

## CHAPTER 19

# Information Technology-Enabled Innovation: A Critical Overview and Research Agenda

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### 1 Introduction

Contemporary studies have broadened our insights about the roles which information technology (IT) plays in supporting innovation in organizations and markets. These studies have also showcased an ever-expanding range of theoretical perspectives. The diversity of issues, levels and perspectives illustrated in the contributing chapters of this handbook raises relevant questions about the degree of theoretical development and integration, and the extent to which a clear cumulative body of knowledge is emerging.

While the diversity of approaches is impressive, there is little integration among them, making coherent innovation models and organisational strategies enabled by IT elusive. This is particularly apparent in the context of new industry dynamics, as the evolving use of the Internet demonstrates. Increasingly, scholars stress the need to cross-fertilize ideas by considering diverse theoretical levels of analysis which take into account the *processes* and *outcomes* of IT-enabled innovation within organisations and markets<sup>10-15</sup>. The articulation of processes and outcomes requires the acknowledgement of the inter-level dynamics, transformational attributes and symbiotic effect of information technology in organizations and markets<sup>19</sup>.

Here we engage in a critical overview of selected representative studies focusing on IT-enabled innovation at the level of the organisation and markets. The purpose of this review is to update our understanding

and help scholars develop more robust and integrated theories of IT-enabled innovation. We make the case that scholars of IT in organizations are best served by adopting theoretical perspectives and research designs that systematically combine the study of research questions related to both *process* and *outcomes* of IT-enabled innovation at various levels of analysis. In doing this, we draw from Markus and Robey's<sup>34</sup> and Klein *et al.*'s<sup>35</sup> work and extend it by explicitly discussing how the level of analysis affects the establishment of valid and meaningful causal relationships. Second, we highlight the usefulness and also possible limitations of strategic management and economic theories. Here we will discuss the pros and cons of variance and process research approaches. Third, we point to recent theoretical developments such as relational and dynamic capabilities, knowledge management and organizational learning, social networks, neo-institutionalism, and adaptive structuring. Finally, we discuss some of the remaining problematic theoretical areas and suggest possible extensions and integration of current strategic management and organization theories.

## **2 Defining IT-Enabled Innovation**

Here we start by broadly defining IT-enabled innovation as “*the patterns of actions, relationships, processes and outcomes embedded in the virtualisation of social relations, knowledge exchange and learning, and value-adding activities spanning the organisational boundaries of the firm*”. More specifically, IT-enabled innovation is characterised by the emergence of virtual organisational forms and collective cognitions based on complex, interdependent relational network of actors and value-augmenting activities, where innovation and learning originates from enabling dialogue and knowledge exchange. In addition, distinguishable patterns of social relations, knowledge exchanges and value-adding activities are *inter-dependant of their technological, economic, social and political ecosystems*.

The implementation and exploitation of IT is enabling innovation in the context of much wider organisational and market transformations. Firms are outsourcing aspects of their value chain and relying more on strategic alliances and collaborations with specialist and intermediary

companies in the hope of becoming more flexible in their production and faster to market. To do this, these firms are entering into strategic alliances and engaging networks of firms through electronic means. This includes the emergence of firms whose business strategies and marketing, production and innovation activities are essentially wholly enabled by IT infrastructures, applications and services. These are key drivers for providing completely new products and services. The use of IT makes possible contractual and collaborative relationships which are characterized by multi-channel transactional and relational processes, and which may span different activities of the value chain. These uses of IT help to alter the structure and basis of competition and collaboration within markets<sup>21-24</sup>.

For example, Nambisan<sup>5</sup> highlights the relationship of new IT and new organisational forms and innovation, leading to virtual customer-supplier product innovation communities. From a practical stance, a group of firms can use Internet technologies in such a way that it can interconnect information systems across multiple research, development and production sites and let information flow across organisational boundaries<sup>70</sup>. For instance, the biotechnology industry has offered appropriate contexts for this type of empirical issues. Before the advent of Internet technology, drug development had traditionally been based on long and costly activities, which was normally performed in-house by large pharmaceutical companies, such as AstraZeneca, Pfizer, and GlaxoSmithKline. These pharmaceutical companies are adopting IT both at the intra-firm and inter-firm level. Large companies and their specialist biotech supply firms engage in virtual inter-organisational networks with their partners acting essentially as knowledge brokers in many of the value-creating activities of drug discovery, development and commercialization. For other relevant examples in the media industries see Cassiman and Sieber, Chapter 14 of this volume.

### **3 Establishing Causal Relationships**

Traditional variance approaches are concerned with “establishing necessary and sufficient causation between dependent and independent variables. Such an approach to knowledge creation is valuable in

contexts that are stable and where the boundaries of the phenomenon under consideration are clear<sup>32</sup> (p. 223). Traditional variance studies in IT tend to focus on a particular level of analysis, be it organisation, individuals or groups inside the organisation, or a network of organisations.

