

## **Value Chain Resource Planning (VCRP): *Adding Value with Systems beyond the Enterprise***

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The ability of a firm to develop a competitive advantage depends on a variety of factors. One of them is the firm's ability to display and make use of value-adding capabilities. These capabilities represent resources that may be made available to a range of customer types, from suppliers to distributors to consumers. The greater and more unique the value-added, the more reliant on that firm other parties are likely to be and, according to established resource-dependency theory (Pfeffer and Salancik 1978), the stronger the network position of the firm. Over the last decade the belief of many firms has been that such value and strategic strength can be augmented by the use of sophisticated enterprise systems (Weston 2003).

Enterprise systems are planning and resource management systems designed to integrate processes, enforce data integrity, and better manage resources. The best known of these systems is Enterprise Resource Planning (ERP) systems. ERP systems are predominantly intra-enterprise focused, and provide, at least in theory, seamless integration of processes across functional areas with improved workflow, standardization of various business practices, improved order management, accurate accounting of inventory, and up-to-date operational data. According to industry reports at least 30,000 companies worldwide have implemented ERP systems (Mabert, et al) since the mid-1990s. As companies have gained more experience with these systems, they are now adding specialized applications to extend their reach well beyond their initial functionalities of processing transactions. These more recent applications have enabled both intra-enterprise and inter-enterprise capabilities.

The term "seamlessness" is often used to describe enterprise systems. Seamlessness is a complex concept that is used in the context of the integration of functionalities and applications

across multiple functional and geographically dispersed facets of an enterprise as well as the access of real-time data from a common enterprise database (Davenport 2000). This integration and the resulting seamlessness is the key to the reduction of ad-hoc conversion interfaces between corporate databases and application modules, as well as the standardization of graphical user interfaces (Jacobs and Bendoly 2003). Providers and practitioners of enterprise systems have in turn associated seamlessness, particularly the availability and accessibility of real-time data, with a facilitation of vital decision making prowess relating not only to simple transactional protocols but, more importantly, to strategic planning and knowledge management competencies that provide unique sources of value and competitive advantage. Thus, seamlessness is often a key objective in setting up of enterprise systems.

This isn't to say that enterprise systems, such as ERP systems, are devoid of interfaces. Even though one of the fundamental design characteristics of these systems has been to break down inter-functional communication barriers, the fact is that additions to these systems continue to be developed. The rapid evolution of these business applications, particularly by non-ERP system developers, has given rise to the "bolt-on movement"; the term "bolt-on" being used to describe specialized applications or systems that provide functionality beyond the basic capabilities of ERP systems. The new applications or systems are "bolted on" to the ERP system using interfaces of some type so that data can flow between these systems. Even though the bolt-ons have resulted in a return to interface proliferation, this trend is increasingly characterized by innovative efforts to provide as smooth as interchange as possible, thereby preserving the concept of seamlessness.

Examples of such applications and systems include enterprise logistics and forecasting, as well as data warehousing and data mining suites, among others. Each of these applications can be considered as resources in a sense very similar to the physical resources controlled by a firm, and therefore can redefine competitive advantages within firms. For example, best-of-breed hybrids of multiple ERP systems and applications have allowed for reductions in the need for business process change, the design of more efficient processes, the provision of better fits to already existing functional competencies, and the effective enabling and augmentation of new

