Online value network linkages: integration, information sharing and flexibility

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Abstract

Organisation’s value chains are part of a wider chain of events – value networks. This paper explores the role of Internet-related technologies (IRT) in improving inter-organisational linkages and information sharing across value networks and the impact it has on the level of product or service delivered to customers. Using case study findings, the paper illustrates how IRT have strengthened and widened linkages by providing a means for greater integration, information sharing, customisation, visibility and flexibility which has lead to greater co-ordination and optimisation. It will also highlight the need for organisations to grant linkages for different value network members and the limitations of IRT.

Keywords: Internet; Value network; Linkages; Integration; Visibility; Information; Flexibility

1. Introduction

A value chain is a well-established concept for considering key activities that an organisation can perform or manage with the intention of adding value for the customer as products and services move from conception to delivery to the customer [1]. Chains of activities are commonly recognised as processes. The value that is added through processes or activities is consistently recognised as “a product of labour and is captured in the price of goods and services that is itself set by the balance of supply and demand” [2]. The key ingredients of this value have however gathered much debate and controversy. The valued elements of a product or service may range from efficiency, profitability, utilisation, quality, innovation to effectiveness, etc. [2]. Moreover, it is now being recognised that what
actually constitutes value may be perceived differently by different stakeholders including customers, suppliers, employees and investors [3].

A variety of reasons have led to organisations’ value chains shifting from being a low profile issue to a more strategic concern including the advancements in the international business environment. Organisations have advanced in terms of becoming more and more globalised. They are entering new marketplaces through the use of information and communication technologies and the development of partnerships with other organisations. In addition, customers have become more demanding in these marketplaces, expecting faster response times, shorter product cycle times and greater customisation of products. These different factors have led to much more competitive and volatile marketplaces. In order to remain competitive, organisations are finding that their value chains have to be more dynamic and responsive.

Most organisations have more than one value chain. Furthermore, organisations are finding that it is no longer enough just to manage their own value chains. They must also be involved in the management of the value chains of the upstream organisations that provide inputs (directly or indirectly) to their value chain as well as the downstream organisations responsible for delivery and after-market service of the product to the end customer [4]. This is even more the case now that organisations are increasingly involved in mergers, acquisitions, partnerships and outsourcing. These different value chains collectively contribute to the value and costs of the end product or service offering and will be referred to as the ‘value network’. More than ever, the value network extends across organisational boundaries [5,6].

The increasing focus on value chains coupled with the advancing complexities of value networks have led to a developing interest in the role of technologies such as the Internet in advancing and improving value chains and more specifically value networks. Therefore, the next section will extend the discussion of value networks and Internet-related technologies. This will be followed by an outline of the empirical research that will explore the role of IRT in value network linkages and information sharing. Then using evidence drawn from case study research, it will illustrate how organisations are using IRT for enhancing and developing value network linkages and information sharing for selective value network members and the limitations that they are up against. Finally, conclusions will be drawn and suggestions for future research highlighted.

2. Value networks and Internet-related technologies

As indicated the value chain of an organisation must be understood as part of a larger ‘system’ of related value chains [7–9] which the paper has referred to as a value network. Inputs that are used in an organisation’s value chain may pass through the value chains of many suppliers or manufacturers on their way to the organisation and outputs from an organisation may pass through many distributors, retailers or customer’s value chains before it reaches the final customer. In addition, the organisation’s value chain may interact with the value chains of many other 3rd parties such as competitors or logistic providers.

Value networks will vary in terms of their horizontal length, i.e., number of tiers of suppliers or customers and also their vertical structure, i.e., the number of customers and suppliers at each tier [10]. Organisations are often involved in a variety of value networks. They may be involved in value networks in different industries and/or value networks that serve different sectors or markets within the same industry and/or value networks that even serve the same sector or market.

The proliferation of telecommunications and information technologies such as the client server concept, the Internet and the www have had dramatic impacts on organisations and the value networks that they participate in. Organisations have employed Internet-technology to build internal corporate communication networks (Intranets) and subsequently, extended these networks to external organisations (extranets). Many other tools and technologies have also emerged that had been developed and are being continually being developed with the Internet as the supporting platform such as e-mail, portals, Electronic
Data Interchange (EDI), Database Management Systems (DBMS), Enterprise Resource Planning (ERP) systems, workflow systems, shared whiteboard, etc. All of these different technologies will be collectively referred to, throughout the paper, as Internet-related Technologies (IRT).