Scholars assume that organizations are somehow homogenous and that causal patterns and relationships of IT-enabled innovation are directly reproduced at all levels. For example, work psychologists and organisational sociologists who study IT implementation tend to study identity and cultural aspects of individuals and groups. Those groups would tend to be treated as homogenous, and the causal relationships assumed to be duplicated across levels.

The level of analysis issue within and across organizations has been addressed previously in widely cited papers in the specialised IT literature by Markus and Robey<sup>34</sup>, and the more general organisation science literature by Klein *et al.*<sup>35</sup>. We draw from this work and extend it by explicitly discussing how the level of analysis affects establishing valid and meaningful causal relationships.

The existing corpus of IT studies spans from the micro to the macro aspects. The theoretical foundations range from an institutional emphasis on cognition and normative social structures within and across organisational boundaries, to an economics-inspired focus on the structure and competition within markets<sup>24-26</sup>. Relevant research questions both focus on and span different levels of analysis. For instance, some micro studies have focused on how firms' organisational characteristics influence their ability to adopt and deploy IT. At the macro level, some studies have often focus on how the strategic effects of IT on industry structure are mediated by changes in regulation<sup>27-30</sup>.

Traditional variance studies often raise the level of analysis to assess aggregated economic impact of IT on national and regional economies, and global industries. For instance, studies have focused on the economic performance and the scale of industry transformation and innovation, and the adoption and diffusion trajectories of e-Business technologies and services in a given market or region. Variance analyses are useful for identifying factors that affect the variation in levels of adoption observed across markets and across organisations.

The above are indeed relevant research issues and questions, but IT studies tend to focus on a particular level of analysis, the macro or the micro, for theory development. As others have noted, the distinction among levels of analysis is often blurred. And, macro (i.e., markets) researchers can learn more about organisational phenomena by engaging studies at the meso (i.e., networks of collaborating firms) and micro-level (i.e., individuals inside the organisation) than they currently do by focusing primarily on an aggregated level of analysis<sup>25</sup>.

Very few studies have attempted to articulate the inter-dependent *competitive and strategic* (i.e., establishing cross-level causal relationships, and measuring performance outcomes and aggregated impact on competitiveness), and *organisational* aspects (i.e., investigating causal relationships, enabling conditions and processes at the micro and meso levels) of IT-enabled innovation. This inter-level dynamics of IT implementation and the constant blurring of boundaries in context to innovation activity have as a consequence the growing significance of articulating both the social phenomena and value-adding activities at multiple levels of analysis in studying organisations and markets<sup>25</sup>.

Also, the inter-organisational and temporal nature of virtual business networks also requires the modification of the variance model in which inter-organisational institutional context is explicitly recognized. Traditional variance studies are less useful for examining questions about the dynamics of the mechanisms or processes of change and innovation. Variance studies often cannot account for the order and sequence of events that unfold in institutional and organisational change processes being studied in context to IT-enabled innovation. Variance studies are limited in that they assume that a *fixed* number of predicting variables identified at a particular time *determine* actions or decisions regarding the organisational phenomena under study. Variance explanations also assume that an identifiable set of independent and contingent variables *can* be both identified and used to explain phenomena at a particular level of analysis<sup>25</sup>. Process analyses make clear that some factors treated as external contingent forces in variance models need now be regarded as part of the relevant emergent organisational interactions<sup>33</sup>.

Unfortunately, very few scholars have, however, made explicit their analytical framework they use to link the organisational level with the inter-organisational level, and explain how outcomes and relationships at organisational levels are related and/or replicated at the market level. For instance, Gittell and Weiss's<sup>8</sup> framework linked intra- and inter-organisational coordination in context to patient care. Organisation design and network perspectives and a process approach are combined to span multiple levels of analysis, focusing on factors that contribute to effective coordination at one level and can also generate effective coordination at other levels. The authors contend that coordination of patient care, enabled by IT in this case, is an important organisational phenomenon that cannot be examined without crossing levels of analysis. The authors contend that organisation decision shapes networks and that information systems act as linking devices supporting a virtual organisational network spanning internal organizational boundaries. Gittell and Weiss's study, however, explicitly disregards what are the relevant value-adding activities and decisions, and how coordination and collaboration lead to new knowledge exchange configurations that align the organization with the overall requirements of patient care and alert them about new opportunities in the external environment.

While information technology-enabled innovation is increasingly being associated with a wider range of inter-organisational, market and institutional dimensions, the micro organisational level still remains problematic<sup>8,31</sup>. Fundamental unresolved questions remain such as:

- Are patterns of IT-enabled innovation reproduced across levels? More specifically, are patterns of *social relations, knowledge exchange and learning, and value-adding activities* produced at the intra-organizational/micro level reproduced at the inter-organizational/macro level, and vice versa?
- How are patterns of IT-enabled innovation related across levels of a social system? More specifically, how do relational and cognitive characteristics, and structural and market conditions interact at organizational and market levels?

