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The Effect of Electronic Commerce in Business Value and Supply Chain Process: Evidence from Iran

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Abstract

This paper aims to develop and test a model to analyze the relationships between three aspects of technical electronic commerce (EC)-based information system (IS) resources and, the supply chain process integration, and business value. The paper is consistent with the perspective on IS-enabled organizational capabilities and resource based view of the firm. A questionnaire-based survey was conducted to collect data from 204 supply chain, logistics, or procurement/ purchasing managers of manufacturing firms. Findings show that supply chain process integration, a key EC-enabled organizational capability, can enhance business value. Additionally, the capability serve as a catalyst in transforming technical EC-based IS resources (technical quality of EC applications, EC advancements, EC alignment and E-branding) into higher value for a firm. Our results suggest that supply chain process integration is an important intermediate organizational capability through which value of EC-based IS resources can be materialized. However, the technical aspects of EC-based IS resources needs to developed to effectively form supply chain capabilities.

Key words: Supply chain integration; Business value; Electronic commerce; Business performance; Resource-based view; Information system; E-branding

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INTRODUCTION

The use of IT is considered as a prerequisite for the effective control of today's complex supply chains. Indeed, a recent study conducted by Forrester Research indicates that U.S. manufacturers are increasingly dependent on the benefits brought about by IT to: improve supply chain agility, reduce cycle time, achieve higher efficiency and deliver products to customers in a timely manner (Radjou, N., 2010). Also investment in EC applications, as a subset of information system has become a strategic imperative for firms that wish to compete successfully in the electronic business environment. Although the adoption, use, and value of electronic commerce have emerged into an active research area in the information systems (IS) discipline, only a small number of studies focused on the business value of EC (Straub et al., 2002). Since contemporary businesses are facing time-to-market pressures and hyper-competition in the highly competitive and turbulent business environment (Overby et al., 2006; Rai et al., 2006), EC-enabled business value is regarded to be an imperative for business success (Zhu, 2004). Value creation in e-business is one of the most important issues in deciding about e-business component investments. Amit and Zott (2001) discuss the sources of e-commerce value creation based on six different theoretical frameworks and summarize that each of them suggests possible sources of value creation.

Many studies in Information systems (ISs) have reported findings about the relationship between IT and firm performance. Several theories have been proposed to explain the widespread of IT, such as the resource-based view (RBV), transaction cost theory (Li and Ye,

1999; Subramani, 2004), media richness theory (Banker et al., 2006), coordination theory (Straub et al., 2004; Lai et al., 2008), or social exchange theory (Goo et al., 2007; Han et al., 2008). These theories have different applicable research domains. For example, the transaction cost theory has been widely used to explain IT outsourcing and the media richness theory has been used to explain the selection of a particular software tool. Among them, the major theory that has been adopted to interpret the relationship between IT and firm performance is the RBV proposed by Wernerfelt (1984). The basic argument of RBV is that firm performance is determined by the resources it owns. The firm with more valuable scarce resources is more likely to generate sustainable competitive advantages. In this view, IT is considered a valuable organizational resource that can enhance organizational capabilities and eventually lead to higher performance. In a recent study, in strategic management, Crook et al. (2008) argued that RBV "has emerged as a key perspective guiding inquiry into the determinants of organizational performance". Viewed from resource based view (RBV), the relationship between firm's IS resources and business value has been scrutinized through two different sets of research models titled "direct-effect models" and "indirect-effect models" (Liang *et al*., 2010). The direct effect RBV-based models try to link firm's IS resources and firm performance (as two main construct) and to investigate the direct relationship between them (Bardhan *et al*., 2006; Bhatt and Grover, 2005). Although several prior studies have tried to directly link firm IS resources to performance gain, they have sometimes been inconstant to justify this link (Liang *et al*., 2010). For example, researchers such as Cragg *et al*. (2002) and Tallon *et al*. (2000) were inconclusive in offering authoritative evidences of benefits resulting from IS investment. The rubric of the "productivity paradox," indicating a weak relationship between IS investment and productivity was culminated by the affirmations of Carr (2003) in his article "IS Doesn't Matter".

Carr (2003) discusses that recent ubiquitous and inexpensive IS are available to all firms. Referring to RBV assuming inimitability and scarcity of organizational resources as the attributes required for performance advantage (Barney, 1991); common and easily-accessible IS cannot provide businesses with supernormal rent (Carr, 2003). Correspondingly, Ray *et al*. (2005) found that IS resources possessed by firm including technical skills of IS unit, managers' technology knowledge, and IS spending do not exercise direct effect on the performance of the customer service process. Contrary, several researchers have provided consolidate evidence of significant link between firm's IS resources and performance gain using direct effect RBV-based models (e.g., Zue and Kraemer, 2002). Bhatt and Grover (2005) and Bardhan *et al*. (2006) respectively reported that firm's IS resources are directly significantly related with competitive differentiation advantage and performance gain. Consistent with discussed paradox, the most recent literature on the business value of IS rationalized these relationships through the so-called IS-enabled organizational capabilities perspective (Rai et al., 2006). From this perspective, IS has an indirect, not a direct, impact on firm performance through higher-order process capabilities. IS-enabled organizational capabilities perspective explains that firm's IS resources can augment critical organizational capabilities, which can result in improved value gain (Bharadwaj, 2000; Bharadwaj et al., 2007). In this regard, physical and managerial capabilities (Fink and Neumann, 2009), relationship learning (Jean and Sinkovics, 2010), entrepreneurial culture (Benitez-Amado et al., 2010a), and in particular, supply chain capabilities (Byrd and Davidson, 2003; Rai et al., 2006; Wu et al., 2006) are some critical organizational capabilities investigated as mediator between IS resources and firm performance. According to Tanriverdi (2005), through the use of related and complementary IS resource and subsequently by creating cross-unit business synergies, IS-based coordination mechanism can be created and organizational capabilities would be enhanced.

In the context of EC and business value, most of prior research have mostly developed and used direct-effect model and provided evidence of significant link between firm's EC-based IS resources and business value/performance gain (Ordanini and Rubera, 2010; Zue and Kraemer, 2002). The e-business value EC was found to lead to improved firm performance in sale, internal processes and customer/supplier relationships through market expansion, improved information sharing efficiency, and improved transactional efficiencies (Ordanini and Rubera, 2010; Zue and Kraemer, 2002, Zue, 2004). However, and to best of our knowledge, little has been done to understand the relationship between EC-based IS resources and higher order organizational capabilities. We believe that similar to corresponding IS stream, assessing the mediating role of higher order organizational capabilities as the catalyst in transforming the value of EC-based IS resources into higher performance gain for a firm can provide better justification for investment in EC, and assist with resolving of IS productivity paradox. As such, the research model of this study posits that firm's complementary EC-based IS resources affect its performance through improving supply chain process integration.

