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Towards a Risk Management tool to support collaboration in Virtual Enterprise

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Abstract: SMEs in the 21 century have to cope with an increasingly dynamic and competitive environment. In order to work effectively within this environment, SMEs have to collaborate with other enterprises in forms of virtual organisations.

Despite the increased interest in the area of virtual organisation collaboration, useful information is still lacking about the risk sources of virtual organisation, where the enterprise face more complicated risk threats than those in traditional enterprise due to the new form of relationships between partners. The main objective of this part of the research is to develop a tool to support collaboration decision making based on risk assessment for each partner in the Virtual Organisation as for the whole of Virtual Organisation.

The aim of this research was to identify a risk management contribution where this research has identified key areas of risk that SMEs are likely to face when working collaboratively in VO. It also enables SMEs to understand the relative importance of these risks.

Areas for further research are suggested to close the gaps and to continue enriching the research.

Keywords: *Virtual Enterprise, Virtual Organisation, Risk, Risk Management, Collaboration.*

Introduction

There are a lot of definitions for the Virtual Organisation (Camarinha-Matos et al., 1997; Fuehrer, 1997; Travica, 1997) but there is no general accepted one but as an we can understand from the definitions that Virtual Organisation is a temporary network of independent companies distributed geographic , who came together to exploit fast changing opportunity in the market usually integrated using ICT, those enterprises which collaborate through the network shares skills, core competencies, knowledge and cost. The collaboration main goal is to exploit this fast market opportunity to gain benefit for all partners.

Enterprise partnerships suggest a relationship between companies and people who share common goals, make every effort to achieve them together and do so in a spirit of co-operation, collaboration and fairness. An enterprise partnership can be a collaborative

alliance of independent enterprises, customers, suppliers, competitors, service providers, also government agencies, academic organisations, etc… Mariotti (1996),
SMEs as Skyrme suggested (2005) can gain a lot of benefits through the Virtual Organisation construction through access to wide range of specialised resources, present a unified face to large corporate buyers, individual members retain their independence and continue their core competences, reshape the enterprise and change the members according to the project or the task and finally no more worries as the divorce settlement as in joint venture where the dissolution phase identified as the last phase in the Virtual Organisation life cycle.
According to Pfohl and Buse (2000) the main objective of a Virtual Organisation is to allow a number of organisations to rapidly develop a common operating environment as the main focus for the Virtual Organisation are customer focus.
The variety of Virtual Organisation structures is caused by different kinds of demand and business environments. Other motives for enterprises to enter a Virtual Organisation are to maximise flexibility and adaptability to environment changes, Development of a pool of competencies and resources, reaching a critical size to be in accordance with market constraints and Optimisation of the global supply chain.
Luis (2002) mentioned agility, complementary roles, achieving dimension, resource optimisation and new ideas innovation as benefits for the Virtual Organisation.
A first basic classification according to a number of characteristics such as the duration, topology, co-ordination, and visibility scope has been introduced by Afsarmanesh et al. Moreover Jagers (1998) Virtual Organisation characteristics list include boundary crossing, complementary core competencies, geographical dispersion, changing participant, participant equality and electronic communication where he argued that the Virtual Organisation can be temporary natural but can also be functional without being finite where other authors postulate the temporary nature of virtual organisation (Travica 2005, Fuerhre 1998, Hall 1997)
DeSanctis et al. (1999) have identified four dimensions that characterise virtual organisations: space, time, culture, and boundary but he focus at the employees part in the Virtual Organisation as he refers the space dimension to the extent of spatial dispersion of employees across different locations, the time dimension pertains to temporal dispersion, in other words, the degree to which employees operate asynchronously, the culture dimension relates to cultural dispersion the extent to which an organisation consists of employees from different countries or cultures and the boundary dimension refers to organisational dispersion the degree to which organisational processes extend the boundary of the focal organisation.
As there are lot of benefits from forming the Virtual Organisation there are a lot of problems and difficulties as well. Where in the Virtual Organisation, the company is no longer a physical entity with a stable mission or location but a shifting set of temporary relationships (Kunter, 1993), moreover obstacles include the lack of appropriate support tools, partners search and selection, Virtual Organisation contract bidding and negotiation, competencies and resources management, task allocation, well-established distributed business process management practices, lack of common ontology's among the cooperating organisations, derivation of the information visibility regulations based on the contracts, the proper support for socio-organizational aspects e.g. lack of a culture of cooperation monitoring and coordination of task execution according to contracts,

performance assessment, inter-operation and information integration protocols and mechanisms (Cascio, 2000; Luis 2002; Hawkins 2004).

Virtual Organisation Advantages

The virtual organisation is able to provide access across a variety of specialised resources and is able to show large corporate buyers a unified entity while at the same time individual members of the voluntary organisation are able to remain independent and develop their specialised skills. At the inception of a project a VO is able to make use of the advantages conferred by flexibility, adaptability and speed.

