Chapter 1

Knowledge Management Strategies for Virtual Organisations

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Much has been written about the virtual organisation and the impact this will have on organisational forms, processes and tasks for the 21st Century. There has been little written about the practicalities of managing this virtual organisation and managing virtual change. The ability of the organisation to change or to extend itself as a virtual entity will reflect the extent to which an understanding of virtual concepts has been embedded into the knowledge management of the virtual organisation as a Virtual Organisational Change Model (VOCM). Managing these change factors is essential to gain and maintain strategic advantage and to derive virtual value. The authors expand these concepts by using the example of organisations using Information and Communications Technology (ICT) and illustrate the three levels of development mode – virtual work, virtual sourcing, and virtual encounters and their relationship to knowledge management, individually, organisationally and community wide through the exploitation of ICT.

What is a virtual organisation? One definition would suggest that organisations are virtual when producing work deliverables across different locations, at differing work cycles, and across cultures (Gray and Igbaria, 1996; Palmer and Speier, 1998). Another suggests that the single common theme is temporality. Virtual organisations centre on continual restructuring to capture the value of a short term market opportunity and are then dissolved

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to make way for restructuring to a new virtual entity. (Byrne, 1993; Katzy, 1998). Yet others suggest that virtual organisations are characterised by the intensity, symmetricality, reciprocity and multiplexity of the linkages in their networks (Powell, 1990; Grabowski and Roberts, 1996). Whatever the definition there is a concensus that different degrees of virtuality exist (Hoffman, D.L., Novak, T.P., & Chatterjee, P.1995; Goldman, Nagel and Preiss, 1995) and within this, different organisational structures can be formed (Davidow and Malone, 1992, Miles and Snow, 1986). Such structures are normally inter-organisational and lie at the heart of any form of electronic commerce yet the organisational and management processes which should be applied to ensure successful implementation have been greatly under researched (Burn and Barnett, 1999; Finnegan, Galliers and Powell, 1998; Swatman and Swatman, 1992).

It could be argued that there is a degree of virtuality in all organisations, but at what point does this present a conflict between control and adaptability? Is there a continuum along which organisations can position themselves in the electronic marketplace according to their needs for flexibility and fast responsiveness as opposed to stability and sustained momentum? To what extent should the organisation manage knowledge both within and without the organisation to realise a virtual work environment?

A virtual organisation's knowledge base is inevitably distributed more widely than a conventional one, both within the organisation and without – among suppliers, distributors, customers, and even competitors. This wide spread can deliver enormous benefits; a wider range of opportunities and risks can be identified, costs can be cut, products and services can be improved and new markets can be reached by using other people's knowledge rather than recreating it. However, this does make it both more important and more difficult to manage knowledge well. It is harder to share knowledge and hence exploit it in a dispersed organisation, and there is an increased risk both of knowledge hoarders and of duplication leading to possible loss of integrity and wasted effort. While competencies and their associated knowledge may be more effectively bought from business partners or outsourced if there are economies of scale, expertise or economic value, care must also be taken to avoid losing the knowledge on which core competencies are based or from which new competencies can be developed quickly.

The ability of the organisation to change or to extend itself as a virtual entity will reflect the extent to which an understanding of these concepts has been embedded into the knowledge management of the virtual organisation as a Virtual Organisational Change Model (VOCM). Managing these change factors is essential to gain and maintain strategic advantage and to derive

virtual value. The authors expand these concepts by using the example of organisations using Information and Communications Technology (ICT) to implement an Enterprise Resource Planning (ERP) system and illustrate the three levels of development mode – virtual work, virtual sourcing and virtual encounters and their relationship to knowledge management, individually, organisationally and community-wide.

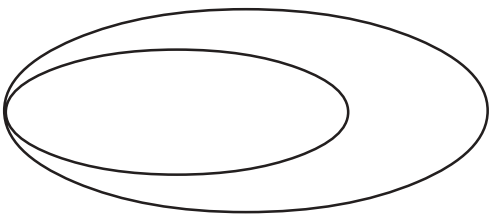
MODELS OF VIRTUALITY

Despite the growth of online activity many firms are nervous of the risks involved and fear a general deterioration of profit margins coupled with a relinquishment of market control. Nevertheless, as existing organisations are challenged by new entrants using direct channels to undercut prices and increase market share, solutions have to be found that enable organisations to successfully migrate into the electronic market (Burn, Marshall and Wild, 1999). The authors suggest that there are six different models of virtuality which may be appropriate:

