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## Sustainability in ICT-Enabled Collaborative Networks

Josephine Leng Leng Chong  
Business Information Systems  
Auckland University of Technology  
Auckland, New Zealand

Bill Doolin  
Business Information Systems  
Auckland University of Technology  
Auckland, New Zealand

### Abstract

*Many organizations form collaborative ICT-enabled networks in order to improve their performance, and we generally understand their motives and benefits in doing so. However, there is little empirical research that focuses on how collaborative relationships are sustained over the longer term. This paper is a first step in addressing this deficiency. Based on a review of the literature on strategic collaboration, we develop a conceptual framework for understanding and exploring the resources and capabilities required to sustain collaborative networks. The framework will provide a theoretical basis for a subsequent empirical investigation.*

### Keywords

Collaborative Networks, ICT, Resources, Capabilities, Resource Complementarity, Sustainability

### INTRODUCTION

As the business environment becomes more dynamic and inconstant, this encourages organizations to collaborate strategically. Scholars typically refer to such collaborations as strategic alliances. Strategic alliances play a particularly important role in dynamic industries such as biotechnology, telecommunications, manufacturing and finance (Hoffmann, 2007). The term alliances can encompass various cooperative relationships between two or more organizations. An alliance is strategic when it is the means by which an organization seeks to implement, in part or in whole, elements of management's strategic intent (Hamel and Prahalad, 1989). In addition, it can also be seen as reflecting a strategy to co-specialize organizational resources and capabilities with resources and capabilities that are accessed through the alliances in order to better achieve organizational performance in one of a number of ways; for instance, entry into a new market, product development, or streamlining operations or activities (Pavlovich and Akoorie, 2003). Hence, a strategic alliance can be defined as a cooperative and strategic relationship between two or more organizations that will improve an organization's competitive position and performance through the sharing of organizational resources and capabilities.

When organizations form and maintain strategic alliances with each other, interrelationships will be created. Many scholars often interchange the term "inter-organizational relationships" with "inter-organizational networks". As Ebers (1997) notes, the term 'network' is sufficiently abstract to cover many different understandings of inter-organizational relationships. Nevertheless, the inter-organizational network can be viewed as a particular form of strategic alliance. For example, some researchers are focusing on strategic networks that can facilitate organizations' access to external resources (Elmuti and Kathawala, 2001; Zaheer and Bell, 2005). According to Gulati et al. (2000), all firms are embedded in one or more networks in which they collaborate with others to create value by gaining information and complementary competencies. For the purpose of this study, all such inter-organizational networks will be broadly referred to as collaborative networks.

Over the last decade, the number of organizations forming collaborative networks has increased (Hoffmann, 2007; Kale and Singh, 2007; Rothaermel and Boeker, 2008). According to Dyer et al. (2001), the top 500 global business firms average 60 major collaborative networks each. And the reason for this growth is because it benefits organizations to acquire, complement or share with each other resources and competencies, which can position the organizations in a better stance of achieving competitive advantage. Organizations are deploying various types of information and communication technologies (ICT), such as the Internet, intranets, extranets, knowledge portals, group decision support systems and electronic meeting systems, to facilitate and support the collaborative network. The essence of ICT-enabled collaborative networks is their capacity to facilitate information processing, communication and collaboration across time and space. Despite the facility and

flexibility afforded by ICT-enabled collaborative networks, most alliances formed are not successful as organizations are not equipped with the necessary capabilities to sustain these networks (Dyer et al., 2001).

Collaborative networks can boost organizational competitiveness in many ways. First, collaborative networks enable a wider scale and scope of inter-organizational information to be exchanged as well as providing access to a larger pool of resources and capacities (e.g. technology, manufacturing or marketing capabilities and financial resources). This enables organizations to position themselves in a stronger competitive stance. Second, collaborative networks facilitate inter-organizational learning. Organizations that are less competent can enhance their knowledge, capabilities and skills through learning from the more competent organizations. This may help less competent organizations to implement strategies that lead to improved performance as well as to create new resources (Ireland et al., 2002). Third, collaborative networks are easily adapted to knowledge-rich environments as they have superior information processing capacity and are not governed by hierarchies or markets (Moller and Svahn, 2003). As contended by Grant (1996), organizational knowledge can create sustainable competitive advantage.