Several authors have discussed the benefits and advantages that virtual organisations may have, such as Wu et al. (2002) who showed that a virtual manufacturing model manifested the advantages of reduced cost of production, improved product quality and shortened lead-time. This is in accordance with the objectives in forming a virtual organisation network, these being to satisfy customer demand by drawing on the greatest competency of each member while at the same time decreasing production costs.

It has been suggested by Skyrme (1996) that the setting up of a virtual organisation can confer the following benefits:

• Access to a wide range of specialised resources.
• The presentation of a unified face to large corporate buyers.
• Individual members are able to retain their independence and continue to develop their core competences.
• An enterprise can be reshaped and its members changed according to the demands of the project or task in hand.
• The need to worry about “divorce settlements” as they exist in formal joint ventures, is removed.

Camarinha-Matos (2002) suggests that when organisations that are intrinsically dynamic come together in order to meet the needs and opportunities presented by the market and are able to remain in operation for as long as the opportunities remain, then a number of benefits ensue, among which are the following:

• Agility: This is the capacity to recognise and then deal with whatever unexpected changes may arise in the environment so that it is possible to more successfully respond to opportunities as well as achieving decreased time to market together with higher quality for less investment. A VO is able to meet the need to bring together the most appropriate set of skills for any particular VO together with the resources that stem from various specific individual organisations and it is also able, should it become necessary, to reorganise itself either through the addition or the expulsion of members or else by actively redistributing the tasks, or the roles of its members.
• Complementary roles: An enterprise will aim to have complementary aspects, that is to create synergies, in order to seize creative business opportunities and develop new markets.
• Achieving dimension: So far as SMEs are concerned, becoming part of a partnership involving others means that they are able to reach a critical mass and present themselves to the market with a greater ‘visible’ size.
• Competitiveness: Cost effectiveness can be achieved where subtasks are appropriately apportioned between those organisations cooperating together.

• Resource optimisation: This occurs when smaller organisations are able to share an infrastructure as well as knowledge and business risks.
• Innovation: There is increased opportunity for the exchange and evaluation of ideas within a network and this is likely to lead to increased innovation.
Grimshaw and Kwok (1998) have identified the following benefits based on a case study of a voluntary organisation:
• Increased competitive capabilities.
• Flexibility.
• Greater responsiveness to market (customers).
• Improved customer service.
• Cost benefits.
• Improved communication and internal control.
It can be seen that many of the benefits accruing to virtual organisations stem from their capacity to modularise, a modular organisation being one in which coordination is the norm so that processes appertaining to organisation can be undertaken within a loosely-coupled structure, with each organisational unit that takes part able to function concurrently but also independently (Sanchez and Mahoney, 1995; Johnson and Scholes, 1999). According to Sanchez and Mahoney (1995) an organisational structure that is modular is better able to rapidly bring together the resources and capabilities of a number of organisations in order to make product development 'resources chains'. These are able to provide a flexible response that is broad, rapid and low cost, to opportunities for new markets and technology by having available products that are either new or modified. A virtual organisation includes many of the principles that underlie modular organisations.
The advantages listed above mean that the a virtual organisation provides a compelling choice for many enterprises, particular in the light of the continuing improvements in information sharing and the coordination technologies that these organisations need in order to function.

Reasons for Adopting the Virtual Organisation Structure

Goldman et al. (1995) maintain that the advantages offered by virtual organisations are substantially greater than any disadvantages, stating that the virtual organisation "is dramatically better than business as usual for a network of enterprises sharing a business opportunity" and they offer six strategic reasons why the VO model should be adopted:

1. In the event of a VO being set up in order to bring a new product to market, the resources put into the infrastructure, together with R&D, costs and risks would be shared.
2. Any particular enterprise becoming part of the VO would benefit from the opportunities that would be provided by allying its own main internal competency with those of the other companies involved.
3. The notion of the time involved would be reduced because the knowledge and skill of various enterprises would be brought together so that the boundaries of the enterprises operating simultaneously would be expanded.
4. The size and scale of operations would be reduced, in the first place through the economy of scale that follows where one company is being worked for rather than a number of separate entities, and secondly in relation to the customers.
5. By becoming part of a VO an enterprise would gain access to new markets as a result of the partnerships which would mean that the loyalty bases of the customers of a

particular enterprise would be shared by virtue of the value that would be added to the new product that the partnership developed.

6. As a result of an enterprise being part of a VO there would be an increase in the speed with which an enterprise moved from selling products to selling solutions.

Risk in Virtual Organization

To gain most of the benefits of the Virtual Organisation we should concentrate to minimise the risks in it.