- Virtual faces
- Co-alliance models
- Star-alliance models – core or satellite
- Value-alliance models – stars or constellations
- Market-alliance models
- Virtual brokers

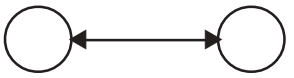
Put simply, virtual faces are the cyberspace incarnations of an existing non-virtual organisation (often described as a "place" as opposed to "space" organisation, [Rayport and Sviokola, 1995]) and create additional value such as enabling users to carry out the same transactions over the Internet as they could otherwise do by using telephone or fax (e.g. Fleurop selling flowers or air tickets by Travelocity). The services may, however, reach far beyond this enabling the virtual face to mirror the whole activities of the parent organisation and even extend these Web-based versions of television channels and newspapers with constant news updates and archival searches. Alternatively they may just extend the scope of activities by use of facilities such as electronic procurement, contract tendering, or even electronic auctions or extend market scope by participating in an electronic

Figure 1: The Virtual Face



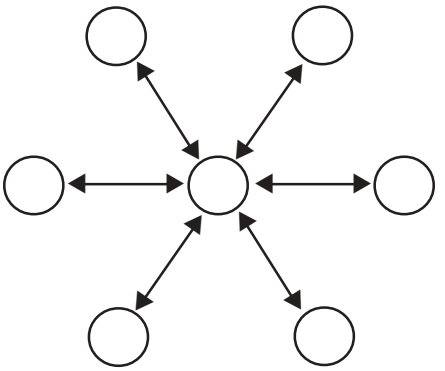
mall with or without added enrichment such as a common payment mechanism.

Figure 2: Co-alliance Model



Co-alliance models are shared partnerships with each partner bringing approximately equal amounts of commitment to the virtual organisation thus forming a consortia. The composition of the consortia may change to reflect market opportunities or to reflect the core competencies of each member (Preiss, Goldman and Nagel, 1996). Focus can be on specific functions such as collaborative design or engineering or in providing virtual support with a virtual team of consultants. Links within the co-alliance are normally contractual for more permanent alliances or by mutual convenience on a project by project basis. There is not normally a high degree of substitutability within the life of that virtual creation.

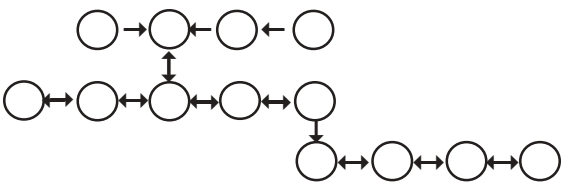
Figure 3: Star -alliance Model



Star-alliance models are coordinated networks of interconnected members reflecting a core surrounded by satellite organisations. The core comprises leaders who are the dominant players in the market and supply competency or expertise to members. These alliances are commonly based around similar industries or company types. While this form is a true network, typically the star or leader is identified with the virtual face and so the core organisation is very difficult to replace whereas the satellites may have a far greater level of substitutability.

Value-alliance models bring together a range of products, services and facilities in one package and are based on the value or supply chain model. Participants may come together on a project-by-project basis, but generally coordination is provided by the general contractor. Where longer term relationships have developed the value alliance often adopts the form of value constellations where firms supply each of the com-

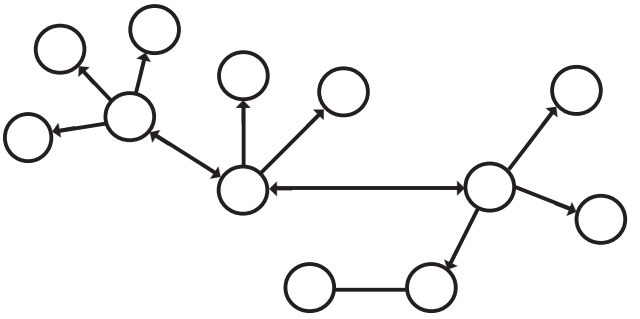
Figure 4: Value-alliance model



panies in the value chain and a complex and continuing set of strategic relationships are embedded into the alliance. Substitutability will relate to the positioning on the value chain and the reciprocity of the relationship.

