THE INNOVATIVE POWER OF VALUE NETWORKS

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Summary

This paper is concerned with the notion of *value network management*. We focus on innovation and recognize the interdependence between collaborating organizations to drive creativity and deliver economic returns from innovative efforts. We draw on existing literature and our practitioner engagements and studies to propose six core elements of a value network approach. The paper is intended as a foundation for our on going developments in this field.

INTRODUCTION

This paper focuses on the development of a *value network management* perspective by drawing heavily on a synthesis of practitioner engagements. Our thinking has evolved from previous theoretical work, which provided a basis for delineating and defining the scope and content of supply chain management (SCM) as an academic discipline (Croom et al 2000, Giannakis & Croom, 2004). The focus of this work was with 'making sense' of phenomena relating to the current body of published research concerned with supply chains, which we recognized as being complicated by the diversity of topics and methodologies adopted to study discrete SCM issues. For example, the lexicon of SCM includes topics such as trust in buyer-seller relationships, logistics process performance and global integrative systems.

The methodologies employed to explore these issues draws on an eclectic theoretical heritage, depending on a range of antecedents in the technological, economic, social and institutional philosophies of organizational and economic behavior.

In taking the evolution of SCM thought further, in this paper we synthesize the empirical evidence and experiences we have collated during the last 10 years. This evidence comes from executive workshops and case evidence compiled in collaboration with a number of leading edge organizations.

Keywords: Value Network Management: Innovation

The Problem Context

Ask virtually any CEO or senior VP about their top corporate priorities and invariably innovation will be amongst the top five criteria. Then, ask precisely how they expect innovation to manifest and watch the withdrawal into slogans, platitudes, or other vague allusions to the importance of innovation. From our interactions and interventions with many senior corporate officers in the US and Europe the process of innovation remains somewhat opaque and misunderstood by many executives. However, somewhat paradoxically, academic research into innovation has provided coherent and insightful knowledge relating to effective innovation processes and the key criteria for successful innovation and new product development. There is thus clearly a challenge in bringing knowledge and practice closer together in this respect.

Managing innovation within the organization is one of the more taxing and challenging issues for organizations, both as consultants and in our research. However, one of the positive changes we have seen in the last decade has been the progress many organizations have made through proactive engagement with suppliers in *collaborative* innovation processes. This collaboration has embraced not just first tier suppliers; innovative activities we have observed have been typified by engagement of other (complementary and competitive) first tier suppliers and their respective upstream supply base. We believe that this profound shift to greater supply chain collaboration necessitates a similar shift in the level of analysis we employ for studying innovation, one that reflects the levels of interdependence and collaboration between organizations to drive effective innovation.

The methodology we employed in developing this paper has primarily been action research. The authors come from the academic and practitioner communities respectively, and so we attempt here to reconcile their two perspectives on the field of supply chains and innovation. This paper builds on our earlier works (Croom *et al*, 2000 and Giannakis & Croom, 2004) in which the foundation for the concepts behind supply chain management and supply networks was discussed and further developed (principally from a conceptual perspective). In taking our understanding of the phenomenon of chains and network management further, it was important to reflect critically on the world of praxis, which caused us to collaborate extensively with leading practitioners. Further, the literature on innovation – specifically on collaborative innovation and new product development – serves to provide a foundation for our initial foray into the area of networks of innovation. This paper thus synthesizes the core issues related to innovation that have emerged from our review of the literature and our empirical investigations and is intended to provide the basis for future discussion of the critical success factors for effective innovation across value networks.

INNOVATION

A sample of definitions of innovation from the literature helps to frame our general area of interest:

> "*...it is the process of bringing new ideas into use.*" (Nystrom, 1990); "*...merging of an exploratory research breakthrough with an existing or potential market*" (Burgelman and Sayles, 1986); "*... the act of creating a new product or process; includes invention as well as the work required to bring an idea or concept into final form*" (Crawford, 1994); "...introduce something new" (O.E.D.).

Innovation is important because it provides the innovator with 'technology rents' (i.e. profits), a consequence of particular monopoly power and carries with it the potential for 'first to market' advantages to sustain these rents. Schumpeter (1935) characterised the significance of economic returns upon innovative effort as a synthesis of both 'exploratory' action (*invention*) and 'exploitative' commercial risk taking. Thus, to accrue any economic benefit, putative innovative ideas need to be *exploited* by entrepreneurial ability, a viewpoint supported by Whipp and Clark (1986).