In spite of a rich literature on collaborative network rationales, the motives and benefits for forming collaborative networks, and the factors needed for successful collaborative networks, the area of sustaining collaborative networks has been relatively less explored (Ebers, 1997; Taylor, 2005). As asserted by Reuer and Zollo (2000), it is critical to know how to manage collaborative networks post-formation, as unsustainable networks might eventually lead to a termination of the inter-organizational relationships (see also Das and Teng, 2000a). Humphreys et al. (2006, p.33) refer to sustainability in a healthcare context as “the ability of a health service to provide ongoing access to appropriate quality care in a cost-efficient and health manner”. If we extend this definition to an inter-organizational collaboration context, ‘sustainability’ is the ability to manage and maintain ongoing collaborative relationships.

The purpose of our research is to empirically investigate the resources and capabilities involved in sustaining ICT-enabled collaborative networks. As a precursor to the empirical investigation, in this paper we develop a framework for conceptualising the sustainability of collaborative networks. To do so, we review the extensive theoretical literature on strategic collaboration that has been accumulated over several decades. Based on this literature review, we derive a series of propositions about the resources and capabilities needed to sustain a collaborative network. We then use these propositions to develop the conceptual framework and draw some conclusions about its utility for informing a subsequent empirical study on this topic.

## RESOURCES

There are two facets involved in sustaining collaborative networks. First, a collaborative network can only be sustained if there is an ongoing inter-organizational co-operation. Second, the co-operation has to be facilitated by a moderate level of connectedness of inter-organizational relationships in a reasonable time frame. As acknowledged by many scholars (Bajwa et al., 2007; Todeva and Knode, 2005; Das and Teng, 2000a), technological resources are capable of supporting and facilitating co-operation across functional boundaries, while organizational resources can bridge the connectedness by reducing conflicts and opportunistic behaviour.

One of the key elements in sustaining a collaborative network is the capability to make the inter-organizational collaboration durable, in another words an ongoing inter-organizational collaboration process (Das and Teng, 2000a; Humphreys et al., 2006). To achieve it, the collaborative network needs to deploy knowledge-based *technological resources* in the form of ICT to deliver an efficient and effective flow of communication so as to process inter-organizational information. Consequently, this leads to an enhanced mutual understanding between the collaborative partners, a better task co-ordination and execution, an integrative conflict management and an improved inter-firm learning which are vital to sustain a collaborative network (Bessagnet et al., 2005, Legler and Reischl, 2003). The functions of the ICT-based resources are to support, facilitate and enhance the communication process across functional boundaries so as to achieve an efficient inter-organizational information processing (refer to Table 1). As contended by Tippins and Sohi (2003, p.745), ICT is known as a “resource to facilitate the effective collection and utilization of information”. The internet, intranets and extranet and other forms of inter-organizational systems are widely used to assimilate and disseminate information which is immediate, cost-effective, more accessible, transparent, rich in format and versatile (Bafoutsou and Mentzas, 2002). As such, we make the following proposition:

*Proposition 1: ICT-based technological resources are needed to support and facilitate co-operation in a sustainable collaborative network.*

Many scholars have contended that organizational resources are the vehicles for positive organizational performances (Barney, 2001; Das and Teng, 2000a; Hoffmann, 2007; Kale and Singh, 2008). As argued by Cullen et al. (2000), it is insufficient to sustain collaborative networks just by focusing on the management of the hard side such as the financial and operational issues; the soft side of management plays a significant role as

well. Building on the work of Morgan and Hunt (1994), Robson et al. (2005, p. 586) contend that the “softer style of alliance management accentuates the cultivation of socio-psychological or behavioural attributes that are beneficial in the alliance working relationship”. As such, this study postulates that deploying knowledge-based *organizational resources* to manage the soft side of the inter-organizational relationship can reduce conflicts and opportunistic behaviours, thus enhancing the sustainability of a collaborative network (refer to Table 2). As such, we make the following proposition:

*Proposition 2: Organizational resources related to relationship management are needed to bridge the connectedness of the inter-organizational relationship in a sustainable collaborative network.*

Table 1. Functions of Technological Resources in Sustaining a Collaborative Network