Market-alliances are organisations that exist primarily in cyberspace, depend on their member organisations for the provision of actual products and services, and operate in an electronic market. Normally they bring together a range of products, services and facilities in one package, each of which may be offered separately by individual organisations. In some cases the market is open and in others serves as an intermediary. These can also be described as virtual communities but a virtual community can be an add-on such as exists in an e-mall rather than a cyberspace organisation perceived as a virtual organisation. Amazon.com is a prime example of a market-alliance model where substitutability of links is very high.

Figure 5: Market-alliance Model



Virtual Brokers are designers of dynamic networks (Miles and Snow, 1986). These prescribe additional strategic opportunities either as third party value-added suppliers such as in the case of common Web marketing events (e-Xmas) or as information brokers providing a virtual structure around specific business information services (Timmers, 1998). This has the highest

Figure 6: Virtual Broker

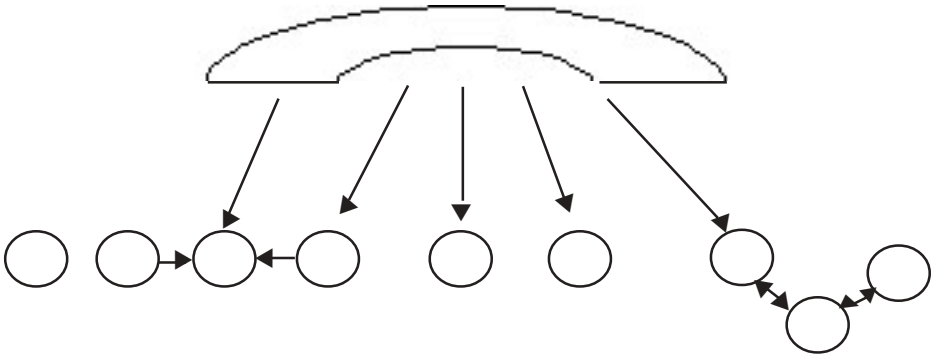
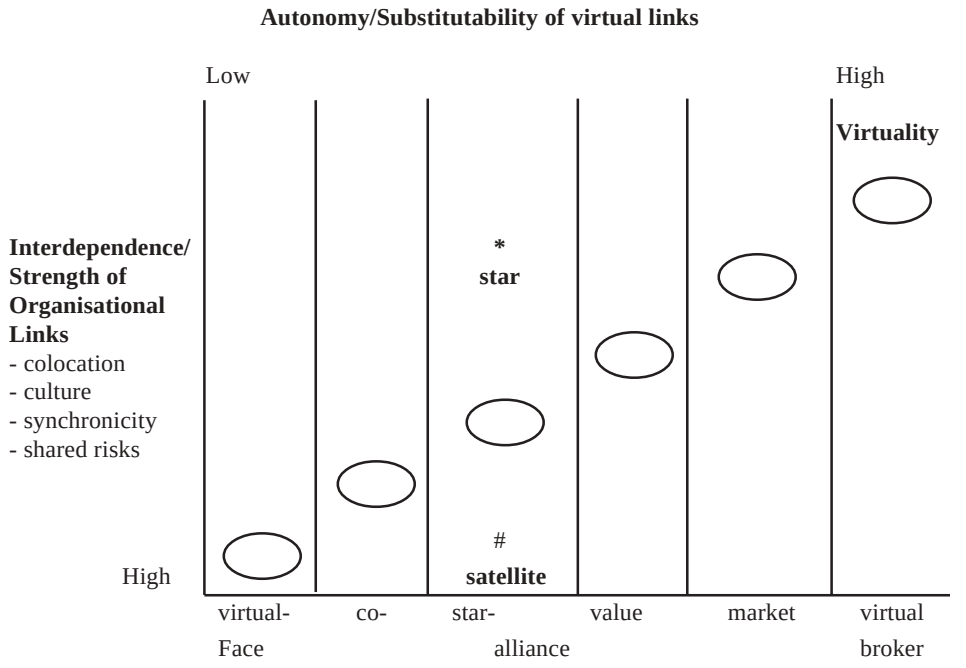


Figure 7: Virtual Alliance Models



level of flexibility with purpose built virtual organisations created to fill a window of opportunity and dissolved when that window is closed.