As structures of meaning inhabit every level of analysis, there is an opportunity to understand the relationship between micro and macro levels by encouraging analysis at multiple level of analysis using process research approaches, as well as promoting variance studies that explicitly establish connections across levels and across time.

#### 4 Strategic Management and Economic Theories

Strategic management theories have traditionally been useful to investigate which strategies add value, which mechanisms can reduce costs, and which designs of inter-organizational networks are cost-effective. More recent studies have been associated with theories and concepts from pricing and auction theory, contract theory, network externalities<sup>14</sup>, intermediation, disintermediation and reintermediation, aggregation and disaggregation<sup>36</sup>, value chain framework and business model concept<sup>37</sup>, resource based views of the firm<sup>38</sup>, and transaction cost economics<sup>30</sup>, which are strongly rooted on the economic view<sup>39,40</sup>. From the transaction cost economics perspective, for example, IT is seen as a means of reducing transaction costs between the buyer and supplier, coordination costs in multiparty bargaining, and communications costs for suppliers (see Table 1a).

Let us illustrate these issues with an example. Berthon *et al.*<sup>39</sup> highlight relevant research issues from a strategic management perspective. The key questions these authors investigated were: *what are the key transaction costs associated with electronic markets, and how is technology affecting these costs; what is the within- and between-company potential for dis/reaggregation and dis/reintermediation; what is the dominant form of economic coordination and mode of interplayer interaction; and which form of Web-enabled organisation is most efficient within a given context?* The authors, not surprisingly, based their framework on transaction cost theory and the notion of social capital. Financial services and electronic procurement markets have offered appropriate contexts for this type of study. In summary, research issues confronted by strategic management scholars include the performance and governance of internet-based firms and electronic markets<sup>42</sup>.

Likewise, Cassiman and Sieber, Chapter 14 of this volume, focused on the roles of the Internet and new opportunities for value creation. They highlight the on-going transformation in those industries in which information plays a key role, be it content (such as the media industry), communication of information (such as the telecommunication industry) or infrastructure for information (such as the computer and electronics industry). For instance, the merger of America Online and Time Warner gives evidence of the early stages of transformation of traditional movie, media and telecommunication companies. AOL Time Warner provides content through a variety of companies of the publishing, filmed entertainment, music, and interactive video industries. These contents are aggregated and brought to the customer using their own Internet access provider (America Online), as well as their own networks (Turner Broadcasting, Home Box Office) and cable systems (Time Warner Cable). Cassiman and Sieber also show that new technology simultaneously affects demand and costs structures leading to a radical transformation of existing market structures. Furthermore, as the Internet impacts industries in several ways simultaneously they find that simply analyzing the effect of Internet on pricing behavior and price dispersion misses the point of industries being transformed, which clearly affects the pricing power and possibilities of individual firms.

In this post-Internet era, where value maximization is seen as a key factor, researchers are applying strategic management theories to investigate strategies to add value and mechanisms to reduce transaction costs, and analyze the strategic role of partners and intermediaries within selected markets<sup>14,39,40</sup>. For instance, the five forces model of Porter<sup>52</sup> advocates independence and power over buyers and suppliers, and competition against rival firms becomes the strategic focus. The specialised strategic IT literature is not short in relevant examples illustrating the strategic value and impact of IT on business networks, including aspects of global product innovation, operational and logistics excellence, improved customer relationships, strategic alliances and knowledge acquisition. Exemplar cases include Ford's EDI-enabled supply chain network<sup>67</sup>, Marshall's value innovation network<sup>68</sup>, Cisco's global supplier integrated network<sup>69</sup>, and BioSpace's global R&D and knowledge management network<sup>70</sup>. Other issues include how the

adoption of internetworking technology influences organisational form. For instance, Brews and Tucci<sup>91</sup> applied the transaction costs economics perspective to analyse the impact of internetworking technology on organisational form.

One of the problems of applying transaction-cost logic to the study of IT-enabled innovation networks is that economic optimisation becomes the overriding focus of analysis<sup>43</sup>. Moreover, strategic management theories rest on the problematic assumption that adaptive behaviour is a natural feature of most formal organisations and business networks<sup>11,55</sup>. That is, it is relatively unproblematic for organisations to gain competitive advantages through the rapid emulation of successful competitors or the adoption of business models enabled by IT. However, alternative forms, and other additional aspects, of coordination to the price systems involve social relationships and dialogue<sup>44,45</sup>. Strategic management theories based on economics and traditional variance approaches have clear limitations for explaining collaborative behaviour in context to IT-enabled innovation<sup>49-51</sup>. Most firms operate in a mixed competitive environment with relational and competitive characteristics<sup>50</sup>.

