Value chain resource planning: Adding value with systems beyond the enterprise

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Competition is no longer limited to the realm of the enterprise. Entire value chains are now starting to act as formidable entities, competing against each other for similar markets. The structures of these partnered communities are both increasingly idiosyncratic and hard to duplicate, which strengthens the sustainability of the competitive advantages of their constituents. But their effectiveness is only as good as the capabilities supported by interfirm ITs. ERP is at the core of these extended systems, though in reality their architectures reach far beyond that. Modern management now requires the consideration of novel Value Chain Resource Planning (VCRP) concepts in order to sustain forward momentum.

The ability of a firm to develop a competitive advantage depends on a variety of factors. One is its ability to display and make use of value-adding capabilities, which 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 other parties are likely to rely on that firm and, according to Pfeffer and Salancik's (1978) established resource dependency theory, the stronger its network position becomes. Over the last decade the belief of many companies has been that such value and strategic strength can be augmented by the use of sophisticated enterprise systems.

Enterprise systems are designed to plan and integrate processes, enforce data integrity, and better manage resources. The best known are Enterprise Resource Planning (ERP) systems, which are predominantly intrafirm focused and provide, at least in theory, seamless integration of processes across functional areas with improved work flow, standardization of various business practices, improved order management, accurate accounting of inventory, and up-to-date operational data. More than 30,000 companies worldwide have implemented ERP systems since the mid-1990s. As companies have gained more experience with ERPs, managers have begun to add specialized applications to extend their reach well beyond the initial functions of processing transactions. These more recent applications have enabled both intrafirm and interfirm capabilities.

Seamlessness, a term often used in the context of enterprise systems, is a complex concept that describes the functional and applicational integration across dispersed facets of an enterprise and the access of real-time data from a common enterprise database. This integration and the resulting seamlessness are key to the reduction of ad hoc conversion interfaces between corporate databases and application modules, as well as the standardization of graphical user interfaces. Providers and practitioners of enterprise systems have, in turn, associated seamlessness, particularly the availability and accessibility of real-time

data, with facilitating vital decision-making prowess not only in simple transactional protocols but, more important, in 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 enterprise systems.

This is not to say that enterprise systems such as ERPs are devoid of interfaces. Even though one of their fundamental design characteristics has been to break down interfunctional communication barriers, the fact is that additions 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 new applications or systems are "bolted on" to the ERP system using some type of interfaces so that data can flow between them. 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 an interchange as possible, thereby preserving the concept of seamlessness.

Examples of such applications and systems include enterprise logistics and forecasting, data warehousing, data mining suites, and others. Each can be considered a resource in a sense similar to the physical resources controlled by a firm and thus can help redefine competitive advantages. For example, best-of-breed hybrids of multiple ERP systems and applications have allowed for the reduced need for business process changes, 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. However, they have 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) report that in the late 1990s approximately 9 percent of manufacturing firms implemented ERP systems using this best-of-breed approach. That number represents only 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 interfirm interactions. Enterprises are now exploring 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 that 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 interfirm IT integrations. This new mindset also represents a shift in focus from the resource-based views of individual firms to those 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 IT and interfaces that bridge the various gaps not only within firms but also between them has become more and more 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 interfirm system integrators will begin to rise. It is also feasible that some ERP developers will evolve into interfirm integrators. The distinction between these two views is illustrated in **Figure 1**.