1. LITERATURE REVIEW AND RESEARCH MODEL

In this research, an integrated model to examine the indirect effect of EC-based IS resources through the mediating role of supply chain process integration is proposed in Figure 1. Since business value, organizational

resources, and organizational capabilities are three major constructs in the RBV-based models investigating IS-enabled value gain, the RBV-based research model of this study is consisted of these three constructs.

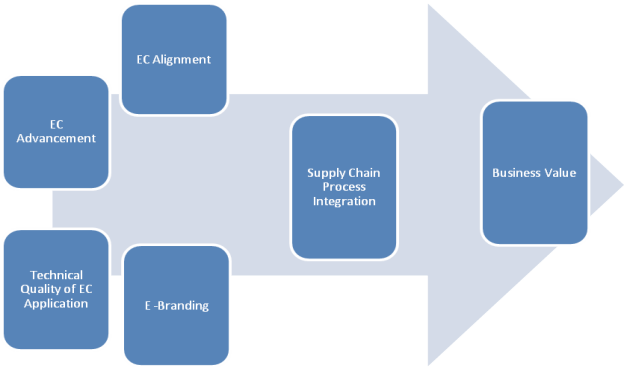


Figure 1
Research Model

1.1 Business Value

Figure 2 depicts the four sources of value creation in business that emerged from the data analysis. The term 'value' refers to the total value created in business transactions regardless of whether it is the firm, the customer, or any other participant in the transaction who appropriates that value. We therefore adopt Brandenburger and Stuart's (2006) view of total value created as the sum of the values appropriated by each party involved in a transaction. Four major value drivers are efficiency, complementarities, lock-in, and novelty. We suggest that the presence of these value drivers, which are anchored in the received entrepreneurship and strategic management theory, enhances the value-creation potential of e-business.

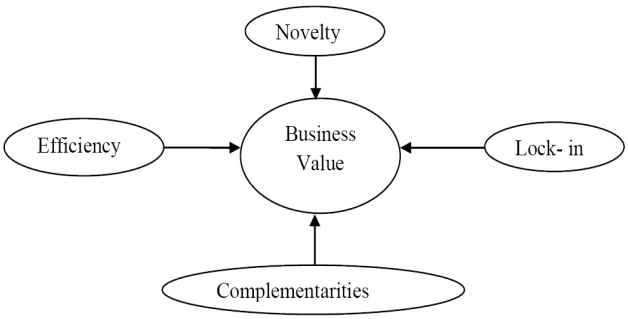


Figure 2
Sources of Value Creation in Business

Efficiency enhancements relative to offline businesses (i.e., those of companies operating in traditional markets), and relative to other online businesses (i.e., those of companies operating in virtual markets), can be realized in a number of ways. One is by reducing information asymmetries between buyers and sellers through the supply of up-to-date and comprehensive information. The speed and facility with which information can be transmitted via the Internet makes this approach convenient and easy. Improved information can also reduce customers' search and bargaining costs (Lucking-Reiley and Spulber, 2010), as well as opportunistic behavior (Williamson, 1975). By leveraging the cheap interconnectivity of virtual markets, e-businesses further enhance transaction efficiency by enabling faster and more informed decision making.

Novelty The value creation potential of innovations has been articulated by Schumpeter (2010). While the introduction of new products or services, new methods of production, distribution, or marketing, or the tappings of new markets have been the traditional sources of value creation through innovations, our data analysis reveals that e-businesses also innovate in the ways they do business, that is, in the structuring of transactions.

Lock-in The value-creating potential of an e-business is enhanced by the extent to which customers are motivated to engage in repeat transactions (which tends to increase transaction volume), and by the extent to which strategic partners have incentives to maintain and improve their associations (which may result in both increased willingness to pay of customers and lower opportunity costs for firms). These value-creating attributes of an e business can be achieved through 'lock-in.' Lock in prevents the migration of customers and strategic partners to competitors, thus creating value in the aforementioned ways. Lock-in is manifested as switching costs, which are anchored in Williamson's (1975) transaction cost framework, and as network externalities, which has its roots in network theory (Katz and Shapiro, 1985; Shapiro and Varian, 1999). It should also be noted that, as RBV theory suggests, a firm's strategic assets, such as its brand name, and buyer–seller trust, both contribute to lock-in.

Complementarities can be defined with respect to outputs or inputs, that is, with respect to the determinants of a firm's profit function. A profit function that is well behaved (i.e., concave, continuous, and twice continuously differentiable) is complementary in its inputs if raising the level of one input variable increases the marginal return to the other input variable. This notion of complementarity goes back to Edge worth, Milgrom, and Roberts (1990, 1995), who present a generalization of this idea that is relevant for the strategy field.

1.3 Supply Chain Capabilities

The role of firm's IS resources in managing the supply chain processes has drawn growing attention in the corporate world (Wu et al., 2006). As companies began to interact with their suppliers electronically over the last decade, supply chain management (SCM) has inherited the forefront of organizational practice to form inter-functional operations within their organizations and to forge electronic connections with key customers

(Byrd and Davidson, 2003; Iyer et al., 2009). The main objectives of the SCM function include cost reduction, improvement and innovation of end-to-end processes between firms and their customers and suppliers, improved communication and interaction among supply chain partners, and improved performance and productivity in a way that benefits all contributors in the supply chain (Rai et al., 2006; Ranganathan et al., 2004). Referring to the "IS-productivity paradox" and other anecdotal evidences questioning the impact of IS on firm performance, several recent researchers have proposed that IS-enabled supply chain capabilities can serve as a catalyst in transforming IS-related resources into business value gain (Bharadwaj, 2000; Ranganathan et al., 2004; Tan et al., 2010). Accordingly, considerable attention has also been devoted to the supply chain capabilities since it has been recognized as one of the today's competitive advantages in a global market place (Rai et al., 2006; Wong and Boon-itt, 2008). Supply chain capabilities allude to the ability of firms to identify, utilize, and assimilate both internal and external resources/information to facilitate the entire supply chain activities (Rai et al., 2006; Wu et al., 2006; Zolait et al., 2010). In this research, we consider supply chain capability as supply chain process integration.

1.3.1 Supply Chain Process Integration and Business Value

We explore two types of integration in this study:

1) interfirm activity integration; and
2) interfirm systems integration.

The extant literature does not differentiate between the two; however, we believe the differentiation is crucial as they are not exactly the same. It is possible for two firms to integrate their systems without integrating activities like planning and collaborating or vice versa. However, this joint planning and collaboration, activity integration, is a step beyond the mere integration of systems as it involves sharing firms' proprietary information for successful integration. The previous literature on supply chain capabilities and its impact on firm performance suggests that two capabilities across the information sharing or exchange (Kim et al., 2006; Rai et al., 2006; Sahin and Robinson, 2002) and supply network including activity integration (Kim et al., 2006; Wu et al., 2006) are some of the main dimensions of supply chain process integration. Therefore, supply chain process integration is conceptualized as a second-order construct that includes two dimensions: activity integration and information sharing.

