

# THE INFLUENCE OF CUSTOMER INTEGRATION, INTEGRATED INFORMATION TECHNOLOGY, AND RELATIONSHIP COMMITMENT ON PERFORMANCE: A MEDIATING AND MODERATING ANALYSIS IN SUPPLY CHAIN MANAGEMENT CONTEXT

---

Abousamra, Alaa; Ruzo Sanmartín, Emilio; Varela González, José Antonio  
Universidade de Santiago de Compostela

## RESUMEN

*Esta investigación amplía el creciente cuerpo de la literatura sobre la integración de la cadena de suministro. A partir de diferentes teorías, desarrollamos hipótesis que proponen relaciones positivas entre la tecnología de información integrada, la integración de clientes, el compromiso relacional y el rendimiento financiero. Además, investigamos los roles complementarios del tamaño del departamento de TI y el apoyo de la alta dirección. Los resultados a partir de una muestra de 205 empresas de Egipto indican que la tecnología de información integrada y la integración de clientes pueden mejorar el rendimiento financiero. Adicionalmente, los resultados muestran un efecto mediador positivo de la integración de clientes en la relación entre tecnología de información integrada y el rendimiento financiero. Además, se confirma que el tamaño del departamento de TI y el apoyo de la alta dirección están relacionados significativamente con la tecnología de información integrada. Finalmente, nuestros resultados también muestran un efecto positivo directo del compromiso relacional en la integración de clientes, así como un efecto moderador positivo del compromiso relacional en la relación entre la tecnología de información integrada y la integración de clientes.*

## Palabras clave:

Gestión de la Cadena de Suministro, Integración de Clientes, Tecnología de Información Integrada, Compromiso Relacional, Rendimiento, Egipto.

## ABSTRACT

*This research extends the developing body of literature on supply chain integration. Theorizing from the supply chain integration literatures, we develop hypotheses proposing direct, mediating, and moderating relations between integrated information technology, customer integration, relationship commitment, and financial performance. Also, we investigate the complementary roles of IT department size and top management support. Our findings from a sample of 205 firms in Egypt indicate that integrated information technology and customer integration can improve financial performance. In addition, our results show a mediating and positive effect of customer integration on the relation between integrated information technology and financial performance. Also, information technology department size and top management support are significantly related to integrated information technology. Finally, our results also show a direct and positive effect of relationship*

*commitment on the customer integration, and a moderating and positive effect of relationship commitment on the relationship between integrated information technology and customer integration.*

**Keywords:**

Supply Chain Management, Customer Integration, Integrated Information Technology, Relationship Commitment, Performance, Egypt.

**1. Introduction**

Why some companies have higher financial performance than others? Does integrated information technology and customer integration influence the financial performance? The purpose of this study is to show how to improve the financial performance and the relationships between firms and their customers, through supply chain integration and integrated information technology. More particularly, it proposes a model in which customer integration directly contribute to a firm's financial performance. Moreover, we focus on the direct and indirect effect of integrated information technology through customer integration. In addition, we investigate the moderating role of relationship commitment in the relationship between integrated information technology and supply chain integration (SCI). Finally, we expect that the Information Technology (IT) department's size and top management support, influence integrated information technology.

This work responds to calls for research and helps to increase awareness of the Supply Chain Management (SCM) phenomenon in various ways. Firstly, while some studies (Das, Narasimhan, and Talluri 2006; Cuijpers, Guenter, and Hussinger, 2011) argue that SCI may impair financial performance, some literature (Flynn, Huo, and Zhao 2010; Kim, 2009) confirmed that SCI has a positive effect on financial performance. Secondly, past evidence (Kettinger et al., 1994; Weill, 1992; Hitt and Brynjolfsson 1996; Lee and Barua 1999; Devaraj and Kohli, 2003) suggests that the investment in information technology (IT) does not guarantee enhanced SCI and organizational performance. Our research tests the impact of integrated information technology on customer integration and financial performance. Thirdly, in this research we focus on the effect of IT department size and top management support, considering them as antecedents for integrated information technology. Fourth, the moderating role for relationship commitment in the relationship between integrated information technology and customer integration is one of our goals in this analysis.

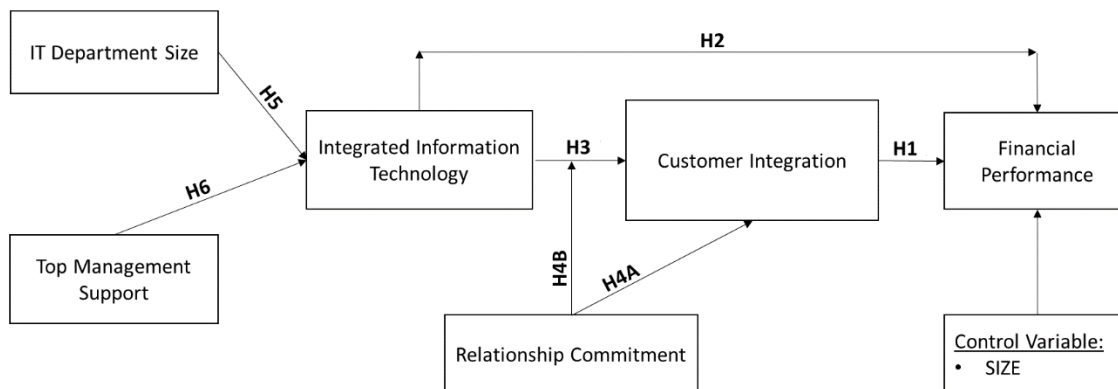
This research focuses on manufacturing and service firms in Egypt. We have selected the Egyptian market because it is a virgin market in the field of SCM research and it is a strong industrial market in this area, with a high level of competition and a differentiation and diversity of industries and products.

