The Impact of ERP Implementation on Financial Processes: A Case Study

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ABSTRACT

In this research we try to investigate impact of Enterprise Resource Planning (ERP) implementation on the effectiveness of financial processes in PETROPARS Ltd as a case study in petroleum industry. In this regard, three indicators of Ahituv and Neumann model containing time, content, and format have been utilized to compare traditional systems used in PETROPARS Ltd before implementation of ERP/SAP system. For this purpose, four hypothesis related to financial processes were developed and data collected from 101 employees related to financial processes in PETROPARS Ltd. There were 10 research questions related to the three indicators of Ahituv and Neumann model. Research findings show that ERP/SAP implementation has a positive and significant impact on financial processes effectiveness compared to the traditional systems previously used (before ERP/SAP system) in PETROPARS Ltd. This research contributes to the body of knowledge for investigation and documentation of actual results of ERP implementation in the petroleum industry of Iran. A phenomenon that has not been previously touched.

1. Introduction

Modern organizations use modernized processes and automation in different operational fields extending from accounting, supply chain management to production supervision. Throughout the years, modern businesses have been considering Enterprise Resource Planning (ERP) system implementation as a necessary attempt in the territory of information and operation management. The implementation of ERP systems has been recognized as a standout amongst the most broadly embraced advancements in management information systems (Al-Mashari., 2002).

ERP is a pact of wide programming bundles made to bolster improvement of coordinated information in various departments of an organization, such as manufacturing, financial and human resources. Organizations endeavor to execute ERP by keeping in mind the end goal to make a value chain inside their organizations. These frameworks are searching for incorporating and versatility in hierarchical procedures and information flow within the organization (Cahyadi, 2016). In recent years, ERP has turned out to be prevalent in mid-sized and large firms across the world. Before this, each function within an organization had its own information system operating independently from information systems of other organizational functions (Rom and Rohde, 2007).

A business process consists of a structured set of activities, which are performed by actors in an organization in order to collaboratively achieve a common business goal-the provision of a service or the production of a product-for an internal or external customer (Melcher, 2014).

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The bottleneck of financial activities in an organization refers to the fact that these activities have their own particular importance. High level of diversification of financial activities and their interdependence and effects of financial performance on another part of organizations require a necessity for developing such activities, in particular; processes. Continuous corrections and improvements in financial processes improve financial performance, provide on-time information and reduce time and cost. Based on the importance of financial department in an organization and its impact on other organizational departments, correction and improvement of financial processes requires particular attention. Improvement in financial processes will result in improvements in overall conditions of organization. PETROPARS Ltd Company was established in January 1998 in partnership with the Employees Retirement Fund of Oil Ministry and IDRO` of Iran with the approval of the Supreme Economic Council on the island of the British Virgin Island. The primary objective of establishing an Iranian general contractor was to implement developmental projects in the oil and gas fields in the country and entering the international markets of oil and gas. In this regard, the 1st, 4th, 5th, 6th, 7th, 8th, 12th, and 19th phases of South Pars gas field was awarded to the PETROPARS ltd based on Buyback or EPC contracts. These contracts have a value of more than 18 billion dollars. PETROPARS ltd has recently implemented ERP system. Therefore, the effects of such implementation should be investigated. One of them is ERP impact on the financial processes of an organization. This effect has not been previously addressed. Therefore, we try to investigate the impact of ERP implementation on the financial processes effectiveness at PETROPARS.

The remainder of this paper is organized as follows: Section 2 begins with the literature review in the field of ERP. Section 3 describes the methodology employed for this study. Section 4 represents and analyses the results of our study. Finally, the paper concludes with a summary including suggestions provided for future research.

2. Materials and Methods

Olhager and Selldin (2003) recommended that organizations which adopted an ERP system are encountering enhancements in performance mainly from the information perspective. They resulted that ERP implementation enhances the accessibility of information, integration of business strategies and functions and the quality of information.

O'Leary (2004) investigated and measured ERP system benefits and its differences between industries. ''He added some other benefits to Deloitte Consulting study which are inventory reduction, financial close cycle reduction, personnel reduction, management improvements, IT cost reduction, on-time delivery, information visibility, integration, flexibility, better decisions, financial controls, new reports – reporting capability'' .

