

# Uncertain Supply Chain Management

homepage: [www.GrowingScience.com/uscm](http://www.GrowingScience.com/uscm)

## The effects of ERP system implementation on the integration of Supply Chain

Hanandeh Ahmad<sup>a\*</sup>, Rami Hanandeh<sup>b</sup>, Hajij Mustafa<sup>c</sup>, Hanady Alzagheer<sup>d</sup>, Samer barakat<sup>e</sup>

<sup>a</sup>Applied Science Private University, Jordan

<sup>b</sup>Amman Arab university, Jordan

<sup>c</sup>Santa Clara University, United States

### CHRONICLE

#### Article history:

Received March 18, 2021

Received in revised format

October 18, 2021

Accepted November 25 2021

Available online

December 1 2021

#### Keywords:

ERP systems

Supply Chain Management

Nuqul Group

### ABSTRACT

The research is aiming to enter deeply into studying the implementation of enterprise resource planning (ERP) and measuring the effects on the integration of supply chain at Jordanian Nuqul Group Company. Defining the effects of applying ERP systems in human resource, and production management departments, and how the implementation process will be effective on the integration with suppliers, customers, and processes are representing the main objectives of this research. 185 research questionnaires distributed, collected, and 150 respondents were accepted for the research study analysis. Furthermore, this research used structural equation models with AMOS for testing research hypotheses. The research findings agreed with the result that applying enterprise resource planning systems could affect positively on the supply chain integration with suppliers, customers, and processes.

© 2021 Growing Science Ltd. All rights reserved.

## 1. Introduction

In our days, firms are facing global challenges and forces such as globalization, customers' demands, government regulations, and fast manufacturing according to the customer's desire. Most firms resorted to applying information technology systems, applications, and tools to meet the previous challenges and to have a competitive environment which is able to meet customers' demands (Battleson et al., 2016). The nature of competition between firms has changed and it became dependent on the strength between supply chain entities starting from resources (suppliers) passing through the main entity (firm) arriving to the last entity (customers). For that, it becomes necessary to improve the internal processes and enhance the relationship with external partners through the integration of supply chain entities (Liu & Wei, 2013). Receiving customer's sales order, starting the production process, producing, and packaging products then transferring end products to the end customers need agile organization, which has a strong relationship with its supply chain external entities in order to be able to produce products in the fastest way (Farjami & Molanapour, 2015). Nuqul Group Company understood the importance of information technology, and it moved towards applying ERP systems to face and solve problems related to managing the company's resources, managing purchasing operations, meeting customer requests quickly, and developing the links with suppliers and customers. Furthermore, Nuqul Group Company aimed to develop their business plans, reduce transaction processes time, increase the share of information between departments, and help and support the decision maker through providing him with accurate and detailed reports which build based on customers' feedback and demands. For that, firms understood that satisfying customers is the priority in order to stay in the competition circle and using the IT systems will be useful for having strong links with customers (Tseng & Lin, 2011). At the same time, customers need products with high quality and short time, so firms understood the need to apply one of the project systems such as the ERP system to have a good relationship with suppliers and customers (Ince et al., 2013). the importance of ERP as a solution for firms to produce products with high quality and low cost, having a good relationship with all suppliers of the raw materials that they need, and deliver products in specific time

\* Corresponding author

E-mail address: [ahandeh@asu.edu.jo](mailto:ahandeh@asu.edu.jo) (H. Ahmad)

(Marinagi et al., 2015; Gollner & Baumane-Vitolina, 2016). In the last, the research study aims to study the impact of ERP systems on supply chain integration at Nuqul Group Company.

## **2. Literature review**

ERP system is considered a good solution for integrating the organization's internal processes and department through collecting all transactions and processes data in one database (Hitt et al., 2012). ERP is used always to get the data from customers and provide the decision maker with accurate reports based on the processing of unified data to make good and intelligent decisions (Mabert et al., 2013). Most firms preferred to implement ERP systems as a good solution for establishing strategic plan, linking operation and processes, managing resources and procurement, decreasing cost, enhancing quality, and increasing customer's satisfaction (Mabert et al., 2013).