**2. Research model and hypotheses**

This section discusses the hypotheses underlying our conceptual model framework.

FIGURE 1

**Conceptual model research framework**



### ***2.1 Direct antecedents of financial performance: customer integration and integrated information technology***

Customer integration refers to “the degree to which a firm can collaborate with its major customers to structure its inter-organizational strategies, practices, procedures and behaviors into collaborative, synchronized and manageable processes to fulfill customer demands” (Zhao, Feng, and Wang 2015, 163). It also describes the process of decisions’ coordination including inventory level, production planning, demand forecasting, order tracking and product delivery between customers and manufacturers. Customer integration includes different kinds of flow, which are flows of information, service and materials; while information is flowing back from customer to supplier, the services and materials flowing forward from supplier to customer (Frohlich and Westbrook, 2001; Narasimhan 1998).

Following the resource based view, establishment of customer integration is important for achieving benefits by leveraging resources and integrated critical information owned by customers (Danese and Romano, 2013; Huo, 2012; Lau, Tang, and Yam, 2010). Deep penetration into the customer organization through customer integration is highly necessary by firms to understand the customer’s product, culture, market and organization in such a way that they can respond precisely to its needs and requirements. On the basis of the foregoing considerations, we propose the following hypothesis:

*H1. Customer integration is positively related to financial performance.*

Although recent studies have concentrated on the benefits associated with information sharing for organizations in the supply chain context (Sahin and Robinson Jr. 2005; Zhou and Benton Jr. 2007; Guo, Fang, and Whinston 2006; Li et al. 2006; Koçoğlu et al. 2011), very few studies investigated the specific impact of information technology (IT) on supply chain relationships and firm performance. This is surprising because growth and development of technology has attracted organizations to increase their interest and investment in IT. At present, many researchers agreed that this areas deserves further research attention (Wu et al., 2006; Liang, You, and Liu, 2010; Oh, Teo, and Sambamurthy, 2012). We agree that IT can represent the technological side of the information system and can play its part when needed. Several studies have showed that overall information technology ability and power are positively related to a firm’s performance (Bharadwaj, 2000; Kearns and Lederer, 2003; Fosso Wamba et al., 2008) and others have showed that a significant competitive advantage can be achieved by investment in information technology (Earl, 1993; Kathuria, Anandarajan, and Igbaria, 1999). Isobe, Makino, and Montgomery (2008) conducted another study with the purpose of identifying the nature of the relationship between technological capabilities and the performance of companies, and the results showed that the technological capacity is significantly and positively linked to a company’s performance.

IT could improve supply chain performance by providing timely, accurate and reliable information. Despite integrated IT implementation becoming widespread among organizations, the direct positive effect on financial performance remains elusive. More recently, resource based view (RBV) represents a potential framework that enhances and improves the conceptual analysis of integrated information technology's effects on a firm's performance, which connects and relates organisation performance to resources and skills (Barney, 1986; Barney, 1991). In general, it is argued that organizations can achieve many benefits through integrative IT processes. Integrated IT offers an appropriate tool that has significant effects on improving the level of prices, reducing the cost of production processes, increasing the speed of achievement, and quality improvement, which leads to increasing the competitiveness of organizations and achieving its goals in survival, development, and expansion in its work performance. However, mixed results have been reached by many empirical studies that have investigated the relationship between integrated IT and performance of a firm. For example, some scholars found a positive and significant relationship between integrated IT and a firm's performance; more specifically, integrated IT enhanced processes (Mukhopadhyay, Rajiv, and Srinivasan, 1997; Hendricks and Singhal 2003; Dehning, Richardson, and Zmud, 2007) and improved efficiency in different firm activities (Stank, Crum, and Arango, 1999). However, a few empirical studies showed ambiguous and equivocal results for the impact of information technology on performance (Weill, 1992; Hitt and Brynjolfsson, 1996). On the basis of the foregoing considerations, we propose the following hypothesis:

*H2. Integrated information technology is positively related to financial performance.*