Spathis and Constantinides (2004) inspected the purposes for endeavors' choice to supplant traditional information systems (IS) with completed ERP systems and investigated the progressions that happen as far as accountant applications. The results delineated that the three most important motives that led to ERP adoption were increased demand for real-time information, information generation for decision-making and need for integration of applications. The most important benefits for accounting due to ERP implementation were increased flexibility in information generation, increased integration of accounting applications, improved quality of reports statement of accounts, improved decisions based on timely and reliable accounting information and reduction of time for closure of annual accounts.

Sutton (2006) showed that data collection and usage change using ERP systems. The accounting process is impacted by these changes. Jarvenpaa (2007) noticed that ERP systems help companies adopting new management accounting practices and accountants accomplish their activities effectively and report more quickly.

Galani, Gravas, and Stavropoulos (2010) in their research about the impact of ERP systems on accounting processes in Greece companies concluded that ERP systems provide higher information integration and flexibility in information availability.

Mohammad Zadeh, Akhavan Safar, and Bakhshaei moghadam (2012) in their article entitled "Enterprise Resource Planning and its effect on accounting", concentrated on the effect of ERP implementation on qualitative characteristics of accounting information. Research findings represent that ERP systems have a favorable effect on reviewed topics. Five hypotheses were explained and examined the impact of ERP implementation on each of qualitative characteristics of accounting information such as relevance, reliability, understandability, and comparability.

Hejazi and Ismaili Kia (2013) in a study entitled the effects of Enterprise Resource Planning systems on internal control effectiveness in relation to financial reporting studied 120 stock companies and research findings represented that companies with Enterprise Resource Planning systems seem to have less internal control weaknesses compared with companies without Enterprise Resource

Planning systems. Also, companies that are unprofitable, have Mergers and acquisitions activities in this period, lower market value and short life of ERP implementation, are less likely prone to internal control weaknesses and experience compared with companies without ERP systems.

Hamidi (2014) in her research about the impact of ERP system on accounting processes in Gilan Power Distribution Company provided evidence that the utilization of ERP greatly improves financial processes compared to traditional systems. Implementation of ERP systems increases the precision of data recording in all processes and reduces the time for carrying out all processes. Also, it increases the reliability of data processing and reporting.

Hesam al-Dini (2015) in his thesis, investigated the effect of ERP on business agility in Hedco Design and Engineering Company. He used questionnaire for data gathering. Results of his survey represent that ERP affects organizational agility, business process satisfaction and goal realization of business processes. He also concluded that ERP has a direct impact on business processes.

Studies in the field of ERP in Iran are more relevant to feasibility studies before the implementation of ERP. Very few companies implement and use ERP systems. So there is not much evidence about the actual results of ERP implementation. The oil industry has its own specific characteristics and PETROPARS is the first petroleum company that has recently implemented ERP system. So as the first ERP experience in the oil industry, this research tries to examine the actual results of ERP implementation in this company.

There were three phases of data collection used for the study. The first phase involved library method for literature review, second and third steps involved a comprehensive case study analysis comprising interviews for financial process identification and documentation and distributing questionnaires for data collection from PETROPARS Ltd employees and managers.

According to Mishra and Mishra (2010), "case study examination gives an advanced understanding of inadequately understood phenomena in a real-world setting with the assistance of transferability of research findings. The researcher analyses a particular case at each time restricted by the activity process or a social group under investigation. This allows the researcher to obtain detailed insights via a diverse range of data collection procedures".

Mabert, Soni and Venkataramanan (2003) recommended that case studies and interviews help researchers provide reliable and detailed information about the ERP implementations.

For the purpose of this study, the researcher used data collection methods including interviews for processes documentation and questionnaire for data collection about the ERP impact on financial processes effectiveness.