IRT have seen the automation and integration of many internal processes and have made real-time on-line communication throughout organisation’s value chains a reality. They have also made inroads in developing inter-organisational processes. Early inter-organisational applications based on IRT were identified by Li and Williams [11], and Benjamin and Wigand [12]. Applications, however, have become more advanced. Organisations are now developing more sophisticated inter-organisational infrastructures by using IRT to develop extranets and portals accessible to other organisations and integrating internal and external processes and systems. Benefits can be realized by speeding up communication with customers and suppliers, improving service levels and reducing logistic costs [13].

Inter-organisational infrastructure and linkages enable different organisational members of a value network to come into contact with an organisation’s value chain at different points. Porter [7] refers to these as contact points. The ability to coordinate inter-organisational linkages is critical in achieving competitive advantage. Organisations need to use IRT to develop linkages with different organisations involved in the value networks with the purpose of developing more dynamic and responsive value networks. Rayport and Sviokla suggest that electronic links should be used to connect the supply side of the value network with the demand side of the value network and an organisation’s performance can be optimized and efficiencies maximized if the demand for its products and services are matched very closely to the supply of resources at all times [8,14]. Information flows and communication needs to be able to take place upstream and downstream between value network members [8,14,15]. The challenge facing managers is to apply Internet-technology in such a way that develops inter-organisational value chain linkages to the benefit of the organisation and helps achieve sustainable competitive advantage.

Furthermore, the inter-organisational linkages that organisations develop with other value network members are likely to be influenced by the relationships that the organisation has with them. Relationships can be placed on a “continuum of possible relationships” from arm’s length to integrated operations. Partnerships in value networks are attributed with involving close, highly interactive relationships between business organisations involving components such as joint planning, sharing of benefits and burdens, extendedness and trust, norms and expectations, systematic operational information exchange, operating controls across firms and corporate culture bridge-building [16,17]. Partnerships tend to involve a shift in focus from “the narrow economically rational goal of winning immediate gain and exploiting dependency to cultivating long-term cooperative ties” [17].

Organisations should be looking to develop long-term secure relationships with key value network members. Key value network members are vital to the overall functioning of the organisation and/or they contribute to their overall strategic effort. Key value network members often shape the value network, have an influence over major decision making and have the power to assert their solutions, i.e., direct the policy network. It is not only beneficial for the organisation to develop long-term relationships with these value network members but also often critical to their position and level of competitive advantage.

Organisations also interact with a range of value network members sporadically in short-term relationships. Short-term relationships are characterised as being lean and used for sporadic transactions. They do not require the same level of human contact or social contract. These relationships can be kept at arm’s length. For example, organisations may purchase materials from suppliers, use the services of logistic provider or customers may purchase a product from the organisation on a one off basis. These types of network members will sporadically change with little damaging effects to the organisation and the linkages that they have different value network members that they have relationships with. Organisations may concentrate on enhancing different aspects of inter-organis-
tional linkages and information sharing through technology depending on the type of partnership that they require to have with other network members.

Overall, there is little empirical research on the role of IRT in developing value network linkages and information sharing and the linkages that they have with different value network members that they have relationships with. The main objective of this research is to analyse the practical role of IRT in optimising inter-organisational linkages and information sharing across value networks and the impact that this has on the level of product or service delivered to customers.

3. Case study research strategy

A case study method was selected for a number of philosophical and practical reasons. Case studies consist of detailed investigations that allow research to be conducted in their natural settings. They are particularly appropriate for ‘sticky’ practical-based problems where the experiences of the actors are important and the context of the phenomena is critical [18]. This particular topic is very much contextually based and includes many ‘how’ and ‘why’ questions, e.g., how do IRT impact value network linkages? and why do they use it for sharing particular types of information? These issues need explanations and require an understanding of the nature and the complexity of the processes taking place. Moreover, research on IRT and value network linkages is still in its infancy and case studies were able to be used to explore this new area of research and induce new theory.

