The impact of enterprise resource planning on supply chain management practices

Mohamed Abdel Aziz
Mohamed A. Ragheb
Aiman A. Ragab
Mohamed El Mokadem
Arab Academy for Science, Technology & Maritime Transport. Egypt

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Abstract

The current research aims at developing a framework of a new enterprise resource planning system to cope with the required level of supply chain management practices to be provided by the companies providing logistics services in Egypt. This aim is achieved through exploring the challenges facing the resource planning system applied in the Egyptian companies providing logistics services and providing solutions to problems regarding the implementation of the enterprise resource planning system. Therefore, a semi-structured interview and questionnaires will be designed to target the top management and employees of logistics services companies to explore the challenges facing the resource planning system applied in the Egyptian companies providing logistics services and provide solutions to problems regarding the implementation of the enterprise resource planning system.

Introduction

It has been two decades since the internal operations are being streamlined, manufacturing boost up, quality of the products are being improved, the costs of manufacturing are being reduced but now the companies are focusing on the reduction of logistics by mean of putting right supply chain strategies for the excellence of organizations. Another issue comes after the cost of modifications that are regularly made in the scope and methodologies of the supply chain management (SCM), which is the advent of the network economy. Nowadays, there is more transparency in the markets where there is more customization added to the demands of the customers. However, it has been noticed that there is always an increment in the prices for the business world. The developments in the supply chain management (SCM) can have a great impact on the businesses.

It had been found that logistics services are still suffering several problems in Egypt on both sides of cost and development. Therefore, this research comes to address such a problem and propose solutions through finding a perfect enterprise resource planning system. Thus, the current research aims to develop a framework of a new enterprise resource planning system to cope with the required level of supply chain management practices to be provided by the companies providing logistics services in Egypt in order to increase companies' profitability.

Today's dynamic environment requires organizations to improve quality and flexibility and also reduce their costs, in such circumstances to enhance the performance of organizations, their competition is necessary. In order to achieve such purpose access to accurate and important information within and outside the organization and efficient use of them play the key role. It had been noticed that supply chain management process had been suffering in Egypt with such dynamic environment. Thus, there is an actual need for a system sustaining some criteria that are supposed to be solving the problems and challenges facing the supply chain management process. In order to achieve this purpose, the enterprise resource planning system is introduced, tested and evaluated as well as some solutions are provided to challenges faced by the system.

Literature Review

This section describes the supply chain management process, its dimensions and different strategies as well as the ERP system and how it is implemented in the supply chain management by logistics companies.

Supply Chain Management (SCM) Process

SCM is understood to be a set of practices for managing and coordinating the transformational activities from raw material suppliers to ultimate customers (Heikkila, 2002). It proceeds and develops through the systematic and strategic coordination of business functions and tactics within and across businesses, with an overall goal of improving the long-term profitability of all involved. It thereby integrates demand and supply management within and between companies. (Das et al., 2006)

SCM is the practices of purchasing and supply management, logistics and transportation, operations management, marketing, organizational theory, and management information systems (Hsu et al., 2009). Logistics researchers tend to focus on the transportation, distribution, and warehousing perspective of SCM, while operations management researchers emphasize buyer-supplier cooperation and information sharing to minimize waste.

Supply chain is a network which consists of suppliers, manufacturers, distributors, customers and many others. There are three types of flow which needs close co- operation and co-ordination (Näslund and Hulthen, 2012). First one is the material flow, which is a physical flow which represents the movement of product from supplier to customers as well as the movement of product from customers to suppliers in case of servicing, repairing and others. Second one is the information flow, which is a flow of information which represents the transmission of orders, tracking of orders and etc. This information flow is always coordinated with the physical flow of goods. Third one is the financial flow, which represents the credit terms, payments and consignments and other ownership arrangements. This flow requires highest level of cooperation between the members of the supply chain (Subramanian et al., 2013).

There is always a need to improve supply chain strategy, because it play important role directly or indirectly in shaping company performance, Based on the different environmental nature of demand and supply (Sun et al.,2009). Lee (2002) proposed four supply chain strategies which are Efficient Supply Chain strategy, Responsive Supply Chain utilizes strategy, Risk-hedging Supply Chain Strategy and Agile Supply Chain Strategy.

Despite the importance of SCM and its benefits that gained by organizations that implement it, many organizations are not implementing it for several reasons. Lack of integration, lack of management buy-in, difficulties in the measurement and availability of information and inadequate information systems can all act as barriers. The one who responsible for this shortage is senior executive how has a real lack of understanding of what SCM is (Talib et al., 2011).

Integrated-interactive performance is the measurement used in judging the results of interaction activities between supply chain members and has always been an important issue in management study over the past decades. The perceived and realized benefits of SCM system consists of tangible and intangible benefits. The tangible benefits of SCM implementation include shorten the product development life cycle, increase on-time order delivery, reduce production costs, improve quality, reduce inventory, and better inventory management. These benefits are highly related to the interface congruence (Hsu et al., 2009).

On the other hand, the intangible benefits include improving service quality, faster response to customer needs, sharing and exchanging information, providing information accurately, timely, and consistently. These intangible benefits directly support the need of resource sharing. The measurement of integrated-interactive performance is far more complicated in comparison with that of organizations and enterprises levels (Hsu et al., 2009).

Enterprise Resource Planning (ERP)

The Enterprise Resource Planning (ERP) is a system that integrates separate, autonomous business functions and processes across a company in order to increase its efficiency. The ERP provides a platform to interconnect functional areas of an organization such as finance, accounting, production, purchasing and customer services (Sternad et al, 2011; Garg and Khurana, 2017). Willis and Willis-Brown (2002) stated that ERP is not an "end all" and "be all". Companies should not spend excessive time trying to retrofit the business to ERP. If ERP does not meet the needs of the organization, it should be extended. ERP must be prolonged beyond traditional bounds of the first phase to obtain the true value of the

system. Advantage of new technologies should be taken to "mobilize" the system. However, the ERP foundation or backbone must be solid before extensions can be successful.

One of the elements strongly influencing ERP implementations is the linking of project management with the strategy of the organization. Modern organizations require the capability to respond rapidly to changing market conditions and, consequently, must build an IS that provides the foundation for this capability (Trinh et al., 2012). CSFs are identified to assist managers to affect the outcome of an effort by proactively taking necessary actions in the areas that have a bearing on the outcome (Ram and Corkindale,2014). Accordingly, a large number of CSF shave been identified for ERP projects to help managers achieve successful implementation outcomes and reap the benefits of the investments made in these systems (Ram et al., 2013).