2.1. Conceptual Framework

Based on the results of prior studies conducted in the

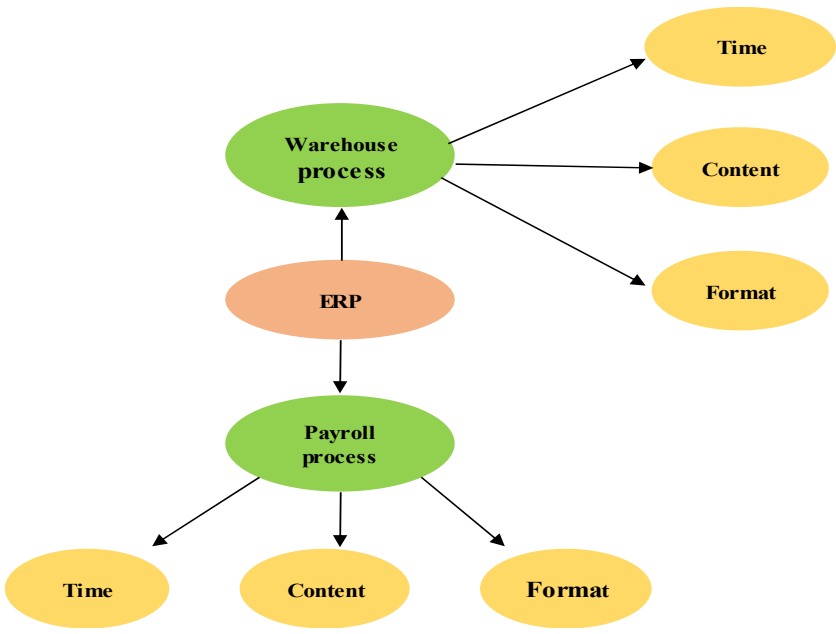

Fig. 1. Conceptual Framework

Table 1: Information systems evaluation models

Model	Indicators
Ahituv and Neumann Model	Timeliness, Content, Format
Portfolio Model	Cost/benefit, Linking value,Acceleration values, Value of reorienting, Innovation
Strategic alignment Model	Business Strategy, Organization Infrastructure, Information Technology Infrastructure
Architecture Model	Business Architecture, Information Architecture, Data architecture, Systems architecture, Technology architecture
Chandler Two-dimensional model	User, system

Table 2: Reliability Statistics

Cronbach's Alpha	N of Items
.803	15

field of ERP, following theoretical model will be used in our research. We use Ahituv and Neumann model for financial processes effectiveness evaluation which include time, content and format. For the purpose of this study, we use warehouse and payroll processed in PETROPARS ltd.

2.2. Research Hypothesis

Based on the results of prior studies in the field of ERP and effects of ERP systems on business processes, following research hypotheses are developed:

H_1: ERP implementation has significant impact on payroll process effectiveness compared with traditional systems.

H_2: ERP implementation has significant impact on warehouse process effectiveness compared with traditional systems.

2.3. Variables definition

This research is an applied research based on its purpose. Research variables are as follows:

Dependent variable: effectiveness of financial processes

Independent variable: ERP system

Since final products of financial processes are the reports provided to external and internal users, we use information attributes of Ahituv and Neumann model for financial processes effectiveness evaluation.

There are five models for information systems evaluations. These models are Ahituv and Neumann Model, Portfolio Model, Strategic alignment Model, Architecture Model, Chandler Two-dimensional model. Indicators of each model have been presented in table 1 (Derakhshani & Vahedi, 2015).

As our research population was small, all members of population were considered for data gathering. Members of population are all PETROPARS employees who were related to each of research hypothesis. So research sample is equal to research population.

The SPSS 22 software has been used for analysis of the data collected through questionnaires (descriptive statistics). Since effectiveness of financial processes is a latent variable and we cannot measure it directly, we used Smart-PLS software and Structural Equation Modeling (SEM) based on partial least square approach for hypothesis testing which is the best method when research hypothesed include latent variables.

The data reliability test of this study was calculated using Cronbach's Coefficient Alpha and the SPSS software. As it is shown in Table 2, results of calculating 20 samples emphasize on the reliability of questionnaires (0.803) which is above 0.7. Nunnaly specifies a value of Cronbach's Alpha above 0.70 as indicative of reliability [Nunnally and Bernstein, 1978].

3. Results

Table 3 shows each department's population. As it is shown, a total of 54 employees worked and involved in the financial processes studied within the PETROPARS Ltd.