Each case study was concerned with studying the role of IRT in business processes in a value network in a particular sector within an industry that cut across and involved the linkages between the value chains of focal organisations and suppliers, customers and/or logistic providers. Case study A involved analysing the Materials Replenishment process in the IT industry. Case study B was based on the ordering fulfillment process in the automobile industry while case study C studied the Customer Service and Support in the IT industry. Finally, case study D analysed the Procurement process for non-production related goods in the telecommunications industry. Information was gathered on five main areas including organisational issues, IT issues, value network issues, value network linkages and information sharing issues and finally the benefits and limitations of using IRT.

Multiple sources of evidence were used in the case studies including semi-structured interviews, informal conversations and e-mail correspondence with top, middle and operational management, IS specialists and end users. Other data collection methods included accessing corporate websites, corporate reports, strategy documents, newsletters, organisational charts, internal surveys, system training manuals, internal correspondence, demonstrations, presentation materials, newspaper articles, etc.

The research involved many cycles of data collection and analysis. The data were analysed using some of the principles of the hermeneutic circle [19] and through an identification of key themes and patterns. The hermeneutic circle involved moving constantly from the individual parts of the phenomena to the whole phenomena and back again until a coherent interpretation had been reached. This was essentially done through the researcher attaining a rich familiarity with parts of each case and then the overall case (within case analysis) and then searching for patterns between the various case studies (cross-case analysis) [20] and so on. Common themes and areas of interest were organised and re-organised under headings and sub-headings until a coherent sense of contribution and interpretation was reached [21].

The very nature of case studies and the variety of data collection methods employed allowed the researcher to gather a richer insight into the field being studied. The purpose of the research was not to produce statistical generalisations but to identify emerging tendencies in the field and put forward theoretical propositions. A wide variety of methods allowed a stronger pool of evidence to be gathered and enabled triangulation to provide stronger substantiation of constructs and hypothesis formulated [20]. The following section will outline the emerging findings of the research.
4. Role of IRT in value network linkages and information sharing

The empirical findings highlight four main contributions to knowledge. Firstly, IRTs are being used to strengthen inter-organisational value network linkages through integration and technologies such as portals thus providing better information sharing and greater visibility. Secondly, IRTs and in particular the www, is providing a mechanism for greater scope and flexibility in the linkages between the value chains of different organisations involved in a value network. Thirdly, organisations need to be careful of which organisations in the value network are provided with this level of flexibility and information sharing. The closeness of relationships will vary at different points of the value network and the appropriate level and nature of Internet-related linkages will need to be matched to different value network members. Finally, there are still a number of limitations associated with using IRT for value network linkages.

4.1. Strengthen value network linkages

Organisations are using IRTs to strengthen linkages with value network members who are involved in common value networks, processes and activities. This is mainly feasible because of the levels of integration, the use of portals, the level of information sharing and the visibility that is now possible. Examples of how each organisation have used IRT to strengthen value network linkages are provided in Table 1.

<table>
<thead>
<tr>
<th>Process</th>
<th>Value network members</th>
<th>Integration</th>
<th>Portals</th>
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<tbody>
<tr>
<td>Case A</td>
<td>Case B</td>
<td>Case C</td>
<td>Case D</td>
</tr>
<tr>
<td>Material replenishment</td>
<td>Order fulfilment</td>
<td>Customer service and support</td>
<td>Non-production related procurement</td>
</tr>
<tr>
<td>Focal organisation, suppliers,</td>
<td>Focal organisation, customers (dealers)</td>
<td>Focal organisation, customers</td>
<td>Focal organisation, suppliers</td>
</tr>
<tr>
<td>Customers, logistic providers</td>
<td></td>
<td>Ordering and delivery</td>
<td>Requisition, ordering and payment</td>
</tr>
<tr>
<td>Customer ordering, materials</td>
<td>e.g. Suppliers – supplier specific information, reports, applications, up and coming events, trade mags, education</td>
<td>Ordering and delivery customer replenishment and customer fulfilment</td>
<td>e.g. Logistic providers – order schedules, distribution information</td>
</tr>
<tr>
<td>replenishment and customer</td>
<td>Organisations currently developing portals for dealers</td>
<td></td>
<td>e.g. Suppliers – product catalogues, requisitions for their products and the status of their account</td>
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<td>fulfilment</td>
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Table 1
Strengthen value network linkages