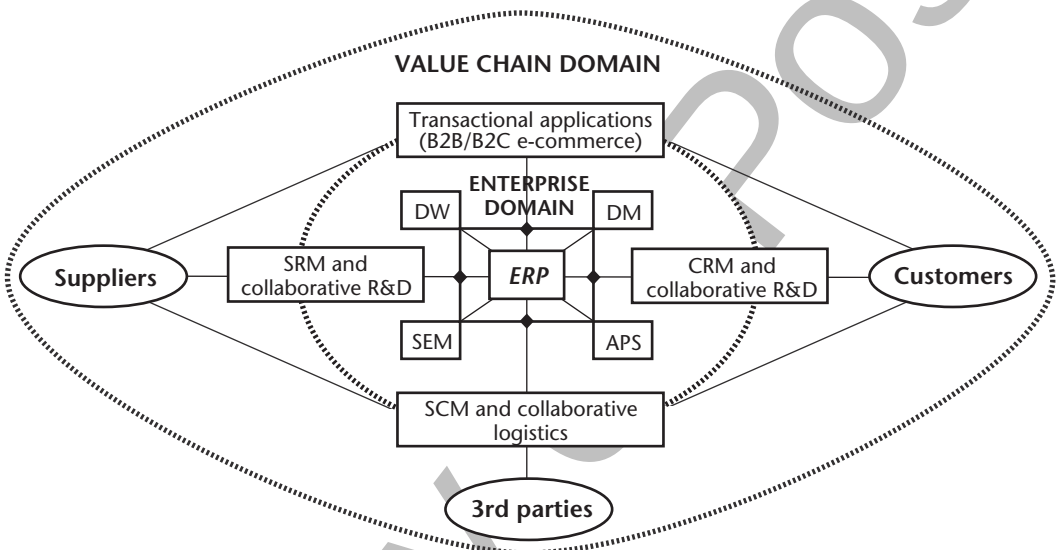
Stepping out of the box

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 Figure 1 shows). Moreover, the value chain domain is complicated by the fact that the numerous firms it comprises not only can cooperate at physical and information levels, they can also compete among one another and operate with potentially conflicting objectives in mind. From a system 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 interfirm technologies has often been paralleled by changes in strategic and organizational commitments. 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, companies 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 added to business propositions can emerge from novel, technology-supported relational efforts has been further assisted by decision support systems that enhance interfirm plan-

Figure 1
Enterprise systems as the core of a value chain system domain



ning 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 manage their fleet resources more efficiently 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 interfirm 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, such as Wal-Mart with 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. Collaboration in new product/service design and development allows for heightened supply chain responsiveness to market changes, and further supports 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 (vehicle fleets, warehouses) and subsequently higher asset use rates. The strategic implications of these collaborative efforts are intriguing because of both greater dependence on critical value chain partners and the means of distributing costs and risks horizontally and vertically.

With these advances, unique benefits to individual enterprises that emerge out of new interfirm technologies and associated value chain structures are becoming practical possibilities. Yet even though all these applications have obvious *links* to the enterprise domain, they also imply the inclusion of external partners in previously internally focused decision-making processes. In particular, the management of competitive capabilities can no longer be discussed purely at 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.

Characterizing the new systems

The community of academics and practitioners dealing with the evolution of technology-supported value chains and resource planning within these chains is facing the crucial task of rationalizing terminology and metrics, if there is to be any meaningful discussion during this development. In much the same way that standardization and database centralization has ensured seamlessness even in the presence of multiple IT structures and applications, the seamlessness of 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 associations 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 replacing a handful of inappropriate elements with a single overarching concept (or at least a 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 *interfirm* interactions. The concept of the "value chain" applies regardless of whether we are dealing with physical material supply chains or information service chains, forward or reverse logistics, vertical or horizontal relationships. By "resource," we refer not only to 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.

One of the first questions firms pursuing the interfirm 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.

While several acronyms and terms have been suggested recently as nomenclature for this new era of business IT, 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 must ensure intuitive meaning and, more important, should not mislead or misrepresent the concepts it embodies. To a large extent, this is why the Gartner Group's introduction of the term ERP in the 1990s was considered superior to others suggested during the dawn of ERP. One such term was MRPIII, short for Manufacturing (or Materials) Resource (or Requirements) Planning III—which would have been wholly misleading since many ERP implementations not only involve non-manufacturing/non-material functions and orientations of the firm but also eventually involve firms operating strictly in the service industry.