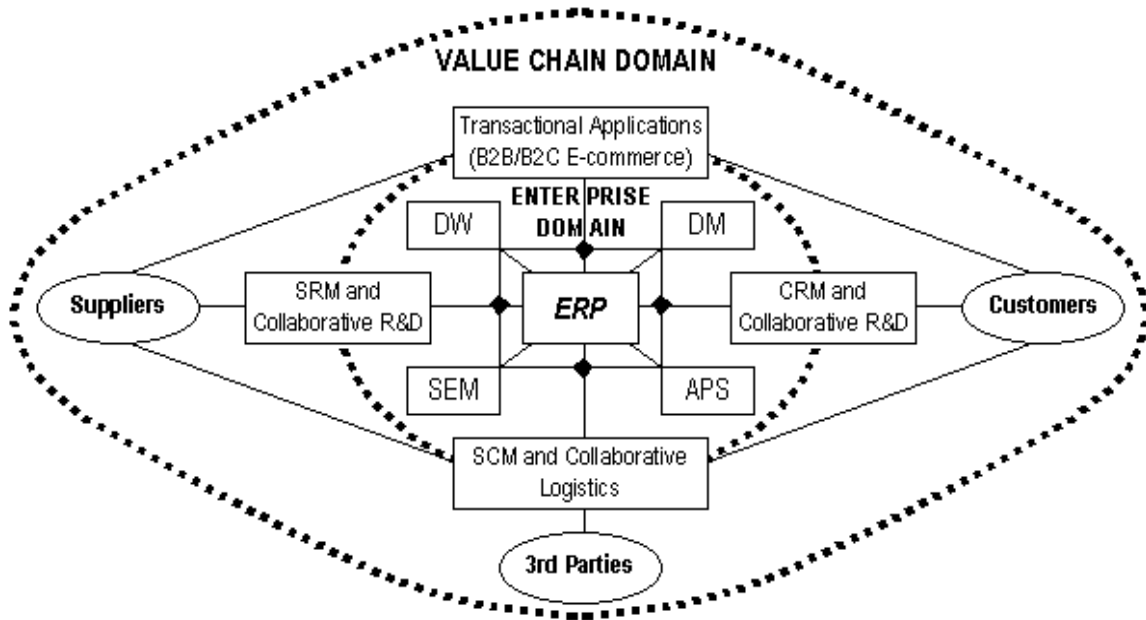
competencies. They have, however, also mandated the deployment of appropriate system interfaces.

In the pioneering days of ERP many manufacturing firms implemented best-of-breed systems, with financial and logistics modules from SAP, Oracle or Baan, and human resource modules from Peoplesoft. For example, Mabert, Soni and Venkataramanan (2000) reported that in the late 1990s approximately 9% of manufacturing firms implemented ERP systems using this best-of-breed approach. This number only represents the tip of the “interface iceberg” today. As new bolt-ons continue to be introduced, and new opportunities for developing competitive advantages for firms emerge, the importance of developing interfaces that allow for the concept of seamlessness becomes even more critical.

This is particularly salient given that bolt-ons are increasingly developed to allow for novel forms of inter-enterprise interactions. Enterprises are now focusing on how inimitable competitive advantage can be garnished through complex relationships with their value chain partners and the resources they possess. As with individual firms, these resource combinations include the complex array of IT resources value chain partners may share synergistically. To this extent the value-added propositions of firms vying for positions in respective value chains include the IT resources they possess and the potential for inter-enterprise IT integrations. This focus also represents a shift from discussion of the resource-based views of individual firms (Barney 1991) to resource-based views of entire value chains that compete against one another. Thus, in a business world that is increasingly looking at how competitive advantage can be gained through coordination between both upstream and downstream partners, a strict focus on the domain of the enterprise is fast becoming obsolete.

As a result, the development of information technologies and interfaces that bridge the various gaps not only within firms but also between them has become increasingly critical. This is where the “value” of pure ERP developers, whose focus is predominantly within the enterprise, is likely to wane, and the “stock” of inter-enterprise system integrators will begin to rise. It is also feasible that some ERP developers will evolve into inter-enterprise integrators. The distinction between these two views is illustrated in Figure 1.