<table>
<thead>
<tr>
<th>Sharing information</th>
<th>Visibility</th>
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<tbody>
<tr>
<td>e.g. Suppliers – material requirements planning, demand replenishment</td>
<td>e.g. the movement of goods from procuring to production to delivery</td>
</tr>
<tr>
<td>e.g. Customers (Dealers) – customer orders, stock of cars, car specifications</td>
<td>e.g. cars at different stages of manufacturing pipeline</td>
</tr>
<tr>
<td>e.g. Customers – technical support, known product faults, parts and installation information, not news</td>
<td>e.g. trails that customers have followed to solve problems</td>
</tr>
<tr>
<td>e.g. Suppliers – aggregated product catalogue of all products, employees expenditure, requisitions, invoices</td>
<td>e.g. the progress of requisitions</td>
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4.1.1. Integration

Intranets enable many different systems, tools and technologies to be fully integrated into a common network. ERP systems, SCM systems, EDI systems, financial systems, procurement systems, customer service and support systems and many other systems can all be integrated and linked to document management systems, decision support tools and project management tools, DBMS and many other tools and applications. These Intranet-based systems can also be easily linked to other organisational Intranets using web links. All the organisations studied had made inroads to integrate systems and processes to ensure consistent information is diffused across the value network and between people involved in processes.

For example, the full procurement process from requisition to payment has been consolidated on the Intranet in case study D. Various tools and technologies have been interlinked including an ARIBA procurement system, supplier’s catalogues, an Oracle Financial System, a Signature Authorisation List Tool and e-mail. Consistent information is shared between the people who raise the requisitions, the buyers, managers and accountants and suppliers.

4.1.2. Portals

Often one of the main problems for other members of the value network accessing an organisation’s Intranet is that they find it difficult to find the information they are looking for. In an attempt to overcome these problems, organisations are setting up portals for value network members. A portal is like a gateway and acts as a major starting site for users when they connect to the Intranet. The portal is customised and personalised to user needs. It incorporates all necessary connections to resources, applications and information unique to their specific requirements. It enables value network members to more readily find the information they are looking for.

The organisation in case study A has set up portals for suppliers, customers and logistic providers. For example, the supplier portal is customised with supplier specific information, reports such as forecasted customer demand, relevant applications, up and coming events, trade magazines and education. The logistics provider portal allows them to access order schedules and distribution information. In case study C, larger customers which the focal organisation has some kind of partnership with have their own dedicated web-portals. The portal is tailored to customer needs and highlights information specific to their requirements. It is set up with the customer’s logo and filled with approved product configurations, prices, systems, accessories and spare parts. It provides facilities for remote support, service ordering and progression tracking. Service and warranty notification are sent automatically to service teams via the portal and warranty upgrades that have been negotiated and agreed are readily available.

4.1.3. Sharing information

Organisations are implementing web-based inter-organisational systems because it opens up endless opportunities for sharing information between organisations involved in a common value network environment. Information ranges from organisation’s forecasts to planning information to product information.

For example, suppliers in case A have access to information on materials requirements planning and demand replenishment. This not only lets them better manage their own value chain activities better, e.g., when and how many components they need to produce but it means there is more chance of the organisation’s supplies being delivered at the right time. It also reduces inventory for the supplier and the organisation which minimises warehousing requirements and therefore costs.

Customers in case study C have access to customer service information. This includes on-line technical support, tips on known product faults, discussion groups, parts information, installation information, software, hot news and warranty issues regarding products. This not only provides the customer with an enhanced, quicker and more accessible service but it also cuts the costs for the organisation providing the service as they have to deal with less customer enquiries and can concentrate their efforts on more complex problems. Also, the organisation has the capability to gather information. Based on the type of questions that
customers are asking, the organisation continually develops the customer service and support web site to provide relevant information. Overall, there is much less problems with their products.

The sharing of information in a common inter-organisational environment enhances the linkages between organisation's value chains in a value network. It facilitates the coordination of products and services from one value chain to another. It helps reduce inventory, save costs, improve decision making, improve timeliness and overall provide a better level of service to the customer.