Interfirm activity integration

The ability for firms to manage a complex network of supply chain relationships has been a central subject of examination in the supply network management literature (Holmen et al., 2007). In the present study we focus on the integration across partners in the supply chain. We conceptualize interfirm activity integration as the extent to which supply chain partners are actually engaged in collaborative planning and forecasting (Kim et al., 2006). Interfirm activity integration can be enhanced only when supply chain partners are willing to attain common goals in the market together as a supply chain. It is not a simple process for firms to achieve activity integration with their supply chain partners. The firm that wishes to achieve this integration has to consciously change its business model to reach its goals with supply chain partners. No longer will it view each transaction as discrete, but rather each transaction will be viewed as part of a larger continuous transaction out of the supply chain relationship. In this way, firms will be able to achieve activity integration with their supply chain partners (Clark and Stoddard, 1996). This ability of a firm to integrate activities with its partners is a capability that can be used to achieve competitive advantage as closely integrated partners can more effectively adjust their business plans and strategies collaboratively according to evolving market conditions (Philipsen and Damgaard, 2008).

Interfirm system integration

Interfirm systems integration in this study refers to the extent that a firm's supply chain communication system is ready and, therefore, able to support potential interfirm activity integration. Through such integration, firms are able to increase the effectiveness and efficiency in their interfirm collaborations (Malone et al., 1987). Interfirm system integration is not necessarily a sufficient condition but a necessary condition for efficient interfirm activity integration. The implementation of a high degree of interfirm system integration allows firms to reduce any technical barriers and incompatibilities that may impede communication between supply chain partners (Byrd and Turner, 2001; Kim et al., 2006). The implementation of a lower-level systems integration may allow supply chain partners to share a limited amount of proprietary information including sales and forecasts (Bowersox et al., 1999, 2002). The implementation of a minimal level of interfirm system integration is likely to involve just electronic order-fulfillment, which is the most fundamental interfirm activity between supply chain partners (Kim and Cavusgil, 2009; Powell, 1992).

Interfirm system integration can be defined as the extent that a firm's supply chain communication system is ready and, therefore, able to support potential interfirm activity integration (Kim and Cavusgil, 2009). Kim et al. (2006) and Esper and Williams (2003) limited the scope of interfirm system integration to important collaborative channel activities such as planning and forecasting with other channel members. Kim and Cavusgil (2009) discuss that interfirm system integration is not manifestly a sufficient condition but an indispensable condition for efficient interfirm activity integration. Decrease in any technical obstacles and incompatibilities possibly hampering communication between supply chain partners

is a significant outcome of deployment of high degree of interfirm system integration (Byrd and Turner, 2001), which will further result in performance gain (Kim et al., 2006). In spite of limited number of researches investigating interfirm activity integration and interfirm system integration as two distinct capabilities (e.g., Kim and Cavusgil, 2009), the literature does not explicitly consider these capabilities as distinct dimensions (Kim et al., 2006). Therefore, in this research, activity integration is defined as both interfirm activity and interfirm system integration without applying any distinction between these two dimensions. Accordingly, collaboration in projecting, planning, and forecasting future demands, as well as compatibility of EC applications with these capabilities are constructs of activity integration in this research.

Information sharing (exchange) is the most obvious and immediate outcome of IS usage in SCM (Kim et al., 2006). Information sharing is defined as the ability of a firm to share knowledge with its supply chain partners in an effective and efficient manner (Wu et al., 2006). The exchange process includes all types of information: operational, tactical, and strategic information (Rai et al., 2006). Consistent with Rai et al. (2006), as well as a recent study by Welker et al. (2008) on information sharing mechanisms among supply chain, the information on inventory and sale specification, production and delivery schedule, and demand forecasting and planning are considered as indicators of information sharing in this research. Information sharing can result in cost reductions in both broad terms and specific costs including freight, inventory, and information handling (Tan et al., 2010). Likewise, some inventory-related metrics can be enhanced due to information sharing (Manabe et al., 2005).

Sharing and exchanging inventory holding information can decrease total inventory in the supply chain network (Rai et al., 2006). Accuracy and timeliness of supplier deliveries and reduced time to process a purchase request are other advantages of information sharing (Tan et al., 2010). Rai et al. (2006) discuss that improved operational efficiencies (resulted from enhanced coordination of allocated resources, activities, and roles throughout the supply chain) can be achieved through production and delivery schedules. Information sharing also positively affects supply chain proximity and flexibility, subsequently supply chain performance (Chan and Chan, 2009), while supply chain proximity exerts a positive impact on firm financial and marketing performance (Narasimhan and Nair, 2005). Moreover, the consequences of the bullwhip effect can be significantly minimized through information sharing capability within supply network (Shore and Venkatachalam, 2003). Investigating channel relationships in supply chain and firm performance, Kim et al. (2006) discuss that firm market performance is directly positively affected by information sharing. With regard to the evidence of direct relationship between firm performance and information sharing (Tan et al., 2010), this integration capability has been identified as one of the most fundamental abilities in the supply chain process integration (Shore and Venkatachalam, 2003; Wu et al., 2006).

1.4 EC-based is Resources

Information systems and technologies are valuable organizational resources and critical enablers of firm performance (Tan et al., 2009). Consistent with RBV, the IS construct can be defined in terms of IS-based resources. Melville et al. (2004) operationalized the IS resource as physical capital (e.g., IS infrastructure and specific business applications) and human capital (e.g., technical and managerial knowledge), and organizational capital resources. Similarly, a recent research by Benitez-Amado et al. (2010b) operationalizes technological IS resources, managerial IS resources, and IS staff's technical skills as three dimensions of firm's IS resources. Fink and Neumann (2009) however discuss that "technical-oriented approach", "component-oriented approach", and "process-oriented approach" are three different approaches to identify and evaluate IS resources and their competence. In this research, we follow technical-oriented approach and addresses the technical aspects of EC-based IS resources and their relative impacts over business value.