### *2.1 Enterprise Resource Planning*

ERP has been defined as a software system which is designed to manage and track customer's information, sales orders, and resources through using one advanced database (Gupta, et. al. 2018). Integrating and managing the firm's relationships with suppliers and customers will give the firm the ability to manage their activities and transactions in a short time (Njihia & Mwirigi, 2014). ERP consists of a set of modules which are specialized with the firm main department's functions, such as manufacturing ERP modules which give the firm the ability to track manufacturing main and sub processes (Ullah, et. al., 2017). Most IT experts consider ERP is software which is able to integrate the internal and external processes for a specific firm by using one database (Ullah et al., 2017). In the last, ERP modules have been designed based on the nature and needs of each department (Syahid et al., 2017). The research study aims to study the implementation of ERP systems in two of the departments in Nuqul Group Company and those departments are: HRM system, and production management system.

#### *2.1.1 HR Management System*

ERP HR management system module is a part of ERP system which gives the firm the ability to achieve and conduct their activities in an efficient and advanced way with the ability to follow every detail, performance, and functions of employees (Korff et al., 2017). Finally, the most important role of an ERP human resource management system is designing all strategies related with hiring, job descriptions and development, using the measurement of business process performance, and preparing all reports which the decision maker needs to create a long-term human resource plan (Zeebaree et al., 2019).

#### *2.1.2 Production Management System (POMS)*

Production department is responsible for the integration between raw materials, the firm's resources, and machines in order to produce products and services (Umeda, 2016). ERP production management system is a specific module which contains operation management that is responsible for a set of production activities, processes, and packaging (Umeda, 2016). The main activities of the production department are managing and monitoring job location, managing products manufacturing and designing, establishing, and developing production plans, managing main products specifications (quality, cost, production time, delivery speed), managing resource warehouses (Day et al., 2018). The complexity and the difficulty of the production department lies in the differences in the tools used based on manufactured products, and difficulty in defining business performance measurements (Day et al., 2018).

### *2.2 Supply Chain Integration*

The integration of supply chain management is defined as a set of methods used to connect supply chain activities starting from resources till transferring products to end customers in the aim of integrating processes and having effective competitive advantages (Poranki et al., 2015). Supply chain consists of the relationships between the firm internal processes with suppliers, distributors, and customers (Lii & Kuo, 2016). The importance of supply chain integration lies in producing high quality products with low cost at the best time in order to improve customer's satisfaction (Qi et al., 2017).

#### *2.2.1 Integration with Suppliers*

The partnership between resources, suppliers, and firms consists of the exchange of raw materials, transactions, and information to execute product manufacturing Plans in the optimal use of company resources and produce high quality products with reasonable cost and time (Danese et al., 2013). the relationship between firms and customers in our days is the success key for sustaining, for that firms understood that to give customers what they want based on specifications they specify, firms should have effective means and collaboration with suppliers to get all needed resources to get raw materials, which is the basis for giving customers what they want (Qi et al., 2017). The importance for the integration between suppliers and firms is related to having all2 the needed materials and decreasing storage and manufacturing costs (Shukor et al., 2016). The integration between supply chain parties, will give all parts the ability to enter in designing products, decreasing cost and

time, and deliver products to end customers at specific time; also, the integration will establish a network of sharing information, experience, skills, creative ideas, new methods for doing business (Feyissa et al., 2019).

### 2.2.2 Internal Processes Integration

At present, most firms understand the integration between external firm's parts and internal processes (Huo, 2014). Achieving business processes and goals depends at the present time on the interdependence of all parties and components of the supply chain to produce and deliver products to customers in the time and specifications required by them (Huo, 2014). Integrating the supply chain components starting from resources passing by firms arriving to customers gives the firm a set of advantages such as building a structure consisting of effective strategies, rules, practices, processes, and resources which can give end customers best product quality, specifications, and less expensive (Nazzal, 2016).