Technological Resources	Types	Functions
ICT Infrastructure	Internet, extranets, intranets, IOS, electronic meeting systems	An enterprise application that supports the communication process to achieve strong inter-organizational information processing within a collaborative network.
ICT Technical Skills	IT/IS know-how knowledge, IT/IS experience, knowledge portals, group decision support system	ICT technical skills can facilitate a dynamic communication process subsequently it can lead to an effective decision making within a collaborative network.
ICT Training	IT/IS human resources and IT/IS financial resources to support the training	To enhance the communication process by promoting the users' readiness towards the utilization of ICT. When users can efficiently deploy ICT, this will enable more information richness and quantity to flow within a collaborative network.

Table 2. Functions of Organizational Resources in Sustaining a Collaborative Network

Organizational Resources	Functions
Alliance Culture	Development of an alliance culture increases trust and commitment and eases communications between network partners (Harvey and Griffith, 2002).
Attitudinal Commitment	Organizations will feel morally obligated to remain in the collaborative network when they are committed to the inter-organizational relationship's norms and values (Kanter, 1968; Porter et al., 1974).
Trust	Trust enables more open communication, a greater ability to predict the other party's behaviour, more confidence in the future success of the relationship, greater dependability and more non-defensive behaviour and greater acceptance of criticism (Howarth et al., 2000; Mohr and Spekman, 1994).

That is, for a collaborative network to be sustainable, it is insufficient just to possess the appropriate resources. In addition, it requires the development of capabilities to leverage these resources to perform their functions (Araya et al., 2007). In the following section we discuss how capabilities can influence the sustainability of a collaborative network.

## CAPABILITIES

While the terms resources and capabilities are often used interchangeably in discussions about how organizations can leverage them to sustain competitive advantage, a distinction can be made between them. As asserted by Amit and Schoemaker (1993, p.35), resources are “stocks of available factors that are owned or controlled by the firm” whereas capabilities are “a firm's capacity to deploy resources, usually in combination, using organizational process to effect a desired end.” Similarly, Grant (1991) defines capability as the ability to co-ordinate resources. From another perspective, Makadok (2001, p. 389) regards capabilities as “organizationally embedded non-transferable firm-specific resources whose purpose is to improve the productivity of the other resources possessed by the firm”. Along this line, Araya et al. (2007) posit capabilities as higher-level resources because capabilities are the vehicles to drive the exploitation of resources to perform their functions. Thus for this paper, capabilities are defined as second-level resources that have the capacity to co-ordinate, deploy and enhance the productivity of first-level resources, which are exploited to perform their functions to effect a

desired end. In particular, a sustainable collaborative network requires both organizational and technological capabilities.

As defined by Grant (1996, p. 377), organizational capabilities are “the ability to perform repeatedly a productive task which relates either directly or indirectly to a firm’s capacity for creating value through effecting the transformation of inputs into output”. Grant argues that the effectiveness of organizational capabilities are dependent on how well that organization is able to unlock each organizational member’s knowledge and subsequently integrate the knowledge into organizational routines or processes. This is because organizational capabilities are embedded in the organizational routines or processes which serve as a platform for gathering and processing information. According to Teece et al. (1997), there are three functions of organizational routines or processes. First, they enable the co-ordination and integration of resources. Second, they facilitate inter-organizational learning and co-ordinate inter-organizational activities. Third, they reconfigure organizational resources to create, integrate, recombine and release resources. As asserted by Grewal and Slotegraaf (2007), knowledge is stored through the accumulation of learning-by-doing and learning from historical experiences in these routines or processes; that is to say, an efficient integration of knowledge will facilitate the effective creation of organizational capabilities. To be able to generate organizational capabilities, organizations have to integrate knowledge through a process of acquisition, creation and exploitation and conversion of both tacit and explicit knowledge through mutual interactions (Ireland et al., 2002, Nonaka, 1994).