As discussed previously each of these alliances carries with it a set of tensions related to autonomy and interdependence. Virtual culture is the strategic hub around which virtual relationships are formed and virtual links implemented. In order to be flexible, links must be substitutable, to allow the creation of new competencies, but links must be established and maintained if the organisation is going to fully leverage community expertise. This presents a dichotomy. The degree to which virtuality can be implemented effectively relates to the strength of existing organisational links (virtual and non- virtual) and the relationship which these impose on the virtual structure. However, as essentially networked organisations they will be constrained by the extent to which they are able to redefine or extend their virtual linkages. Where existing linkages are strong, e.g. co-located, shared culture, synchronicity of work and shared risk (reciprocity), these will both reduce the need for or perceived benefits from substitutable linkages and inhibit the development of further virtual linkages. Figure 7 provides a diagrammatic representation of these tensions and their interaction with the Virtual Alliance Models (VAM).

Table 1: E-Market Ecosystem

EcoSystem Stage	Leadership Challenges	Cooperative Challenges	Competitive Challenges
Birth	Maximise customer delivered value	Find and Create new value in an efficient way	Protect your ideas
Expansion	Attract Critical Mass of Buyers	Work with Suppliers and Partners	Ensure market standard approach
Authority	Lead co-evolution	Provide compelling vision for the future	Maintain strong bargaining power
Renewal or Death	Innovate or Perish	Work with Innovators High Barriers	Develop and Maintain

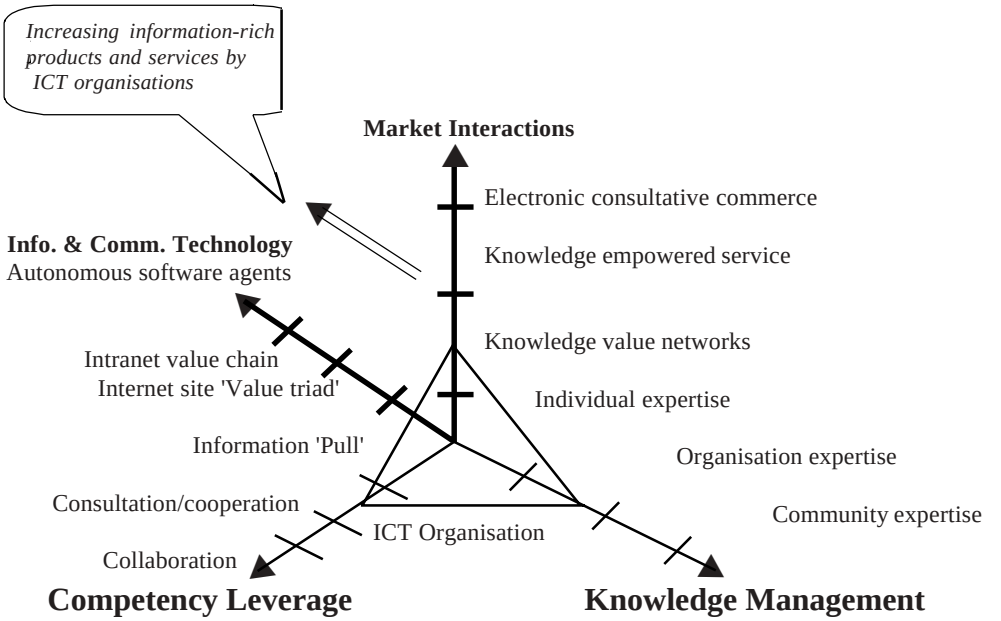
These six models are not exclusive but are intended to serve as a way of classifying the diversity of forms that an electronic business model may assume. Some of these are essentially an electronic re-implementation of traditional forms of doing business, others are add-ons for added value possibly through umbrella collaboration and others go far beyond this through value chain integration or cyber communities. What all of these have in common is that they now seek innovative ways to add value through information and change management and a rich functionality. Creating value through virtuality is only feasible if the processes that support such innovations are clearly understood.

VIRTUAL ORGANISATIONAL CHANGE MODEL

Virtual organisations all operate within a dynamic environment where their ability to change will determine the extent to which they can survive in a competitive market. Organisational theorists suggest that the ability of an organisation to change relates to internal and external factors (Miles and Snow, 1978), including the organisation's technology, structure and strategy, tasks and management processes individual skills and roles and culture (DeLisi, 1990; Henderson and Venkatraman, 1996) and the business in which the organisation operates and the degree of uncertainty in the environment (Donaldson, 1995). These factors are also relevant to virtual organisations but need further refinement.