## **2.2 Antecedents of customer integration: integrated information technology and relationship commitment**

Integrated IT can facilitate and enhance supply chain integration between firms and ultimately improve a firm's performance through improved integrative channel capabilities by "cementing relationships with customers, enabling integration forwards or backwards in the industry value chain or in establishing a technical lead" (Roberts and Mackay, 1998, 176). That is, integrated IT has great potential to expedite and accelerate integration among supply chain partners, through effective coordination and sharing of information on demand forecasts and production schedules, that instruct supply chain activities (Karoway, 1997; Chen and Paulraj, 2004). Supply chain members who apply technological and administrative integration can be more active in the sharing of planning, strategies, resources, and competencies among partners (Kim, Cavusgil, and Calantone, 2006). Integrated IT supports supply chain integration in various aspects, such as enterprise resource planning, customer relationship management, advanced planning, transportation management, and warehouse management systems (Kim, Cavusgil, and Calantone, 2006). Electronic data interchange (EDI) is one of the most important elements, which plays a significant and vital role in supply chain integration (Rogers, Daugherty, and Stank, 1993). The technological connectivity among supply chain partners requires a high level of systems integration, that allows two supply chain proprietary systems to reduce technical barriers, inconsistency and incompatibility, which lead to better and effective communication during coordinating activities (Bowersox, Closs, and Stank, 1999). Carr and Pearson (1999) indicated that replacing inventory with perfect information is the main goal of information systems. Therefore, most researchers consider that integrated IT is a key enabler of supply chain integration by the sharing of important information concerning business processes inside and outside organization's boundaries (Clemons, Reddi, and Row 1993; Frohlich and Westbrook 2001; Sanders and Premus 2002; Vickery et al. 2003; Kelle and Akbulut 2005). We believe that integrated IT has a positive effect on customer integration. On the basis of the foregoing considerations, we propose the following hypothesis:

*H3. Integrated information technology is positively related to customer integration.*

Relationship commitment refers to the level of readiness of a firm to invest its resources physically and financially in a long-term relationship (Morgan and Hunt, 1994). Relationship

commitment includes a strong sense of identification, loyalty, affiliation, and obligation. People develop and maintain personal relationships that contribute and reinforce their formal roles (Lawler and Yoon 1998; Ring and Ven 1994). As such, relationship commitment also shapes a motivational impact that favors integrated information level with customer. In the context of supply chain, relationship commitment is an attitude of supply chain partners to establish, maintain and develop a stable, long-term reciprocal relationship (Anderson and Weitz, 1992; Moore 1998; Zhao et al., 2008).

Relationship commitment can play a significant and vital role in supply chain relationships (Zhao et al., 2008). For example, the rapid advance in information technology has presented firms with new, integrated technology-based solutions, such as customer relationship management (CRM) technology, to manage customer relationships.

Several scholars have investigated factors that influence inter-firm relationships from the relationship commitment perspective (Brown, Lusch, and Nicholson, 1995). For example, research conducted by Morgan and Hunt (1994) showed a positive and significant association between relationship commitment and integrative cooperation. However, the impact of relationship commitments on customer integration is still little known in a supply chain integration context. In effect, few researches have studied the impact of relationship commitment on customer integration from a supply chain management perspective (Zhao et al., 2008).

Based on the foregoing considerations, we propose the following hypothesis:

*H4A. Relationship commitment is positively related to customer integration.*

### ***2.3 Customer integration and integrated information technology: the moderating role of relationship commitment***

Given the high value of information and the costs associated with integrated information systems development, a high degree of relationship commitment between supply chain partners is necessary to ensure both the security of the information exchange and the recovery of systems costs over the length of the relationship. For this reason, relationship commitment is considered as a key moderator between integrated IT constructs and their influence on the customer integration. A high commitment may make that the integrated IT increase customer integration. Just as high trust can encourage integrated IT to increase supplier integration, high commitment should also support customer integration.

Therefore, the effect of integrated IT on customer integration, will be enhanced when a relationship commitment between partners exists. Relationship commitment increases the integrated IT - customer integration relationship by providing stable long-term relationships with customers and by reducing opportunistic behaviors that contradict the interests of the other party (Williamson, 1985). On the basis of the foregoing considerations, we propose the following hypothesis:

*H4B. Relationship commitment moderates the relationship between integrated IT and customer integration, so that the higher the relationship commitment, the greater the integrated IT - consumer integration relationship.*

### ***2.4 Antecedents of integrated information technology: IT department size and top management support***

IT departments help to implement and maintain links between different resources owned by different supply chain partners (Dong, Xu, and Zhu, 2009) and improving a firm's ability to address business uncertainties (Bensaou and Venkatraman, 1995). Therefore, a sufficient IT department size with qualified staff is highly needed to facilitate and enhance the integrated information technology processes. Businesses are investing more and more in IT, paying more attention to the IT department's size and considering the importance of keeping a strong, qualified, professional workforce of a sufficient size. IT departments are an asset for companies and have become the main driver for all the activities inside and outside the organisation, by managing and improving the integration processes,

including communication, inventory management, data management, management information systems and customer relationship management. As a higher number of employers can lead to better integrated information within a firm, we propose the following hypothesis:

*H5. IT department size is positively related to integrated information technology.*

Top management support is very important in providing and conducting convenient climates, suitable work environments and appropriate management styles, to achieve benefits from integrated IT and supply chain integration (Lee, Shiue, and Chen, 2016). However, there are many elements that can be considered as enablers or barriers to top management support, such as organisational culture, experience, and management policies (Lee, Shiue, and Chen, 2016). Although top management support has been inclusively and globally studied, the role of top management support in integrated IT and the supply chain integration process is still unknown (Swink, Narasimhan, and Wang, 2007). We argue that top management support has a positive effect on integrated information technology and can lead to better integrated information within a firm. In other words, a firm with a high level of top management support will have better integrated IT amongst supply chain partners into its operating activities. Conversely, a firm with a low level of top management support, will be unable to integrate the information from supply chain partners into its operating activities. On the basis of the foregoing considerations, we propose the following hypothesis:

*H6. Top management support is positively related to integrated information technology.*

### **3. Methodology**

#### ***3.1 Sample and data collection procedure***

This study was conducted in 2016 using a sample of manufacturing, retailing, wholesaling and shipping services firms headquartered in Egypt. Following Morgan, Kaleka, and Katsikeas (2004), a multi-industry sample was used, in order to increase observed variance and to reinforce the generalization of the results. To collect the data, a structured questionnaire was developed starting from a comprehensive review of the literature in the area (sources of scales from the literature are presented in the next section). The content validity of the items was assessed by five academic experts familiar with this topic, and the questionnaire was also pre-tested by ten supply chain and general managers. The sampling frame for the study was based on a government agency database. We considered those companies belonging to sub-sectors related with manufacturing, retailing, wholesaling and shipping service in Egypt. Considering these criteria, initial population of our study was compounded by 1,264 companies. Therefore, questionnaires were distributed to 1,264 senior managers with responsibilities in the field of supply chain, logistics, purchasing, marketing, and operations. Respondents were contacted through different ways, including e-mailing, phone, and personal interviewing. After eliminating non-valid questionnaires, we retained 205 usable questionnaires, representing a response rate of 16.22%. This constitutes a fairly good response rate, considering that the average top management survey response rates are between 15 and 20% (Menon, Bharadwaj, and Howell 1996).

#### ***3.2 Measures***

To operationalize the variables, this study relies on previously-validated scales, measured on five-point scales (1=totally disagree; 5=totally agree). First, Financial Performance was based on the approach of Lee, Shiue, and Chen (2016), using 7 items. Second, Customer Integration was based on the approach of Flynn, Huo, and Zhao (2010) using 11 items. Third, Integrated Information Technology was measured using 6 items adapted from Chen and Paulraj (2004). Fourth, Relationship Commitment was based on the approach of Zhao et al. (2008) using 6 items. Fifth, Top Management Support was based on the approach of Zhao, Feng, and Wang (2015), using 6 items. Finally, IT Department Size was measured by the number of employees belonging to IT Department. In addition

to the variables specified in our theoretical model, we included one control variable, Firm Size, measured by the total number of employees.

## 4. Analysis and results

### 4.1 Reliability and Validity

Content validity was established through a comprehensive literature review and by consulting experienced researchers and managers, ensuring that the measures satisfied the requirements for content validity. Discriminant validity, convergent validity, and scale reliability was assessed with confirmatory factor analysis, following Gerbing and Anderson (1988) guidelines. The results from the estimation of CFA (previous table) show that the overall chi-square for this model was 453.832 with 272 degrees of freedom. We examined four measures of fit, comparative fit index (CFI=0.953), incremental fit index (IFI=0.954), Tucker-Lewis index (TLI=0.944), and root mean square error of approximation (RMSEA=0.057), which are inside conventional cut-off values (Vandenberg and Lance 2000), so we deemed the model acceptable. To assess convergent validity we observed individual loadings, and the results show that all items load on their specified latent variables and that each loading is large and significant, thus indicating convergent validity (Anderson and Gerbing 1988). To assess discriminant validity we observed construct intercorrelations, and the results show that they were significantly different from 1, and that the shared variance between any two constructs (square of their intercorrelations) was less than the average variance explained in the items by the construct (Fornell and Larcker 1981).

TABLE 1  
Correlations between constructs and AVE

CONSTRUCT	1	2	3	4	5	6	7	AVE
1. TMS	<b>0.816</b>							0.666
2. IIT.	0.270	<b>0.796</b>						0.634
3. CI	0.305	0.741	<b>0.752</b>					0.566
4. FP	0.461	0.632	0.661	<b>0.807</b>				0.651
5. RC	0.364	0.181	0.406	0.27	<b>0.727</b>			0.529
6. ITSIZE	0.196	0.49	0.492	0.495	0.138	<b>1.000</b>		1.000
7. SIZE	0.271	0.386	0.458	0.481	0.188	0.733	<b>1.000</b>	1.000

*Note: Diagonal is the square root of the AVE*

**Notation:**

ITSIZE: IT Department Size; TMS: Top Management Support; IIT: Integrated Information Technology; CI: Customer Integration; FP: Financial Performance; RC: Relationship Commitment.

Previous table shows that intercorrelations are greater than square root of AVE, indicating that discriminant validity is adequate for all latent variables. Finally, regarding reliability all constructs presented acceptable levels of composite reliability (CR), considerably exceeding the level of .60 recommended by (Bagozzi and Yi 1988): top management support (CR=0.922), integrated information technology (CR=0.838), customer integration (CR=0.796), financial performance (CR=0.928), and relationship commitment (CR=0.845). In terms of variance extracted, all latent variables exceeded the recommended level of the average variance extracted (0.50). Therefore, results show that the indicators were sufficient and adequate in terms of how the measurement model was specified for all latent variables.