The successful exploitation of 'newness' is the central defining characteristic of innovation. Schumpeter (1935) claimed that innovation occurs in five distinct categories:

> the development of *new products*;
> development of *new processes*;
> the opening up of a *new markets*;
> the acquisition of a *new source* of raw materials;
> or the *structural reorganisation* of an industry.

We would contest that many recent strategic initiatives have expanded the fifth category (structural reorganization of an industry) beyond traditional industry boundaries through innovations such as vendor

managed inventory and category management, which are distinctive, sustainable and have a major impact on economic performance and profitability. Thus, we add *new business models* as a sixth category of innovation.

What makes this six-dimensional model of innovation attractive in practice is that it empowers non-technical people to engage fully in all but one of the type of innovation. We have found that all too often that many executives focus their innovation processes on the technical aspects of *invention* rather than on the economic *exploitation* of ideas and invention. In the literature we have seen a significant body of seminal, informative work addressing the issue of sources of innovation and interaction between organizations.

INNOVATION PROCESSES & NETWORKS

The seminal work on sources of innovation is that of Von Hippel (1978), in which he concluded that the process of product development is an interactive process between manufacturers (suppliers) and users (customers). This is key to our understanding and examination of value networks. He hypothesised that two different paradigms describe the generation of new ideas - the *manufacturer active paradigm* (**MAP**) and the *customer active paradigm* (**CAP**). Simply put, the first paradigm sees new products emerging from the innovative endeavour of suppliers, whilst in the second paradigm the customer identifies ideas and chooses the means of development. In later works (1985 & 1986) he discusses the notion of lead users as customers who are the main drivers of particular innovative efforts. In other words, not every customer is going to be a dominant innovator in the market place, and thus innovation by suppliers may be strongly determined by the activities of one or two customers.

Foxall (1986:23-24) contended that in fact there is not a simple dichotomy between CAP and MAP, citing Foxall & Teirney (1984) who made a distinction between CAP1 and CAP2. The distinction being that the CAP2 focuses on the customer role as the active partner in the commercialisation (‘exploitation’) of innovative ideas, whilst CAP1 restricts the customer role to purely a technical or inventive (‘exploratory’) action.

Foxall and Johnston (1987) further extended Von Hippel's paradigms, proposing five variants of the driving force of innovation between the extremes of manufacturer (customer) innovating and exploiting, to user (supplier) innovating and exploiting. They indicate that between the extremes of Von Hippel's MAP and CAP lie various collaborative forms (Håkansson, 1982), and they offer a continuum of paradigms or scenarios (Biemans, 1992), as represented in table 1.

Manufacturer-initiated innovation (MII)	Supplier performs all stages in the new product development process (Von Hippel's MAP)
User-initiated innovation 1 (UII1)	Customer develops new product for internal use
User-initiated innovation 2 (UII2)	The customer-initiator approaches manufacturer with innovation for manufacturer to supply (Von Hippel's CAP)
User-initiated innovation 3 (UII3)	In addition to UII2, customer also commercially exploits the innovation
User-initiated innovation 4 (UII4)	Customer is responsible for all stages in the development process, including consumption

Table 1. Foxall & Johnston's Locus of Responsibility for Product Development (adapted from Biemans, 1992:74)

Recognising that responsibility for the exploration and exploitation of innovation may occur in a number of different ways, involving varying degrees of interaction and influence between customer and supplier, raises a fundamental question - what determines the driving force (or *paradigm*) under which innovation occurs?

Nystrom (1990) claims that collaborative product development is influenced by four main factors: the number of distinctive uses for a product or product category; the number and different combinations of products which individual buyers purchase; the cost and demand interdependencies between products; and the technological complexity of the products or processes (1990:163-166). Wheelwright and Clark (1992:93) claim that collaborative development (which they call *alliance* or *partnered* projects) is most likely to take place for projects involving substantial change, and therefore technical novelty and complexity, rather than projects involving incremental change (see also Nystrom, 1990:166). Many writers would tend to add to these factors by incorporating the firm's existing relationship strategy and the complementarity of resources and competences between buyer and seller as significant determinants of vertical collaboration. (Teece, 1986; Ford, 1988; Håkansson, 1989; Lamming, 1993; Nishiguchi, 1994). Von Hippel (1978) claimed that the clarity of customer need and the accessibility of the supplier to the new product activity constituted the determining factors.