### 2.2.3 Integration with Customers

The relationship with customers becomes urgent for firms to compete in the competitive market, the customers' opinions, feedback, complaints, and requests are representing the input for firms' strategies and plans (Alfalla et al., 2013). Firms give their customers more empowerment in the goal of having more creative and innovative ideas which will help firms to enhance and develop their product specifications (Huo et al., 2014). Managing business processes easily needs a strong relationship with customers to improve products, having efficient strategic plans, managing sales orders, increasing productivity, enhancing customers satisfaction, doing business through using accurate information passing through supply chain components based on customers feedback and demands (Nazzal, 2016).

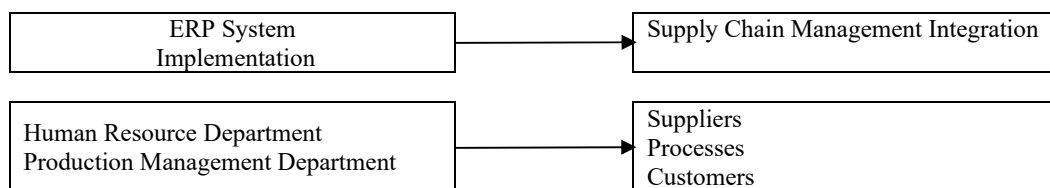
## 2.3 The Relationships between Enterprise Resource Planning (ERP) System and Supply Chain Integration (SCI)

Enterprise resource planning proved that it is considered an efficient and important key success key for enhancing supply chain management and integration (Alimohamadian & Abdi, 2014). ERP proved its efficiency in managing supply chain components and relationships with resources, suppliers, and customers and offering unified databases which contain information shared between all parts (Abro et al., 2017; Aziz et al., 2018). Finally, ERP proved also its effects on managing firms' business financial issues through decreasing costs and time of conducting businesses and transactions (Aziz et al., 2018). Depending on previous studies, this research proposed the first main hypothesis and the following sub-hypotheses:

**H<sub>1</sub>:** *Applying ERP systems in human resource and production management departments has a direct positive in supply chain integration with (Suppliers, processes, and customers).*

**H<sub>1.1</sub>:** *Applying ERP systems in the human resource department has a direct positive in supply chain integration with (Suppliers, processes, and customers).*

**H<sub>1.2</sub>:** *Applying ERP systems in the production management department has a direct positive in supply chain integration with (Suppliers, processes, and customers).*



**Fig. 1.** Research model has been developed based on the following studies (Hammouri, 2015; Annan et al., 2016; Almajali & Tarhini, 2016; Ociepa, 2017; Aziz et al., 2018; Theebbeh et al., 2017, Al-maaitah, 2021)

## 3. Theoretical framework

### 3.1 Measurement

This study used some measurements for studying the impact of ERP systems implementation on human resource and manufacturing departments and its effects on the supply chain integration with suppliers, processes, and customers. This research used a specific research questionnaire to measure the reliability and constructs of these research theoretical model variables (Syahid et al., 2017). The research questionnaire has been distributed to managers and employees in human resource and production management departments at Nuqul Group Company. The questionnaire has been measured by using seven-point Likert scales which applied the conceptual model constructs.

### 3.2 Data collection

The research questionnaire has been distributed at human resource and manufacturing departments at Nuqul Group Company. The research study consists of two main parts: 1. the theoretical model which was designed based on scientific studies. 2. Practical part which was designed based on using descriptive and analytical methods for collecting data and testing hypotheses. All the collected data and hypotheses will be tested to study the research model. 185 research questionnaires had been distributed, and 150 respondents were received to answer research questionnaires and testing research hypotheses. As shown in the figure below, the respondents of the research questionnaire were male (85%), and female (15%).