1.5 Technical Quality of EC Applications

It has been reported that technical IS resources are the most used measure to investigate firm's IS resources (Wu et al., 2006). Technical IS resources referring to the physical aspect of IS resources including the specification and quality of hardware, software, databases, applications and networks, has also been named as technological IS resources by previous researchers (Benitez-Amado et al., 2010b; Ray et al., 2005). Byrd and Davidson (2003) discuss that the technical quality of IS department is a momentous element of IS resources controlled by firm that significantly affects the IS enabled supply chain capabilities and subsequently firm performance. The performance and the efficiency of hardware, operating systems, communication service, and business application software, as well as end user support of adopted IS are some value measures of IS technical quality (Weill and Broadbent, 1998). This discussion provides support for Byrd and Turner (2001) and Mata et al. (1995) who found that IS technical quality is critical to maintaining sustained competitive advantage from an organization's IS resources. Therefore, we note that in addition to other investments in business resources, organizations need significant investment in technical quality of IS resources to develop higher order organizational capabilities, as IS resources have been considered to be key enablers of firm innovation (Koellinger, 2008). Investments in IS can enable IS department and business employees to access information and to collaborate with other workers and

departments in the firm itself, and within supply partners in ways that they have not previously interacted (Benitez-Amado et al., 2010a).

Technical IS resources also improve supply chain efficiency by facilitating the creation of business to business/business to customer data integration processes and enabling the standardization of data interchange interfaces through facilitating the standardization of business processes as it provides an asset to codify and modularize business process knowledge (Bardhan et al., 2006). Therefore, and consistent with prior literature suggesting the positive relationship between higher order organizational capabilities (e.g., information sharing and coordination with trading partners) and technical quality of IS resources (Byrd and Davidson 2003; Fink and Neumann, 2009), we believe that higher technical quality of EC applications such as electronic supply chain management (ESCM) systems (e.g., regarding the compatibility with existing procedure) will provide the focal firm and its trading partners with capabilities for better information sharing, collaborative planning and forecasting, and support for activity integration.

1.5.1 EC Advancement

We also believe that the advancement of EC applications is another strategic resource controlled by firms facilitating higher order organizational capabilities and consequently business value gain. In our model, EC advancements mainly refers to the deployment of the most advanced EC applications for the focal firms to improve their supply chain communication system (SCCS) in supply chain relationships. It is expected that organizations successfully enhance efficiency in their business activities and processes through advanced EC applications since firms with advanced technology outperform their competitors (Kim et al., 2006). Consistent with the RBV suggesting the complementarities of firm resources in value creation (Tippins and Sohi, 2003), using advanced IS such as sophisticated EC applications is expected to facilitate three sub-processes of relationship learning including information exchange, joint sense making, and relational-specific memory in supply chain relationships so that value of advanced IS can be enhanced by complementing with information-intensive inter and intra-organizational process (Jean and Sinkovics, 2010). As such, and due to its wide availability in the market, generic IS alone cannot be a source of competitive advantage (Kim et al., 2006) and thus only when a business integrates the advanced technology (e.g., advanced EC applications) with its core strengths, assets, or capabilities (e.g., strong channel and customer relationships through administrative innovations) business value gain would be facilitated (Barney 1991). Accordingly and consistent with RBV, we believe that using advanced EC applications ahead of competitors will make IS resources firm specific and imperfectly mobile across firms, providing the adopting firm with additional business value not achievable by late users.

Advanced EC applications in SCCS can help build stronger supply chain capabilities in several ways. These applications such as collaborative planning, forecasting, and replenishment (CPFR) or advanced ECSM systems can help uncover patterns in data and accelerate the speed of information acquisition and information exchange, thus assist with processing large quantities of information shared across supply chain (Jean and Sinkovics, 2010). These applications can provide supply chain partners with interpreting information in a more timely and accurate way (Malhotra et al., 2005). Moreover, the deployment of advanced EC applications in the supply chain system can result in better coordination and reduce transaction costs between partners, and can also improve interfirm integration between channel partners (Wu et al., 2006). The advancement of EC in SCCS such as IS-enabled interpretation systems can result in creation of new knowledge through enabling the information obtained from supply chain partners to be organized, rearranged, and processed to (Malhotra et al., 2005). Likewise, advanced and efficient EC applications in SCCS provide business partners with greater ability to respond to market changes and customer requests in a timely manner (e.g., by enabling just-in-time inventory techniques) along with efficient information exchange and coordination activities (Stank et al., 1999; Wu et al., 2006). Given the potential impact that advanced EC applications have on the various supply chain processes and relationships including information sharing, joints sense making, collaborative planning and forecasting, and activity integration.

1.5.2 EC Alignment

Strategic IS alignment reflects the incorporation of the business strategies, goals, and mission into the IS strategy during the IS planning process (Kearns, 2005). Accordingly considerable concern has been expressed by chief executive and information officers over alignment between IS strategies and business strategies (Zviran, 1990). In the context of supply chain management, IS alignment is defined as the extent to which a firm's information system is compatible with that of its channel partners (Powell, 1992). IS alignment refers to extend to which information system is embedded across the supply chain and it requires channel partners to coordinate and align their business processes and strategies with each other in order to achieve efficiency (Wu et al., 2006).

Although it has been reported that due to ease of access to common IS, firms can enhance efficiency in their business activities and processes by adopting advanced IS (Stank et al., 1999; Tippins and Sohi, 2003), yet, alignment of IS are equally important for the functional adequacy of SCCS as well (Hausman and Stock, 2003). Kearns (2005) discusses that non-existence of IS alignment might result in lower returns, market place

confusion, and erosion of the firm's competitive position due to in coordination of EC strategies and overall direction of company. In this regard, it has been reported that IS alignment can positively affect both competitive advantage and firm performance (Chan and Huff, 1993; Lederer and Mendelow, 1989). The rationale behind is that through the process of business processes alignment in the supply chain network, firms would be competent to develop a higher level of supply chain process capabilities that are otherwise barely attainable when acting alone. These capabilities necessitate the integration of resources across the supply chain process, and ARE alignment provides the basis for such integration (Wu et al., 2006). Similarly, the flow of information and resource sharing within firms can be enhanced through improvement in IS alignment (Garcia et al., 2003). Finally, IS alignment can provide businesses with enhanced collaboration with partners (aimed at addressing the changing market needs), superior coordination of strategic planning process, improved supply chain responsiveness, and organizational effectiveness (Philip and Booth, 2001; Segars et al., 1998). Therefore, in this research, it is assumed that EC alignment defined as the extent to which EC applications such as EDI used for SCCS are well aligned with a focal firm and its supply partners (regarding technology, supply chain strategies, and other criteria) is positively related with supply chain capabilities and business value gain.

1.6 E-Branding

Brand is defined in many ways in the literature. The consumer psychology perspective depicts brand equity as a multidimensional construct consisting of loyalty, quality, brand associations, and brand awareness (Aaker, 1991, 1992, 1996) or as the sum of brand knowledge (Keller, 1993). The overall supply chain will impact e-branding as well. For a firm to be able to increase its brand, it needs to be able to respond to the changing needs of the customers. It needs to be able to build an emotional connection with customers to ensure that they remain brand loyal. Firms that effectively integrate their supply chains are able to exchange accurate and timely information about customers (Moberg et al., 2002; Stank et al., 1999). This will allow the firms to ensure that customers are aware of the advertising and that it is targeted toward the correct customer. Therefore, the research hypotheses are following:

H1. The supply chain process integration has a positive and significant effect on firm business value.