ERP is implemented as a project in all organizations. The key aspect of the project is that it always has a defined beginning and end point. However, like any other project there are many risks in the ERP implementation project as well. Risk implies a threat to the performance; in other words, aspects which can jeopardize the project performance. In the current context, the project is ERP implementation in retail. Factors imply the elements which can be grouped together leading to a particular kind of risk in the context of ERP implementation project. These were grouped into six categories as mentioned by Garg and Khurana (2017) which are User risk, Project management risk, Technological risk, Team risk, Organizational risk and Project performance risk.

The benefits achieved, so far, provide a cost justification and confirmation of the will to invest in a new ERP system and amongst others, include Inventory reductions, Labor cost reductions, Improved customer service and Improved visibility. Su and Yang (2010) found that results of researches on the performance of an integrated ERP system in firms fluctuates. Some believe the costly budget that is associated with the acceptance of an ERP system does not match its acclaimed practicality. On the other hand, some believe adopting the ERP system raises operational efficiency, as most firms, regardless of size, have been eager to invest in an integrated ERP system. However, this investment needs large sums of capital and human resources; they hope the adoption would improve their firm's skill in supply chain management and overall performance. But how an integrated ERP system might be predictable to support firm performance of SCM, and this prospect is not exclusively a myth. The relationship between benefits of ERP systems implementation and impacts on firm performance of SCM was studied.

Azan and Bollecker (2011) observed that the Management controllers was studied in which the prevalence of technological contingency on the evolution of management and control skills was confirmed. Also, ERP systems have dramatically changed management controllers' assignments as the use of ERP systems makes IT skills essential. Management controllers not only need to develop action and interaction skills, but they also need to be able to use systems competently, and even to have programming and algorithmic skills. The managerial impact is considerable. Then, the French university programs rapidly develop greater focus on ERP training, and job and skill referential need to be updated in organizations, especially promotion, valorization, evaluation, and career development systems.

Interpersonal relations in business organizations have changed completely; communication takes place through integrated tools and there is less face to face, but on the other hand relationships are pre-ordained by IS tools. The way economic, accounting, and financial knowledge is disseminated will also change as it is communicated more explicitly. At the same time, it was indicated that controllers will be in high demand in exceptional situations arising from inadequate tools. Thus, contingency factors are crucial and this gives rise to differentiation within the management controllers' profession. The globalization and internationalization of large-sized enterprises has led to task virtualization. Such management virtualization can be explained by the fact that interaction skills are not considered particularly important in ERP management control.

Marciniak et al. (2014) observed that the Cross-Functional Awareness CFA is a critical issue in many crucial organizational processes. The concept of ERP-enabled CFA was explored and the understanding of the influence of firm size on the impact of implementation strategies on CFA was also developed. A contingency perspective was adopted which considers size as a moderator of ERP-ISC (a rapid, core function and flexibility-oriented ERP implementation strategy based on an organizational vision and Business Process Re-Engineering BPR) predictor of CFA. This perspective contrasts with

previous research and is dedicated to delivering better understanding of ERP-enabled CFA. Considering CFA concept validation and rigorously test the relationship between implementation strategy factors and CFA and the moderating role of size, in the context of ERP.

Three key contributions: first, some answers were provided to the question of how to accurately and reliably measure CFA and the main ERP-ISC factors that contribute to CFA achievement. It demonstrates through the use of the PLS-SEM approach that flexibility, organizational vision, BPR, speed of implementation, and focus on core modules have a direct positive relationship and, an indirect relationship in large firms (via data quality improvement) with the appearance of CFA; second, a test was provided showing data quality as one of the key factors which lead larger firms to derive CFA from ERP; and third, it was suggested that firm size moderates the resulting emergence of ERP-enabled CFA. It also demonstrates that the firm size effect across a wide continuum of firms should be inspected at the level of SMEs and larger firms separately, rather than at an overall level. Finally, the CFA concept was believed to has high relevant in IS research and should receive more attention in the future.

Supply Chain Management Performance

Tan and Cross (2012) focused on the role of inter-organizational coordination in forming SCM, especially in the context of manufacturing and retail firms. Tan and Cross (2012) analyzed the impact of traditional resource-based factors and inter-organizational coordination on a firm's SCM focus to uncover which factor provides a stronger explanation for the differing focus of a firm's SCM practices. Survey data was analyzed and succeeded to confirm the significant positive associations between the two sets of antecedents and SCM focus to suggest that inter-organizational coordination offers an alternative perspective to explain a firm's SCM focus.

It was concluded that both resource-based capability and inter-organizational coordination play a key role in a firm's SCM focus. In particular, resource-based capability helps to integrate a firm's internal functions, such as supply management, purchasing, operations management, marketing, logistics, and physical distribution to create an internally integrated supply chain. Once the internal functions within the four walls of a firm are seamlessly integrated, the firm can extend outward to utilize its inter-organizational coordination competence to integrate with upstream suppliers and downstream customers. Thus, the resource-based capacity is a set of internal competencies, whereas the latter serve as unique assets to link manufacturing firms and retail organizations in a supply chain.

For several decades, supply chain management (SCM) scholars have dedicated considerable efforts to explore the intricate relationship between organizational antecedents and SCM practices. SCM emphasizes the seamless integration of value creating activities across firm boundaries to bring products and services to end users in the most cost effective and efficient manner. Obviously, integrating value-creating activities across a supply chain magnifies the complexity and intricacy inherent in business decision making. There is neither a commonly accepted theoretical framework that can explain this relationship, nor a theoretical model exists to explain the existence and boundaries of SCM. Scholars have begun to embark on the adventure to study SCM as the interface of other disciplines.

Tsanos and Zografos (2016) concluded that mutuality, reciprocity, trust and commitment are crucial for the creation of supply chain relationships characterized by higher information integration. Consequently, information integration has much stronger influence on the coordination of operational decisions related to production and demand planning than on decisions related to actual production processes, but, remarkably, the latter affects supply chain performance much more than the former.

Enterprise resource planning (ERP) is intended to incorporate all facets of a company's business operations including production planning, material purchasing, inventory control, logistics, accounting, finance, marketing, and human resource management by creating a single depository of the database that can be shared by the entire organization and its trading partners. Hwang and Min (2015) identified a multitude of drivers that smooth or hinder the implementation of ERP in business environments. Also, they were able to establish its role in supply chain operations and assesses its impact on supply chain performances.