**Figure 1: Enterprise systems as the core of a value chain system domains**



### Stepping out of the Box

From both strategic and technological standpoints, enterprise management issues can be viewed as being encompassed by the domain of the value chain as a whole (as shown in Figure 1). Moreover, the value-chain domain is complicated by the fact that the numerous enterprises that compose it can not only cooperate at a physical and information levels, but also may compete among each other and operate with potentially conflicting objectives in mind. From a systems perspective, numerous applications provide interfaces between these partners. Traditionally, transactional applications between firms have been most prominent. Business-to-business e-commerce applications, evolving out of the technological foundations of Electronic Data Interchange (EDI), allow firms to trade across large virtual expanses with partners they may never have known existed in years past. The diffusion of these inter-enterprise technologies has often been paralleled by changes in strategic and organizational commitments (O’Callaghan et al. 1992). Business-to-consumer applications, on the other hand, have allowed new channels of commerce to open up, accompanied by new models for logistical deployment. With the advent

of customer relationship management (CRM) philosophies and supporting technologies, firms have further attempted to use these new channels strategically to foster long-term customer commitment and retention of market share.

This strategic refocusing and realization that value additions to business propositions can emerge from novel technology-supported relational efforts has been further assisted by decision support systems that enhance inter-enterprise planning capabilities. For example, tactical and operational applications, including supply chain management (SCM) applications developed by such firms as i2, Manugistics and ORTEC, have provided capabilities for firms to more efficiently manage their fleet resources and develop more appropriate production schedules, ordering protocols and postponement strategies. Contract monitoring programs, available through CRM and supplier relationship management (SRM) vendors such as Oracle, Siebel, RiverOne, and Supplyworks, continuously monitor the fulfillment of contracts to ensure quality and long-term reliability.

The prospect of strategically focused inter-enterprise collaboration exists along these functional frontiers as well. Collaborative planning, forecasting and replenishment (CPFR) activities allow for greater effectiveness in vendor managed inventory programs and rolling mix strategies. Some intrepid firms (for example, Wal-Mart and its use of NCR's Teradata software) even go as far as to provide direct though limited data-warehouse access to its partners to further facilitate CPFR (Foote and Krishnamurthi 2001). Collaboration in new product, and new service design and development allow for heightened supply chain responsiveness to market changes, and further support both rolling mix strategies and integrated relationships between suppliers and customers. Collaborative logistics and associated resource coordination/planning systems provide new opportunities for sharing distribution resources (for example, vehicle fleets and warehouses), and subsequently higher asset utilization rates. The strategic implications of these collaborative efforts are intriguing since they imply both increased dependence on critical value chain partners as well as means of distributing costs and risk both horizontally and vertically.

With these advances, unique benefits to individual enterprises that emerge out of new inter-enterprise technologies and associated value chain structures are becoming practical possibilities. Yet, while all of these applications have obvious *links* to the enterprise domain, they more

dramatically imply the consideration of dependencies on external partners and customers into previously internally focused decision-making processes. In particular, the management of competitive capabilities can no longer be discussed purely on an enterprise level alone. As complicating as it might seem to pursue new discussions that incorporate the role of other value-adding partnerships and possibilities, the option of ignoring these broader-reaching issues is quickly becoming unrealistic. Instead, as with most major changes in business, this evolution requires a fundamental recasting of management frameworks, models and approaches (Hammer and Champy 1993).

### **Characterizing the New Systems ....**

The community of academics and practitioners dealing with the evolution of technology-supported value chains and resource planning within these relationships, are faced with a crucial task of rationalizing terminology and metrics if there are going to be any meaningful discussions during this development. Much in the same way that standardization and database centralization has ensured seamlessness even in the presence of multiple IT structures and applications, the seamlessness of a discourse on extensions of enterprise technologies is going to be critical in facilitating future research and managerial practice. The rationalization of key terms is something that practitioner organizations such as the Supply Chain Council have been promoting for the last several years; both with respect to the use of a common “language” for management communication and comparable or potentially universal performance metrics.

Yet, at the same time, rationalization often requires the replacement of a handful of inappropriate elements with a single overarching concept (or at least more defining smaller set). Along these lines and for consistency of discussion, we propose the use of a single universal term that represents the next phase of system developments whose reach lies outside the enterprise. With reference to Figure 1, we suggest the use of the term “**Value Chain Resource Planning**” (**VCRP**) to emphasize a fundamentally distinct focus on *inter*-enterprise interactions. The concept of the “value chain” applies regardless of whether we’re dealing with physical material supply chains or information service chains; forward or reverse logistics; vertical or horizontal relationships. By “resource” we refer to not only physical assets and inventories but also more

generally to mobile workers, knowledge resources and product/service designs, hence opening the door for the consideration of collaborative development and deployment among firms.