Relational characteristics of business networks are more complex and less understood than transactional or competitive characteristics. Relational characteristics are reflected in buyers and sellers forming strong, long-term relationships in a very similar way to single organisations. As organisations vertically disintegrate and outsource services, collaboration and coordination with external organisations becomes increasingly important for achieving high performance outcomes. Thus, 'pure' market mechanisms are often insufficient for coordinating the resulting relational interdependencies among organisations, thus requiring explicit attention to the design of mechanism for managing inter-organisational networks<sup>8,45</sup>. Other controversial issues include the limitations of the economic-oriented strategic management theories such as TCE for example, to account for institutional and organisational aspects, including the role of professions and associations, and consumer and partner trust formation<sup>46,47</sup>.

Table 1a. Theoretical Developments and Questions for Further Research

	<b>Focus &amp; Authors</b>	<b>Questions for Further Research</b>
<b>1. Strategic Management and Economic Theories (e.g., TCE, Resource Dependence)</b>	<ul style="list-style-type: none"> <li>- Value adding strategies, cost reducing mechanism, cost-effective inter-organisational designs.</li> <li>- Kambil and Heck 1998, Brynjolfsson and Hitt 2000, Cassiman and Sieber 2001 &amp; 2006, Kraemer and Dedrick 2002, Amit and Zott 2002, Berthon et al 2003, Banker and Kauffman 2004, Brews and Tucci 2004.</li> </ul>	<p>What are the key transactions costs associated with electronic markets?</p> <p>How technology is affecting these costs: what is the within- and between-company potential for dis/reaggregation and dis/reintermediation?</p> <p>What is the dominant form of economic coordination and mode of interplayer interaction; and which form of IT-enabled organisation is most efficient within a given context?</p> <p>What aspects of internet business models are most likely to be adopted and diffused at different organisational/market levels?</p> <p>What are the structural and organisational conditions for a given level of adoption to take place?</p>
<b>2. Relational and Dynamic Capabilities Views</b>	<ul style="list-style-type: none"> <li>- Obtaining and sustaining competitive advantage through the development of a set of distinctive organisational capabilities.</li> <li>- Wheeler 2002, Zahra and George 2002.</li> </ul>	<p>What are the key organisational capabilities and knowledge exchange mechanisms required for the successful implementation of IT-enabled innovation, and what are the unique, inimitable attributes of these capabilities?</p> <p>How do these capabilities are mobilised and recombined, and what are the relevant organising and learning processes?</p> <p>What are the necessary contextual conditions for creating distinctive dynamic capabilities that enable sustained IT-enabled innovation?</p>
<b>3. Knowledge Management and Organisational Learning</b>	<ul style="list-style-type: none"> <li>- Emergent hybrid perspective based on positivist (i.e., information sharing) and interpretivist (i.e., social interaction) views.</li> <li>- Schuitze and Boland 2000, Newell et al 2001, Nambisan 2002.</li> </ul>	<p>What are the boundaries of effective customer involvement in new product development set by new technologies?</p> <p>How should organisations establish and govern a customer community of value creation with permeable boundaries?</p> <p>What is the significance of network relationships and new forms of interacting, leading and organising?</p> <p>What patterns of social structuring of organisational activity have greater impact on the utilisation of information technology?</p>

Table 1b. Theoretical Developments and Questions for Further Research

	<b>Focus &amp; Authors</b>	<b>Questions for Further Research</b>
<b>4. Social Network Theory</b>	<ul style="list-style-type: none"> <li>- Impact of information systems on network structure, structural effects of internetworking, formation of inter-organisational networks.</li> <li>- Kreiner and Schultz 1993, Ebers 1997, Lee and Pennings 2002, Brews and Tucci 2004, Roijakkers et al 2006.</li> </ul>	<p>Which features of organisational network design give rise to effective coordination at more than one level of analysis?</p> <p>What are the specific characteristics of these personal communication networks underlying alliance networks and how do they affect the effectiveness of inter-firm learning?</p> <p>How do characteristics of the overall alliance network interact with specifics of the personal communication network in influencing inter-firm learning?</p> <p>How is IT implementation affecting communication, information processing and decision-making within and across organisational boundaries?</p> <p>How are boundaries likely to be redrawn as a result of an increased in the adoption and diffusion of IT?</p> <p>Which aspects are likely to be subject to individual and organisational agency?</p>
<b>5. Neo-Institutional Theory</b>	<ul style="list-style-type: none"> <li>- Organisational fields, institutional environments, normative and cognitive elements of institutions, mimetic processes of form replication.</li> <li>- Mitev 1996, West 2000, Helper and MacDuffie 2003, Crowston and Myers 2004, Seror 2006, Pentland 2006.</li> </ul>	<p>What effects do institutional structures have on virtual networks?</p> <p>How do business networks' structural and cognitive organisational characteristics influence their ability to adopt and deploy IT?</p> <p>How the effects of IT on industry innovative performance and firm organisational structure are conditioned by the structural and cognitive dynamics of customer-supplier networks?</p>
<b>6. Adaptive Structuring and Practice Perspective</b>	<ul style="list-style-type: none"> <li>- Symbiotic relationship between IT development and organisational forms. Individual shape structuring processes and relationships.</li> <li>- Newell et al 2001, Schultze and Orlikowski 2004, Barret 2006.</li> </ul>	<p>How does IT implementation cause changes in social relations, and in knowledge exchange and learning at the individual, group, organisational and inter-organisational level?</p> <p>What are the intervening contextual conditions affecting those changes?</p>