An organizational learning process is an organizational activity or a dynamic process which enables the integration of knowledge to be facilitated (Jiang and Li, 2008). According to Nonaka (1994) knowledge can be classified into tacit and explicit knowledge. Tacit knowledge is embedded within an individual’s actions, commitment and involvement in a specific context hence it is difficult to express in words. Since tacit knowledge cannot be expressed in any explicit form therefore it cannot be transferred easily over distances. In contrast, explicit knowledge can easily be transferred via ICT as it can be codified in the form of formal and systematic language. The creation of knowledge occurs when an organizational member’s tacit knowledge is transferred as an explicit knowledge via ICT that consequently transformed as a tacit knowledge which is captured by another organizational member (Grant, 1996; Nonaka, 1994). Jerez et al. (2005) have pointed out that organizational learning is a continuous process as the development of knowledge begins at an individual level, subsequently it moves to the group level, and ultimately to the organizational level and back again. Therefore, the role of organization learning is to foster the process of knowledge integration which is crucial to build effective organizational capabilities so as to enhance the organization’s competitive advantage (Grant, 1996; Schreyogg and Kliesch, 2007). Further, effective organizational capabilities are based on an efficient integration of knowledge which is facilitated by a resourceful organizational process (Grant, 1996; Schreyogg and Kliesch, 2007). Building on these two characteristics, this study will propose that a *collaborative network learning capability* is needed to enhance the exploitation and co-ordination of organizational resources to sustain a collaborative network. A collaborative network learning capability involves a learning process which has the capacity to enhance the leverage of organizational resources to bridge the connectedness of the inter-organizational relationships.

According to Das and Kumar (2007), there are three types of learning processes in a collaborative network. The first type of learning process is known as content learning which enables a collaborative partner to acquire and internalize knowledge from the collaborative network. As the learning of this knowledge can increase the possibility of achieving positive organizational performances, the content leaning process can leverage the calculative component of the attitudinal commitment to draw the inter-organizational relationships to be more connected. This is because collaborative members feel more motivated by the perceived economic reward which is the gaining of knowledge (Cullen et al., 2000).

The second type of learning is known as the partner-specific learning which involves learning from a collaborative partner and learning about a collaborative partner. When collaborative members learn more of each other this allows a better mutual understanding of each other’s characteristics such as organizational and cultural fit as well as organizational and operational processes. Consequently, knowledge based trust can be cultivated as when the collaborative members have more knowledge of one another, this enables them to understand and predict the other collaborative member’s behaviour with more confidence (Lander et. al., 2004). To a further extent, the emotional attachment component of attitudinal commitment can also be developed as the authors point out (p.690), “learning about one’s partner is crucial because the motivation and ability of a member firm to act in ways that will maximize joint value creation are clearly of some importance in sustaining and deepening commitment in the alliance”.

The third type of learning is known as alliance management learning where collaborative partners learn from prior alliance experiences. Such alliance experiences include past practices and skills of the collaborative members of how to co-operate with other organizations so that an effective management of the collaborative network can be achieved. This type of learning creates an active learning environment, that is one in which the

collaborative members constantly acquire, gather, share and disseminate the know-how of alliance management skills to strengthen connectedness of the inter-organizational relationship in a collaborative network (Nielsen et al., 2008). An active environment brings about an alliance culture where the collaborative members share the norms and values that is to gain the knowledge to effectively manage the collaborative network. Emden et al. (2005) assert that commitment is embedded in the sets of norms and values thus they are important factors to effect attitudinal commitment to induce the collaborative members to maintain their organizational memberships in the collaborative network (Kanter, 1968; Porter et al., 1974). Based on the above, we make the following proposition:

*Proposition 3: An organizational collaborative network learning capability is needed in a sustainable collaborative network.*

Bharadwaj (2000, p.171) defines technological capability as the “ability to mobilise and deploy IT-based resources in combination or co-present with other resources and capabilities”. There is a rich body of research on studying how IT capabilities can engender positive organizational performances (Bharadwaj et al, 1999; Bharadwaj, 2000; Bhatt and Grover, 2005; Feeny and Willcocks, 1998; Grewal and Slotegraaf, 2007; Lee and Kelley, 2008; Li et al., 2006; Pham and Jordan, 2007; Ross et al., 1996). These researchers focus on one common theme which is that technological resources are only valuable knowledge-based resources as they can easily be imitated, substituted and traded. Thus, they can only improve an organization’s efficiency and effectiveness. It is only the development of technological capabilities that play a significant role in sustaining competitive advantage and longer-term organizational performance. As asserted by Bharadwaj et al. (1999), technological capability is not concerned with the specific set of sophisticated technological functionality; rather it is more like an enterprise-wide ability to leverage technology to differentiate from competition.