4.1.4. Visibility

Integrated IRT also supports clearer visibility and understanding of what is happening across the value network. For example, the on-line ordering system allows the organisation and its dealers (essentially its customers) to have clear visibility of cars at different stages in the manufacturing pipeline. Before the system was introduced, dealers would try and manually locate vehicles to meet customer orders. This was a timely exercise and would invariably lead to orders being placed for cars which were lying unsold at other locations. The Internet-based system, however, enables them to easily view unsold cars online at different stages of the pipeline: planning stage, production stage or built and in storage stage. It enables dealers to tap into this information and snatch cars to meet the demands of their customers. This will improve customer service in terms of how quickly they can get the cars to the customers and allow dealers to accurately match customer requirements. It also helps to cut down on cars in stock and therefore reduce costs and enables cars to be transferred to suitable customers before they become obsolete.

The Customer Service employees, of case study C, also have clearer visibility of the trails that customers have followed in order to try and solve problems with products. When the customer sends an e-mail regarding their problem, the trail that they have already followed would be swept up and attached to the e-mail. Customer service and support employees can use this trail of information to help solve the problem and pursue alternative avenues. The employees now have facilities to even see what is going on, in a customer's PC, using IRT.

Overall, inter-organisational linkages involving different value network members can be strengthened by the integration of IRT, systems, facilities and applications. Greater information can be shared between value network members and portals can assist in streamlining and customising the information that is shared. The visibility that has been gained through this integration has also clearly enhanced value network cohesiveness and coordination.

4.2. Increase value network flexibility

Traditionally, value network members had limited points of contact with each other and limited methods of making contact. However, using a range of different IRT, the choice of paths and options for contact are increasing. There is greater scope and flexibility for establishing more diverse linkages and pathways. These are summarised in Table 2. This is largely due to the web links and integration between systems and the information sharing and visibility now possible.

4.2.1. Different links to same point of a value chain

There are now often a number of alternative ways of linking to the same point of contact in an organisation's value chain using IRT. For example, in case study C, there is two web links that customers can use to access the relevant level of customer service and support in the organisation. They can either go in as an experienced user or as an inexperienced user. The experienced user can access it using a quick path while the less experienced user can be walked through the system step by step using an on-line assistant. These may be two different pathways but each pathway has consistent information. The end result is the same but the level of support and time taken in each pathway is different.

4.2.2. Links to different points of a value chain

There is also an increase in the number of different paths a value network member can access within an organisation's value chain. For example, in case study A, IRT supports different members
of a supplier’s value chain in interacting with different areas of the focal organisation’s value chain. These links can be easily accessed via the supplier portal and are illustrated in Fig. 1. The supplier may access an online scorecard application that is produced by the organisation’s Performance Management (Link S1) or the demand replenishment material from the organisation’s Order Fulfilment (Link S2). The focal organisation’s Quality department can access updates on processes or products from the suppliers (Link S3). Supplier’s Planners can collaborate with the organisation’s planners on materials replenishment plans (Link S4) and so on. The diagram only shows the relevant functional areas.

Case study C also highlighted many different points of contact between a customer’s value chain and the organisation’s value chain with the customer portal providing a starting point. This is also shown in Fig. 1. Customers are able to view
shipments of orders online through Order Fulfilment (Link C1) and they can access warranty information from Customer Service & Support (Link C2). Moreover, the focal organisation’s Engineering function can access known product faults from the customer’s quality department (Link C3).

Even though the diagram only illustrates a collection of linkages between organisations and selected suppliers and customers, it demonstrates the potential complexity and diversity in different linkages that have emerged, supported by IRT. Many different linkages have developed between organisations and other value network members.

Organisations can also set the portals up in such a way that they can monitor how many times the value network members log in and how many times they use particular links or applications. This informs organisations of what linkages and facilities that other members find most useful.

4.2.3. Links to different tiers of value network members

This concept can be widened to the overall value network as well. Traditionally, inter-organisational linkages were restricted to key suppliers and key customers (1st tier). A common network connection provides more flexibility and opportunity for inter-organisational linkages between other tiers of suppliers and customers. Previously, many of the organisations studied would only have been able to have limited interactions with 1st tier suppliers or customers. Now many of the organisations may have on-line interactions with 2nd tier suppliers and customers and other tiers of suppliers and customers. This is displayed in Fig. 2.