### 4.2 Testing of Hypotheses

Based on the complexity of the model and the need to test the relationships between the different constructs at the same time, we used Structural Equation Modeling by using the maximum likelihood method. To estimate interaction effects using structural equations we followed a method based on the guidelines of Kline and Dunn (2000) and Marsh, Wen, and Hau (2004). First, Kline and Dunn (2000) proposed the use of a deviation-score or centering approach to the problem of interaction terms in structural equation models, where the original variables have to be uncentered while the

interaction terms have to be created from the centered original variables. In addition, Marsh, Wen, and Hau (2004) shows a specific strategy to build the multiple indicators of the latent interaction factor, a so-called “matched-pair strategy”, where all indicators of each first-order factor are used in the construction of multiple product indicators, and none is used more than once, in such a way that indicators were paired from the highest factor loading each for first interaction term to the lowest factor loading each for last interaction term. This way, the interaction latent variable and its measures were then directly included in the model. Following this procedure, the hypothesized model was estimated, having the results that are shown in Table 2.

The fit indexes were inside the conventional cut-off values, thus the model was deemed acceptable (Vandenberg and Lance 2000): chi-square=477.616, d.f.= 343; CFI=0.966; IFI=0.967; TLI=0.960; RMSEA=0.044. Next, we examine the test of hypotheses proposed in our model. On the one hand, we found support for the positive influence of supplier integration on financial performance (H1) which returned estimated coefficients of 0.309 ( $p < .01$ ), and for the positive influence of integrated information technology on financial performance (H2), which returned estimated coefficients of 0.329 ( $p < .01$ ). We also found support for H3, indicating that integrated information technology positively influence customer integration, with an estimated coefficient of 0.741 ( $p < .001$ ), and for H4A, indicating that relationship commitment has a positive effect on customer integration, with an estimated coefficient of 0.274 ( $p < .001$ ). On the other hand, IT department size also showed a positive and significant effect on integrated information technology, with an estimated coefficient of 0.485 ( $p < .001$ ), thus supporting H5. Lastly, H6 was also supported, demonstrating that top management support has a positive and significant effect on integrated information technology (0.212,  $p < .01$ ).

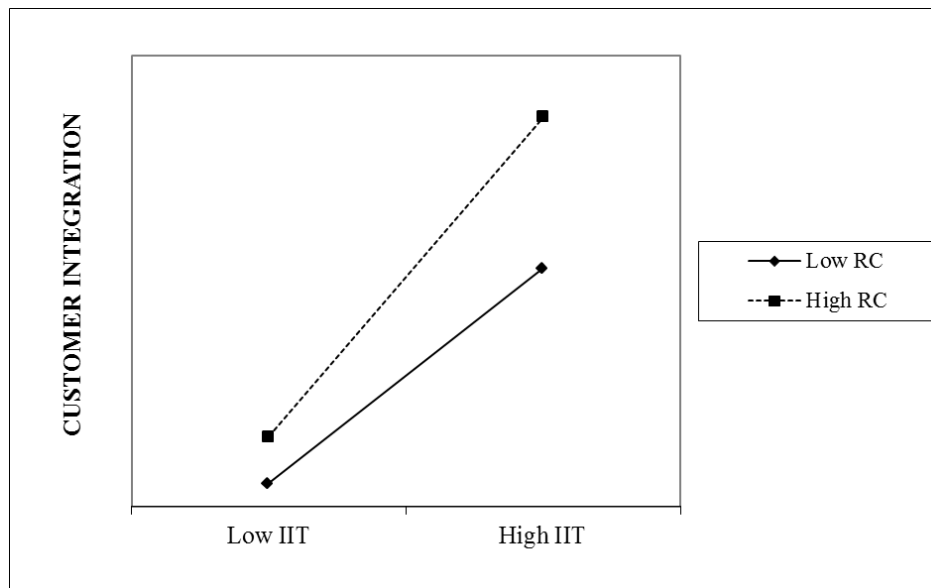
TABLE 2  
**Structural Equation Modeling: model fit summary and estimates**

HYP.	RELATIONSHIPS	STAND. PAR. ESTIMATE	TEST
H1	$CI \rightarrow FP$	0.309 **	<i>Supported</i>
H2	$IIT \rightarrow FP$	0.329 **	<i>Supported</i>
H3	$IIT \rightarrow CI$	0.741 ***	<i>Supported</i>
H4A	$RC \rightarrow CI$	0.274 ***	<i>Supported</i>
H5	$ITSIZE \rightarrow IIT$	0.485 ***	<i>Supported</i>
H6	$TMS \rightarrow IIT$	0.212 **	<i>Supported</i>
MODERATING EFFECTS			
H4B	$IIT \times RC \rightarrow CI$	0.144 *	<i>Supported</i>
CONTROL EFFECTS			
	$SIZE$	0.211 ***	
MODEL FIT SUMMARY			
Chi-square=477.616, df=343			
CFI=0.966; IFI=0.967; TLI=0.960			
RMSEA=0.044			
<i>Note:</i> * $p < 0.05$ ; ** $p < 0.01$ ; *** $p < 0.001$ ; <i>ns</i> =not significant			
<b>Notation:</b>			
ITSIZE: IT Department Size; TMS: Top Management Support; IIT: Integrated Information Technology; CI: Customer Integration; FP: Financial Performance; RC: Relationship Commitment.			