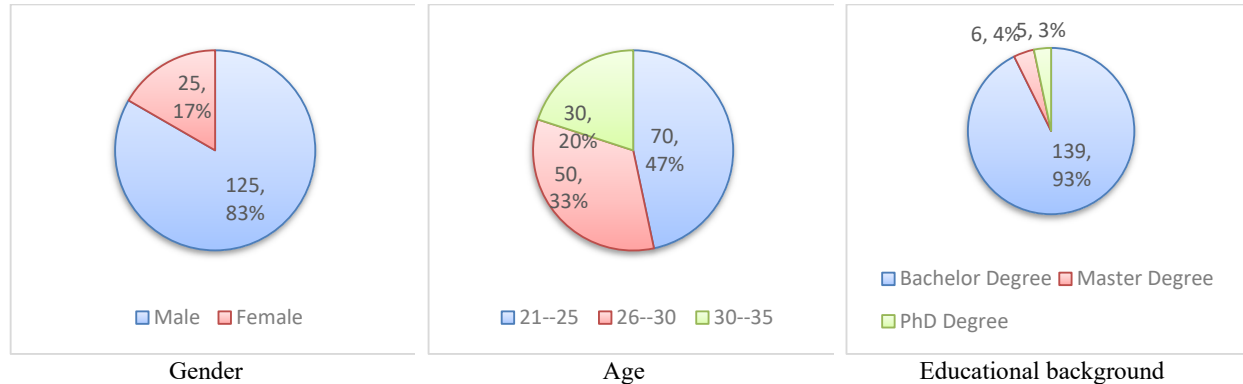


Fig. 2. Personal characteristics of the participants

## 4. Research Analysis and Results

The research study is a descriptive study which is aiming for studying The Impact of Enterprise Resource Planning (ERP) System Usage on Supply Chain Integration at Jordanian Nuqul Group Company. The research study used previous studies and reviews in building and developing the study model. Then, the researcher improved a research questionnaire which carried out and collected data of managers and employees in human resource and production management departments. This research used AMOS to analyze all the collected data. After that, the research validity and reliability have been tested and the correlation among research variables checked. Finally, this research used multiple regressions to test the research hypotheses. The research used CFA analysis and discriminant validity assessment for testing the research reliability and validity.

### 4.1 Measurement model

Firstly, this research must measure the research in the theoretical framework. The research model has five constructs measured by 25 items which are evaluated by using Structural Equation Model (SEM).

**Table 1**  
CFA analysis result and validity and reliability measure

Constructs	Code	Factor loading	Composite Reliability	AVE	Cronbach's alpha
HR Dept.	HR1	0.62	0.84	0.71	0.72
	HR2	0.81			
	HR3	0.71			
	HR4	0.68			
	HR5	0.88			
PM Dept	PM1	0.82	0.89	0.67	0.87
	PM2	0.60			
	PM3	0.64			
	PM4	0.78			
	PM5	0.78			
Integration with Suppliers	IS1	0.72	0.78	0.78	0.73
	IS2	0.88			
	IS3	0.91			
	IS4	0.82			
	IS5	0.80			
Integration with Processes	IP1	0.65	0.67	0.86	0.80
	IP2	0.68			
	IP3	0.79			
	IP4	0.91			
	IP5	0.83			
Integration with Customers	IC1	0.76	0.92	0.81	0.81
	IC2	0.71			
	IC3	0.67			
	IC4	0.69			
	IC5	0.85			

The measurement model revealed acceptable measures should exceed the following values (RAMSE < 0.08, GFI  $\geq$  0.80; CFI  $\geq$  0.90; NFI  $\geq$  0.90; and IFI  $\geq$  0.90). The second step is to measure the validity of the research model through evaluating the reliability of the research survey by using Cronbach's alpha test and Confirmatory Factor Analysis test (CFA). Cronbach's alpha is one of the best tests used for testing research reliability and measuring the quality of research model variables. In order to test the research reliability, the acceptable Cronbach's alpha values were recommended to be between 0.60 and 0.80 (Hair et al., 2006). Based on the table below, Cronbach's alpha values ranged from 0.72 to 0.87 which exceeded the lowest acceptable value. For testing the research validity, the researcher used CFA to measure the validity of the research model. Based on Table 1 (50%) of the AVE values exceeded the acceptable values. Table 4 below shows that AVE values were between the range of 0.66 to 0.89 which exceeded the recommended value (Fornell & Larcker, 1981). Based on Table 1 and 2 AVE values were greater than the squared correlations between the variables. Finally, the research tested and measured the research model convergent and discriminant validity.