While terms such as “ERP II”, “ECM” or “Extended-ES” have been recently suggested as nomenclature for this new era of business information technology, they do not clearly and meaningfully capture the scope of **VCRP** for several reasons. To begin with, good epistemological practice mandates that the introduction of new terminology ensures intuitive meaning and, more importantly, does not mislead or misrepresent the concepts that they embody. To a large extent, this is why the Gartner Group’s introduction of the term “ERP” in 1990’s was considered superior to other terms suggested during the dawn of ERP. One such term was “MRP II” (Manufacturing Resource Planning), a term which would have been wholly misleading since many ERP implementations not only involved non-manufacturing/non-materials functions and orientations of the firm but also would eventually involve firms operating strictly in the services industry.

Unfortunately, the use of the Gartner’s term “ERP II” (2001) as a designation of the next era of functionality “beyond” enterprise systems would be similarly misleading. “ERP II” in many ways suggests analogy to the development of “MRP II”, particularly in the minds of those who still believe ERP is just another extension of MRP (Materials Requirements Planning) to begin with. While the MRP/MRP II evolution was characterized by a sustained functional focus, this is certainly *not* the case in this next stage of inter-enterprise innovation. Rather the evolution of what can be referred to as **VCRP** applications represents a dramatic shift in functional focus (towards the value chain as a whole), and along with it a dramatic change in the metrics used to measure the effectiveness of such systems/applications. In contrast, the move from MRP to MRP II ostensibly retained the same metrics for measuring system effectiveness. Using the term “ERP II” to describe this shift therefore limits the immediate views of what exactly is at stake.

A similar problem is posed by the use of the terms “Extended-ES” or “ECM” (Enterprise Commerce Management, as utilized by AMR Research). Reference to the enterprise, without reference to the value chain in which these new inter-enterprise systems are set and upon which managerial use of these systems must focus, can mislead interpretations of the true capabilities

and appropriate use of these systems (Mello 2001). A more universal term that would better guard against such premature market-jostling slurs such as “ERP is dead” should be applied as a blanket for future development.

But, as always, the technological future remains uncertain. It is easy to say “we’re moving towards seamless integration across the value chain”, but it is an entirely different matter to actually go ahead and make such seamlessness functional. One of the first questions firms pursuing the inter-enterprise **VCRP** initiative need to ask themselves is what specific aspects of “seamless integration” are already possible and which ones must be pursued prior to others. Countless options, idiosyncratic to individual firms and their business partners, will present themselves. Some will require more inter-enterprise coordination while others will require less. Those that require less inter-enterprise coordination may not be as representative and may be less indicative of the grandeur of the movement in general but nonetheless represent important steps beyond the enterprise system. Furthermore, these may be the experiential stepping-stones towards higher levels of future integration. As most firms with experience with ERP systems have come to know all too well, implementing an enterprise system is a slow and, often, painful process.

Stepping-stones towards the development of the functional **VCRP** may include initiatives aimed only at minimal levels of inter-enterprise integration such as sharing of data as opposed to collaborative decision-making. These can involve end-consumer return management processes, downstream links to real-time point-of-sale data for vendor managed inventory initiatives, and shared access to production, inventory and resource availability calendar summaries across value chain partners. More ambitious aspirations may include the prospect of coordinated inter-enterprise fleet planning and production / inventory *schedule development* across value chain partners. Alternatively, they may involve virtually-integrated new product and new service development programs allowing for numerous simultaneous and ad-hoc collaborative groups to emerge among value chain partners. The realization of these advanced developments may require the application of cross-enterprise resource optimization routines and therefore assumes the ability to develop metrics acceptable to all parties and a willingness to share adequate asset information to make such considerations possible.