Hwang et al. (2015) developed a research framework based on two well-known theories in the strategy literature: a contingency theory; and a resource-based view of the firm. A series of hypotheses

concerning the use of ERP for strategic sourcing was developed. It was concluded that the firm's ERP adoption and implementation decision is mainly influenced by its internal environment. Defying the conventional wisdom, the firm's external environment has little influence on its decision to adopt and implement ERP. However, through the mediating role of an internal environment, an external environment still indirectly impacts the ERP adoption and ERP implementation decision. Also, it was found that ERP could improve the ERP adopter's organizational capability and supplier capability. Shatat and Udin (2012) noticed the relationship between ERP system and SCM performance and it was found that the relationship between them is significant. So, it was concluded that there is a positive significant relationship between ERP system (i.e. integration "significant positive", material management, production planning "significant positive", and controlling) and SCM performance.

Generally, it was implied that the successful implementation and the effective usage of ERP system can contribute toward enhancing SCM performance in many ways such as, internal business processes integration, information flow enhancement among different departments inside the company, improvement of the company's relationships and collaboration with outsourcing suppliers, customers, and supply chain partners, global sourcing, sharing, exchange and information movement, goods and services, product quality improvement, flexibility and customer responsiveness, and finally reduction of inventory and operation costs. Then, those companies who have achieved successful implementation of ERP system and attain effective usage of the system certainly will reap high and effective SCM performance. Malaysian manufacturing companies implemented ERP system with the integration in order to combine all applications among several departments inside the company as well as through the supply chain to provide an easy work and rapid stream of quality information within the company's' supply chain.

It was found that there are three constructs of ERP benefits positively impact on SCM performance. The first, the operational functions of ERP benefit are very important influence factors in enhancing performance of SCM in internal and external business processes. The second, the tactical benefits are important influence factors in improving SCM performance in customer service and cost management. The third, the strategic benefit only has impact on internal business process and has no effect on external business process. The possible clarifications for these findings are: the strategic benefits of ERP include building external connections and extending the value chain to improve firms' aptitude to make important integration decisions in internal and external business process.

However, some of Taiwanese IT firms approved the first generation of ERP products, which has been designed to integrate the various operations of an individual firm, while in modern SCM; the unit of analysis has become a network of organizations, making these ERP products have some limits in external business process. Even though the limits in external business process performance, the finding underscores the important role an ERP system plays in the functioning of supply chain organizations.

Bhutta et al. (2007) attempted to provide a window into the supply chain practices of the small and medium enterprise sector in Pakistan. The Small and Medium Enterprise Center (SMEC) at the Lahore University of Management Sciences conducted a survey to gauge the health of this sector where it comprised 650 firms in ten districts in the country. Bhutta et al. (2007) presented the results and analyses of the factors related to supply chain management practices that seem to correlate with the health of the enterprise.

The analysis demonstrated that successful firms on average had more products, more customers as well as more new customers. SMEs into exports were the healthiest and revealed most dynamic characteristics, followed by those that sold to Original equipment manufacturers (OEMs). Another remarkable insight is that growing firms sold more directly to end users while firms with higher sales per employee sold the least to the end user.

Chong et al. (2011) proposed a framework which identifies the relationships between supply chain management (SCM) practices, operational performance and innovation performance of Malaysian manufacturing and service firms. It included six dimensions of SCM practices which are strategic supplier partnership, customer relationship, information sharing, IT, training and internal operations. It was suggested that they can improve firms' innovation and organizational performance which was measured using items like lead time, inventory turnover, product rejection/return, sales level, cost reduction and

meeting customers' requirements. Additionally, the model suggested that innovation performances can enhance organizational performance where innovation practices is divided into the two categories of process innovation and product/service innovation. Decision makers should therefore continue to improve their firms' innovation performance.

Pishdad and Haider (2013) stated that the ERP assimilation is the extent to which the organization has progressed from understanding the ERP system's potential and functionalities to mastering and deploying them in their key value chain processes. A fully assimilated ERP system would bring many tangible and intangible advantages for all functional, managerial, strategic and organizational areas of the organization. However, it was reported previously that the high percentage of failure in achieving pre-determined corporate goals and desired benefits in ERP projects; as they are extremely complex and difficult to implement. Institutionalization of ERP is then the result of ERP implementation in an organization and routinized usage and embedded

Katerattanakul et al. (2014) claimed that cluster analysis was employed to identify groups of manufacturing firms having related business characteristics and adopting similar ERP implementation approaches. Outcomes of the cluster analysis propose three clusters or groups of manufacturing firms. However, none of the three ERP implementation approaches inspected before (i.e. MODIFY, SELECT, and ROLLOUT) are significant factors for grouping manufacturing firms. Then, on the other hand, the two business characteristics was included (i.e. SIZE and MTSMTO) are significant criteria for grouping manufacturing companies. It was suggested that the company size and production approaches are useful variables for grouping manufacturing firms into clusters of companies.

Beheshti et al. (2014) examined the contributing factors to the successful acquisition, implementation and adjustment to ERP systems in six manufacturing firms. Some enlightening insights into how manufacturing firms utilize ERP systems were revealed. All firms served customers both domestically and globally. Three companies had implemented ERP systems over eight years, by using different type of software. The remaining companies had been using ERP software between six and eight years, with each respondent in this time category also using separate ERP vendors. When the surveys were analyzed for finding the preferred ERP software brand name, it became obvious that no single ERP vendor has a dominant position with the manufacturing firms in Virginia.

An analysis of the results reveals that having clear goals and objectives, user training and education, interdepartmental communication as well as user involvement in evaluation, modification and implementation are considered most critical by five of the six participants when pursuing such a drastic change to daily operations. ERP systems are designed to have the ability to be linked to suppliers and business partners which reduces problems, related to the activities between the supplier and buyer as well business partners in the supply chain. It was exciting to find that only two of the respondents stated that they have their ERP software synchronized with any other organizations.

Garg and Khurana (2017) observed that Enterprise resource planning is an important tool for information integration which may subsequently form a basis for finding data patterns using business analytics and for enhanced decision making. While, ERP implementation is still a challenge for organizations. The key risk factors were identified. This was done by extensive literature survey risks were identified, these were then grouped using data collection followed by factor analysis. Subsequently, CFA was carried out and structural equation model SEM techniques were used to confirm the factors impacting risks for ERP implementation. The result was identification of the key risks. Accordingly, the following section discusses the measurement scale for ERP and SCM and how to evaluate the relationship between them.