Addressing this point Asanuma (1989) offered a useful categorisation of suppliers in which he posits that the extent to which suppliers contribute to the development of new products can be considered in terms of their "degree of technological initiative" (which is much the same as Von Hippel's view that a manufacturer's accessibility is important). Asanuma contends that the paradigm employed is determined by the characteristics of the origin of product or component being supplied. He observed that Japanese auto manufacturers had three broad types of product; those for which the customer provided the full specification ('drawing supplied', or DS parts); those parts which the supplier specified and the customer approved ('drawing approved', or DA parts); and components which were proprietary, which he called 'marketed goods'. This can be seen to support Foxall & Johnston's (1987) view of the various loci of innovation, and serves as a useful application of their viewpoint to auto industry. Table 2 shows Asanuma's classification scheme:

	Parts manufactured according to specifications provided by the core firm ("ordered goods")						Parts offered by catalogue ("marketed goods")
	Parts manufactured according to drawings provided by the core firm			Parts manufactured according to drawings provided by the supplier			
	I	II	III	IV	V	VI	VII
Criterion for classification	The core firm provides minute instructions for the manufacturing process	The supplier designs the manufacturing process based on blueprints of products provided by the core firm	The core firm provides only rough drawings and their completion is entrusted to the supplier	The core firm provides specifications and has substantial knowledge of the manufacturing process	Intermediate region between IV and V	Although the core firm issues specifications it has only limited knowledge concerning the process	The core firm selects from a catalogue offered by the supplier
Example	Small parts assembled by firms offering assembly service	Small outer parts manufactured by firms offering stamping service	Small plastic parts used in dashboard	Seat	Brakes, bearings, tyres	Radios, electronic fuel injection systems, batteries	

Classification of Parts and Suppliers According to the Degree of Initiative in Design of the Product and the Process (Asanuma, 1989:15)

Suppliers involved in their customers' new product development programmes may participate in a number of different ways, determined, in Asanuma's view, by the extent to which they have discretion over the design of the product or component concerned. Accordingly, the opportunity to undertake collaborative product design is considered to be strongly influenced by both the technical requirements of the product design and the innovative capability of the various members of the network.

Ford, Hakansson & Johansson (1986) and De Man et al (2001) maintain that the strategic value of alliances can only be fully exploited if attention is paid to the overall network in which the firm is imbedded. Embedded in the networks are relationships involving varying degrees of commitment and intent; relationships that could include the following:

- the means to acquire and leverage capabilities for value creation upstream and downstream
- the means for accessing and combining knowledge of different partners to develop cutting-edge solutions,
- the means to increase differentiation of products and services, and
- the means to improve competitive positions in present markets, and to take options in the future.

Managing innovation networks involves gaining overall appreciation of their critical underlying alliance “architectures” that connect the network (Lynch 1993). Networks that are base on replicable, systematic, and reliable (as opposed to the ad-hoc) alliance architectures are far more likely to succeed. In his analysis of the networked economy’s strategy, structure, and management, de Man (2004) has shown that 35% of the stock market value of major global companies is due to alliances – much of which is designed to create innovation flows between business entities in what had, in the past, been thought of as transactional value chains.

Large-scale strategic change projects in companies may be supported by using alliance innovation networks. IBM's change from an exploitation strategy towards an exploration strategy required a radically different network strategy as well according to de Man et al (2004). IBM supported its transformation from a hardware manufacturing company to a global service provider and software company by engaging extensively in innovation networks, both upstream and downstream in the network.

Innovation Architecture

In our consulting engagements and field work interactions with ‘real world’ innovation, we have seen important structural and strategic shifts promoting the innovation process as a catalyst for organizations to adapt to the “new business order” of collaborative *networks* of interdependent organizations.

The key characteristic we saw synthesized from the preceding literature review related to the structural characteristics of collaborative innovation. In our involvement with successful innovation processes, the most significant challenges to emerge relate to the leadership required for effective execution:

- Strategic thinking has to include the role of suppliers in the creation of core value.
- This leads to leadership challenges for engaging people and teams across multiple parties within supply chains to generate innovative products, processes, and services.
- The expansion of these *value networks* and their associated processes has led to more powerful innovation architectures.

- Building strategic relationships with key suppliers capitalizes on what we call the "synergy of compatible differences".
- Such synergies require new tools and metrics to link strategies to action.