H2. The technical quality of EC applications has a positive and significant effect on supply chain process integration.

H3. EC advancement has a positive and significant effect on supply chain process integration.

H4. EC alignment has a positive and significant effect on supply chain process integration.

H5. EC alignment has a positive and significant effect on firm business value.

H6. E-branding has a positive and significant effect on supply chain process integration.

1.7 Control Variable

Firm size has traditionally been used as a control variable when firm performance is used as a dependent variable. Larger businesses could derive greater synergy effects from human and financial resources that lead to better performance (Wu et al., 2006). In this research Total number of full-time equivalent employees and sales volume of past year was used as a measure of firm size. We believe the control of business size enables us to identify the nature of relationship between supply chain capabilities and firm performance more effectively.

2. RESEARCH METHODOLOGY

2.1 Instrument Development

We primarily tried to develop the measurement items by adapting form validated existing scales from prior literature. For new measures and for those significantly adapted or changed, we acted on the foundation of guidelines and exemplars in the literature (e.g., Straub, 1989; Sethi and King, 1991). Three well-established IS scholars having high experience in survey research and expertise in the subject domain were asked to assess the instrument. The questionnaire and all scales were translated to Persian through assistance of two native professional English translators. The IS scholars further helped us with the process of "back-translation" of items into English to ensure the validity of questionnaire. After incorporating suggested changes and in order for testing and assuring face validity of the questionnaire, we piloted the questionnaire on 8 supply chain and logistics managers in all three provinces and within different industries through face to face interview. Based on feedbacks from the pilot study, some questions were rephrased to improve their clarity. As a result, some minor revisions were applied to the questionnaire before final data collection. In the proposed research model, business value and supply chain process integration are second order construct. The first-order indicators for business value are market efficiency, financial efficiency, and product/process efficiency. The first-order indicators for supply chain process integration however include activity integration and information sharing. The measurement items of applied instrument are shown in Table 1 in which for all scales, each item was measured using a seven-point Likert scale.

Table 1
Operationalization of the Constructs of Research Model

Lable	Item	Source
Business value (1-7, strongly disagree to strongly agree/ very inferior to very superior)		
Process Efficiency		
Pef1	EC technology infrastructure has provided with decreased inventory costs	Zhu and Kraemer (2005)
Pef2	EC technology infrastructure has provided with coordination with suppliers	
Pef3	EC technology infrastructure has provided with staff productivity	
Pef4	EC technology infrastructure has provided with decrease in costs of operation	
Market Efficiency		
Mef1	Company performs much better than competitors in market share of products	Zhu et al. (2004), Wu et al. (2006)
Mef2	Company performs much better than competitors in increased sale of products	
Mef3	Company performs much better than competitors in customer relationships	
Financial Efficiency		
Fef1	How would you characterize your company's return on assets (ROA) Compared to that of your competitors?	Byrd and Davidson (2003)
Fef2	How would you characterize your company's return on investment (ROI) compared to that of your competitors?	
Fef3	How would you characterize your company's overall profitability compared to that of your competitors?	
Supply chain capabilities (1-7, strongly disagree to strongly agree)		
Information Sharing		
Is1	Production and delivery schedules are shared across the supply chain	Rai et al. (2006) and Wu et al. (2006)
Is2	Collaboration in demand forecasting and planning is consistently conducted with our business partners	
Is3	Our downstream partners (e.g., distributors, wholesalers, retailers) share their actual sales data with us	
Is4	Inventory data are visible at all steps across the supply chain	
Activity Integration		
Ai1	My company projects and plans future demand collaboratively with our partner	Rai et al. (2006) and Wu et al. (2006)
Ai2	Collaboration in demand forecasting and planning with our partner is something we always do in my company	
Ai3	My company always forecasts and plans activities collaboratively with our partner	
Ai4	My company can forecast and plan collaboratively with our partner through EC-based SCCS applications	
Ai5	Collaboration in demand forecasting and planning with our partner is always possible through our EC applications	
Technical quality of EC Applications (1-7, "very inferior to" and "very superior to" closest competitors)		
ECq1	How would you characterize your firm's hardware and operating systems performance?	Byrd and Davidson (2003)
ECq2	How would you characterize your firm's communications services (i.e., LAN, EDI and firm own website)?	
ECq3	How would you characterize your firm's advanced business applications software (i.e., ESCM systems and CPFR) performance?	
ECq4	How would you characterize the level of EC applications investment and expenditure in company?	
Adv1	Our company uses the most advanced EC applications for supply chain management	Jean and sinkovics (2010), Kim et al. (2006)
Adv2	Relative to competitors, our EC applications for supply chain management is more advanced	
Adv3	My company is always first to use new EC applications for supply chain management in our industry	
Adv4	In our industry my company is regarded as an EC advancement leader for supply chain management	
EC alignment (1-7, strongly disagree to strongly agree)		
Alig1	My company's EC applications for SCCS is well aligned with our partner	Wu et al. (2006)
Alig2	My company invests in EC applications to align our SCCS infrastructure with our partner	
Alig3	Our partner invests in EC applications to align their SCCS infrastructure with us	
Alig4	Both my company and our partner always work together for the best EC alignment	
Alig5	EC advances for SCCS, between my company and our partners, are well aligned for best supply chain performance	
E-branding		
EB1	E-branding provide a high level of quality and performance and effectively communication in the supply chain	Kotler and Pfoertsch 2007
EB2	E-branding has the ability to react to competitors in an effective and timely manner will increase the competitive advantage of the firm	

2. 2 Sampling Plan

This study examines supply chain partnerships at the business unit level. The most appropriate informant for this study was the supply chain manager, and where firms did not have a supply chain manager we included logistics managers and procurement/purchasing managers as potential informants. Using a member list of the Council of Logistics Managers (CLM), we sent a preliminary request for participation to the pool of 1,949 managers via e-mail. Five managers declined to participate and 218 e-mails were returned as undeliverable. Included with the e-mail was a URL link to the survey. A reminder

was sent out after just over a week. We set a three week deadline and within those three weeks 264 managers out of the remaining 1,726 responded. This shows an effective response rate of 15.3 percent. Our final sample had 204 responses, as 80 of the responses were incomplete. Table 2 reports the characteristics of the responding firms.