Research Framework

Data collection for this study has relied on both primary and secondary data. Semi structured interview is applied for qualitative purpose to target the top management level of companies providing logistics services in Egypt. In addition, the quantitative study will be addressed through a questionnaire survey to target the specialized employees of logistics services companies in Egypt.

The questionnaire that was used for the quantitative study included nine constructs divided in the three dimensions: Enterprise Resource Planning, Organization Learning and Supply Chain

Management, respectively. Each construct included between three to five items. Respondents were asked to answer the questions based on a five point likert scale with responses ranging from 1=Strongly Disagree to 5=Strongly Agree. The research questions were ordinal in nature. However, the results are treated as if they were given at continuous scales.

The following hypotheses can be observed from the research conceptual framework:

H_1: There is a significant impact of Enterprise Resource Planning (ERP) dimensions on Strategic Supplier Partnership

H_2: There is a significant impact of Enterprise Resource Planning (ERP) dimensions on Customer Relationship

H_3: There is a significant impact of Enterprise Resource Planning (ERP) dimensions on Information Sharing

H_4: There is a significant impact of Enterprise Resource Planning (ERP) dimensions on Information Quality

Accordingly, the research framework could be presented using the following figure:

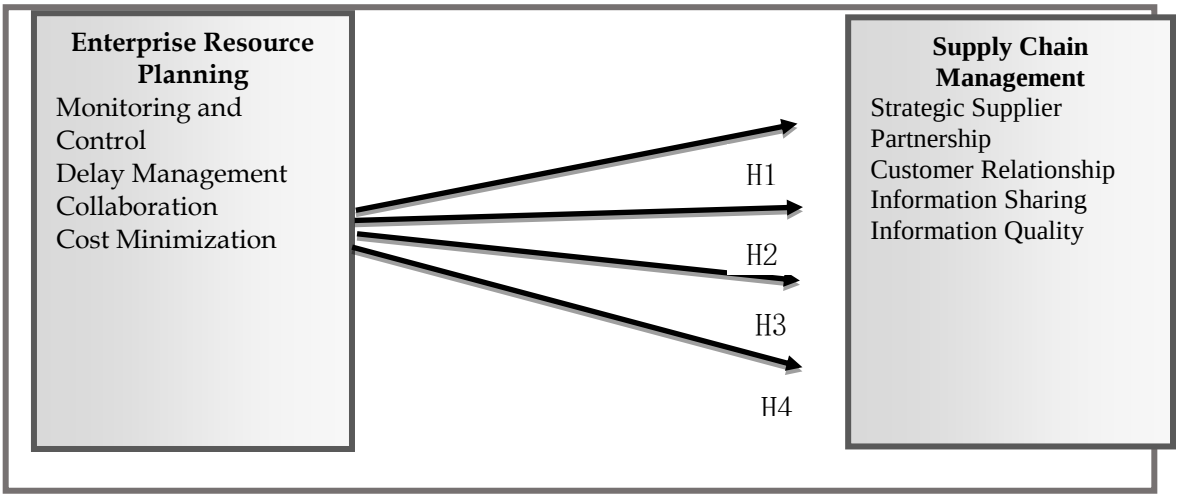

Figure 1 Research Framework

The following section discusses the results obtained by using regression and SEM analysis for the data collected through the questionnaire under study.

Results and Findings

This section presents output of the statistical package; SPSS "Statistical Program in the Social Science" – Version 22, where several tools are used to describe the relationship between the independent and the dependent variables. Descriptive analysis had been obtained to show the nature of the variables under study. Data collected through questionnaire had been tested for its validity and reliability to be able to check if the research is exposed to any errors while obtaining the results of the relationship between variables. In addition, a regression analysis and models had been fitted to show the impact of the independent variable(s) on the dependent variable.

Table 1 shows the mean and standard deviation of the research variables. It was noticed that the mean values of all the research variables are Above Average of 2.5. Also, all frequencies of research variables are relatively higher in the zone of 2&3, indicating that most of the respondents' opinions lie in the zone of agreement

Table 1 Descriptive Analysis of the Research Variables

Variables	N	Mean	Std. Deviation	Frequency				
				1	2	3	4	5
Monitoring and Control	448	2.8259	1.17050	66	119	125	103	35
Delay Management	448	2.6562	1.15959	82	130	124	84	28
Collaboration	448	2.7009	1.13705	62	159	109	87	31
Cost Minimization	448	2.3348	1.19261	128	156	76	62	26
Strategic Supplier Partnership	448	2.7634	1.24145	79	126	112	84	47

Customer Relationship	448	2.5759	1.14245	85	139	138	53	33
Information Sharing	448	2.7165	1.17867	73	139	112	90	34
Information Quality	448	2.6674	1.11271	61	162	121	173	31

Convergent validity shows that items of one variable can be used to show the assigned variable in the right way. Table 2 shows that all Average Variance Extracted (AVE) are greater than 50% after deleting some statements. Also, it shows that all Factor Loadings are greater than 0.4. This means that variables under study all have adequate convergent validity after deleting some items of the questionnaire statements.

Table 2 Convergent Validity of the Research Variables

Variable	AVE	Items	Factor Loading
Monitoring and Control	75.678%	Item 1	0.770
		Item 2	0.739
		Item 3	0.746
		Item 4	0.773
Delay Management	60.652%	Item 1	0.628
		Item 2	0.610
		Item 3	0.591
		Item 4	0.597
		Item 5	Deleted
Collaboration	64.311%	Item 1	0.689
		Item 2	0.606
		Item 3	0.660
		Item 4	0.617
Cost Minimization	67.815%	Item 1	0.627
		Item 2	0.763
		Item 3	0.644
Strategic Supplier Partnership	62.988%	Item 1	0.595
		Item 2	0.644
		Item 3	0.626
		Item 4	0.655
Customer Relationship	61.234%	Item 1	0.608
		Item 2	0.616
		Item 3	0.603
		Item 4	0.622
Information Sharing	60.264%	Item 1	0.620
		Item 2	0.568
		Item 3	0.621
		Item 4	0.601
Information Quality	62.945%	Item 1	0.599
		Item 2	Deleted
		Item 3	0.678
		Item 4	0.612
		Item 5	Deleted

Reliability refers to internal consistency between items supposed to measure one variable. If items are reliable, internal consistency between them is supposed to be high and vice versa. Cronbach's Alpha is one famous measurement of reliability. Also, Reliability refers to the internal consistency between statements of one factor. It is tested using Cronbach's Alpha, which is the most commonly used test of reliability. Alpha coefficient ranges in from 0 to 1, where the higher the score, the more reliable the generated scale is. Alpha coefficients are claimed to exceed 0.7 to refer to an adequate reliability (Nunnaly, 1978). Table 3 shows that all Cronbach's alpha are greater than 0.7 implying the presence of adequate reliability.