4.2.4. Direct links between other value network members

Even more revolutionary, though, is the Internet’s capability to establish new, direct links between the other value network members, i.e., between suppliers and customers, between suppliers and logistic providers and between logistic providers and customers. This concept had emerged in case study A with 1st tier value network members now being able to directly interact with each other through the organisation’s portal. These linkages are highlighted in Fig. 3. For example, suppliers can interact with customers and gain access to real-time customer ordering information. Logistic providers can interact with suppliers and customers

Fig. 1. Links to different points of value chains.
enabling them to aggregate different products that make up an order and deliver the order in one batch rather than in bits and pieces. Information sharing and collaboration is no longer through an intermediary.

There are many reasons why organisations will be tempted to pursue these developments. It can result in mutual process efficiencies for all value network members involved. It brings suppliers closer to end customer, it enables suppliers to make decisions based on knowledge of actual customer demand and reduces supplier planning cycles. It allows organisations to reduce costs and inventory, improve quality and responsiveness and shorten lead times. It provides logistic providers access to information necessary to anticipate, aggregate and deliver orders and overall provide customers with a more proficient service. Value network linkages can be developed to even more advanced levels, by enabling direct communication between value network members.

Overall, IRT offers so much more flexibility for the scope and diversity of inter-organisational linkages. Also the information and applications that can be shared across inter-organisational systems will pull value network members closer together. As a result, this improves the efficiency and effectiveness of the value network that is serving the end customer.

4.3. Differentiate value network relationships

The other factor that needs to be taken into account in inter-organisational linkages is the level of relationship an organisation has with different members of the value network. Organisations...
should be applying IRT differently depending on the nature of the relationship. This should be in terms of the level of customisation, the level of information that is shared and the level and diversity of linkages that are enabled.

4.3.1. Long-term/key relationship

Organisations should concentrate on developing long-term cooperative relationships with key value network members that are critical to the operation of their value network and/or beneficial to their strategic effort. For example, in case A the materials replenishment process is a critical process in the day-to-day operation of the organisation. It is an inter-organisational process that cuts across the value chain network with key component suppliers playing a vital role. Thus, it is important that long term, secure and reliable relationships are built up with key component suppliers to ensure a good level of supplier service. Likewise in case D, the non-production related procurement process is not critical to the end product or service of the organisation. However, it provides support to the day to day running of other processes in the organisation. There are a selected number of key suppliers of non-production related goods that the organisation needs to build up long-term relationships with. This can help reduce costs and provide other benefits to the organisation.

Organisations should invest a lot more time, effort and money in technological linkages with these types of value network members. They should be provided with access to more aspects of organisation’s Intranets, specialised applications and other resources. The relationships should be developed more fully by sharing a more in-depth level of information, a greater flexibility of linkages and superior customisation of links.

This can be illustrated by considering case study C. A key value network member would be provided with a greater variety of ways of accessing customer service and support. The technical support would also be customised for them. One of the main criticisms in the past was that too much information was available and it took too much time and effort to find the information they were looking for. Through customer profiling and using cookies in customer’s machines, the web-site has been customised to provide an appropriate level of information. The saves customers a lot of time when using the service and support (saves clicks and frustration). Also, occasionally, the organisation can send them pro-active e-mails about developments to a product or faults, etc.

4.3.2. Short-term/non-key relationship

Shorter relationships may be developed with non-key value network members and they would be provided with more limited level of linkages, information and less customisation. The level of linkages and information sharing can be controlled by the security and accessibility provided via web links. For example, the organisation in case study C provides access to portals, vast amounts of information and facilities to long-term key members while short term, non-key customers only have a standard level of access to on-line customer service and support. Despite this, more and more of the short-term customer are using the self-help facility available on-line. It adequately meets the needs of their one off queries and it saves a lot of time for employees in customer service and support.

Another example can be provided using the material replenishment process of case study A. A key aspect of many large organisations’ procurement strategy, at the moment, and including this one, is dynamic bidding or on-line auctions. Organisations trade through electronic intermediaries with short-term suppliers for sub-tier components or one-off components. For example, the organisation would hold an auction if they have needed some extra disk drive space. Suppliers would be informed that a bid was taking place, the auction would open electronically for 10 min and all suppliers would make their bids online. The interaction would be short, sporadic and would not develop any kind of long-standing, trusting relationship between the organisations. However, the interaction meets the needs of the circumstances. The organisation has also used these auctions for off-loading excessive stock to customers. Again, customers would be informed that they were holding an auction to sell stock
and customers would make the appropriate bids to buy the stock.