These more advanced, almost “mythical”, inter-enterprise extensions represent the true vision of **VCRP**. For most firms such developments are still nothing more than pipedreams, and the road from myth to reality can be dotted with obstacles. Just as research and experience has shown that cooperation across SBUs and top-level managers is critical to successful ERP projects, coordination at the level of the value chain is and will continue to be critical to advanced **VCRP** initiatives. The creation of true collaborative capabilities between value chain partners through the use of such systems will involve a mix of the proprietary developmental dynamics experienced in the hay-days of EDI adoption as well as the cross-functional integrative dynamics associated with the ERP movement. In the absence of well developed relationships, or at least an interest in developing such relationships, regardless of how much IT capital is thrown into such projects their prospects will remain elusive. As daunting as past EDI and ERP initiatives have been, by this standard the full vision of **VCRP** can pose unfathomably greater challenges.

## **Realizing the Dream**

Does this mean that the full potential of the **VCRP** concept is fundamentally impractical? Certainly not. In fact a number of firms have already embarked on forward-looking initiatives to make such integration possible.

### ***Georgia-Pacific***

Take Georgia-Pacific for example. With SAP’s R/3 system at its core, the firm has begun to reach out to its surrounding value chain at essentially every level (transactionally, logistically, relationally and collaboratively) outlined in Figure 1. From a purely transactional standpoint, it continues to advance the notion of item-level information standardization for use in order fulfillment and replenishment activities with its retailers. Information visibility starts with the linking of ERP data via software provided by webMethods to a packaged-goods B2B e-commerce exchange controlled by Transora (*PR Newswire* 2003). UCCnet, a not-for-profit standards organization, provides item registration and data synchronization based on industry standards to accompany orders placed through the exchange. The ultimate goal is to enhance the

collaborative planning, forecasting and replenishment (CPFR) capabilities of Georgia-Pacific and, in turn, enhance customer relationship management (CRM) capabilities.

Supplier relationship management (SRM) represents the other side of the value chain's relational coin, and another aspect viewed as critical to Georgia-Pacific's strategy. Strategic sourcing of a diverse set of base chemical, fuel and wood product providers is coupled with gain-sharing activities and the use of Web-based communication / collaboration technologies (Turbide 2002). Gains from these technologies allow for a greater understanding of both the capabilities and limitations of the firm's suppliers and, thus, heightened knowledge of what expectations are appropriate in the maintenance of these relationships. Such linkages also allow for facilitated knowledge exchange in new product development ventures.

Georgia-Pacific has also extended its value chain relationships to include third parties that consumers might not normally associate with the firm's operations. While the firm relies on links between its SAP R/3 system and supply chain software developed by RedPrairie (DLx) to manage dedicated carrier selection and deployment, it also makes use of a collaborative logistics offering developed by Nistevo to facilitate fleet sharing capabilities with firms such as General Mills and Pillsbury. Such technology-supported third-party alliances have enabled deadhead (ie. empty vehicle return) rate reductions from 10-15% to 3%, while ensuring service reliability levels of over 99% and driver turnover rates below 10% (Mazel 2001).

### ***Owens Corning***

Owens Corning has also shown its innovative zeal with respect to its focus on value chain systems. After realizing difficulties with attempting to use information technology that did not align well with long-standing contractor relationships (Buss 2002), the company has more recently concentrated on strengthening existing relationships through intra-enterprise approaches. Part of this effort has involved the use of business-to-business applications developed by e-BizChain Inc that utilizes links to Owens Corning's SAP system to allow the firm to interact with trucking carriers on issues regarding contract shipping status and logistical planning (Songini 2001). Logistical advancements have gained additional strength through the

linking of the firm's ERP architecture to its ViaWare warehouse management system (WMS) developed by Provia Software. Through this system, detailed customer order descriptions can be shared with carriers so that upon pick-up they can begin any tracing and delivery time procedure necessary to fulfill their contract (Knill 2000).