Table 2
Sample Profile

Respondent gender	Number of respondents (Percent)
Industry	
Automotive	37 (18.14)
Computer and communication	16 (7.84)
Electronic equipment	11 (5.39)
Food and beverage	28 (13.73)
Industrial machinery	18 (8.82)
Optical and medical instruments	16 (7.84)
Petrochemical	24 (11.76)
Wood, tissue, and paper products	20 (9.80)
Other	34 (16.67)
Total	204 (100)
Number on Employees	
< 50	16 (7.84)
50-100	31 (15.20)
100-250	61 (29.90)
250-500	73 (35.78
> 500	23 (11.27)
Total	204 (100)
Annual sale (million US$)	
< 10	47 (23.04)
10-50	53 (25.98)
50-100	51 (25.00)
100-200	32 (15.69)
>200	21 (10.29)
Total	204 (100)

3. MEASUREMENT MODEL

We used the two-step approach (Anderson and Gerbing, 1982, 1988; Bollen, 1989) beginning with a confirmatory factor analysis (CFA). The two-step approach involves assessment of the measurement model before estimating the study model to examine the adequacy of the measurement model independently from the study model, using the structural equation modeling (SEM) technique. Some items that weakly loaded on their respective constructs were eliminated in the measurement purification process. The results from the CFA demonstrate excellent fit between the co variances from the data and the CFA model (χ^2 = 131.132, d.f = 94, CFI= 0.982, NFI = 0.977, and RMSEA =0.047). Subsequently, we proceed to assess the adequacy of the study constructs. From the CFA results, we assess the reliability and validity of the study constructs. First, we calculated the composite reliability using techniques proposed by Fornell and Larcker (1981). Unlike alphas, composite reliability allows assessment of construct reliability using the loadings of all measurement items directly from CFA. The composite reliabilities ranged between 0.86 and 0.92, suggesting excellent reliability of the measures. We also examined the parameter estimates and the t-values associated with these for convergent validity. All the loadings were shown to be significant, indicating a good level of convergent validity. As a means of showing discriminate validity, average variance extracted (AVE) for each construct is calculated. We then calculated the shared variance between constructs and verified that they were lower than the AVEs for the constructs (Fornell and Larcker, 1981). Thus, all pairs of constructs reveal an adequate level of discriminate validity. In summary, our measurements show acceptable reliability and validity. Table 3 shows the loadings, composite reliabilities and average variance extracted from the CFA. Table 4 shows the correlations of the measures.

Table 3
Summary Statistics of the Constructs and Measures

Variable	Factor loading (>0.7)	Cronbach's alpha	Composite reliability (> 0.7)	Average variance extracted (>0.5)
Business value				
Process Efficiency	-	0.781	0.879	0.811
Pef1	0.78			
Pef2	0.84			
Pef3	0.89			
Pef4	0.80			
Market efficiency	-	0.901	0.940	0.681
Mef1	0.82			
Mef2	0.81			
Mef3	0.76			
Financial efficiency	-	0.874	0.910	0.698
Fef1	0.88			
Fef2	0.86			
Fef3	0.93			
Supply chain capabilities				
Information sharing	-	0.915	0.954	0.768
Is1	0.78			
Is2	0.79			
Is3	0.84			

To be continued

Continued

Variable	Factor loading (>0.7)	Cronbach's alpha	Composite reliability (> 0.7)	Average variance extracted (>0.5)
Is4	0.80			
Activity integration	-	0.871	0.891	0.769
Ai1	0.91			
Ai2	0.88			
Ai3	0.90			
Ai4	0.81			
Ai5	0.84			
Technical quality of EC applications	-	0.894	0.899	0.675
ECq1	0.88			
ECq2	0.88			
ECq3	0.85			
ECq4	0.90			
EC advancement	-	0.874	0.897	0.781
Adv1	0.77			
Adv2	0.87			
Adv3	0.81			
Adv4	0.83			
EC alignment	-	0.901	0.934	0.691
Alig1	0.90			
Alig2	0.85			
Alig3	0.79			
Alig4	0.83			
Alig5	0.80			
E-branding	-	0.924	0.951	0.812
EB1	0.92			
EB2	0.90			

Table 4
Correlations of Latent Variables

	1	2	3	4	5	6	7	8	9
1. EC alignment	1								
2. EC advancement	0.125**	1							
3.Technical quality of EC applications	0.365*	0.258*	1						
4.Information sharing	0.498*	0.592*	0.359*	1					
5. Activity integration	0.389*	0.378*	0.571*	0.598*	1				
6. Process efficiency	0.594*	0.159**	0.157**	0.571*	0.591*	1			
7.Financial efficiency	0.562*	0.325*	0.698*	0.596*	0.792*	0.489*	1		
8.Market efficiency	0.681*	0.254*	0.589*	0.789*	0.728*	0.584*	0.698*	1	
9.E-Branding	0.459*	0.351*	0.471*	0.265*	0.687*	0.368*	0.752*	0.514*	1

Notes: *P<0.01, ** P<0.05

5. STRUCTURAL MODEL RESULTS

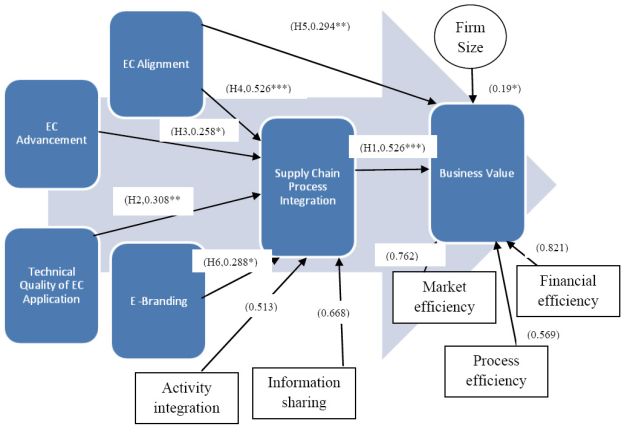
As the second step of structural equation modeling approach, the validity of structural model needs to be assessed since the measurement model has been already specified and validated with CFA. In order to assessing the validity of research structural model, it should be noted that the recursive structural model cannot provide any better fit than measurement model (e.g., providing a lower X2 comparing measurement model) (Hair et al., 2006). Thus, structural theory might lack validity if structural model fit is significantly worse than CFA fit (Anderson and Gerbing, 1992). The summary indices of structure model are shown in Table 5. The results show an acceptable fit between the model and the sample (χ^2= 133.216 with d.f= 96, CFI= 0.982, NFI = 0.977, and RMSEA = 0.046).