**Table 2**

Discriminant validity

Constructs	HRD	PMD	IS	IP	IC
HRD	0.71	0.18	0.22	0.26	0.29
PMD		0.67	0.31	0.18	0.14
IS			0.78	0.21	0.19
IP				0.86	0.34

#### 4.2 Structural Model and Hypotheses Testing

In Table 3 below, model indicators are described, which has shown the acceptable goodness of suitable to the collected data.

**Table 3**

Structural Model

Chi SQ/DF	RMSEA	GFI	CFI	NFI	IFI
1.88	0.056	0.783	0.911	0.913	0.942

Based on the analysis results which showed a complete support all paths of research model, the table below shows that applying ERP system in human resource and production management departments can explain 75.1% of variation on supply chain integration where ( $R^2 = 0.751$ ,  $F = 175.754$ ,  $Sig = 0.000$ ). For that reason, hypothesis one is accepted, which states that applying ERP systems in human resource and production management departments has a direct positive in supply chain integration with (Suppliers, processes, and customers) when the level of significance is five percent.

**Table 4**

Multiple Regressions of ERP Implementation on Supply chain Integration

Model	r	$R^2$	Adjusted $R^2$	f	Sig.
1	0.867	0.751	0.748	175.574	0.000

Finally, Table 5 below shows the hypothesis testing which shows that implementing ERP in human resource and production management departments has a positive significance. In addition, the table below shows that implementing ERP in supply chain integration was significant ( $\beta = 0.28$ ,  $p < 0.05$ ), implementing ERP in human resource department in supply chain integration was significant ( $\beta = 0.41$ ,  $p < 0.005$ ), and implementing ERP in production management department in supply chain integration was significant ( $\beta = 0.37$ ,  $p < 0.05$ ).

**Table 6**

Testing hypotheses – Direct Relationship

Hypothesis	Path	$\beta$	CR	P-Value	Result
H1	ERP System → SCM Integration	0.28	2.10	*	Supported
H1.1	HR Dept. → SCM Integration with (Suppliers, processes, and customers)	0.41	4.90	***	Supported
H1.2	PM Dept. → SCM Integration with (Suppliers, processes, and customers)	0.37	3.16	*	Supported

(\*\*\*:  $p < 0.005$ , \*:  $p < 0.05$ ) ( $\beta$ ): path coefficient, P = Level of significance

## 5. Discussion

Studying ERP implementation nowadays is very important for firms; especially in Jordan Nuqul Group Company the goal of helping firms to enhance it is supply chain integration with suppliers, processes, and customers. The research main goal provides future researchers with more valuable information about the effects of ERP implementation in Human resource and production management departments in enhancing supply chain integration with suppliers, processes, and customers. The main result is matched with previous studies which acknowledged that implementing ERP firms' departments could have a positive effect on enhancing supply chain components. Finally, this research provides future research more recommendations about implementing ERP in human resource and production management departments which could be the bias for other studies to study the implementation in other departments such as accounting and finance, marketing and sales.

## 6. Conclusion and implications

Implementing enterprise resource planning is becoming useful and important for firms at present; Nuqul Group Company aims to improve the supply chain integration with suppliers and customers. This research provides other researchers with more information about the effects of ERP implementation on the integration of the supply chain with suppliers, processes, and customers. The main result of this research is matched with previous studies and reviews which confirmed that implementing Enterprise resource planning within firms' departments such as human resource and production management department could affect positively on the supply chain implementation. Finally, this research recommended future research to focus on the implementation of ERP in other departments such as finance and sales departments.