Based on Table 4, about 15 percent of respondents

Table 3: Respondent for each process

		Frequency	Percent	Valid Percent	Cumulative Percent
valid	Payroll	26	48.15	48.15	48.15
	Warehouse	28	51.85	51.85	100.00
	Total	54	100.0	100.0	

Table 4: Respondent's Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Contracts & Commercial	8	14.81	14.81	14.81
	Financial Man	20	37.04	37.04	51.85
	Human Resource	12	22.22	22.22	74.07
	Planning	4	7.41	7.41	81.48
	Project	10	18.52	18.52	100.00
	Total	54	100.00	100	

Table 5: . R Square

	R Square	GOF
Payroll process	0.80	0.48
Warehouse process	0.85	0.51

worked in contracts and commercial department, 37 percent in financial management department, 22 percent in HR department, 19 percent in project, and 7 percent in planning department. Because of our concentration on financial process, most of the respondents selected from the financial management department.

3.1. Hypothesis Testing

We used Smart-PLS software for hypothesis testing. The Smart-PLS software is used for the structural equation modeling and testing relationship between dependent and independent variables which one or both of them is/are latent variable(s) that are not observable directly and substitute indicators are used instead of them.

In this research, dependent variable was financial process effectiveness that could not be measured directly. Based on the research model, three indicators were used: timeliness, content and format. For each of these three indicators the related questions were asked in the questionnaire.

In structural equation modeling, each model includes two models which are measurement model and structural model. Measurement model computes relationship between each latent variable and its indicators. Structural model measures relationship between latent variables.

After the algorithm calculation of the construct scores, the scores are used to estimate each partial regression model in the path model.

PLS-SEM is an OLS regression-based estimation technique that determines its statistical properties. Unlike CB-SEM, PLS-SEM does not optimize a unique global scalar function. The lack of a global scalar function and the consequent lack of global goodness-of-fit measures are traditionally considered major drawbacks of PLS-SEM.

When using PLS-SEM, it is important to recognize that the term fit has different meanings in the contexts of CB-SEM and PLS-SEM. Fit statistics for CB-SEM are derived from the discrepancy between the empirical and the model-implied (theoretical) covariance matrix, whereas PLS-SEM focuses on the discrepancy between the observed (in the case of manifest variables) or approximated (in the case of latent variables) values of the dependent variables and the values predicted by the model in question.

The structural model estimates are not examined until the reliability and validity of the constructs have been established. If assessment of reflective and formative measurement models provides evidence of the measures' quali-