4.4. Limitations of IRT

Finally, although the role of IRT in virtual networks has vast potential, there are still a number of factors that have been highlighted throughout the case studies that limit the role of IRT and may prevent certain aspects of inter-organisational linkages and information sharing from successfully being automised. These are related to organisational, social, cultural, technological and security issues.

Firstly, there are a number of organisational limitations that should be understood. Although, on-line value networks offer the flexibility of an increasingly distributed workforce, organisations need to be careful that dysfunctions such as low commitment, poor morale, role ambiguity and social loafing do not become exaggerated. A more rigorous management approach is likely to be required for on-line value network linkages. Furthermore, the workforce skills will have to advance accordingly. Some employees are reluctant to share information as they perceive the information as power and as securing their position within the organisation. Other employees provide too much information leading to ‘information overload’. Organisations need to look at ways of promoting effective information sharing and recognising employees’ abilities to share information across value network linkages.

Social limitations may also hamper the role of IRT. For example, although long-term relationships may be strengthened and enhanced through integration, greater information sharing, customised portals, more flexible linkages, etc., sometimes technological linkages are still not enough on their own. Many organisations still favour an element of social face to face interaction for developing trust, common understanding, compatibility and other attributes associated with long term relationships. As a result, long-term key relationships will often be lead and negotiated by top management teams that meet periodically face to face. The Materials Manager in Case study A indicated that although suppliers are measured on aspects such as cost, quality, availability, strategic capability and technical capability, often their performance on these aspects is very similar. In these situations, it is actually the experience of working with a supplier or the way they do business that will make the final decision. Overall, long-term relationships do not just develop overnight. Long-term relationships can take two to three years to fully develop.

Culture can additionally limit the role of inter-organisational systems. Although more and more people are using IRT, there are still people who are not as comfortable using the technology and tend to prefer conventional mediums. Consequently, the Customer Service and Support function of case study C recognise the importance of still providing other communication links to customers such as the telephone. Technological issues also still prevail. The infrastructures in different countries can vary dramatically in terms of performance and level of advancement. This may be a problem if other value network members are based in different countries. Finally, security can also still be an issue for inter-organisational linkages. Some value network members are using Intranets that do not have the same level of security as the focal organisation’s own Intranet. This issue needs to be taken into consideration when the organisation decides which linkages and which information they will make available to them. There is also always the fear that other organisations will use the information that they have access to against you. As indicated previously, organisations need to be extremely careful which organisations they decide to share information with.

Overall, these various limitations must be given due attention in the development of technological linkages. The final section will summarise the findings of the paper and suggest some future areas of research.

5. Conclusions and future research

IRT are increasingly being used to strengthen value network linkages. This is attributed to its ability to integrate and customise value network systems and improve information sharing and visibility. Furthermore, IRT has advanced the poten-
tial level of flexibility for establishing more diverse linkages and pathways across value networks in terms of enabling different ways of accessing value chain contact points, linkages to different points of organisation’s value chains, linkages with different tiers of value chain members and direct linkages between other value network members.

The strengthening of value network linkages and making value network linkages more flexible has succeeded in benefits such as increased responsiveness, cost savings and reduced inventory and bringing value network members closer together, establishing a more coordinated and optimised value network and overall enhancing the level of service and product offering.

The level of closeness required and the length of a relationship clearly varies at different points in the value network. This will dictate the diversity of the inter-organisational linkages that should be established, the level of enhancement and the communication channels that should be used. Organisations need to place a lot of emphasis on developing linkages with key organisations in the value network and have an awareness of the limitations that are still apparent.

There are obviously many potential benefits from applying IRT to value network activities. However, the long-term role of IRT in value networks still remains uncertain. As many previously human handled value network linkages are being automated using IRT, future research will have to focus on the lasting impact of technological linkages on personal relations between different organisations in terms of trust, cohesiveness, common understanding, etc. Also technology is always developing and emerging technologies that are likely to impact value networks include smart tags and mobile technologies. The impact that these additional technologies will have on inter-organisational linkages and gathering and distributing information up and down the value network will have to be investigated.

References