Table 5
The Results of Structural Equation Modeling

Measure	Cut-off values	Value	
		Measurement Model	Structural Model
Root mean square error of approximation (RMSEA)	RMSEA<0.08	0.047	0.046
Standardized root-mean-square residual (SRMR)	<0.05	0.0418	0.0484
Comparative fit index (CFI)	>0.90	0.982	0.982
Normed fit index (NFI)	>0.90	0.977	0.977
Goodness of fit index (GFI)	>0.90	0.919	0.908
The chi-square/ degrees of freedom	$1<\chi^2/df<3$	1.38	1.38

We next tested our hypotheses. The first set of hypotheses is supported. For H1, the result indicates that supply chain process integration has positive effect on business value ($\gamma = 0.526$, $p< 0.001$). The second set of hypotheses was Technical quality of EC applications is positively related to supply chain process integration ($\gamma = 0.308$, $p <0 .01$). The result also confirms that EC advancement has positive effects on supply chain process integration which provides support for H3 ($\gamma = 0.258$, $p < 0.05$). H4 and H5 EC alignment have positive effects on supply chain process integration ($\gamma = 0.417$, $p < 0.001$) and business value ($\gamma = 0.294$, $p < 0.01$) respectively. H6. E-branding has a positive effect on supply chain process integration ($\gamma = 0.288$, $p < 0.05$). Finally, firm size, as the control variable, revealed to have relatively significant effect on business value ($\gamma = 0.19$, $p < 0.05$) so that larger firms were found to achieve higher business value gain. Figure 3 illustrates the significant structural relationship among the research variables and the standardized path coefficients in which all of the hypotheses were strongly supported.

To assess the mediation effect of supply chain process integration on the relationship between the EC alignment and business value, two other alternative models were estimated. First, only the direct effects of EC alignment on business value was estimated (assuming there is no relationship between EC alignment and supply chain process integration). Second, the direct effect of EC alignment on the business value was excluded from the original model (assuming that the effect of EC alignment on business value is fully mediated by supply chain process integration) and then the model was analyzed. The comparisons between the original and two alternative models revealed that the highest total effect of EC alignment on business value is provided in the original model. Similarly, the original model also provided the highest model fits (regarding the indices in Table 5). This finding supports our perception that the effect of EC alignment on business value should be considered through the mediating role of supply chain process integration.



Notes: *p<0.05, ** p<0.01, *** p<0.001

Figure 3
Structural Pass Model with Standardized Path Coefficient

6. DISCUSSION

Drawing on the RBV of the firm, we explored the role of supply chain capabilities as a key mediator between EC investment and business value gain. Although our study shows theoretically and empirically how firms can generate business value from EC-enabled organizational capabilities in SCM context, a topic that has received little attention to date, this issue that why a new theoretical model for justifying EC investment and use should be developed in this research given that there are already a significant number of researches in similar research streams might be of some concern. It should be mentioned that businesses in developing countries face challenges different from those in developed countries and differs greatly in adopting and benefiting from EC (Tan et al., 2007), and EC investment and use in developing countries context has only recently gained attention in the academic press (Molla and Licker, 2005a).The literature suggests that in most of the developing countries, EC implementation and institutionalizing has been hindered by the quality, availability, and cost of accessing necessary infrastructure while developed countries have employed a relatively well-developed, accessible and affordable infrastructure for EC. Likewise, the readiness of businesses to govern and regulate EC is an essential element, but one lacking in developing countries, for the trust necessary to conduct e-business (Molla and Licker, 2005b). Since web and communications technologies are complex and offer a variety of functionalities ranging from the static presentation of content to the dynamic capture of transactions with provisions for security and personalization, organizations in developing countries must understand these technologies and decide how to draw upon their functionalities for effectively developing EC initiatives (Chatterjee et al., 2002; Sutanonpaiboon and Pearson, 2006). Owing to the contextual differences

both organizational and environmental) between these two socio-economic arenas, it is recently warranted to understand how businesses in developing countries could overcome the environmental and organizational EC readiness impediments and benefit from EC. For example, Table 6 shows the ICT Development Index (benchmarking tools to monitor information society developments worldwide) of countries that has hosted the surveys in prior literature on EC commerce. These statistics may signify that businesses in developed and developing countries differ in respect to information technology and EC context.

Table 6
Comparison Between ICT Development of Developed and Developing Countries

Country	Development	ICT Development Index (IDI) 2008-2007			
		IDI 2008	Ranking 2008	IDI 2007	Ranking 2007
Sweden	Developed	9.15	1	7.94	1
Luxembourg	Developed	8.92	2	7.15	3
Korea (Rep.)	Developed	8.51	3	7.52	2
Japan	Developed	7.58	8	6.58	12
USA	Developed	6.54	19	6.33	17
Singapore	Developed	6.95	14	6.47	15
Canada	Developed	6.49	21	6.30	18
Iran	Developing	3.08	84	2.73	86
South Africa	Developing	2.79	92	2.64	91
China	Developing	3.23	79	3.03	81
UAE	Developing	6.12	29	5.12	32
Bahrain	Developing	6.01	33	4.87	42
Qatar	Developing	5.45	45	4.71	44
Saudi Arabia	Developing	4.98	52	4.12	55
Kuwait	Developing	3.89	65	4.10	57

Source: ITU Measuring the Information Society 2010

DISCUSSION, CONCLUSION AND MANAGERIAL IMPLICATIONS

This paper provides empirical evidence for the EC enabled supply chain integration especially for Iranian manufacturing firms who lack the resources and capability comparing to huge and overpowering firms with billion dollars annual sale studied in developed countries. Accordingly, our study can help businesses in developing countries with better strategies for justifying IS investment. However, our finding is not limited to the developing countries context as its exploratory findings in signifying the noteworthiness of effects of supply chain capabilities in transforming technical quality of EC-based IS resources to business value are in line with parallel research streams in developed countries (i.e. Jean and Sinkovics, 2010; Kim and Cavusgil, 2009; Rai et al., 2006; Wu et al., 2006). The results suggest that supply chain process integration is a valuable capability that leads to business value enhancement and the three aspects of technical IS resources (technical quality of EC applications, EC advancement and EC alignment) lead to the development of supply chain process integration.

We found that supply chain capabilities are able to transform EC-related resource into a higher business value for a firm, in particular in terms of market efficiency, financial efficiency, and process efficiency. Through embedding EC-based IS resources into a firm's supply chain system, the firm is able to enhance channel-specific assets through effective information exchange and better activity integration with supply chain partners aimed at effective collaborative planning and forecasting. This study also highlighted the significance of EC-based IS resources in achievement of supply chain strategy through IS-enabled upstream and downstream integration as part of the operational and manufacturing strategy.

This study signifies that technical aspect of EC-based IS resources, a specific dimension of IS resource for businesses in supply networks, helps in enhancing the value creation process of supply chain process integration. Moreover, the result revealed that supply chain capabilities are also affected by EC advancement which is accordance with previous researches by Jean and Sinkovics (2010) and Kim et al. (2006). The advancement of EC applications for SCCS enables trading partners to effectively conduct collaborative forecasting and planning and facilitates the breath and quality of information exchange between them. Likewise, and consistent with Byrd and Davidson (2003), the study found that technical quality of EC applications significantly influence the formation of higher supply chain capabilities so that the higher performance and the efficiency of these applications will facilitate supply chain integration efficiency by improving the coordination of the flow of goods and information across supply network. This finding suggests that consistent with RBV; EC-based advantage for firms tends to diminish quickly owing to the relatively low barriers to imitation and acquisition of similar EC application by other firms. Therefore, by implementing advance EC resources ahead of competitors, enhancing the performance and the efficiency of EC resources across supply chain, and with higher system compatibility and integration between channel partners, EC resources controlled by firms becomes unique and imperfectly mobile across their rivals, which can provide them with exclusive benefits through higher efficiency than those of their rivals for at least a certain time period.