## 5 New Theoretical Developments

We have identified at least five areas of growing research activity regarding IT enabled innovation: relational and dynamic capabilities, knowledge management and organizational learning, social networks, neo-institutionalism, and adaptive structuring (see Tables 1a & 1b). We have chosen to review these five areas because they explicitly address the process nature of social relations, and knowledge exchange and learning aspects, which are central to our previous definition of IT-enabled innovation. Each one of these theoretical perspectives has the potential to extend the breadth of intellectual space of strategic management relative to IT IT-enabled innovation.

### 5.1 *Relational and dynamic capabilities views*

The relational perspective argues that actions of organisational agents are driven by personal motives and emotions, and do not necessarily relate to opportunistic profit-seeking behaviour, and in these cases the rational-actor assumption that underlies the economic-oriented views fails<sup>54,55,56</sup>. From a relational view, organisations and markets are re-conceived as “resource-flows, information flows and webs of significance”<sup>44</sup> (p. 123). Presently, there is little direct empirical comparison of the relational perspective to the more common economic perspectives. In addition, the concept of dynamic capabilities has become a major focus of scholars and practitioners in the strategy field. This view gives special attention to obtaining and sustaining competitive advantage through the development of a set of distinctive organisational capabilities, rather than through conventional strategies based on industry structure and positioning. The more contemporary conception of the dynamic capabilities view has been enriched by other theoretical perspectives such as the resource-based view and the relational view, and more recently the knowledge management and organisational learning perspective. This evolution in the conceptualisation of dynamic capabilities has been accompanied by an increasing number of empirical studies published in strategic management literature, and more recently in the IT management literature. For instance, Wheeler<sup>6</sup> identified and measured the organisational capabilities that comprise the ongoing work net-

enablement in electronic markets. He lays out a 'Net-Enabled Business Innovation Cycle' (NEBIC) theory rooted in strategic management's dynamic capabilities perspective and the notion of absorptive capacity. 'Net-enablement' is seen as a dynamic capability with four constructs: choosing emerging and enabling information technologies; matching economic opportunities with enabling IT; executing business innovation; and assessing customer value. Dynamic capabilities are seen as leading to resource configurations that generate value-creating strategies, which can be imitated and developed through multiple learning paths. In this view 'creating customer value' is the dependent variable from an economic variance view, and 'net-enablement' is a process variable from a socio-organisational view. The main research questions that we would like to highlight here are: *what are the key organizational (and relational) capabilities required for the successful implementation of IT-enabled innovation, and what are the unique, inimitable attributes of these capabilities? Also, how are these capabilities mobilized and recombined, and what are the relevant organising and learning processes? And, what are the necessary contextual conditions for creating distinctive dynamic capabilities that enable sustained IT-enabled innovation?*

## **5.2 Knowledge management and organizational learning**

The knowledge management and organisational learning view of IT-enabled transformation is a second contemporary thrust in strategic management. In the more specialised IT literature, the role of collaboration, knowledge sharing and learning in competitive strategies and innovation are highlighted. The intensity and pace of innovation in knowledge-intensive and hypercompetitive markets has brought the need for organisations to exploit their collaborative networks to boost their own innovation capacity. Scholars have reviewed the role that IT plays in promoting information and knowledge sharing, collaboration and coordination both inside and across organisational boundaries; transformational attributes include the role that information technologies have on re-shaping inter-organisational collaboration and innovation. In this work, they acknowledge the symbiotic relationship between the

approaches for information technology development and the emergence of inter-organisational forms and structures<sup>58,59,60,61</sup>.

IT-enabled innovation can be characterised by two broad assumptions about the nature of knowledge: (a) the content, intensity and frequency of the knowledge production and sharing actions; or (b) the social patterns or structure of the connections between heterogeneous actors across multiple levels<sup>62,63,64</sup>. The first assumption advocates that information and knowledge can be made explicit and be transferred easily regardless of the characteristics of the organisational context. The second assumption acknowledges a more reflective “interpretative” view -that information and knowledge sharing are characterised by being highly tacit and inter-dependent on the social setting. Likewise, IT-enabled innovation can be characterised by two broad assumptions about the nature of learning: (a) that learning primarily occurs within individuals, or (b) learning is the result of a wider and richer socialization process. There has been a progressive shift away from thinking about knowledge as a commodity or asset that organisations have or may acquire, towards the study of knowing as something that individuals and teams do and how this can in turn be harnessed by the firm. Mutually supportive relationships must exist among organizational members since knowledge creation is a social process.