Adding to this value chain relationship focus, Owens Corning has also begun to implement a series of Web-based extranet applications to give partners access to tools for assisting in order scheduling activities based on information housed in its SAP R/3 archives. Such developments are also aimed at providing mechanisms for eliciting customer feedback. Recent reports further cite the use of BroadVision's Business Commerce and InfoExchange Portals to allow Owens Corning customers to consolidate groups of Web pages into customized portals to encourage richer information exchange (Chen 2001). Additional applications provided by e-BizChain allow for the sharing of CAD/CAM files for scenarios in which such detailed information may be critical either in logistical or product development efforts. These collaborative capabilities are complemented by Owens Corning's use of mySAP.com.

New transactional efficiencies have also been pursued through the use of ERP-linked technologies. For example, the firm has recently pursued efforts to enable smaller suppliers not currently conducting transactions electronically to take advantage of potentially viable Internet-based options, such as that provided by Advanced Data Exchange (ADX) (Bednarz 2002). Sourcing of non-strategic goods via the Internet has also become prevalent. Use of on-line auctions has allowed Owens to reduce negotiation times with critical suppliers from 2-3 months to 90 minutes (Verespej 2002). Rather than viewing e-marketplaces as the means of moving in and out of new relationships, the firm sees it as a mechanism for increasing the efficiency of such relationships. Ultimately, these forums provide suppliers with full visibility of the market structure so that they can continue to support the competitiveness of the value chain they share with Owens Corning.

## ***Cardinal Health***

A third example of **VCRP** development can be drawn from references to the many innovative projects recently pursued by Cardinal Health and its subsidiary Medical Products and Services (formerly Allegiance Healthcare). In efforts to strengthen its relationships with its customers, the range of CRM tools linked to enterprise technologies includes applications aimed at improving product returns, pricing, availability and order fulfillment (Collett 2003). Through the ValueLink program (a mix of functional and IT protocols) Medical Products and Services has pursued “closed-loop replenishment” in which transactions recorded at point-of-service within hospitals are recorded and inventory control and replenishment activities automated through direct connections between the hospital’s materials management and/or accounts payable systems and Allegiance’s system. This information exchange is further facilitated through the use information and robotic technologies provided by Pyxis, another affiliated unit of Cardinal (Werner 2002). In sum, the capabilities provided by these exchanges enhance the just-in-time (JIT) capabilities of Cardinal Health and its partners in the affiliated value chain.

Cardinal Health and its affiliated divisions are also making ample use of on-line marketplaces to provide various purchasing options to their customers through their main portal cardinal.com. They have also developed specialized portals for different types of customers as well as for internal use. For example, given the different buying patterns of hospitals and physicians, physicians have a separate portal, cardinalMD.com. Internally, a CRM application that is integrated with their SAP system allows their customer service representatives and order takers to check the status of orders, payments, and other information associated with orders. Partnerships with application providers such as Medibuy and the use of both Extended Markup Language (XML) and EDI standards allow for increased accuracy and transactional efficiency for its customers (DeJohn 2002). In the recent past Cardinal Health has also teamed up with other industry giants to develop on-line contract negotiation capabilities (*Drug Store News* 2001).

Perhaps one of the most interesting of Cardinal’s IT ventures has been with regards to its growing wealth of pharmaceutical information, placing it in data sophistication category

analogous to the popularized Wal-Mart model. Cardinal's RxRealTime technology is designed to capture data from pharmacy computers at established retailers (including Wal-Mart) and update sales databases on a near real-time continuous basis (Heun 2001). Straddling the CRM and SRM fronts, proprietary links to Cardinal's databases and the use of data-mining software provides powerful and previously unavailable visibility to partnering pharmaceutical suppliers and hospital groups such as University HealthSystems Consortiums (*ManagedHealthcase.Info* 2002). Such visibility allows these suppliers to determine the impact of new product launches and whether existing drugs are selling better in some parts of the country. Since the data can include sales information for both the drugs of a given pharmaceutical firm and those of its competitors, sophisticated production/marketing plans can be pursued collaboratively by both Cardinal Health and its pharmaceutical suppliers.