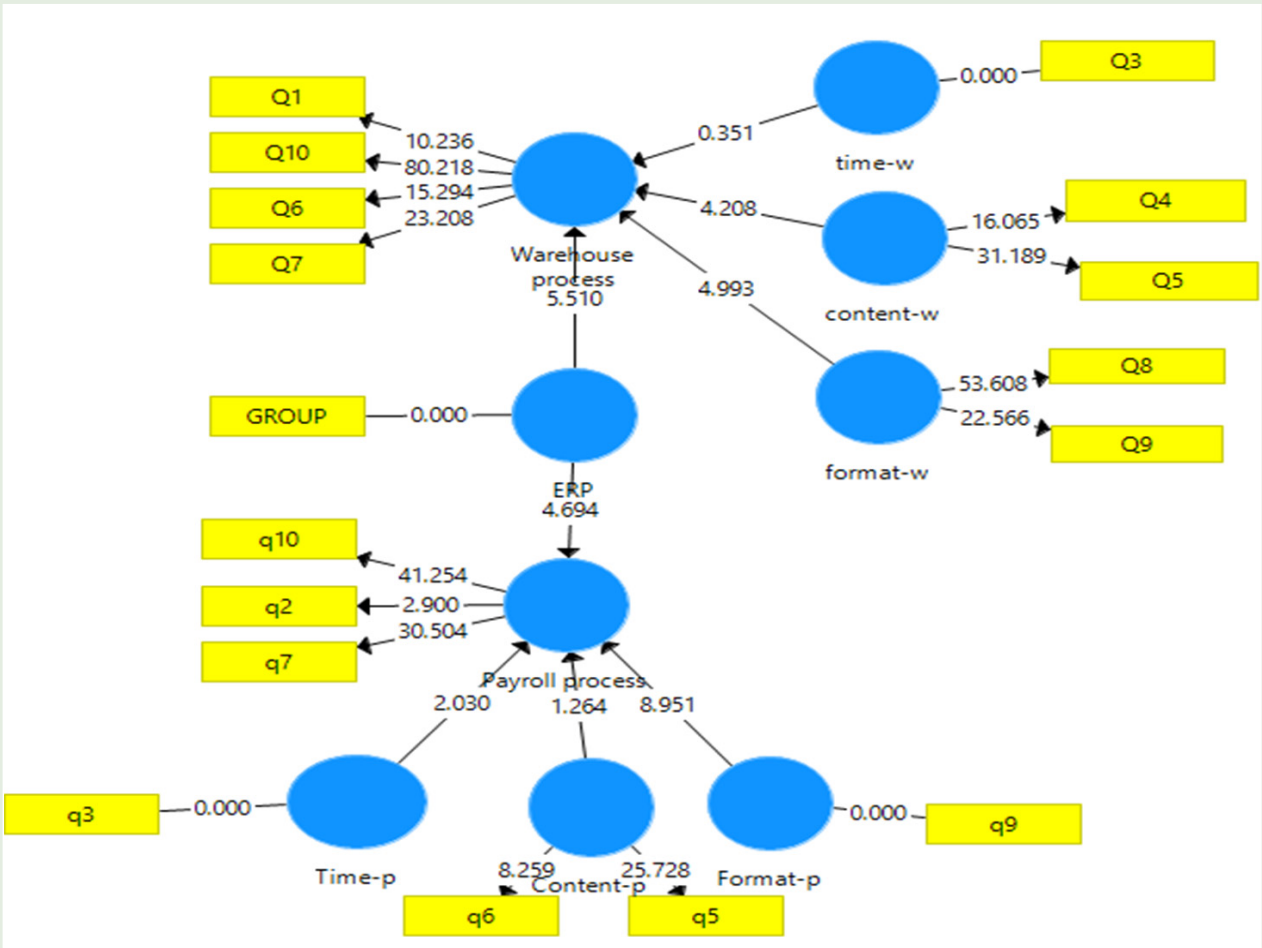

Fig. 2. path coefficient

ty, the structural model estimates are evaluated. PLS-SEM assessment of the structural model involves the model's ability to predict. Hence, after establishing reliability and validity, the primary evaluation criteria for PLS-SEM results are the coefficients of determination (R2 values) as well as the level and significance of the path coefficients which are five percent in this research" (Hair, Hult, Ringle, and Sarstedt, 2016).

3.2. Convergent Validity

"A common measure to establish convergent validity on the construct level is the average variance extracted (AVE). Therefore, the AVE is equivalent to the communality of a construct. Using the same logic as that used with the individual indicators, an AVE value of 0.50 or higher indicates that, on average; the construct explains more than half of the variance of its indicators" (Hair, Hult, Ringle, and Sarstedt, 2016).

For each hypothesis the path coefficient for measurement and structural models will be shown.

For the path coefficient, following hypothesis testing are used:

H_0: Path coefficient=0

H_1: Path coefficient≠0

If path coefficient between dependent and independent variables shows non-zero numbers, it means that there is relationship between dependent and independent variables. After accepting H1, significance of this relationship should be examined. So we should use following hypothesis testing.

H0: T<1.96

H_1: T≥1.96

If T-statistics of the path coefficient presents a figure bigger than 1.96, H_0 is rejected and H_1 accepted; which indicates that ERP has significant effect on the financial processes effectiveness compared with traditional systems at the significance level of 95 percent.

If the path coefficient between dependent and independent variables shows positive numbers and T-statistics shows a number bigger than 1.96, it means that ERP has