Some scholars have attempted to combine these two positivist (e.g., information sharing) and more interpretive (e.g., social interaction, knowing) views about knowledge and learning<sup>64,65</sup>. For instance, Nambisan<sup>5</sup> investigated the knowledge creation issues, customer interaction, and motivations in a computer-mediated and community-oriented environment. The main research questions here are *what are the boundaries of effective customer involvement in new product development set by new technologies; and how should organisations establish and govern a customer community of value creation with permeable boundaries?*

Scholars need to move away from first-order questions such as *how effectively organizations are using information technology to collect and disseminate knowledge which can be harnessed to gain competitive advantage*, towards second-order questions such as *what is the significance of network relationships and new forms of interacting*,

*leading and organising? and what patterns of social structuring of organizational activity have greater impact on the utilisation of information technology?*

### **5.3 Social network theory**

There is a growing literature that examines when, where, why, and how organisations engage in inter-organisational networking. An important research issue has been the impact of information systems on network structure<sup>71</sup>. Related issues include the structural effects of internetworking and the formation of inter-organisational innovation networks<sup>72-75</sup>. Inter-organisational forms can take the shape of interconnection between firms, such as strategic alliances and federated organisational structures enabled by inter-organisational information systems.

Ebers<sup>73</sup> (p. 13), however, warns us that “we know much less about how inter-organisational networking relationships are built, develop, and dissolve. That is, we know little about the intermediate processes, the steps and activities that translate motives into particular network structures and about the contingencies that facilitate and constrain these relationships and processes”. Also, it is assumed by the economic perspective that organisations are free to make choices about potential partners without reference to wider institutional or industry norms<sup>76</sup>.

As noted in Section 3, Gittel and Weiss<sup>8</sup> examined the coordination of patient care crossing levels of analysis. Their premise is that organisation design is both shaped by and shapes social networks. Information systems are conceptualized as linking devices, which support organisation design to create a virtual organisation. This leads to questions regarding *which features of organisational network design give rise to effective coordination at more than one level?*

In Chapter 11 of this volume, Roijackers, Duysters and Sadowski-Rasters studied learning in the context of the personal social communication network underlying alliance networks. Their critical examination of the networking literature showed that a number of important research questions that relate to communication networks and strategic alliances have, until now, remained largely unanswered. They

point out that most studies of alliances and networks do not include an evaluation of lower-level communication networks through which tacit technical knowledge has to be transferred and new technologies have to be learned into their analysis of the effectiveness of inter-firm learning. The main unresolved questions they highlight are *what are the specific characteristics of these personal communication networks underlying alliance networks and how do they affect the effectiveness of inter-firm learning? How do characteristics of the overall alliance network interact with specifics of the personal communication network in influencing inter-firm learning?*

In addition, other critical questions we would like to highlight are *how is IT implementation affecting communication, information processing and decision-making within and across organizational boundaries? How are boundaries likely to be redrawn as a result of an increased in the adoption and diffusion of IT? Which aspects are likely to be subject to individual and organizational agency?*

#### **5.4 Neo-institutional theory**

Neo-institutional theory is articulated primarily at the macro level of analysis, concerning itself with such phenomena as social institutions, organisational fields, institutional environments and societal sectors. The neo-institutional approach is also concerned with cognitive elements of institutions: the frames through which meaning is made and social action constructed. Neo-institutionalism focuses attention to institutional effects, such as the ways organisations and their members are influenced by, and influence, institutionalized rules and institutional environments. Institutional processes create both cognitive and structural constraints, or an 'iron cage' in Max Weber's terms<sup>20</sup>. Institutionalised modes of organizing can provide legitimated ways of proceeding in inter-organisational interaction. These modes may, in turn, hinder free choice and innovation. As established inter-organisational activity becomes widely accepted, organisational actors may be affected by the increased risks of innovating (i.e., modifying and expanding the network), the demand for further reflection, and the potential reduction of legitimacy<sup>77</sup>.

The specialised IT literature has given comparatively less explicit attention to the relationship between institutional contexts and inter-organisational networks embedded in those contexts. Relatively few variance studies have primarily focused on the effect of environmental factors or forces, often together with organisational factors, on the adoption of inter-organisational systems and the development of business networks in the context of innovation<sup>78-80</sup>.

Neo-institutional analysis can take into account both the isomorphic and the constitutive nature of institutional forms and processes of formation of Internet-enabled business networks. IT scholars have not yet appropriately studied organisational forms at birth and birth and survival rates, or the mimetic processes of form replication and the distinct institutional and socio-organisational forces shaping these processes. West<sup>83</sup> found that the institutional context within which organisations operate exerts an influence on their choice of organisational form, drawing on an information-processing and institutional *contingent* approach to understanding optimal organisation structure. Likewise, Helper and MacDuffie<sup>84</sup> investigated the evolution of electronic business in the auto industry, and their effects on consumer and supplier relationships, focused in part on the industry value chain relative to employee unions. Anand *et al.*<sup>48</sup> examined a mechanism through which organisational fields are constituted in the music industry. They conclude that markets can serve as a magnet, around which groups of actors consolidate, and that cognition of markets occurs through the creation, distribution and interpretation of a web of information about the market.