## Acknowledgement

The authors would like to greet Applied Science Private University for giving them all support for the success of this work.

## References

- Abro, M., Memon, Z., Shah, A., & Naqvi, I. (2017). Antecedents of Enterprise Resource Planning and its Impact on Firm Performance with Supply Chain Integration as mediating factor. *Mehran University Research Journal of Engineering and Technology*, 36(2), 407-418.
- Alfalla-Luque, R., Medina-Lopez, C., and Schrage, H. (2013). A study of supply chain integration in the aeronautics sector. *Production Planning and Control*, 24(8-9), 769-784.
- Almajali, D. A., & Tarhini, A. (2016). Antecedents of ERP systems implementation success: a study on Jordanian healthcare sector. *Journal of Enterprise Information Management*, 29(4), 549-565.
- Alimohamadian, S., & Abdi, F. (2014). Analyzing the effects of information technology on supply chain integration: The role of ERP success mediator. *Management Science Letters*, 4(4), 799-806.
- Al-maaitah, D. A., Majali, T. E., Alsoud, M., & Al-maaitah, T. A. (2021). The Role Of Leadership Styles On Staffs Job Satisfaction In Public Organizations. *Journal of Contemporary Issues in Business and Government*, 27(1), 772-783.
- Annan, J., Boso, N., Mensah, J., & Nagbe Sulee, E. (2016). Antecedents and Consequences of Supply Chain Integration: Empirical Evidence from a Developing Economy. *International Journal of Supply Chain Management*, 5(1), 10-24.
- Aziz, M. A., Ragheb, M. A., Ragab, A. A., and El Mokadem, M. (2018). The impact of enterprise resource planning on supply chain management practices. *The Business & Management Review*, 9(4), 56-69.
- Battleson, D. A., West, B. C., Kim, J., Ramesh, B., & Robinson, P. S., 2016. Achieving dynamic capabilities with cloud computing: An empirical investigation. *European Journal of Information Systems*, 25(3), 209-230.
- Danese, P., Romano, P., & Formentini, M. (2013). The impact of supply chain integration on responsiveness: The moderating effect of using an international supplier network. *Transportation Research Part E: Logistics and Transportation Review*, 49(1), 125-140.
- Day, M., Demski, R., Pronovost, J., Sutcliffe, M., Kasda, M., Maragakis, L., & Winner, L. (2018). Operating management system for high reliability: Leadership, accountability, learning, and innovation in healthcare. *Journal of Patient Safety and Risk Management*, 23(4), 155-166.
- Farjami, Y., & Molanapour, R., (2015). *Business intelligence (from Idea to Practice)*, Ati-Negar press, first Edition.
- Feyissa, T. T., Sharma, R. R. K., & Lai, K. K. (2019). The impact of the core company's strategy on the dimensions of supply chain integration. *The International Journal of Logistics Management*, 30(1), 231-260.
- Gollner, J., & Baumane-Vitolina, I. (2016). Measurement of ERP-Project Success: Findings from Germany and Austria. *Engineering Economics*, 27(5), 498-508.
- Gupta, S., Kumar, S., Singh, K., Foropon, C., & Chandra, C. (2018). Role of cloud ERP on the performance of an organization: Contingent resource-based view perspective. *The International Journal of Logistics Management*, 29(2), 659-675.
- Hitt, M., Wu, J., & Zhou, X. (2012). Investment in enterprise resource planning. *Journal of Management Information Systems*, 19(1), 71-98.
- Huo, B., Qi, Y., Wang, Z., & Zhao, X. (2014). The impact of supply chain integration on firm performance: The moderating role of competitive strategy. *Supply Chain Management: An International Journal*, 19(4), 369-384.
- Ince, H., Imamoglu, Z., Keskin, H., Akgun, A., & Efe, N. (2013). The impact of ERP systems and supply chain management practices on firm performance: Case of Turkish companies. *Procedia-Social and Behavioral Sciences*, 99, 1124- 1133.
- Korff, J., Biemann, T., & Voelpel, S. (2017). Human resource management systems and work attitudes: The mediating role of future time perspective. *Journal of Organizational Behavior*, 38(1), 45-67.
- Lii, P., & Kuo, F. (2016). Innovation-oriented supply chain integration for combined competitiveness and firm performance. *International Journal of Production Economics*, 174, 142-155.
- Liu, H., Ke, W., Wei, K. K., & Hua, Z. (2013). The impact of IT capabilities on firm performance: The mediating roles of absorptive capacity and supply chain agility. *Decision Support Systems*, 54, 1452-1462 .
- Mabert, A., Soni, A., & Venkataramanan, M. (2013). Enterprise resource planning Managing implementation process. *European Journal of Operational Research*, 146(2), 304-314.
- Marinagi, C., Trivellas, P., & Reklitis, P. (2015). Information quality and supply chain performance: The mediating role of information sharing. *Procedia- Social and Behavioral Sciences*, 175, 473-479.