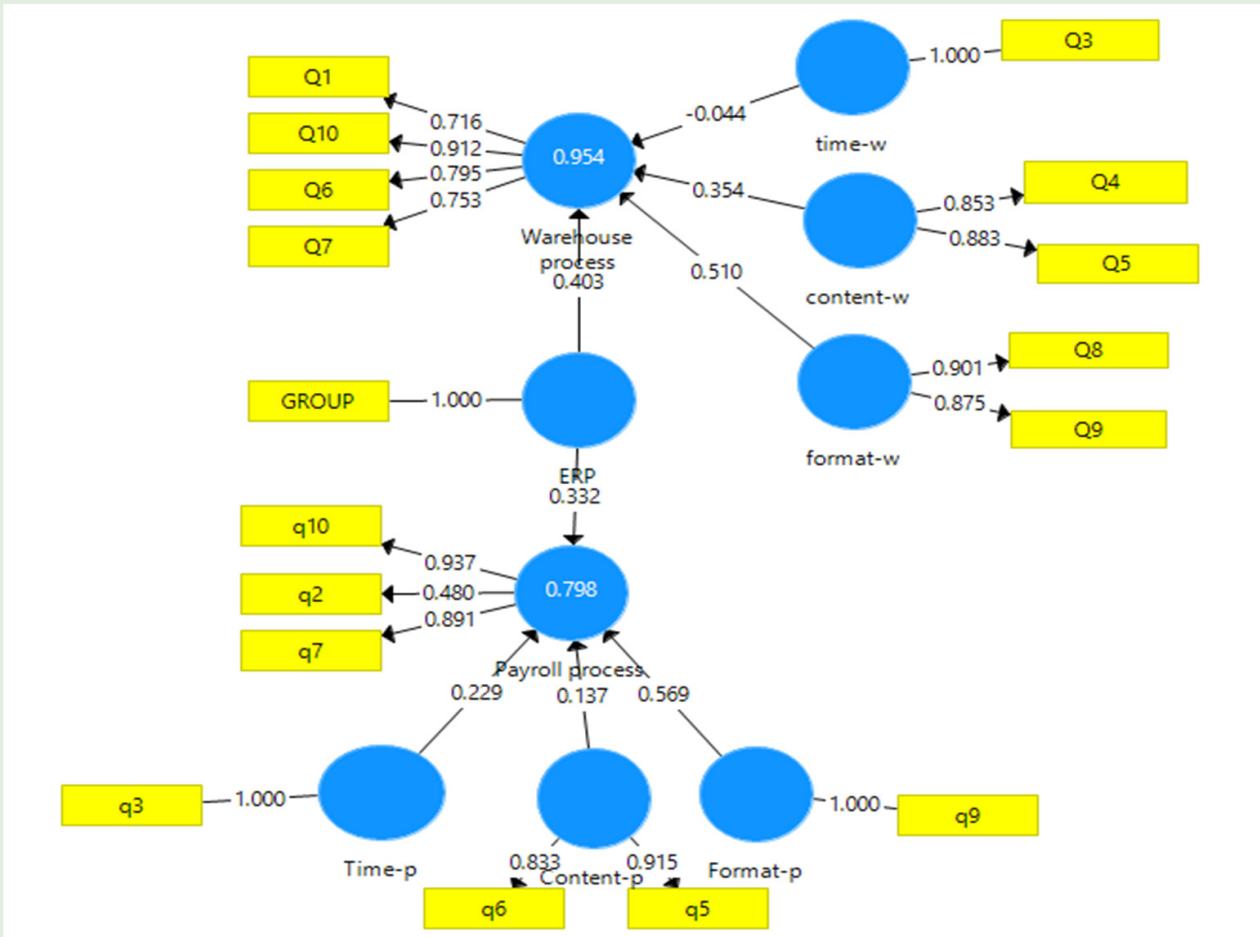

Fig. 3. T-statistics of path coefficient

positive impact on the financial process effectiveness. If the path coefficient between dependent and independent variables reflects negative numbers and T-statistics shows a number bigger than 1.96, it means that ERP has a negative impact on the financial process effectiveness compared with traditional systems.

3.3. Hypothesis Testing

According to the figure 1, the final path coefficient between dependent and independent variables shows positive numbers. It means that there is a positive relationship between ERP and the payroll process effectiveness and warehouse process effectiveness in comparison to the traditional systems. Figure 2 shows T-statistics for each path. The T-statistics between dependent and independent variables is bigger than 1.96. As a result, H_0 is rejected and H_1 is accepted at the confidence level of 95 percent. It is concluded that ERP has a positive impact on the payroll process effectiveness and warehouse process effectiveness. Tables 4, 5, and 6 show all indicators of validity and reliability of the model. All indicators are in acceptable levels in the model.