Neo-institutional researchers have, to date, shown far less concern with the origin of form (as the product of ongoing interaction of individual members). Endogenous organisational dynamics are rare in accounts of institutional change. The dynamics of organisational transformation and innovation is also treated differently by institutional researchers. Institutional theorists suggest that organisations become more similar over time because of normative processes that reward similarity (e.g., IT education and accreditation promoting particular codes of conduct and collective cognition).

Most neo-institutional analyses, like many traditional strategic management studies, tend to regard the relationship among contextual economic and regulatory factors *and* the content of innovation and transformation as deterministic. The more embedded an organisation is in its institutional and market environments; the more likely it is that their relationships will be symbiotic. There have been very few authors who have investigated the enabling role of information technology in several markets.

In Chapter 7 of this volume, Seror developed a neo-institutional framework for analyzing the future development of virtual infrastructures in service delivery systems illustrated in the health care context. Market dynamics and control mechanisms define the logic of system structures, processes and ideologies. Ideology, defined as the integrated theories and values that constitute a coherent socio-political system, is expressed in patterns of stakeholders' participation in the financing, administration, and regulation of service delivery, including the roles of government, service providers, and consumers.

In Chapter 10, Pentland, using organizational ecology as a starting point, outlines a framework for studying the ecology of inter-organizational routines in e-commerce. Net-based technologies are distinctive because they require integration with the systems of other organizations, as well as one's own internal systems. From the received literature, Crowston *et al.*<sup>33</sup> investigated the interplay between structure and information technology in the real estate industry, while Mitev<sup>86</sup> investigated the failure of implementation and adoption of a computerised reservation system within the French railways. Crowston and Myers<sup>15</sup> successfully developed a framework and investigated transformation enabled by information technology using three theoretical perspectives in the real estate industry. Their analysis included the economic analysis of IT-induced reduction in cost of locating properties and disintermediation of real estate agents, the institutional analysis of the use of IT mandated by the regulatory environment and the role of rules and agreements between agents in transactions, and the socio-organisational analysis of the role of agents in contextualizing information from databases and use of IT to support social networks of agents, customers and other professionals.

From the neo-institutional perspective, remaining central research questions spanning levels of analysis are *what effects do institutional structures have on virtual networks? How do business networks' structural and cognitive organisational characteristics influence their ability to adopt and deploy IT?* Also, while economic and macro structural issues (i.e., return of investment, size of firms) are widely discussed in variance-based studies of IT, the dynamics of inter-organisational business networks and changing institutional environments have not yet been properly analysed and integrated at the organisation, network and market levels, e.g. *how are the effects of IT on industry innovative performance and firm organisational structure conditioned by the structural and cognitive dynamics of customer-supplier networks?* Other questions that can be addressed by adopting a process view based on an neo-institutional stance include: *what aspects of Internet business models are most likely to be adopted and diffused at different organizational/market levels, and what are the structural and organizational conditions for a given level of adoption to take place?*

### **5.5 Adaptive structuring and practice perspectives**

Increasingly, researchers are acknowledging the symbiotic relationship between the approaches for IT development and the emergence of organisational forms in the context of innovation. From the adaptive structuring perspective, which is informed by Giddens'<sup>87</sup> structuration theory, individual social agents try intentionally and reflexively to shape structuring processes and relationships in order to coordinate the activity within an organisation or network. Recent studies have observed that inter-organisational networks can be facilitated by explicit and ongoing adaptation of technology to changing contexts of use.

In Chapter 2 of this volume, Barrett reviewed key dimensions of intraorganizational and interorganizational forms, which can be facilitated by advances in IT, and the potential of the IT to enable changing organizational forms. His review included the technological imperative, structural approaches, and an extended discussion of the emerging perspective of 'practice lens' approach.

Schultze and Orlikowski<sup>88</sup> analyzed the implications of using IT to mediate electronic brokerage relationships that are enacted through work practices and interactions of actors representing customer and provider firms. The authors view business-to-business settings as typically maintained through inter-personal interactions between customers and their providers. They adopt a ‘practice’ perspective to examine the structural and interpersonal elements that produce and are produced by everyday activities, arguing that a practice lens requires neither a choice between a macro- and a micro-level of analysis, nor a conflation of the two. Further, this practice lens directs attention to how macro-phenomena are constituted by micro-interactions, and how those micro-interactions, in turn, are shaped by macro influences and effects.