The resource-based view forms the basis of technological capability as inimitable, non-substitutable, imperfectly mobile and shaped through the combination of various technological resources (Table 3).

**Table 3. Technological Resources that Constitute Technological Capability**

Source	Technological resources
‘Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis’ (Mata et al. 1995)	Access to capital, Proprietary technology, Technical skills, Managerial skills
‘Develop Long-Term Competitiveness Through IT Assets’ (Ross et al., 1996)	Technology asset (reusable technology), Relationship asset (IT-business partnering relationship), Human asset (IT human resources)
‘IT Capabilities: Theoretical Perspectives and Empirical Operationalization’ (Bharadwaj et al., 1999)	IT business partnerships, External IT linkages, Business IT strategic thinking, IT business process integration, IT management, IT infrastructures
‘A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation’ (Bharadwaj, 2000)	IT infrastructure, Human IT resources and IT-enabled intangibles
‘IT Competency and Firm Performance: Is Organizational Learning a Missing Link?’ (Tippins and Sohi, 2003)	IT objects (hardware, software and support personnel), IT knowledge (technical knowledge about IT systems), IT operations (IT utilization to manage information)
‘The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research’ (Wade and Hulland, 2004)	External relationships management, Market responsiveness, IS-business partnership, IS planning and change management, IS infrastructure, IS technical skills, IS development, Cost effective IS operations
‘Information Technology Capability, the Effects on Organizational Performance’ (Pham and Jordan, 2007)	IT human resource, IT partnership, IT infrastructure

Ross et al. (1996) have argued that there are three resources that constitute technological capabilities: technology resource (i.e. a reusable technology base), human resource (i.e. highly competent IT staff) and relationship resource (i.e. a strong partnering relationship between the business and IT management). They stress that an organizational long-term competitiveness can be developed when an organization has an empowered IT team which can apply its technical skills to meet changing business opportunities. And the team has to be supported by solid technological architectures such as shareable technical platforms and data bases. In addition, the IT team must gain support from top management as well as it must develop a positive relationship with other business groups. Along the same line, Pham and Jordan (2007) conducted an empirical research to examine which components of the IT capabilities that will affect the development of an organization’s competitive

advantage the most. From the study, it is found that the IT human asset is the most significant; follow by the IT infrastructure, whereas the IT relationship asset has the least influential on the developing of competition advantage. This is consistent with Tippins and Sohi's work on IT capabilities (2003), in which they argue that the IT human asset can be reinforced with an effective organizational learning process in which IT knowledge is created and integrated, and that this is important for information processing.

For this paper, technological capability is regarded as the ability to *leverage technological resources* to support and facilitate co-operation in a collaborative network. Building on work from the literature, technological capability is composed of two critical components: human competence and relationship competence. The third potential competence, a technology resource, is similar to the ICT infrastructure outlined above, and is not discussed further here as a component of technological capability.

The human competence refers to the managerial IT skills which are needed to develop and leverage technological resources to support and enhance the organizational activities. Managerial IT skills are known to be inimitable, non-substitutable and imperfectly mobile as they are often developed through over longer period of time through accumulation of experience by trial and error learning, which poses a difficulty for competitors to duplicate such managerial IT skills (Mata et al., 1995). Managerial IT skills encompass of learned abilities, expertise and knowledge to support and enhance activities such as IT planning, IT project management practices, planning for security control and standards compliance, consistency of IT policies and competent IT skill base (Bharadwaj, 2000). An efficient leveraging of technological resources such ICT infrastructure is dependent on managerial IT skills. This is because, as contended by Mata et al. (1995), ICT infrastructures are merely sources of temporary competitive advantage. Instead managerial IT skills are required to combine, co-ordinate and exploit with other resources to transform ICT infrastructures as sources of sustained competitive advantages. The construction of solid and inimitable technological architectures such as technical platforms, networks, inter-organizational information systems and infrastructure requirements requires effective IT planning, security control and standards compliance planning and technical skills.