Table 3 Reliability Analysis of the Research Variables

Variable	Cronbach's Alpha
Monitoring and Control	0.893
Delay Management	0.783
Collaboration	0.815
Cost Minimization	0.761
Strategic Supplier Partnership	0.804
Customer Relationship	0.789
Information Sharing	0.780
Information Quality	0.703

Table 4 shows the multiple regression analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Strategic Supplier Partnership. It could be observed that there is a positive significant influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on the dependent variable; Strategic Supplier Partnership with coefficients of 0.161, 0.415, 0.391 and 0.079 respectively, as well as P-values of 0.000, 0.000, 0.000 and 0.015 respectively Also, the R square is 0.737 which means that "Monitoring and Control, Delay Management, Collaboration, and Cost Minimization "explains 73.7% of the variation in **Strategic Supplier Partnership.**

Table 4 Regression Model of Independent Variables on Strategic Supplier Partnership

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	R Square
	B	Std. Error	Beta			
(Constant)	-.035	.087		-.399	.690	
Monitoring and Control	.161	.037	.152	4.341	.000	
Delay Management	.415	.042	.388	9.917	.000	0.737
Collaboration	.391	.043	.358	9.043	.000	
Cost Minimization	.079	.032	.076	2.449	.015	

Table 5 shows the SEM analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Strategic Supplier Partnership. It could be observed that there is a positive significant influence of Monitoring and Control, Delay Management, and Collaboration on the dependent variable; Strategic Supplier Partnership with Estimates of 0.128, 0.510 and 0.353 respectively, as well as P-values of 0.012, 0.000 and 0.000 respectively, while there is an insignificant relation between Cost Minimization on Strategic Supplier Partnership with p-value of 0.169. Also, the R square is 0.839 which means that "Monitoring and Control, Delay Management, and Collaboration explains 83.9% of the variation in **Strategic Supplier Partnership.**

Table 5: SEM of ERP effect on Strategic Supplier Partnership

			Estimate	P-value	R Square
Strategic Supplier Partnership	**<---**	**Monitoring and Control**	.128	.012	
Strategic Supplier Partnership	**<---**	**Delay Management**	.510	***	0.839
Strategic Supplier Partnership	**<---**	**Collaboration**	.353	***	
Strategic Supplier Partnership	**<---**	**Cost Minimization**	.079	.169	

The model fit indices; CMIN/df = 1.848, GFI = 0.943, CFI = 0.975, and RMSEA = 0.044 are all within their acceptable levels.

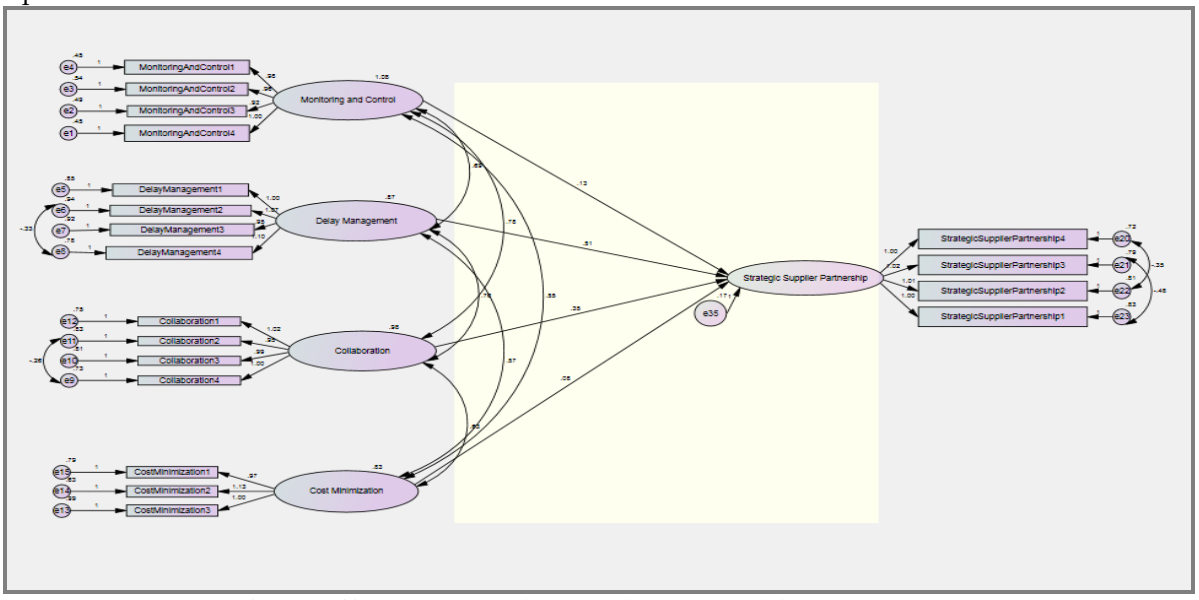

Figure 2 SEM Model of ERP Effect on Strategic Supplier Partnership

Therefore, the first sub hypothesis that there is a significant relationship between ERP and Strategic Supplier Partnership is partially supported.