Table 5 shows R Square and GOF for both hypotheses. GOF is an indicator that considers both measurement model and structural model. It is used as a benchmark for measuring the overall performance of the model. Tenenhaus, vinzi, Chantelinc, and Lauro (2005) considered three values of 0.1, 0.25, and 0.36 as a weak, medium, and strong for GOF. In this study GOF shows values more than 0.36 which are strong amount for GOF. Construct reliability and validity is shown in table 6. The AVE is equivalent to the communality of a construct. Since AVE is more than 0.6, so construct explains more than half of the variance of its indicators.

Table 7 represents discriminant validity of the model. Fornell-Lacker criterion is an assessment method for discriminant validity. It compares the square root of the average variance extracted with the correlation of latent constructs. A latent construct should explain better the variance of its own indicator

Table 6: Construct Reliability and Validity

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
ERP	1	1	1
Payroll process	0.7	0.83	0.63
Content-p	0.7	0.87	0.77
Format-p	1	1	1
Time-p	1	1	1
Warehouse process	0.8	0.87	0.64
Content-w	0.7	0.86	0.75
Format-w	0.73	0.88	0.79
Time-w	1	1	1

Table 7: Discriminant Validity

	Content-p	ERP	Format-p	Payroll process	Time-p	Warehouse process	Content-w	Format-w	Time-w
Content-p	0.87								
ERP	0.13	1							
Format-p	0.35	0.24	1						
Payroll process	0.53	0.51	0.77	0.8					
Time-p	0.68	0.07	0.31	0.52	1				
Warehouse process	0.21	0.65	0.19	0.35	0.11	0.8			
Content-w	0.15	0.07	0.07	0.04	0.06	0.71	0.87		
Format-w	0.22	0.5	0.22	0.31	0.15	0.68	0.64	0.89	
Time-w	0.03	0.86	0.16	0.35	0.02	0.58	0	0.54	1

Table 8: . Result Summary

Hypothesis	Result
H_1	accepted
H_2	accepted

rather than the variance of other latent constructs. Therefore, the square root of each construct's AVE should have a greater value than the correlations with other latent constructs. Table 6 shows that how discriminant validity of the model is confirmed.

4. Discussion

Table 8 below summarizes the results of hypotheses testing. based on research findings, ERP has a positive and significant impact on the effectiveness of financial processes in PETROPARS Ltd. Results of this study are in accordance with studies of Olhager and Selldin, Galani, Hamidi, and Hessam al-Dini which resulted that ERP has a positive effect on business processes.

5. Conclusion

ERP leads companies to being process oriented albeit the traditional systems which lead them to functional orientation. ERP has had a positive and significant impact on the effectiveness of financial processes in PETROPARS Ltd. Financial process effectiveness means receiving on-time information and reports, reliable and more accurate information in comparison to traditional systems were used in organizations. Using more accurate and reliable information enables managers to make better decisions in such a way that the ultimate performance of their organizations will increase considerably.

So it is necessary to pay attention to the usefulness and necessity of ERP systems and provide necessary prerequisites for implementing such systems. One of these important prerequisites is business process reengineering which leads to implementing effective business processes in organizations. Based on the research results, it is recommended PETROPARS Ltd to reconsider documentation of its procedures and provide sufficient evidence for the all processes after ERP implementation. Based on documented processes, instructions and procedures for each process should be identified and organizational tasks should be defined using new processes after ERP implementation. Also as SAP provides the best practices for each industry, it is recommended that PETROPARS Ltd evaluates its processes and try to match them with SAP best practices which have been experienced and used by many companies in different disciplines all around the world. This study contributes to the body of knowledge by investigating and documenting the actual results of ERP implementation in one case company within the oil industry as an important industry in Iran. The Partial Least Square (PLS) and SMART-PLS software were used for data analysis. It is a new method of structural equation modeling in data analysis. Further research is recommended to determine ERP impact on financial processes in other industries. Also, it is recommended that the relationship between ERP and other management accounting practices such as Activity Based Costing, performance evaluation, is investigated. As PETROPARS Ltd decided to implement ERP system and has been trying to implement it since 2013, it is necessary to investigate cost-benefit analysis of ERP implementation in PETROPARS Ltd. It is recommended to evaluate the impact of ERP implementation on the financial performance of PETROPARS Ltd as well.

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