The relationship competence refers to the ability to foster rich partnerships between the technology providers and the technology users (Bharadwaj et al, 1999). It enables the process of integration and alignment between IT/IS functions with other departments' functions in an organization (Wade and Hulland, 2004). The effectiveness in the leveraging of technological resources critically depends on the interaction between the technology providers and technology users (Bhatt and Grover, 2005). The technology providers must have a sound understanding of the organization's operation and strategy so that they can work hand-in-hand with the technology users as they are the ones who are using the technology. In addition, the relationship component also refers to the commitment and support from the top management to envision how IT contributes to business value and the ability to integrate IT planning with the organization's business strategy (Bharadwaj et al, 1999). A lack of top management's commitment and support will induce an ineffective leverage of technological resources (Wade and Hulland, 2004). Examples of such support include: provision of financial resources to build technological architectures and to train the employees and cultivating an IT culture to close the gap between technology providers and users. Based on the above, we make the following proposition:

*Proposition 4: A technological capability in leveraging technological resources is needed for a sustainable collaborative network.*

There are a growing number of scholars who contend that the deployment of ICT cannot be regarded as a stand-alone resource; instead, it has to interweave with organizational resources (e.g. Barua et al., 2004; Carr, 2003; Mata et al, 1995; Tippins and Sohi, 2003; Wade and Hullman, 2004). By extending this rationale to the context of capabilities, this paper further proposes that a collaborative network has to develop a *resource complementarity capability* – a capacity to effectively combine the technological capability with the organizational capability. There are two factors to support this perspective. First, as mentioned earlier, resources have to be complemented so that synergistic effects can be created which is crucial in sustaining a collaborative network. If first-level resources have to be complemented, implicitly, technological and organizational capabilities as the second level of resources have to be complemented as well, since the effectiveness in leveraging of those resources is dependent on these capabilities. Second, according to Tyler (2002), when capabilities are complemented this enables a greater potential basis of competitive advantage, that is to say, greater synergistic effects. Organizations will only want to form a collaborative network when they can anticipate synergistic gains. The greater the synergistic gains, the more effective and sustainable a collaborative network will be, as the collaborative partners are more committed to reducing the occurrence of opportunistic behaviour (Lee et al., 2008). Literally, synergy can facilitate an ongoing inter-organizational co-operation as long as the collaborative partners can foresee the existence of synergistic gains.

Technological capability is the ability to deploy ICT infrastructures to support, and ICT technical skills to facilitate communication in which an efficient information processing can be effected. And the quality of the

information is dependent on the connectedness of the inter-organizational relationships, that is to say to what extent the collaborative members are willing to share the information with each other. As such, it requires a collaborative network learning capability to bridge the connectedness so that more richness and resourceful information can be assimilated and disseminated in the collaborative network. Bharadwaj (2000) points out that managerial skill are evolved through the accumulation of experiences which are stored in the organizational routines and processes. As per se, there is a need to complement with the collaborative network learning capability in which IT knowledge can be created and integrated consequently it enables an efficient facilitation of information processing (Tippins and Sohi, 2003). On the other hand, a strong collaborative network learning capability can be created when there is an integration of ICT infrastructure with ICT technical skills (Bharawaj, 2000). ICT infrastructures connect the collaborative members by supporting the communication whereas ICT technical skills facilitate the communication process in a collaborative network. Technological capability acts as a co-ordinating mechanism to facilitate the co-operative activities in a collaborative network hence it can foster the connectedness between the inter-organizational relationships (Li et al., 2006). As such, this paper will further emphasize that a collaborative network ought to develop a complementary capability in complementing both technological and organizational capability in sustaining a collaborative network:

*Proposition 5: A resource complementary capability in complementing both technological and organizational capability is needed for a sustainable collaborative network.*