Moore (1997) suggests that businesses are not just members of certain industries but parts of a complex ecosystem that incorporates bundles of different industries. The driving force is not pure competition but coevolution. The system is seen as "an economic community supported by a foundation of interacting organisations and individuals —over time they coevolve their capabilities and roles, and tend to align themselves with the direction set by one or more central companies" (p. 26). The ecosystems evolve through four distinct stages:

Figure 8: Information-rich Products and Services by ERP Organisations



- Birth
- Expansion
- Authority
- Death

And at each of these stages the system faces different leadership, cooperative and competitive challenges.

This ecosystem can be viewed as the all-embracing electronic market culture within which the e-business maintains an equilibrium. The organisational "virtual culture" is the degree to which the organisation adopts virtual organising and this in turn will affect the individual skills, tasks and roles throughout all levels of the organisation .

Henderson and Venkatraman (1996) identify three vectors of virtual organising as:

- Virtual Encounters
- Virtual Sourcing
- Virtual Work

Virtual encounters refers to the extent to which you virtually interact with the market defined at three levels of greater virtual progression:

- Remote product/service experience
- Product/service customisation
- Shaping customer solutions

Virtual sourcing refers to competency leveraging from:

- Efficient sourcing of standard components
- Efficient asset leverage in the business network
- Create new competencies through alliances

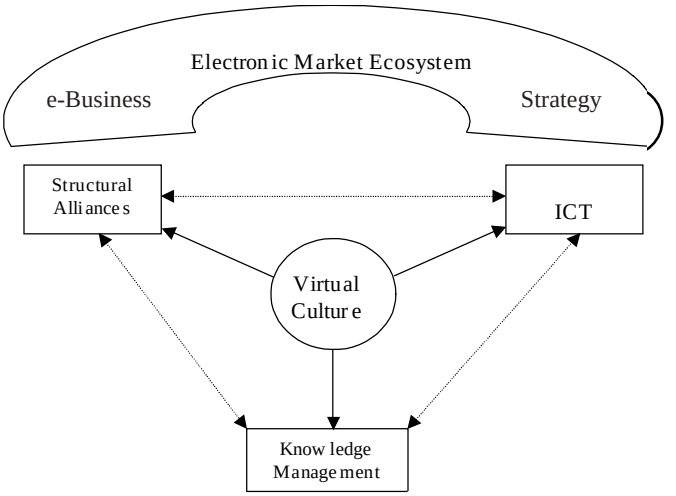
Virtual Work refers to:

- Maximising individual experience
- Harnessing organisational expertise
- Leveraging of community expertise

Figure 8 is an adaptation of the 'Virtual Organising' model proposed by Venkatraman and Henderson (1998). The component parts of this paper have been embedded into their original diagram. As a holistic model it summarises the way the four dimensions (activities) work together with synergy, to enable an ICT enabled organisation to deliver information rich products and services for sustainable competitive advantage. Observe the value and complexity increases for each activity as you step up the axes away from the origin.

As organisations step up the 'Information and Communication Technology' axis, there is a cause and effect or pull of 'enabling technologies' on the other axes. This is illustrated in the model by a shift of the small triangle (ICT organisation) away from the origin along this axis. It also means a shift to higher levels in the other three dimensions of competency, management, and market behaviour. Thus migrating the organisation towards an *electronic consultative enterprise*. Furthermore, there is the potential to take the organisation beyond an electronic consultative enterprise, where collaboration and competition are in tension with each other at all levels. To obtain returns on investment the networked organisation or virtual organisation

Figure 9: Virtual Organisational Change Model (VOCM)



must establish explicit processes to increase collaboration and to facilitate the flow of knowledge throughout the enterprise.

If we view this as the virtual culture of the organisation then this needs to be articulated through the strategic positioning of the organisation and its structural alliances. It also needs to be supported by the knowledge management processes and the ICT. These relationships are depicted in a dynamic virtual organisation change model as shown below.

The degree to which virtuality can be applied in the organisation will relate to the extent to which the VOCM factors are in alignment. When these are not aligned then the organisation will find itself dysfunctional in its exploitation of the virtual marketspace and so be unable to derive the maximum value benefits from its strategic position in the virtual marketspace.