Likewise, Newell, Scarbrough and Swan<sup>65</sup> investigated the adoption of intranet technology as a vehicle for encouraging organisation-wide knowledge sharing within a large, global bank, focusing attention on the enabling and dis-enabling effects of intranet technology on the processes of communication, collaboration and social coordination. They find that intranet adoption helped to reinforce the existing functional and national boundaries with electronic fences. They advocate that the intranet can be conceptualised as an interactive and decentred technology, which therefore has the potential for multiple interpretations and effects.

The main research questions that we would like to highlight here are: *how does IT implementation cause changes in social relations, and in knowledge exchange and learning at the individual, group and organizational level? What are the intervening contextual conditions affecting those changes?*

## **6 Further Intersections and Research Agenda**

In this section we critically discuss how recent theoretical developments can be applied to the remaining problematic empirical areas illustrated in sections four and five. These theoretical developments applied to the IT domain are contributing to partially filling the knowledge gap: Wheeler’s<sup>6</sup> “Net-Enabled Business Innovation Cycle” adopting a relational and dynamic capabilities view, Nambisan’s<sup>5</sup> ‘hybrid’ knowledge-based view on virtual new product development communities, Schultze and

Orlikowski<sup>88</sup> and Barrett (Chapter 2 of this volume) using adaptive structuring and practice perspective. These novel studies are moving from contingent causality of variance to a process logical structure of analysis, and from a unitary level to multi-level analyses.

While new insights from recent studies like those reviewed above have broadened our understanding of IT-enabled innovation (e.g., virtual collaboration, value-creation and organizational change), there is still little empirical evidence as to how intra- and inter-organisational innovation and market dynamics can be articulated. Additional empirical evidence and relevant integrative analyses are required to illuminate the formulation of coherent competitive strategies and the promotion of more effective organisational forms and processes.

First, the dynamic capabilities perspective should be further developed using more contemporary notions derived from the knowledge management and organisational learning perspectives. This would enable fresh investigations of the dynamic organisational nature of strategic IT-enabled innovation. This pluralistic combination of perspectives need to emphasize the strategic value of higher order resources allowing the generation of and renewal of core capabilities and competitive advantage, as well as the significance of self-reinforcing tacit knowledge exchanges and learning processes.

Second, future studies should extend strategic management theories with neo-institutional analysis to account for isomorphism and the constitutive nature of institutional forms and processes of formation of Internet-enabled business networks and markets, which has so far been a neglected area. While management studies have already developed robust frameworks combining, for instance, strategic and neo-institutional perspectives<sup>81,82</sup>, there are, however, very few IT studies following that route. Some new IT studies are starting implicitly to bring together strategic management and neo-institutional theories. For instance, Jin and Robey<sup>46</sup> extended a market-level analysis based on transaction-cost economic with neo-institutional theory and social network theory in order to explain the emergence of 'cyber-mediaries' in electronic commerce in retailing. Beside the economic benefits of reducing buying time and providing new products and services, Jin and Robey found that 'cybermediaries' persist in electronic form because

they are institutionalised structural forms, which conform to regulative, normative and cognitive expectations, and are therefore seen as legitimate. They also found that 'cybermediaries' occupy strategic positions in complex social networks, thereby acquiring social power. The previously noted study by Crowston and Myers<sup>15</sup> successfully developed a framework and investigated transformation enabled by information technology using three theoretical perspectives in the real estate industry<sup>85</sup>. These studies need to be supplemented by new research combining the focus on institutional norms of the institutional perspective with the strategic management perspective explicitly addressing *how and why new cognitive and structural forms of such strategic networks of firms and electronic-enabled ecosystems are created and replicated*.

Third, a focus on adaptive structuring, relational, and knowledge management views can supplement strategic management theories and assist researchers in gaining deeper and richer insights about the relational aspects of inter-organisational interactions and the endogenous dynamics of knowledge-intensive firms. A problematic issue dictated by emergent global and distributed innovation scenarios is: *what are the social processes and intervening conditions by which individuals build and maintain their explicit and tacit knowledge exchanges in the context of these virtual environments?*

Fourth, extending the strategic management perspective *with* neo-institutional theory *and* adaptive structuring perspectives at various levels of analysis has the potential to explain second-order transformation in the context of innovation. As one of the growing area of controversy focuses on *how people within organisations come to share cognitions and norms about appropriate innovative behaviour, and how different organisational forms or designs develop*, the neo-institutional and adaptive structuring perspectives need to be integrated by researchers attempting to fully understand IT-enabled innovation.

The above intersections should contribute to advancing our understanding and build more robust and integrated theories. Researchers need to further develop their theoretical frameworks and research designs using the above intersections in order to systematically combine macro market and institutional forces, and micro organisational forces shaping

IT-enabled innovation, and also integrate variance (e.g., antecedents and consequences) with process approaches. Methodologically, scholars should incorporate market-level data analysis with organisational-level data analysis in order to capture the complex dynamics of inter-organisational networks and markets<sup>81,89</sup>. Analyses spanning multiple levels and approaches will contribute to understanding issues of causation and reproduction of form in complex virtual organisations and markets<sup>90</sup>.

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