We essentially view *value networks* as a distinctive form of network collaboration, which transcends purely transactional (supply) interactions, to be far more focused on collaborative co-creation. Such multi-organizational, complex, integrated adaptive systems are not easy to manage without a disciplined, rigorous architecture based on clearly defined and tested best practices. For those companies that have taken the time to put value networks in place, the results have been quite rewarding. However, many organizations we have encountered adopt a less than robust approach, one that is based more on the intuition of a few key managers than an established process, which will then have inconclusive or ephemeral results. Amongst the examples we provide, Motorola at times used the intuitive approach in an attempt to stimulate innovation through its value networks, but with few sustainable benefits. In contrast, Cisco Systems has adopted a systematic approach to its value networks and has shown stronger and clearly sustainable results.

In developing and managing an innovative value network, the "connective tissue" that links the network together is a critical element to the success of the network. One school of thought related to network theory promotes information system architecture as the core binding tissue. For example, the use of CAD and shared design systems certainly play a major role in software and hardware development, but it is one small element of the systematic set of linkages that are necessary.

Another school of thought (eg within the IMP Group) believes that social network architecture should be effective as the connective tissue. Social networks are based fundamentally on informal interpersonal connections, which seldom have the strategic value necessary to create competitive advantage, nor do social networks engage in the systematic methodology required to develop a fundamentally sound, long term business alliance.

Again, social interactions are of importance, but it is our contention that the *value network* perspective extends our understanding of such connectivity by focusing on strategic fit, chemistry and cultural fit and operational fit. Companies such as IBM, Cisco Systems, Eli Lilly, Rolls Royce, and Procter & Gamble that have addressed all three dimensions have reaped extremely high value from their alliance-based innovation networks.

Constructing Value Networks

The fundamental architectural framework for any practitioner seeking to create an innovation-driven value network in terms of six essential elements:

Strategic Imperative

A clear strategic rationale for innovation amongst the parties of an interdependent value network is necessary to provide the compelling logic and direction on which to base any innovation efforts, particularly designing the program and allocating resources. The strategic policies & programs to launch an innovation program need to be coordinated across all the parties to the network – as we saw earlier, the lead for innovation is not always clearly vested in one party or another to the network (see esp. the works of Foxall and Asanuma) so coordination and alignment of the network level policies and procedures often takes the form of an alliance infrastructure.

Leadership & Relationships

Defining a strategic rationale for innovation does not guarantee success. This is where senior executive leadership is really does begin to represent either the catalyst or constraint. The role of leadership within the network requires a significant shift in thinking and behavior. In so many ways, what we encounter in network innovation are the common challenges of leadership and change management. Paradoxically, if new network architectures are decided upon then the imperative to collaborate often motivates the parties to develop far more collaborative and cross-organizational approaches to change. It is often the case that the value of collaborative innovation is that it spreads the risk and change expediencies across several organizations. We often describe this as a form of multi-party 'skunk works'. No one party's culture can dominate or inhibit the momentum and so synergistic results are achievable with relatively low inertia.

Organizational Design

Our reviews of our field implementation engagements reveal reflect a problematic characteristic of organizations – most are designed for functional efficiency, not for innovation. This clearly has created a number of structural barriers to innovation. Three major organizational design issues have to be addressed in developing continuous streams of innovation: 1) insularity of organizations and their rejection of any ideas and connectivity outside their boundaries, 2) the fear and distrust of other organizations outside their boundaries because command and control leadership is not effective, and 3) "siloed" structure of organizations creates a set of internal barriers to innovation, which is inherently a non-linear function requiring cross-functional teaming.

Increasingly we are seeing multi-functional teams being deployed in many development programs. Program management within organizations enhances internal connectivity through cross functional teams. Companies like Procter & Gamble have advanced their thinking of value networks to replace their "research and development" system with a "connect and develop" architecture that aims at deriving fifty percent of their innovation from outside sources. This also enhances the linkages back into the functional organization. However, even adopting cross functional program management will not help generate collaborative innovation unless there is close integration between value network partners. Drawing on the technical expertise of specialist suppliers and system integrators can only serve to enhance the innovative efforts of the alliance network and generate the opportunities for IP creation that would otherwise be less likely to emerge.

On its own, structural redesign alone will not drive collaborative innovation. Organizational design must address the development of conducive cultural attributes that enhance interpersonal cooperation. Such developments include the introduction of reward and recognition practices that clearly acknowledge collaboration and synergistic actions. The objective here is to developing the skills, abilities, and infrastructures throughout the network that will improve individual, team, and cross-functional capability to perform at world-class standards of innovation. One of the most ephemeral, but critical elements in the design of an organization is to create an open "culture of innovation." Studies (such as by Egon Zehnder) show consistently that the most critical driving force innovation is a set of values, rewards, and mindsets that make innovation, risk taking, exploration, and learning a fundamental set of core values.