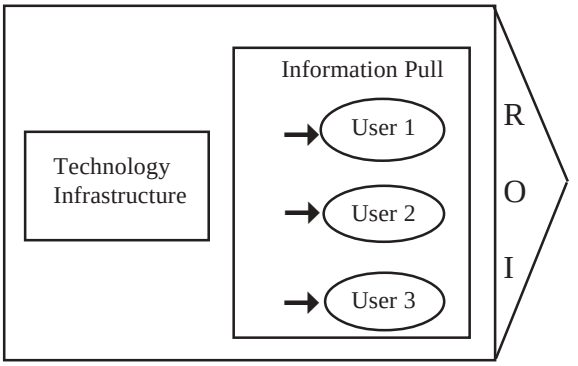
The organisation needs to examine the VOCM factors in order to evaluate effectiveness and identify variables for change according to the virtual culture. Change directions should be value led but there is as yet very little empirical research to identify how value is derived in a virtual organisation and even less to identify how that knowledge should be built into the management of the virtual organisation. For virtual organisations performance measurements must cross organisational boundaries and take collaboration into account but it is also necessary to measure value at the individual level since it is feasible that one could be effective without the other (Provan and Milward, 1995).

VIRTUAL KNOWLEDGE MANAGEMENT STRATEGIES

This new world of knowledge based industries is distinguished by its emphasis on precognition and adaptation in contrast to the traditional emphasis on optimisation based on prediction. The environment is characterised by radical and discontinuous change demanding anticipatory responses from organisation members leading to a faster cycle of knowledge creation and action (Denison and Mishra, 1995).

Knowledge management is concerned with recognising and managing all of an organisation's intellectual assets to meet business objectives. It " caters to the critical issues of organisational adaptation, survival and competence in face of increasingly discontinuous environmental change. Essentially, it embodies organisational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings." (Malhotra, 1997). Knowledge does not come from processes or activities; it comes from people and communities of people. An organisation needs to know what knowledge

Figure 10: Deploying Web Technology



it has and what knowledge it requires – both tacit and formulated, who knows about what, who needs to know and an indication of the importance of the knowledge to the organisation and the risks attached. The goal of a knowledge management strategy should be to understand the presence of knowledge communities and the various channels of knowledge sharing within and between them, and to apply ICT appropriately. This takes place at the level of the individual, networks of knowledge within the organisation and community networks.

EMPOWERING THE INDIVIDUAL

The key characteristic of ICT is it enables a shift in the control of information flow from the information creators to the information users (Telleen, 1996). Individuals using the Web are able to select the information they want, a model of retrieval referred to as information pull. This contrasts with the old 'broadcast' technique of information push where the information is sent to them 'just-in-case,' normally determined by a prescribed list. Such technology empowers individuals. (Figure 10).

For success in deploying ICT management needs to focus on internal effectiveness. In particular, effective integration of the technology into the enterprise infrastructure and a shift in the control of information flow to the users. To be effective and not just efficient (high ROI), requires not only a new information infrastructure, but also a shift in individual attitudes and organisational culture. This can be summarised as in Table 2.

To supplement the ideas expressed in Figure 10, Gonzalez (1998), gives two key factors for successful intranet development. Firstly, the intranet must fulfill its value proposition. Secondly, employees must want to pull content

Table 2: A Summary of Traits of Knowledge Workers (Andriessen, 1998)

INDIVIDUAL	TEAM	ORGANISATION
Learning	Sharing	Codifying
behaviour		
I am responsible for learning	My knowledge grows when it flows	My company benefits from my knowledge
beliefs		
Self-esteem	Respect	Trust
values		

to themselves. Here the term value proposition is used to expand the requirements for a successful Web site:

- satisfy employees' communication and information needs, e.g. helps me do my job better,
- possess outstanding product features, e.g. intuitive navigation, visually pleasing,
- exhibit operating excellence, e.g. convenient, reliable.

These three elements referred to as the Value Triad, work together to create a value proposition. If any one of the three is weak or fails, then the value proposition is reduced.

