables			
0.837	7			

Item-Total Statistics

		Scale Mean if Item deleted	Scale Variance if Item deleted	Corrected Item-Total Correlation
LEA1	Improve employee motivation	20.9871	8.039	0.525
LEA2	Allow support services to be shared by all levels in businesses	20.9740	7.764	0.636
LEA3	Support the development of the business sector in the market	21.1262	7.353	0.608
LEA4	Encourage staff to actively solve problems	21.2393	7.485	0.594
LEA5	Allow employees to work independently	21.0436	7.658	0.592
LEA6	Support coordination among departments	21.0656	7.021	0.702
LEA7	Facilitate businesses to work with each other	20.8754	7.913	0.624

Source: Data analysis result of the research

4.2.2. Exploratory Factor Analysis (EFA)

After Cronbach's Alpha test, 30 observational variables were retained for further analysis of the EFA process. During the first EFA running, Minimize labor costs variable and Support for introducing new services variable presenting small load factors, respectively 0.389 and 0.378, were eliminated. The second EFA analysis outcome shows that the observational variables focused on 4 research constructs with the KMO = 0.827, which is satisfactory (Hair et al., 2005) (Table 8).

Table 8

Result of the EFA factor analysis

	o. Variables		Research constructs				
No.			Finance	Customer	Business Process	Learning and Growth	
01	FIN1	Increase business profits	0.833				
02	FIN2	Increase Return on Equity (ROE)	0.812				
03	FIN3	Increase sales revenue	0.775				
04	FIN4	Minimize operating costs	0.754				
05	FIN5	Increase Return on Investment (ROI)	0.747				
06	FIN6	Increase Return on Assets (ROA)	0.722				
07	CUS1	Support order delivery		0.801			
08	CUS2	Create better transaction value for customers		0.793			
09	CUS3	Support interactive services with customers		0.785			
10	CUS4	Improve customer satisfaction		0.742			
11	CUS5	Establish relationships with customers		0.708			
12	CUS6	Improve the quality of customer service		0.694			
13 14	BUS1 BUS2	Improve productivity Restructure the working process			0.812 0.803		
15	BUS3	Make changes in the working process			0.774		
16	BUS4	Improve the quality of decision making			0.762		
17	BUS5	Provide better production management			0.751		

	Variables		Research constructs			
No.			Finance	Customer	Business Process	Learning and Growth
18	BUS6	Support inventory management			0.738	
19	BUS7	Improve management productivity			0.722	
20	BUS8	Assist in working with suppliers			0.667	
21	BUS9	Support for better control			0.657	
22	LEA1	Improve employee motivation				0.802
23	LEA2	Allow support services to be shared by all levels in businesses				0.797
24	LEA3	Support the development of the business sector in the market				0.705
25	LEA4	Encourage staff to actively solve problems				0.694
26	LEA5	Allow employees to work independently				0.656
27	LEA6	Support coordination among departments				0.649
28	LEA7	Facilitate businesses to work with each other				0.573

Rotation: Promax with Kaiser Normalization; Bartlett test <0.05; General variance deduction: 54.722 KMO index = 0.827

Source: Data analysis result of the research

By EFA analysis, the author retains 28 variables grouped by 4 research constructs of the BSC model (Figure 8). These are significant observation variables for evaluating the effectiveness of integrated AIS in ERP environments of Vietnamese garment companies from managers' viewpoint.

5. Conclusions and future research

Focusing on the evaluation of integrated AIS in an ERP environment from the managers' viewpoint, this paper proposes a research model based on the BSC theory. The author (1) examine the status of assessing the effectiveness of integrated AIS in the ERP environment in Vietnamese garment companies and (2) identify the factors that determine the

effectiveness of AIS in the ERP environment in such companies from managers' view. The author studied to develop and test scales of four (04) BSC research constructs to determine the effectiveness of integrated AIS in ERP environments in Vietnamese garment companies.

The results of the study presented the evaluation status of the effectiveness of integrated ERP-AIS in Vietnamese garment companies. Furthermore, based on the BSC theory model with four research constructs, the author has published *28 significant factors* for assessing the effectiveness of integrated AIS in the ERP environment in Vietnamese garment companies from managers' viewpoint (Figure 8). Hopefully, the initial results of this paper would become a reliable reference for future research in the field of integrated AIS in an ERP environment in Vietnam in the garment and other industries as well. In addition, more research must be done on the evaluation of integrated AIS's effectiveness from the perspective of other stakeholders including AIS academic researchers, ERP-AIS solution providers and so on.

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