Table 6 shows the multiple regression analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Customer Relationship. It could be observed that there is a positive significant influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on the dependent variable; Customer Relationship with coefficients of 0.148, 0.196, 0.424 and 0.149 respectively, as well as P-values of 0.000. Also, the R square is 0.648 which means that "Monitoring and Control, Delay Management, Collaboration, and Cost Minimization explains 64.8% of the variation in **Customer Relationship.**

Table *6*: Regression Model of Independent Variables on Customer Relationship

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	R Square
	B	Std. Error	Beta			
(Constant)	.142	.093		1.534	.126	
Monitoring and Control	.148	.039	.152	3.760	.000	
Delay Management	.196	.045	.199	4.395	.000	0.648
Collaboration	.424	.046	.422	9.223	.000	
Cost Minimization	.149	.035	.155	4.310	.000	

Table 7 shows the multiple regression analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Customer Relationship. It could be observed that there is a positive significant influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on the dependent variable; Customer Relationship with Estimates of 0.116, 0.152, 0.452, and 0.224 respectively, as well as P-values of 0.031, 0.036, 0.000, and 0.000 respectively. Also, the R square is 0.759 which means that "Collaboration, and Cost Minimization explains 75.9% of the variation in **Customer Relationship.**

Table 7: SEM of ERP effect on Customer Relationship

			Estimate	P-value	R Square
Customer Relationship	**<---**	**Monitoring and Control**	.116	.031	0.759
Customer Relationship	**<---**	**Delay Management**	.152	.036	
Customer Relationship	**<---**	**Collaboration**	.452	***	
Customer Relationship	**<---**	**Cost Minimization**	.224	***	

The model fit indices; CMIN/df = 1.618, GFI = 0.951, CFI = 0.981, and RMSEA = 0.037 are all within their acceptable levels.

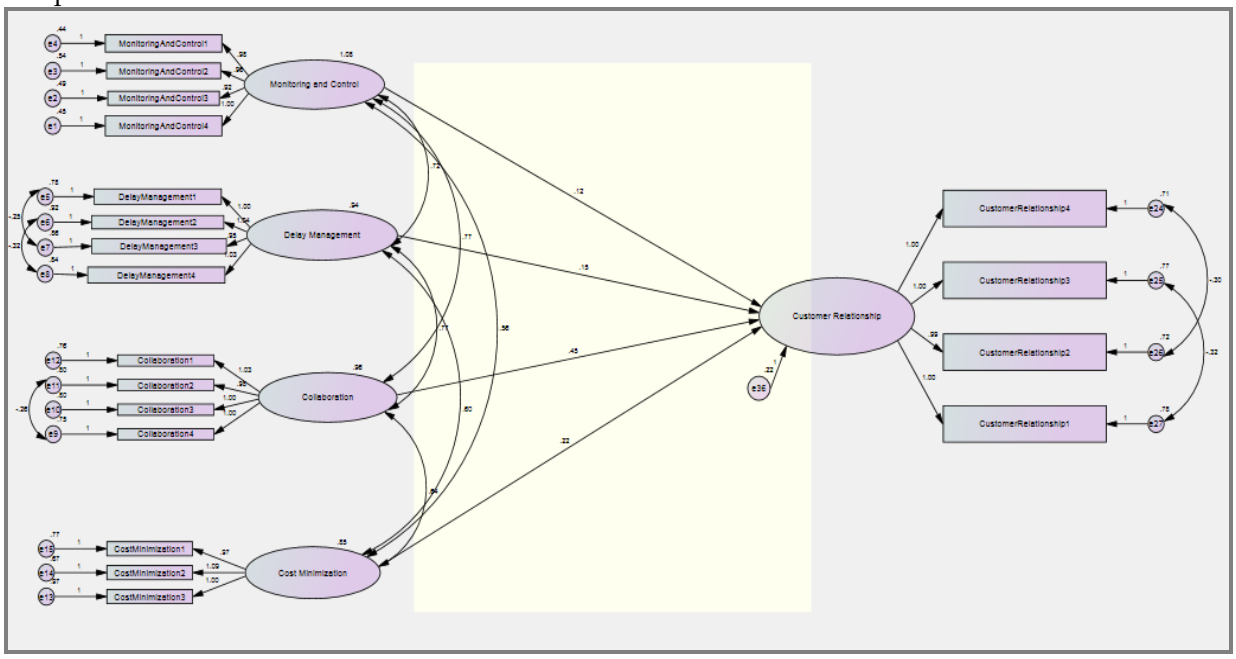

Figure 3 SEM Model of ERP Effect on Customer Relationship

Therefore, the second sub hypothesis that there is a significant relationship between ERP and Customer Relationship is fully supported.

Table 8 shows the multiple regression analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Information Sharing. It could be observed that there is a positive significant influence of Monitoring and Control, Delay Management, and Collaboration on the dependent variable; Information Sharing with coefficients of 0.234, 0.201 and 0.275 respectively, as well as P-values of 0.000, 0.000, 0.001, and 0.000, while, there is an insignificant influence of Cost Minimization on Information Sharing with p-value of 0.188 more than 0.05. Also, the R square is 0.432 which means that "Monitoring and Control, Delay Management, and Collaboration "explains 43.2% of the variation in **Information Sharing.**

Table *8* Regression Model of Independent Variables on Information Sharing

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	R Square
	B	Std. Error	Beta			
(Constant)	.641	.122		5.268	.000	
Monitoring and Control	.234	.052	.233	4.527	.000	
Delay Management	.201	.058	.197	3.434	.001	0.432
Collaboration	.275	.060	.265	4.554	.000	
Cost Minimization	.060	.045	.060	1.319	.188	

Table 9 shows the multiple regression analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Information Sharing. It could be observed that there is a positive significant influence of Monitoring and Control, and Collaboration on the dependent variable; Information Sharing with Estimates of 0.208, and 0.372 respectively, as well as P-values of 0.003, and 0.000 respectively, while there is an insignificant relation between Delay Management, and Cost Minimization on Information Sharing with p-value of 0.166 and 0.480, Also, the R square is 0.493 which means that "Monitoring and Control, and Collaboration "explains 49.3% of the variation in **Information Sharing.**

Table *9*: SEM for ERP Effect on Information Sharing

			Estimate	P-value	R Square
Information Sharing	**<---**	**Monitoring and Control**	.208	.003	
Information Sharing	**<---**	**Delay Management**	.130	.166	0.493
Information Sharing	**<---**	**Collaboration**	.372	***	
Information Sharing	**<---**	**Cost Minimization**	.056	.480	

The model fit indices; CMIN/df = 1.885, GFI = 0.943, CFI = 0.971, and RMSEA = 0.045 are all within their acceptable levels.