Unfortunately, the use of the Gartner Group's term ERPII as a designation of the next era of functionality beyond enterprise systems would be similarly misleading. In many ways, it suggests an analogy to the development of MRPII, particularly in the minds of those who still believe that ERP is just another extension of MRP (Materials Requirements Planning) to begin with. The MRP/MRPII evolution was characterized by a sustained functional focus, but this is certainly *not* the case in this next stage of interfirm innovation. Rather, the evolution of what can be referred to as VCRP applications represents a dramatic shift in functional focus—toward the value chain as a whole—and an accompanying dramatic change in the metrics used to measure the effectiveness of such systems/applications. In contrast, the move from MRP to MRPII ostensibly retained the same metrics for measuring system effectiveness. Using the term ERPII 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 ECM (Enterprise Commerce Management, as used by AMR Research) or Extended-ES. Reference to the enterprise without reference to the value chain in which these new interfirm systems are set and upon which their managerial use must focus can mislead interpretations of the true capabilities and appropriate uses of the systems. A more universal term that would better guard against premature market-jostling slurs such as "ERP is dead" should be applied as a blanket for future development.

As always, however, the technological future remains uncertain. It is easy to say "We're moving toward seamless integration across the value chain," but it is an entirely different matter to actually go ahead and make such seamlessness a fact. One of the first questions firms pursuing the interfirm 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 interfirm coordination; others will require less. The latter may not be as representative and may be less indicative of the grandeur of the movement in general, but they nonetheless represent important steps beyond the enterprise system. Moreover, these may be the experiential stepping stones toward higher levels of future integration. As most firms with experience in ERP systems have come to know all too well, implementation is a slow and often painful process.

Stepping stones toward the development of the functional VCRP may include initiatives aimed only at minimal levels of interfirm integration, such as data sharing rather than 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 interfirm fleet planning and production/inventory schedule development across value chain partners. Or they may involve virtually integrated new product/service development programs allowing for numerous simultaneous, ad hoc collaborative groups to emerge among value chain partners. The achievement of these advanced developments may require the application of cross-enterprise resource optimization routines and thus 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" interfirm extensions represent the true vision of VCRP. For most companies, such developments are still nothing more than pipe dreams, and the road from myth to reality can be dotted with obstacles. Just as research and experience have 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 heyday 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 them, the prospects for such projects will remain elusive, regardless of how much IT capital is thrown in. 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. Here are three examples.

Georgia-Pacific

With SAP's R/3 system at its core, Georgia-Pacific has begun to reach out to its surrounding value chain at essentially every level outlined in Figure 1—transactional, logistical, relational, and collaborative. 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 linking ERP data via software provided by webMethods to a packaged-goods B2B e-commerce exchange controlled by Transora. UCCnet, a not-for-profit standards association, provides item registration and data synchronization based on industry standards to accompany orders placed through the exchange. The ultimate goal is to enhance the CPFR capabilities of Georgia-Pacific and, in turn, to enhance CRM capabilities.

SRM, which represents the other side of the value chain's relational coin, is another aspect seen as critical to GP'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. 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 maintaining these relationships. Such linkages also allow for facilitated knowledge exchange in new product development ventures.

GP has also extended its value chain relationships to include third parties that consumers might not normally associate with the company's operations. While it 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 companies such as General Mills and Pillsbury. Such technology-supported third-party alliances, reports Mazel (2001), have enabled deadhead (empty vehicle return) rate reductions from 10–15 percent down to 3 percent, while ensuring service reliability levels of over 99 percent and driver turnover rates below 10 percent.

Is the full potential of the VCRP concept basically impractical? Certainly not. In fact, a number of firms have already embarked on forward-looking initiatives to make such integration possible.

Owens Corning

Owens Corning has also shown its innovative zeal with respect to its focus on value chain systems. After encountering difficulties in attempting to use IT that did not align well with long-standing contractor relationships, the company has more recently concentrated on strengthening existing relationships through intrafirm approaches. Part of this effort has involved B2B applications devel-

oped by e-BizChain Inc. that use links to Owens Corning's SAP system to allow the firm to interact with trucking carriers on issues of contract shipping status and logistical planning. Logistical advancements have gained additional strength by linking the firm's ERP architecture to its ViaWare warehouse management system 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 tracking and delivery time procedures necessary to fulfill their contract.