- Nazzal, S. (2016). The Effect of Supply Chain Integration on Sustainable Development of Jordanian Phosphate Fertilizers Manufacturing Companies. Unpublished Master Thesis, Middle East University, Jordan.
- Njihia, E., & Mwirigi, F. (2014). The Effects of Enterprise Resource Planning Systems on Firm's Performance: A Survey of Commercial Banks in Kenya. *International Journal of Business and Commerce*, 3(8), 120-129.
- Ociepa-Kubicka, A. (2017). The Extent of ERP Systems' Implementation and Its Impact on the Performance of Pharmaceutical Manufacturing Companies in Jordan. *World Scientific News*, 89, 237-243.
- Poranki, K., Perwej, Y., & Akhtar, M. (2015). Integration of SCM and ERP for Competitive Advantage. *Research Journal of Sciences and IT Management*, 4(5), 17-24.
- Qi, Y., Huo, B., Wang, Z., & Yeung, H. (2017). The impact of operations and supply chain strategies on integration and performance. *International Journal of Production Economics*, 185, 162-174.
- Shukor, A. S. A., Muhammad, M. F., Khaderi, S. S., & Halil, F. M. (2016). Supply Chain Integration: Establish the Appropriate Challenges in Improving Integrated SC in an Innovative Approach of IBS. *Environment-Behavior Proceedings Journal*, 1(3),79-88.
- Syahid, M., Ebrahim, Z., Mahmood, W., & Rahman, M. (2017). An Insight into Enterprise Resource Planning System Research Trend. *Journal of Ilmi*, 7, 109-126.
- Theebah, Z. A. H. A., AL-Mubaydeen, T. H., & Ismael, M. F. (2017). The Effect of Applying the Organization Enterprise Resource Planning System (ERP) in the Quality of Internal Audit: A Case of Jordanian Commercial Banks. *International Journal of Economics and Finance*, 10(5), 96-104.
- Tseng, Y. H., & Lin, C. T. (2011). Enhancing enterprise agility by deploying agile drivers, capabilities and providers. *Information Sciences*, 181, 3693–3708.
- Ullah, A., Baharun, B., nor, K., Siddique, M., and Sami, A. (2017). Enterprise Resource Planning (ERP) Systems and User Performance (UP). *Journal of Managerial Sciences*, 11(3), 377-390.
- Umeda, S. (2016). *Advances in Production Management Systems: Innovative Production Management towards Sustainable Growth*. Springer Publishing Company.
- Zeebaree, S., Shukur, H., & Hussan, B. (2019). Human resource management systems for enterprise organizations: A review. *Periodicals of Engineering and Natural Sciences*, 7(2), 660-669.



© 2021 by the authors; licensee Growing Science, Canada. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).