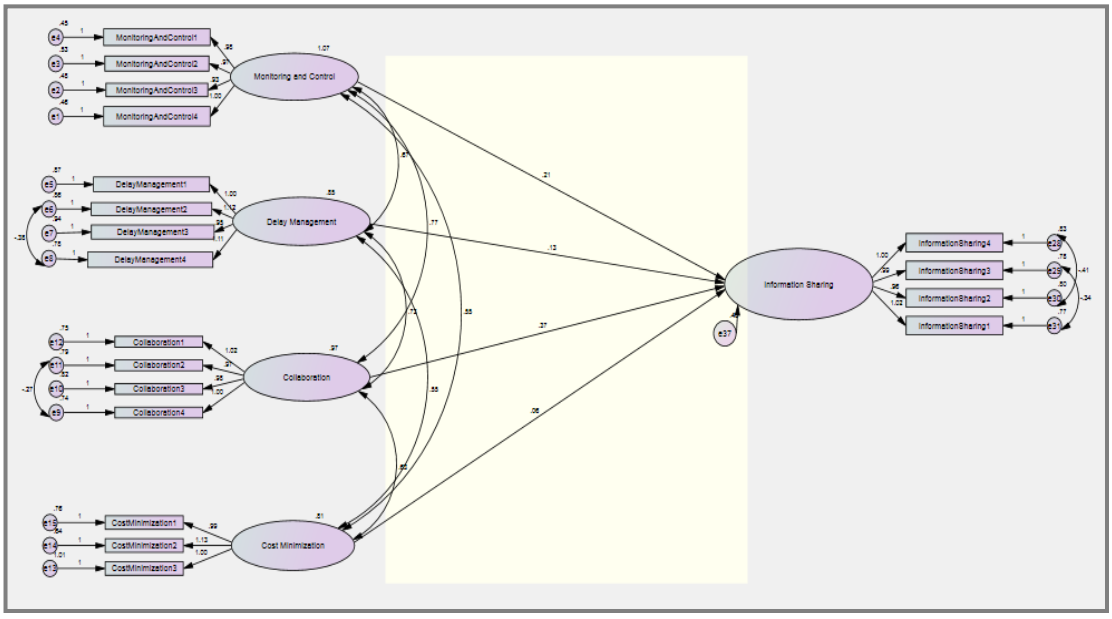

Figure 4 SEM Model of ERP Effect on Information Sharing

Therefore, the third sub hypothesis that there is a significant relationship between ERP and Information Sharing is partially supported.

Table 10 shows regression analysis of the influence of "**Monitoring and Control"** on "**Information Quality"** It could be observed that there is a positive significant effect of Monitoring and Control on the dependent variable; Information Quality with coefficients of 0.570, as well as P-values of 0.000. Also, the R square is 0.359 which means that "**Monitoring and Control "**explains 35.9% of the variation in **Information Quality.**

Table *10* Regression Model of Independent Variables on Information Quality

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	p-value	R Square
(Constant)	.648	.112		5.774	.000	
Monitoring and Control	.265	.048	.279	5.560	.000	
Delay Management	.222	.054	.231	4.121	.000	0.457
Collaboration	.199	.056	.204	3.587	.000	
Cost Minimization	.060	.042	.064	1.441	.150	

Table 11 shows the multiple regression analysis of the influence of Monitoring and Control, Delay Management, Collaboration, and Cost Minimization on Information Quality. It could be observed that there is a positive significant influence of Monitoring and Control, and Delay Management on the dependent variable; Information Quality with Estimates of 0.255, and 0.230 respectively, as well as P-values of 0.000, and 0.011 respectively. While there is insignificant relation between Collaboration, and Cost Minimization on Information Sharing with p-value of 0.023 and 0.330, Also, the R square is 0.669 which means that "Collaboration, and Cost Minimization **"**explains 66.9% of the variation in **Information Quality.**

Table *11*: SEM for the Effect of ERP on Information Quality

			Estimate	P-value	R Square
Information Quality	**<---**	**Monitoring and Control**	.255	***	0.669
Information Quality	**<---**	**Delay Management**	.230	.011	
Information Quality	**<---**	**Collaboration**	.222	.023	
Information Quality	**<---**	**Cost Minimization**	.072	.330	

The model fit indices; CMIN/df = 1.946, GFI = 0.944, CFI = 0.970, and RMSEA = 0.046 are all within their acceptable levels.

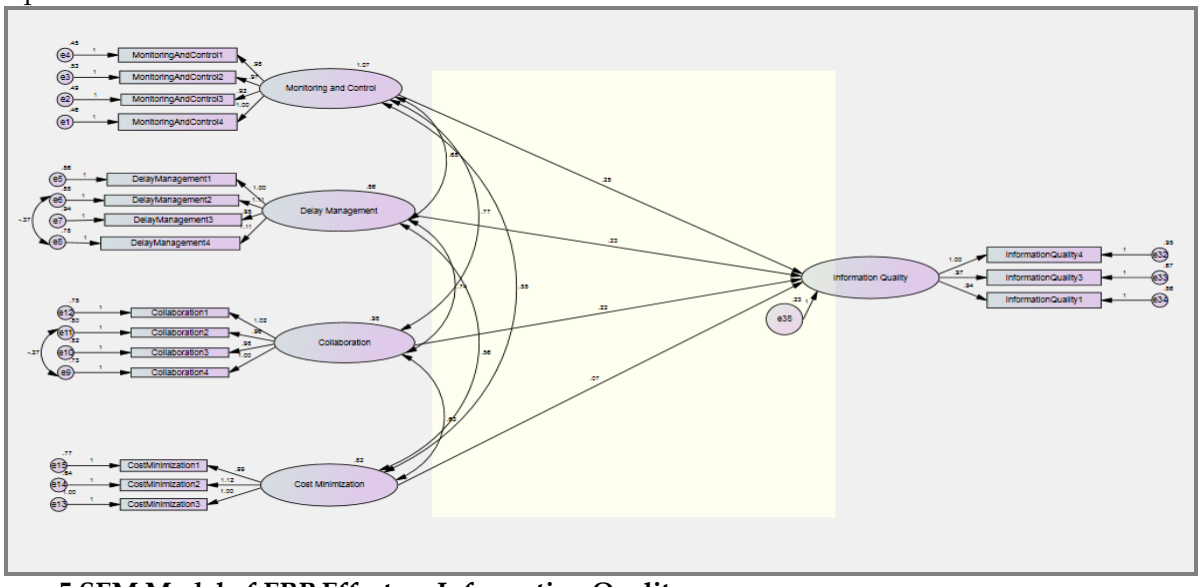

Figure 5 SEM Model of ERP Effect on Information Quality

Therefore, the fourth sub hypothesis that there is a significant relationship between ERP and Strategic Supplier Partnership is partially supported.