Finally, regarding moderating effect which predicted that relationship commitment strengthens the positive relationship between integrated information technology and customer integration, the results support this prediction, as the coefficient for this interaction is positive and significant (0.144;  $p < 0.05$ ) supporting H4B. To facilitate interpretation of the moderating effect of relationship commitment on the integrated information technology - customer integration relationship, these constructs are depicted graphically using the procedure suggested by Aiken and West (1991) (see next figure).

FIGURE 2  
**Illustration of moderating effects: IIT x RC**





## 5. Discussion

Overall, our results endorse the position that SCI benefits and customer integration are related to firm's financial performance. We further find that relationship commitment plays complementary roles to customer integration. Also, our finding supports that integrated information technology and applying software system is a basic asset to firms that help and facilitate the integration process with customers. Therefore, integrated information technology is positively related to customer integration as well as to financial performance. Finally, top management support and IT department size were beneficially related to integrated information technology.

This research makes several contributions. Firstly, this study has contributed to filling the gap that exists in the relationships (direct and mediated) among integrated information technology, customer integration, and financial performance. The final models contribute new evidence to the literature, analyzing complex models that relate a set of variables that to date had not been studied jointly or in such detail. Integrated information technology has not been greatly addressed in supply chain research and there are no studies have analyzed customer integration acting as a mediator between integrated information technology and financial performance. In general terms, the paper attempts to clarify the mediating effects of customer integration between integrated information technology and financial performance in definitive models that nuance the direct relationships initially found. Secondly, this study contributes to the literature by providing a detailed study of the direct effects of customer integration on financial performance. A conceptual model was created for this that enabled the way that the relationships became nuanced to be observed as mediating constructs and antecedents were added. Thus, we provide empirical evidence that can explain the heterogeneous results in the prior research that analyses the relationship between customer integration and performance. Thirdly, this study contributes to the literature by providing a detailed study of the moderating effects of relationship commitment on the relationship between integrated information technology and customer integration. Finally, our study is the first to study these relationships using data collected from manufacturers, retailers, wholesalers and freight forwarders in Egypt. Because of Egypt's rapidly growing economic base and unique national culture, our findings provide fruitful managerial implications for both supply chain practitioners and researchers.

This study makes a significant contribution to the SCM literature by examining the influence of integrated information technology on financial performance along with mediating and moderating effects in supply chain management context. Overall, the results show that integrated information technology can significantly enhance financial performance directly and through mediating or

moderating support. These findings offer a more refined understanding of the reasons and situations under how SCI enable firms to gain superior financial performance in Egypt.

## 6. Limitation and future line of research

Although this study makes significant contributions towards the understanding of IIT and CI, there are some limitations and more opportunities for future research. Perhaps an important limitation of this study is that the data analyzed is based on (single respondent) managers' self-perceptive answers. Although most respondents were senior executives (of the level of Directors and Vice Presidents) in supply chain functions such as purchasing and logistics, and the questions were well designed and clear, bias arising from respondent subjectivity and misunderstanding is a possibility since it is rare for one person in an organization to supervise the entire supply chain.

Additionally, not all respondents were at the same level or held the same role within the firm. While this potentially introduces extraneous variance in the data, it may also strengthen the data by incorporating multiple perspectives. Having multiple respondents for each company could improve the study's reliability. Also, our findings cannot resolve all the inconsistencies concerning the relationships between CI and financial performance. Some of our findings present additional contradictions to the previous findings. To make the findings on these relationships more robust, future research should examine the effects of IIT and CI on financial performance in greater depth. We investigate the direct effects of CI on financial performance without paying great attention to the intervening mechanisms of how CI can impact financial performance. Future research should consider the mediating variables in the CI–financial performance relationship. In addition, factors that may influence the degree of supplier integration (such as business environment, and power) are not examined in our study. Future studies should investigate the impact of these factors on CI.

Moreover, the data used in this study are cross-sectional, and therefore cannot provide causal explanations for the observed effects of IIT and CI on financial performance. Future research should use longitudinal data to test the relationships between IIT, CI and financial performance. Since the business environment is constantly changing, longitudinal follow-up studies could be designed to identify these changes and re-examine whether and how these relationships are changing.