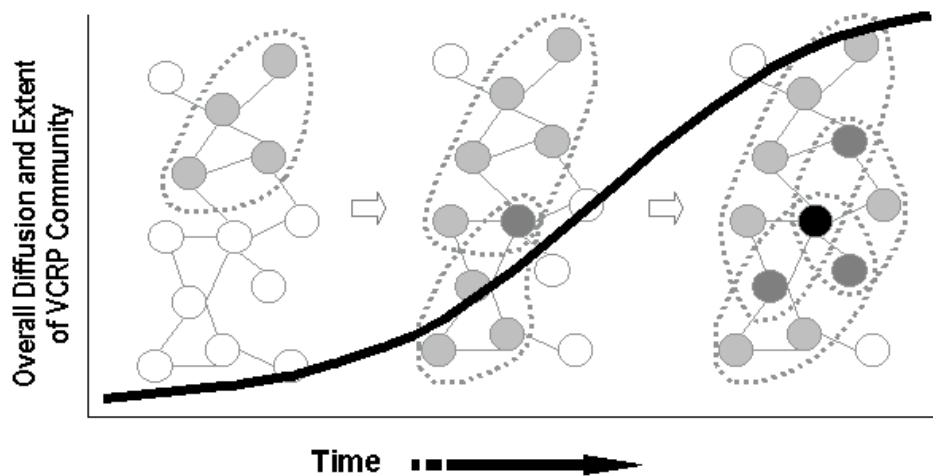
### **A Rising Tide...**

...lifts all ships. Or so the saying goes. As demonstrated by cases such as Georgia-Pacific, Owens Corning and Cardinal Health, **VCRP communities** (collectives of value chain enterprises interconnected by collaborative **VCRP** systems) have already begun to emerge and grow. Drawing on Rogers' (1995) classic conceptions of critical mass in technology diffusion, and a view of value chains as overlapping threads in a general global network, we perceive the creation of globally linked **VCRP** communities possessing a wide range of distinct characteristics as inevitable. Figure 2 depicts this progression from networks of enterprises with un-integrated or only marginal transactionally integrated systems into overlapping **VCRP** cells connected both at operational and collaborative exchange levels.

As with most new technology adoptions, the development of a few early success cases of **VCRP** communities will be essential to drive subsequent adoption by smaller players. Low-cost standards such as XML and support from the existing ubiquitous nature (ie. boundless pervasiveness) of the Internet will only continue to facilitate both the growth of these cells and as well as the emergence of other unique communities by allowing even the smallest firms to become involved in the **VCRP** movement. Future cells should build on the experiences and investments, both good and bad, of earlier beneficiaries of these initiatives and develop

idiosyncratic characteristics encourage the alignment of corporate value propositions with the competitive capabilities of these value chains.

**Figure 2: The diffusion of VCRP initiatives and community development**



Building from another popular adage: Whatever doesn't kill an enterprise only makes it stronger (or more appropriately *smarter*). An enterprise's simultaneous activity in multiple value chains, regardless of why such activity was initiated, can provide significant sources of organization knowledge growth, provided that these multiple activities do not as a whole force the enterprise to operate outside of or adversely impact its competitive capabilities. Activity in multiple **VCRP** communities only furthers the potential for such growth by facilitating information access, communication and process visibility. It also facilitates the potential for IT user communities beyond existing value chain affiliations and subsequently opens the door for new value chain formations.

In this regard, the birth of new value chains in general can be linked not only to existing value chain structures but also to **VCRP** technology affiliations. The same can then be said of the continuous development and evolution of new **VCRP** communities. This ongoing and inherently fluidic dance of birth, death and rebirth between operationally linked value chains and IT-supported **VCRP** communities may eventually become the norm for global business structures, and both the primary driver and product of market change. As future inter-enterprise

integration pushes forward, only time can tell the sheer magnitude of organizational restructuring that this movement will ultimately result in.

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