Conclusion

This research provides an insight to the use of Enterprise Resource Planning in developing the Supply Chain Process. It was found that the three forms of ERP, which are Monitoring and Control, Delay Management, and Collaboration are significantly affecting the Strategic Supplier Partnership. Also, it was observed that all forms of ERP under study, which are Monitoring and Control, Delay Management, Collaboration, and Cost Minimization are affecting Customer Relationship. In addition, it was noticed that Monitoring and Control, and Collaboration are significantly affecting Information Sharing. Finally, it was found that Monitoring and Control, Delay Management, Collaboration are affecting Information Quality. This means that all aspects of ERP are significantly affecting Supply Chain Management Process in a way or another. This provides decision makers a vision of how to develop a framework using ERP that cope with the supply chain management process level required by the market.

References

Azan, W. and Bollecker, M., 2011. Management control competencies and ERP: an empirical analysis in France. *Journal of Modelling in Management*, *6*(2), pp.178-199.

Chong, A.Y., Chan, F.T., Ooi, K.B. and Sim, J.J., 2011. Can Malaysian firms improve organizational/innovation performance via SCM?. *Industrial Management & Data Systems*, *111*(3), pp.410-431.

Das, A., Narasimhan, R. and Talluri, S., 2006. Supplier integration—finding an optimal configuration. *Journal of Operations Management*, *24*(5), pp.563-582.

Garg, P. and Khurana, R., 2017. Applying structural equation model to study the critical risks in ERP implementation in Indian retail. *Benchmarking: An International Journal*, *24*(1), pp.143-162.

Heikkilä, J., 2002. From supply to demand chain management: efficiency and customer satisfaction. *Journal of operations management*, *20*(6), pp.747-767.

Hillman Willis, T. and Hillary Willis-Brown, A., 2002. Extending the value of ERP. *Industrial Management & Data Systems*, *102*(1), pp.35-38.

Hsu, C.C., Tan, K.C., Kannan, V.R. and Keong Leong, G., 2009. Supply chain management practices as a mediator of the relationship between operations capability and firm performance. *International Journal of Production Research*, *47*(3), pp.835-855.

Huaping, Z. and Suodi, Z., 2013. The effect of urban amenities on commercial housing price: Dynamic panel models of thirty-five large and medium scale cities. *Journal of Applied of Statistics and Management*, *32*(4), pp.706-717.

Hwang, D. and Min, H., 2015. Identifying the drivers of enterprise resource planning and assessing its impacts on supply chain performances. *Industrial Management & Data Systems*, *115*(3), pp.541-569.

Hwang, D., Yang, M.G.M. and Hong, P., 2015. Mediating effect of IT-enabled capabilities on competitive performance outcomes: An empirical investigation of ERP implementation. *Journal of Engineering and Technology Management*, *36*, pp.1-23.

Katerattanakul, P., J. Lee, J. and Hong, S., 2014. Effect of business characteristics and ERP implementation on business outcomes: An exploratory study of Korean manufacturing firms. *Management Research Review*, *37*(2), pp.186-206.

Khurrum S. Bhutta, M., Rana, A.I. and Asad, U., 2007. SCM practices and the health of the SMEs in Pakistan. *Supply Chain Management: An International Journal*, *12*(6), pp.412-422.

Lee, H.L., 2002. Aligning supply chain strategies with product uncertainties. *California management review*, *44*(3), pp.105-119.

M. Beheshti, H., K. Blaylock, B., A. Henderson, D. and G. Lollar, J., 2014. Selection and critical success factors in successful ERP implementation. *Competitiveness review*, *24*(4), pp.357-375.

M. Beheshti, H., K. Blaylock, B., A. Henderson, D. and G. Lollar, J., 2014. Selection and critical success factors in successful ERP implementation. *Competitiveness review*, *24*(4), pp.357-375.

Näslund, D. and Hulthen, H., 2012. Supply chain management integration: a critical analysis. *Benchmarking: An International Journal*, *19*(4/5), pp.481-501.

Pishdad, A. and Haider, A., 2013. ERP institutionalization: exploring the influential factors. *Journal of Enterprise Information Management*, *26*(6), pp.642-660.

Ram, J. and Corkindale, D., 2014. How "critical" are the critical success factors (CSFs)? Examining the role of CSFs for ERP. *Business Process Management Journal*, *20*(1), pp.151-174.

Ram, J., Corkindale, D. and Wu, M.L., 2013. Implementation critical success factors (CSFs) for ERP: Do they contribute to implementation success and post-implementation performance?. *International Journal of Production Economics*, *144*(1), pp.157-174.

Saleh Shatat, A. and Mohamed Udin, Z., 2012. The relationship between ERP system and supply chain management performance in Malaysian manufacturing companies. *Journal of Enterprise Information Management*, *25*(6), pp.576-604.

Sternad, S., Gradisar, M. and Bobek, S., 2011. The influence of external factors on routine ERP usage. *Industrial Management & Data Systems*, *111*(9), pp.1511-1530.

Su, Y.F. and Yang, C., 2010. Why are enterprise resource planning systems indispensable to supply chain management?. *European Journal of Operational Research*, *203*(1), pp.81-94.

Subramanian, K., Rawlings, J.B., Maravelias, C.T., Flores-Cerrillo, J. and Megan, L., 2013. Integration of control theory and scheduling methods for supply chain management. *Computers & Chemical Engineering*, *51*, pp.4-20.

Sun, S.Y., Hsu, M.H. and Hwang, W.J., 2009. The impact of alignment between supply chain strategy and environmental uncertainty on SCM performance. *Supply Chain Management: An International Journal*, *14*(3), pp.201-212.

Talib, F., Rahman, Z., Qureshi, M.N. and Siddiqui, J., 2011. Total quality management and service quality: an exploratory study of quality management practices and barriers in service industry. *International Journal of Services and Operations Management*, *10*(1), pp.94-118.

Trinh-Phuong, T., Molla, A. and Peszynski, K., 2012. Enterprise Systems and Organizational Agility: A Review of the Literature and Conceptual Framework. *Communications of the Association for Information Systems*, *31*.

Tsanos, C.S. and Zografos, K.G., 2016. The effects of behavioural supply chain relationship antecedents on integration and performance. *Supply Chain Management: An International Journal*, *21*(6), pp.678-693.