## 7. References

- Barney. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management Science*, 32(10), 1231–1241.
- Barney. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Bensaou, M., & Venkatraman, N. (1995). Configurations of Interorganizational Relationships: A Comparison between U.S. and Japanese Automakers. *Management Science*, 41(9), 1471–1492.
- Bharadwaj, A. S. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly*, 24(1), 169–196. <https://doi.org/10.2307/3250983>
- Bowersox, D. J., Closs, D. J., & Stank, T. P. (1999). *21st Century Logistics: Making Supply Chain Integration A Reality*. Retrieved from <http://trid.trb.org/view.aspx?id=672144>
- Carr, A. S., & Pearson, J. N. (1999). Strategically managed buyer–supplier relationships and performance outcomes. *Journal of Operations Management*, 17(5), 497–519. [https://doi.org/10.1016/S0272-6963\(99\)00007-8](https://doi.org/10.1016/S0272-6963(99)00007-8)
- Chen, & Paulraj. (2004). Towards a theory of supply chain management: the constructs and measurements. *Journal of Operations Management*, 22(2), 119–150. <https://doi.org/10.1016/j.jom.2003.12.007>
- Clemons, E. K., Reddi, S. P., & Row, M. C. (1993). The Impact of Information Technology on the Organization of Economic Activity: The “Move to the Middle” Hypothesis. *J. Manage. Inf. Syst.*, 10(2), 9–35. <https://doi.org/10.1080/07421222.1993.11517998>

- Cuijpers, M., Guenter, H., & Hussinger, K. (2011). Costs and benefits of inter-departmental innovation collaboration. *Research Policy*, 40(4), 565–575. <https://doi.org/10.1016/j.respol.2010.12.004>
- Dale S. Rogers, Patricia J. Daugherty, & Theodore P. Stank. (1993). Enhancing Service Responsiveness: The Strategic Potential of EDI. *Logistics Information Management*, 6(3), 27–32. <https://doi.org/10.1108/EUM0000000002905>
- Das, A., Narasimhan, R., & Talluri, S. (2006). Supplier integration—Finding an optimal configuration. *Journal of Operations Management*, 24(5), 563–582. <https://doi.org/10.1016/j.jom.2005.09.003>
- Devaraj, S., & Kohli, R. (2003). Performance Impacts of Information Technology: Is Actual Usage the Missing Link? *Management Science*, 49(3), 273–289. <https://doi.org/10.1287/mnsc.49.3.273.12736>
- Dong, S., Xu, S. X., & Zhu, K. X. (2009). Research Note—Information Technology in Supply Chains: The Value of IT-Enabled Resources Under Competition. *Information Systems Research*, 20(1), 18–32. <https://doi.org/10.1287/isre.1080.0195>
- Earl, M. J. (1993). Experiences in Strategic Information Systems Planning. *MIS Q.*, 17(1), 1–24. <https://doi.org/10.2307/249507>
- Flynn, B. B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*, 28(1), 58–71. <https://doi.org/10.1016/j.jom.2009.06.001>
- Fosso Wamba, S., Lefebvre, L. A., Bendavid, Y., & Lefebvre, É. (2008). Exploring the impact of RFID technology and the EPC network on mobile B2B eCommerce: A case study in the retail industry. *International Journal of Production Economics*, 112(2), 614–629. <https://doi.org/10.1016/j.ijpe.2007.05.010>
- Frohlich, M. T., & Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. *Journal of Operations Management*, 19(2), 185–200. [https://doi.org/10.1016/S0272-6963\(00\)00055-3](https://doi.org/10.1016/S0272-6963(00)00055-3)
- Guo, Z., Fang, F., & Whinston, A. B. (2006). Supply chain information sharing in a macro prediction market. *Decision Support Systems*, 42(3), 1944–1958. <https://doi.org/10.1016/j.dss.2006.05.003>
- Hitt, L. M., & Brynjolfsson, E. (1996). Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value. *MIS Quarterly*, 20(2), 121–142. <https://doi.org/10.2307/249475>
- Isobe, T., Makino, S., & Montgomery, D. B. (2008). Technological capabilities and firm performance: The case of small manufacturing firms in Japan. *Asia Pacific Journal of Management*, 25(3), 413–428. <https://doi.org/10.1007/s10490-008-9098-z>
- Karoway, C. (1997). Karoway, C., 1997. Superior supply chains pack plenty of byte. *Purchasing Technology* 8 (11), 32-35. Retrieved February 4, 2016, from <http://www.sciepub.com/reference/44415>
- Kathuria, R., Anandarajan, M., & Igarria, M. (1999). Linking IT Applications with Manufacturing Strategy: An Intelligent Decision Support System Approach. *Decision Sciences*, 30(4), 959–991. <https://doi.org/10.1111/j.1540-5915.1999.tb00915.x>
- Kearns, G. S., & Lederer, A. L. (2003). A Resource-Based View of Strategic IT Alignment: How Knowledge Sharing Creates Competitive Advantage. *Decision Sciences*, 34(1), 1–29. <https://doi.org/10.1111/1540-5915.02289>
- Kelle, P., & Akbulut, A. (2005). The role of ERP tools in supply chain information sharing, cooperation, and cost optimization. *International Journal of Production Economics*, 93–94, 41–52. <https://doi.org/10.1016/j.ijpe.2004.06.004>
- Kettinger, W. J., Grover, V., Guha, S., & Segars, A. H. (1994). Strategic Information Systems Revisited: A Study in Sustainability and Performance. *MIS Quarterly*, 18(1), 31–58. <https://doi.org/10.2307/249609>
- Kim. (2009). An investigation on the direct and indirect effect of supply chain integration on firm performance. *International Journal of Production Economics*, 119(2), 328–346. <https://doi.org/10.1016/j.ijpe.2009.03.007>