KNOWLEDGE VALUE NETWORKS

Prior to the development of the Internet, manufacturing companies successfully utilised the value chain approach to increase their ability to compete. Faced with increasing cost pressure from global competitors with significantly more favourable labour costs, companies understood that pure price competition was not a viable option. Through the use of the value chain model, companies determined that speed and service would offer the best hope for continued success and growth. But are they able to sustain their success? The sustainable competitive advantage of the firm derives from the "synergy" of the firm's various capabilities. Porter (1995) proposed a similar concept in his notion of "comple-mentarities." He argued that the various competitive capabilities of the firm should be "complementary" or "synergistic" so that the synergy resulting from them can not be easily imitated by current or potential competitors.

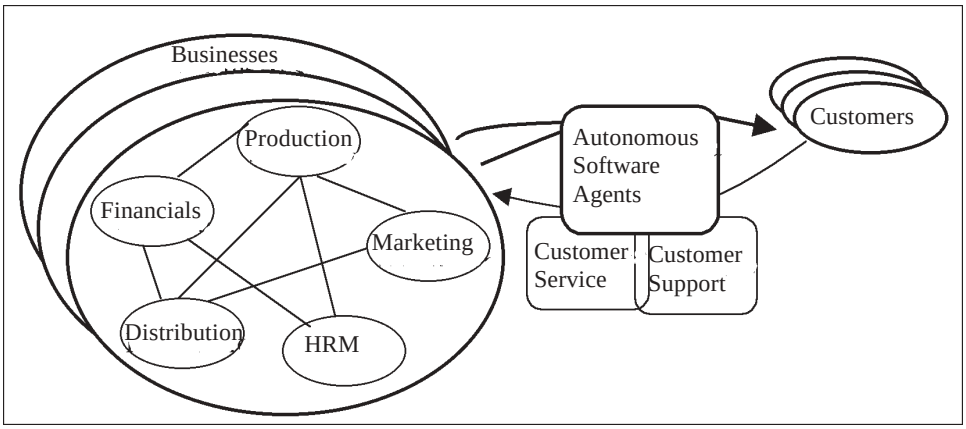
Carlson (1995) uses the idea of synergy to develop a 'totally new' model called the Value Network. This model involves the creation of a shared knowledge infrastructure that enables and "harnesses the flow of knowledge within and between communities." The premise used here is that sustainable competitive advantage can only be attained through a careful integration of activities in a firm's value chain (network) with knowledge being the basis for this activity integration. Whereas a chain implies sequential flow, a network carries a "connotation of multidimensional interconnected-ness." He has developed a model for guiding or managing the change of an old world enterprise through three stages of migration to a knowledge-based enterprise that is able to deliver information-rich products and services, namely:

- **Knowledge Value Networks** - extend the value chain model for competitive advantage to a highly interconnected internet of knowledge flows;
- **Knowledge Empowered Service** - builds on the value network, enabling customer service representatives to become more effective agents of the organization by giving them better access to the shared knowledge;
- **Electronic Consultative Commerce** - creates competitive advantage by taking e-commerce to the next higher plane, where customers have direct access to the organization's intelligence.

The knowledge value network and knowledge empowered service are the first steps towards *electronic consultative commerce*. With electronic consultative commerce a customer would engage in a collaborative process, where human and computer software agents both perform tasks, monitor events, as well as initiate communication.

In Figure 11 the diagram illustrates how the various communication links or channels are assisted by software agents and/or human consultants.

Figure 11: Electronic Consultative Commerce (adapted from Carlson, 1995)



The various channels for doing business are usually categorised as consumer-to-business, business-to-business, and Intranet employee-relationships interactions. Together they contribute to an increasing level of knowledge creation.

Many organisations are expanding the role of consultative customer interaction beyond sales to include consultation in every customer contact and are implementing this through an Enterprise Resource Planning Model (ERP). One such package is SAP, now being implemented widely across the world. For example, SAPNet is SAP's main medium for information and communication between SAP and its customers and partners. SAPNet contains nearly everything you may wish to know about SAP AG, products and processes, partners and solutions, news groups and SIGs. Most of these roles can be supported, at least partially, with a simple Internet site design that includes an underlying information base and a consultative interaction (SAPNet, 1998).