This research also demonstrated that that EC-enabled supply chain process integration leads to enhanced business value gain which is consistent with the perspective of IS-enabled organizational capabilities that perceives IS resources as impacting positively on firm performance by means of other higher-order process capabilities (Benitez-Amado et al., 2010a,b; Rai et al., 2006). Information flow integration imposed the largest effect on the formation of supply chain process integration capability which is consistent with Rai et al.'s (2006) finding, which is followed by activity integration.

Information sharing provides manufactures with competence to improve forecasts, synchronize production and delivery, coordinate inventory-related decisions, and develop a shared understanding of performance bottlenecks with their supplier partners (Rai et al., 2006). Activity integration however enables firms with the ability to integrate business processes and activities with its partners, which can be used to achieve sustained performance gain and subsequently competitive advantage as closely integrated partners can more effectively adjust their business plans and strategies collaboratively according to evolving market conditions (Kim and Cavusgil, 2009).

Similarly, our results suggest that supply chain process integration significantly mediates the impact of EC-based IS resources on business value gain, thus imply that examining the impact of EC applications in a specific setting such as a firm's supply chain system can assist to better assess the effect of IS resource on value gain aimed at resolving the "IS productivity paradox". Our results indicate that market efficiency has a very strong and significant weight in the formation of the business value construct, followed by financial efficiency and product /process efficiency. This finding suggests that supply chain process integration enhances marketing excellence relative to competition by squeezing out delays, redundant tasks, and inefficient flows. It provides supply chain partners with an opportunity to jointly codify valuable market knowledge into explicit strategies. More specifically, information sharing capability trough the integrated SCCS can potentially increase the sales volume of supply partners by reaching customers directly and promptly whenever a new product is introduced, and by tapping into markets that were inaccessible on account of distribution or other infrastructure constraints (Wu et al., 2003, 2006). Likewise, supply chains integration provides operational visibility, coordination of plans, and streamlined flow of goods that condense the time interval between a customer's request for a product or service and its delivery, and thus can positively affect the top and bottom line financial performance (Hult et al., 2004; Rai et al., 2006). Integration of supply chain processes also boosts product/process efficiency as it can assist businesses with simplifying the organizational process and reducing lead times with suppliers (Christopher and Ryals, 1999), and allows a firm the ability to produce and deliver products or services to customers at lower cost and higher speed through the improvement in coordination between supply chain partners (Wu et al., 2006). We believe that the suggested model and relative results make a unique contribution to the research and practice in manufacturing sector. Using cross-sectional survey data from a sample of leading Iranian manufacturing firms from 17 different industries we found that:

(1) The development of technical aspects of EC-based IS resources such as technical quality of EC applications, EC advancement, and EC alignment helps firms with the development of higher order process capabilities like supply chain process integration;

(2) The supply chain process integration is a critical capability that increases business value gain through which EC-based IS resources influence firm market, financial, and process efficiency.

Moreover, and to the best of our knowledge, this is the first study examining the effects of technical aspects of EC-based IS resources on supply chain process integration while incorporating the concept of activity integration in this organizational capability. Therefore, our study makes four key contributions to the literature by first both theoretically and empirically showing how firms can develop supply chain process integration by focusing on key roles of EC-based IS resources. Second, this paper reveals how manufacturing firms, particularly in developing countries can generate business value from EC-enabled organizational capabilities, a topic that has received little attention to date. Third, and contrary to previous research examining the role of strategic alignment between IS and overall business strategy of a firm, our study broadens the scope of EC alignment to the entire supply chain and signifies its impact over formation of supply chain process integration. The research findings also have important implications for IS, supply chain, and business managers. Managers need to note that according to RBV, EC-based IS resources offer value when they are embedded in specific organizational processes thus the role of supply chain capabilities in realizing the value of these resources should be recognized. Therefore, development of technical aspects of EC-based IS resources aimed at increasing the firm's ability to develop supply chain process integration is imperative. Supply chain process integration enhances operational performance relative to competition by decreasing inventory and operation costs, delays, redundant tasks, as well as, enables market penetration and provides agility to ensure that sales opportunities associated with the launch of new products and entry into new markets are captured (Rai et al., 2006). Moreover, deployment of the state-of-the-art EC applications for SCCS, especially before it is diffused widely is imperative since it can improve information sharing and coordination between channel partners more effectively. However, it should be noted that reliance on advanced IS technologies alone does not improve supply chain capabilities directly, both in terms of information exchange and coordination activities. Our findings suggest that EC alignment with channel partners is equally indispensable, if not more since EC alignment is imperative for both formation of supply chain process integration and business value gain, thus, a simultaneous investment in EC by all trading partners is needed to achieve the full potential of conducting value chain activities. Finally, this study shows that brand and e-branding has a positive effect in supply chain

integration.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

There are specific limitations to our work that can be addressed in future research. The context of this study is limited to the perspective of Iranian manufacturing firms, which limits the generalize ability of the findings to this specific business sector. Future research that examines our model in other cultural contexts and business context such as retail sectors may improve generalize ability of our findings. Moreover, this study relied on single informant from each firm in testing the study model. Although managerial insights and experience of supply chain/ logistics managers are valuable sources of information in studying a firm business value, the relationships between constructs could have been inflated because of biases. To minimize such biases, future researches are needed to consider collecting data from multiple informants in each business unit. On the other hand, our study is cross-sectional in nature, while we acknowledge that the nature of higher order organizational capabilities is dynamic and continuous. Therefore, although this will add layers of complexity, collecting data over time from the participating managers can offer richer implications, thus it would be interesting to validating the findings of this study using a time-series data. Finally, our study has only examined a subset of technical EC-based resources. Future research should continue to study other IS resources; in particular human IS resources such as technical quality of EC users and expertise and management commitment to EC for supply chain management as warranted by prior literature. Extending the framework of this study, future study may explore the impact of a firm's supply chain integration and responsiveness on customer equity, a newly emerging construct in the marketing literature. Customer equity, which is most firms' ultimate goal, is driven dynamically by brand equity, value equity, and relationship equity of the firm. Therefore, incorporating such equity variables together will allow an investigation on how a firm's supply chain activities influence a firm's ultimate goal more dynamically. In this way the focus of the results would go beyond focusing on the brand, what the firm offers, to focusing on the customers, what the market is seeking.

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