## CONCLUSION

This paper refers to network sustainability as the ongoing maintenance of a collaborative network. For a collaborative network to be sustainable, it requires two characteristics. First, a collaborative network can only be sustained if there is an inter-organizational co-operation. Second, the co-operation has to be facilitated by a moderate level of connectedness of inter-organizational relationships in a reasonable time frame. ICT-based technological resources are capable of supporting and facilitating co-operation across functional boundaries, while organizational resources can bridge the connectedness by reducing conflicts and opportunistic behaviour. To a further extent, a collaborative network needs to develop a technological capability and an organizational capability, a higher-level of resources which are the vehicles to drive the exploitation of the first-level resources to perform their functions (Araya et al., 2007). Subsequently, these two capabilities have to complement each other in creating synergistic effects. These synergistic effects can determine the sustainability of a collaborative network (Zineldin, 1998). As the greater the synergistic gains, the more sustainable a collaborative network will be, as the collaborative partners are more committed consequently reduce the occurrence of opportunistic behaviour (Lee et al., 2000). Based on these propositions, a conceptual framework for understanding how a collaborative network is sustained is presented in Figure 1.

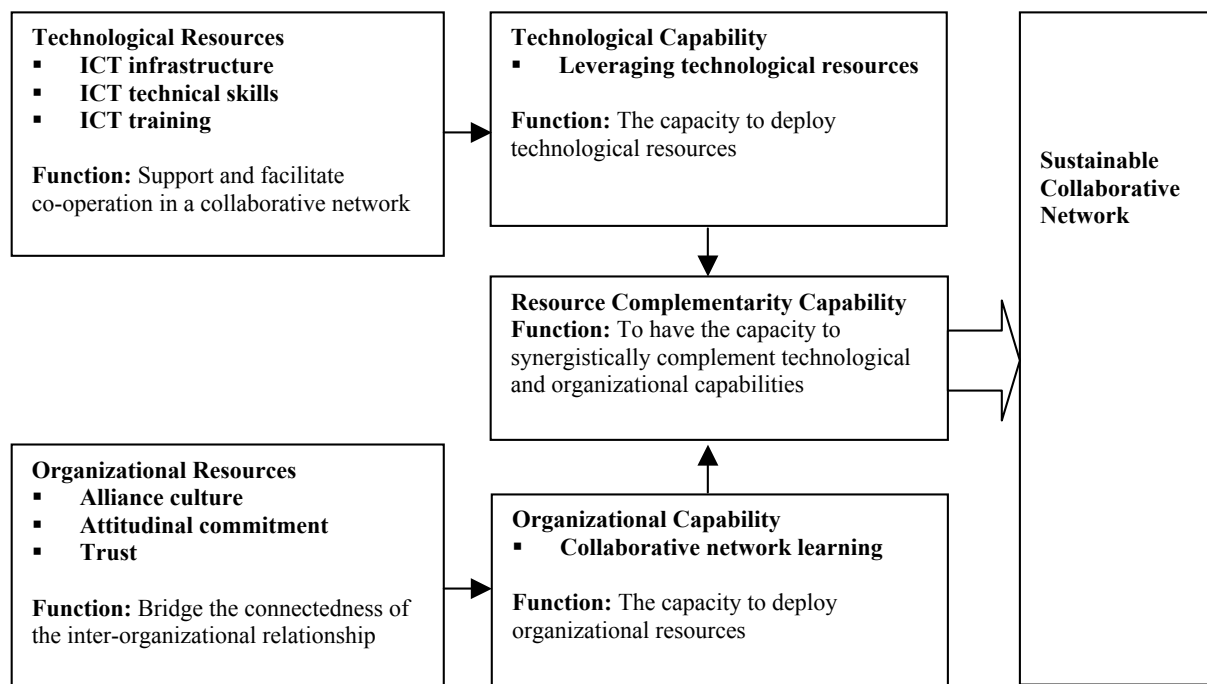


Figure 1. Conceptual Framework of a Sustainable Collaborative Network



This paper provides an important contribution to both research and practice. It opens a wider lens in examining the role of capabilities in sustaining a collaborative network; specifically the need for a collaborative network to develop three types of capabilities: technological capability, organizational capability and a resource complementary capability. Each capability has its unique function in making the collaborative network sustainable. From a managerial standpoint, this paper provides a framework in which the managers can assess the impact of the capabilities on the collaborative network's sustainability. It gives an insight to the managers for deciding to what resources to be allocated in order to constitute the identified capabilities in sustaining the collaborative network. The framework will also be used as the basis for a subsequent empirical study of collaborative networks by the authors.

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