However, more advanced solutions are being developed that employ knowledge-based system technology traditionally found in expert systems, to bring consultative sales directly to the customer through use of *autonomous agents* (software) that provide assistance to users. 'Instead of user-initiated interaction via commands and/or direct manipulation, the user is engaged in a cooperative process in which human and computer agents both initiate communication, monitor events and perform tasks. '(Carlson, 1995)

Market niche players like Radnet provide tools and expertise to develop collaborative enterprise applications that fully leverage relational database technology and the entire range of intranet, extranet, and Internet standards. Radnet's InternetShare products and technology helps companies realise their competitive advantage by bringing advanced Internet-based collaborative features to their core product offerings. (Radnet, 1998)

Autonomous agents can make decisions on a set of options learned from past experiences. So they are fundamentally knowledge-based and belong to the world of artificial intelligence. These agents can be classified in two types: business agents that perform tasks based on business practices, and learning agents that act as electronic teachers. For example, business agents search product catalogs or 'smart catalogs' while learning agents can assist to configure products of all combinations, all accessible via an Internet browser.

It is imperative for organisations to supplement an electronic commerce strategy with human involvement. A software agent underlying the customer's system interface determines when human assistance is necessary and automatically establishes a telephone connection with a service representative. A

more advanced use of learning agents for product configuration can be extended to solve problems associated with R/3 installations. Learning agents have the capacity to search out irrelevant detailed information and deliver the most appropriate information for the user to learn —addressing the problem of information overload R/3 installation learning agents which would greatly reduce the time for business consultants to implement R/3 as well as radically change the way industry-specific application are deployed. In response to this problem SAP has developed employee self- service intranet application components that deliver preconfigured access to R/3 application servers, making implementation simple and fast (SAP, 1998).

Ultimately the learning agents will enable the non- technical employees to configure new business processes. This assumes IT specialists and employees come together to perform the activities of the value chain so that it becomes possible for users to have a part in the enterprise re-engineering. Furthermore, this merging of roles represents a change in ownership of the electronic consultative enterprise's business processes.

There are many claims about enabling technologies which can help to capture and leverage knowledge within the organisation but little about explicit knowledge-sharing strategies. Although knowledge is a strategic asset (Eisenhardt and Schoonhoven, 1996; Winter 1987), embedded or tacit knowledge is difficult to transfer and also vulnerable to loss through misfortune or asset transfers and terminations. Such an important asset should be cultivated and measured, but this becomes an impossible task without trust and a close relationship at all levels of the organisation (Scott and Gable, 1997; Badaracco, 1991). This is particularly true of the virtual organisation.

To leverage the benefits of supply chain modeling and management via the internet you need to be aware of the influences beyond your company . Success in exposing your business partners to enterprise systems depends as much on people issues – trust, understanding and communication – as it does on technology (Chirgwin, 1998). This implies a shared vision of culture across all levels of the enterprise.

CONCLUSIONS

The virtual organisation is recognised as a dynamic form of interorganisational systems and hence one where traditional hierarchical forms of management and control may not apply. Little, however, has been written about the new forms that management and control might take other than to espouse a "knowledge management" approach. Managing knowledge about what? In an organisation where change is the only constant then there has to be a system that can capture the organisational core competencies and

leverage these to provide strategic advantage. This may be a competitive advantage or a strategic advantage in collaboration with the competition. Knowledge has become the major asset of the organisation, and its recording, communication and management deserve attention. Without the ability to identify who has the key information, who the experts are, and, who needs to be consulted, management decisions are unlikely to be optimal. Both the importance and the difficulty of the issue are magnified by virtuality in the form of decentralisation and dispersion, empowerment and continual change. In interdependent organisations the synergy of knowledge may be the principal benefit of the interdependence and the issue is again magnified.

In dispersed organisations more conscious efforts and explicit procedures are needed. Skills may not be available where they are wanted, data may not be shared and might be used inefficiently or wrongly. New skills need to be developed quickly and employees will have to take personal responsibility for their own knowledge development. This implies that the virtual organisation will need a number of managers with converging expertise in the areas identified within the VOCM. There may no longer be a separate ICT or knowledge management function. Indeed there may no longer be any management function that does not explicitly demand expertise in these areas. The implications for IS professionals are quite frightening. Whole areas of new skills need to be acquired, and these skills are themselves constantly in a process of development, demanding continual updates. We are still struggling with the information age as we are being thrust into the knowledge age but without the intermediation services to support this. Opportunities abound for skilled IS professionals at every level of the organisation but this must be supported by an on-going education programme at the heart of every organisation. The virtual organisation that succeeds will be the learning organisation where people are regarded as their greatest core asset.

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