Legal and Contractual

The value of intellectual property (IP) is short-lived in a fast-moving world and therefore the generation of future new royalty streams is equally as important as the protection of current IP and royalty streams. Since IP is increasingly being generated by multiple parties often in alliance with each other, the demands for collaborative networks and even attention to establishment of legally defined alliances takes on an increasing impetus to provide protection for all parties.

Naturally, an increasingly sensitive global environment pushes many organizations towards securing legal safeguards through contracting – but we have found serious issues arise if putting the right agreement in place impacts on project timelines. It is also our observation that the more flexible contracts are the better able the network will be to adapt quickly to changes imposed or required by the strategic environment

Performance Management

The adage: *Vision without execution is hallucination* is extremely relevant to any effort to accelerate innovation both internally and externally. Our empirical research in networks such as P&G's Connect and Development system show that the best performers in the network are highly disciplined in their use of best practices in alliance formation and management, their deployment of carefully selected human resources, their methodical implementation of processes, and their utilization of the right frameworks for the right situations.

For example, one of P&G's key suppliers is the Danish enzyme manufacturer Novozymes. This firm had, over the course of many years, developed sophisticated methodologies for joint development with its customer and suppliers. Its performance processes embrace sophisticated procedures for filling the innovation pipeline, managing a joint portfolio of innovation projects, handling jointly developed intellectual property, managing the cooperative relationships, and commercialization procedures. In another example, Rolls-Royce jet engines developed its "Starfish" alliance with suppliers, using set of best practices for alliance formation and management used by the alliance professional association.

Econometrics & Rewards

Failure to recognize and reward innovative efforts and processes is a critical barrier to collaborative efforts. The implication is that all parties to the alliance network need to address performance management.

It's abundantly true that "if you can't measure it, you can't manage it." So also is it true that without metrics you can't sustain it, reward it, or nurture it. Metrics focus on identifying where value is created. Once metrics are clearly aligned with strategy, then rewards must be aligned to ensure a symbiotic effect between strategic objectives, metrics, and rewards within the network. In the end, the right metrics don't just measure innovation, they actually drive innovation and ensure that the network doesn't just innovate for innovation's sake, but creates useable, sustainable, and valuable innovation. This involves some basic benchmarking, particularly determining the key metrics and identifying the current baseline level of performance. However, a core tool in our experience has been adoption of a total cost of ownership approach (TCO) across the network. This enables all parties in the network to

understand how value is created or diminished, and how to engage in innovative methods to make the value-linkages more competitively advantageous.

One core concern that often poses challenges to the network is measuring and rewarding synergy amongst members. This requires all network members to develop not just a mutually aligned set of metrics, but, in addition, a set of rewards that encourage sharing of ideas, establishment of effective sub-system networks, and cooperation on solving problems and taking advantage of opportunities rapidly. Unless metrics and rewards are effectively aligned, the network (and the members in it) will exhibit highly dysfunctional behavior.

Conclusion

Innovation plays a central role in the sustainability and growth of organizations. Increasingly innovative success depends on accessing the capabilities of other organizations across the supply network, which has been reflected in much of the existing literature. The paradox that we have found between research findings and typical practice to lead innovation highlights a serious disconnect between the theory and the practice. A core challenge that we have seen relates to the connectivity across value networks in terms of clear strategic leadership and management processes. We identified six essential elements of value network management, namely strategic imperative, leadership relationships, organizational design, legal and contractual, performance management and econometrics and rewards.

These issues are not, of course, particularly controversial and would be common themes in many management writings. However, our experience has been that across organizations, these fundamental traits are all too frequently lacking. In trying to ‘make sense’ of supply networks and particularly the characteristics of value networks, attention to structural, relational and coordinating infrastructures form the basic skeleton of an innovative infrastructure.

This paper has thus laid down the foundation for our on going studies and engagements relating to collaborative innovation. In our future work, we will build on this foundation to provide a richer empirical body of evidence and reinforce the conceptual development of a value network management perspective.

It is our contention that organizations need to look beyond supply chain and network practices if they are to harness the strategic power of their collaboration partners in order to deliver world-class levels of achievement.

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