There are lot definitions for risk in general where the most scientific one was provided by the royal society (1992) "The probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge. As a probability in the sense of statistical theory, risk obeys all the formal laws of combining probabilities", other scientific perspective on risk is what Mitchell said that the risk is the probability of loss and the significance of that loss to the organisation or individual where he expressed that by a formula:

$$Risk\ n = P\ (loss\ n)\ X\ L\ (loss\ n)$$

Where n is the event, *P* is the probability and *L* is the significance.

Risk can be losing of time or quality or cost or a total failure for the Virtual Organisation.

Risk can be defined as objective or subjective (Rascue et al., 2000). For example objective risk is inherent in certain situation such as rowing dice or playing cards where subjective risk is an individual assessment of situation that motivate to take action.

Risk in the supply chain is near to our field so we can take the similar things to gain better understating for the Virtual Organisation risk.

Risk in the supply chain context has been defined as the potential occurrence of an incidence associated with inbound supply in which the result is the inability of the purchasing organisation to meet customer demand (Zsidism, 2000; 2004).

Junttner et al. (2002) suggest organising risk sources relevant for supply chains in three categories external to the supply, internal to the supply chain and network related.

External risk sources such as natural risks, political risk, social risks and industry market risk.

Internal risk sources range from labour (such as strikes) or production (as machine failure) to IT system problems.

Where the network related risks occur from interactions between organisations within the supply chain.

We can see clearly that there are no differences between the internal and external risk sources in supply chain and Virtual Organisation where the difference risk sources in the network related risk due to the different relations between the supply chain and the Virtual Organisation.

Risk management process for the network risk related in Virtual Organisation can have the same phases of a typical risk management process:

1- Risk identification.
2- Risk assessment.
3- Identification and implementation of risk reduction.
4- Risk monitoring.

The first phase can be seen as the fundamental phase in the risk management practice. It follows that by identifying risk, a decision member or a group of decision makers become conscious about event that may cause uncertainty.
The main focus of risk identification is thus to recognise future uncertainties.
There are many methods for risk identification and analysis. One of them is an important tool which is a risk mapping, to use a structured approach and map risk sources by understanding their potential consequence.
Two other commonly used techniques for researching factors and causes contributing to accidental events including the fault tree analysis (FTA) (Kim, 1996) and the event tree analysis (ETA) (Brown, 1973). Both are logic diagrams that represent the sequences of failure that may be propagated through a complex system. FTA examines all the potential events leading up to the critical event and is a graphical diagram that shows how a system can fail. The analysis starts with top events, then the necessary and sufficient hazardous events, their causes and contributing factors are identified together with their logical relationships using a backward logic.
The ETA is also a graphical logic diagram but goes the other way. It focuses on events that could occur after some critical event, identifies and quantifies possible outcomes following events could be used to get an idea of final probability (Deloach, 2002).
Pfohl and Buse (2000) suggested that attention could be paid to strategic networks and Virtual Organisations which are dynamic and non-hierarchical in nature Virtual Organisation represent dynamic networks, whereas strategic networks can be seen as more stable in nature. The tier in the network make coordination difficult, as the responsibilities must be shared between the first tier supplier and the multi-tier suppliers. In addition the logistics and service providers between the buyer and the first tier supplier make the network structure more complex. In a Virtual Organisation the enterprises no longer produce complete products in isolated facilities instead of that they operate as nodes in a network of customers, suppliers, services, providers and other specialised players.

Norman et al. (2004) defined “the supply chain risk management is to collaboratively with partners in a supply chain apply risk management process tools to deal with risks and uncertainties caused by or impacting on logistics related activities or resources” this definition which deals with collaborative situations will here be complemented with the situations when a single enterprise in the chain is engaged in risk management issues on its own this will lead to the following definition.

Network Related Risks in Virtual Organization

Networked risks related to the collaborative are no merely dependent on the enterprise goals and objectives, although in many relationships there is a dominant party whose aspiration is to take responsibilities of managing the entire supplier network. The increasing sharing of responsibilities and the dynamic nature of relationships require the assessment in a dyadic fashion (Hallikas et al., 2004).
To be able to manage these scenarios proactively in our concern in the network-related risk identifying the risks becomes more difficult because of dependencies with other enterprises.
Interruption, quality failure, and delivery fluctuation are common strong signals of risk production systems. However, not all the risks are easy to identify.

Identify these risk is the first step then finding the relationships between these risk elements using special techniques before weighting these elements based on their impact and probability all of this will make the operation of risk mitigation in the Virtual Organisation more easier..

Conclusion

Along with their numerous advantages virtual organisations together with the virtual integration of supply chains also pose several challenges, including risks such as lack of trust, lack of top management commitment, insufficient information sharing, inadequate collaboration agreements, ontology differences, risk from heterogeneity, structure and design risks, loss of communication, culture differences, difficulties arising from geographic distribution, knowledge about risks, bidding for several virtual organisations at the same time and wrong partner/s selection.

All of these risk sources require serious attention in the formation and operation of the virtual organisation.

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