- Kim, D., Cavusgil, S. T., & Calantone, R. J. (2006). Information system innovations and supply chain management: Channel relationships and firm performance. *Journal of the Academy of Marketing Science*, 34(1), 40–54. <https://doi.org/10.1177/0092070305281619>
- Koçoğlu, İ., İmamoğlu, S. Z., İnce, H., & Keskin, H. (2011). The effect of supply chain integration on information sharing: Enhancing the supply chain performance. *Procedia - Social and Behavioral Sciences*, 24, 1630–1649. <https://doi.org/10.1016/j.sbspro.2011.09.016>
- Lee, B., & Barua, A. (1999). An Integrated Assessment of Productivity and Efficiency Impacts of Information Technology Investments: Old Data, New Analysis and Evidence. *Journal of Productivity Analysis*, 12(1), 21–43. <https://doi.org/10.1023/A:1007898906629>
- Lee, J.-C., Shiue, Y.-C., & Chen, C.-Y. (2016). Examining the impacts of organizational culture and top management support of knowledge sharing on the success of software process improvement. *Computers in Human Behavior*, 54, 462–474. <https://doi.org/10.1016/j.chb.2015.08.030>
- Li, J., Sikora, R., Shaw, M. J., & Woo Tan, G. (2006). A strategic analysis of inter organizational information sharing. *Decision Support Systems*, 42(1), 251–266. <https://doi.org/10.1016/j.dss.2004.12.003>
- Liang, You, & Liu. (2010). A resource-based perspective on information technology and firm performance: a meta analysis. *Industrial Management & Data Systems*, 110(8), 1138–1158. <https://doi.org/10.1108/02635571011077807>
- Menon, A., Bharadwaj, S. G., & Howell, R. (1996). The quality and effectiveness of marketing strategy: Effects of functional and dysfunctional conflict in intraorganizational relationships. *Journal of the Academy of Marketing Science*, 24(4), 299. <https://doi.org/10.1177/0092070396244002>
- Morgan, N. A., Kaleka, A., & Katsikeas, C. S. (2004). Antecedents of Export Venture Performance: A Theoretical Model and Empirical Assessment. *Journal of Marketing*, 68(1), 90–108. <https://doi.org/10.1509/jmkg.68.1.90.24028>
- Mukhopadhyay, T., Rajiv, S., & Srinivasan, K. (1997). Information Technology Impact on Process Output and Quality. *Management Science*, 43(12), 1645–1659. <https://doi.org/10.1287/mnsc.43.12.1645>
- Oh, L.-B., Teo, H.-H., & Sambamurthy, V. (2012). The effects of retail channel integration through the use of information technologies on firm performance. *Journal of Operations Management*, 30(5), 368–381. <https://doi.org/10.1016/j.jom.2012.03.001>
- Roberts, B., & Mackay, M. (1998). IT supporting supplier relationships: The role of electronic commerce. *European Journal of Purchasing & Supply Management*, 4(2–3), 175–184. [https://doi.org/10.1016/S0969-7012\(97\)00030-0](https://doi.org/10.1016/S0969-7012(97)00030-0)
- Sahin, F., & Robinson Jr., E. P. (2005). Information sharing and coordination in make-to-order supply chains. *Journal of Operations Management*, 23(6), 579–598. <https://doi.org/10.1016/j.jom.2004.08.007>
- Sanders, N. R., & Premus, R. (2002). It Applications in Supply Chain Organizations: A Link Between Competitive Priorities and Organizational Benefits. *Journal of Business Logistics*, 23(1), 65–83. <https://doi.org/10.1002/j.2158-1592.2002.tb00016.x>
- Stank, T. P., Crum, M. R., & Arango, M. (1999). BENEFITS OF INTERFIRM COORDINATION IN FOOD INDUSTRY SUPPLY CHAINS. *Journal of Business Logistics*. Retrieved from <http://trid.trb.org/view.aspx?id=615319>
- Swink, M., Narasimhan, R., & Wang, C. (2007). Managing beyond the factory walls: Effects of four types of strategic integration on manufacturing plant performance. *Journal of Operations Management*, 25(1), 148–164. <https://doi.org/10.1016/j.jom.2006.02.006>
- Vickery, S. K., Jayaram, J., Droge, C., & Calantone, R. (2003). The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships. *Journal of Operations Management*, 21(5), 523–539. <https://doi.org/10.1016/j.jom.2003.02.002>
- Weill, P. (1992). The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector. *Information Systems Research*, 3(4), 307–333. <https://doi.org/10.1287/isre.3.4.307>

- Wu, F., Yenyurt, S., Kim, D., & Cavusgil, S. T. (2006). The impact of information technology on supply chain capabilities and firm performance: A resource-based view. *Industrial Marketing Management*, 35(4), 493–504. <https://doi.org/10.1016/j.indmarman.2005.05.003>
- Zhao, Feng, & Wang, D. (2015). Is more supply chain integration always beneficial to financial performance? *Industrial Marketing Management*, 45, 162–172. <https://doi.org/10.1016/j.indmarman.2015.02.015>
- Zhou, H., & Benton Jr., W. C. (2007). Supply chain practice and information sharing. *Journal of Operations Management*, 25(6), 1348–1365. <https://doi.org/10.1016/j.jom.2007.01.009>