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 assistance 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. Additional applications provided by e-BizChain allow CAD/CAM files to be shared 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 Net-based options, such as that provided by Advanced Data Exchange (ADX). Sourcing non-strategic goods via the Internet has also become prevalent. Use of online auctions has allowed Owens to reduce negotiation times with critical suppliers from 2–3 months to 90 minutes. Rather than viewing e-marketplaces as the means of moving in and out of new relationships, the company sees them as mechanisms for increasing relationship efficiency. Ultimately, these forums provide suppliers with full visibility of the market structure so they can continue to support the competitiveness of the value chain they share with Owens Corning.

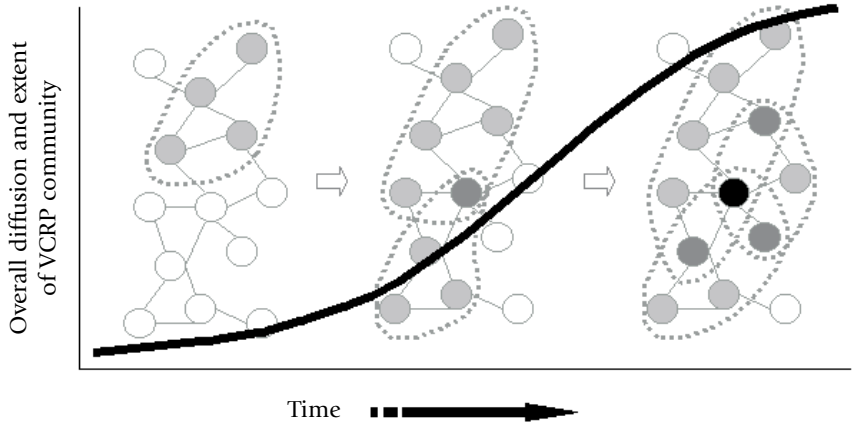
Cardinal Health

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 customers, the range of CRM tools linked to enterprise technologies includes applications aimed at improving product returns, pricing, availability, and order fulfillment. Through the ValueLink program (a mix of functional and IT protocols), Medical Products and Services has pursued "closed-loop replenishment." This means that point-of-service transactions in hospitals are recorded, and inventory control and replenishment activities automated, through direct connections between the hospital's material management and/or accounts payable systems and Allegiance's system. This exchange is further facilitated through the use of information and robotic technologies provided by Pyxis, another affiliated unit of Cardinal. In sum, the capabilities provided by these exchanges enhance the just-in-time capabilities of Cardinal Health and its partners in the value chain.

Cardinal Health and its affiliated divisions are also making ample use of online marketplaces to provide various purchasing options to their customers through their main portal, www.cardinal.com. They have also developed specialized portals for different types of customers as well as for internal use. For example, because of the different buying patterns between physicians and hospitals, physicians now 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. 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 customers. In the recent past, Cardinal Health has also teamed up with other industry giants to develop online contract negotiation capabilities.

Perhaps one of the most interesting of Cardinal's IT ventures has been its growing wealth of pharmaceutical information, placing it in a data sophistication category analogous to the popularized Wal-Mart model. Cardinal's $R_x$ealTime 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. Straddling the CRM and SRM fronts, proprietary links to Cardinal's databases and the use of data-mining software provide powerful and previously unavailable visibility to partnering pharmaceutical suppliers and hospital groups such as University HealthSystems Consortia. 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. Because 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.

Figure 2
The diffusion of VCRP initiatives and community development



A rising tide lifts all boats, or so the saying goes. As demonstrated by cases such as Georgia-Pacific, Owens Corning, and Cardinal Health, *VCRP communities* have already begun to emerge and grow. Drawing on Rogers's (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 at both 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—the boundless pervasiveness—of the Internet will only continue to facilitate both the growth of these cells and 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 that encourage the alignment of corporate value propositions with the competitive capabilities of these value chains.

Building from another popular adage: Whatever doesn't kill an enterprise only makes it stronger—or more appropriately, *smarter*. A firm's simultaneous activity in multiple value chains, regardless of why such activity was initiated, can provide significant sources of organizational knowledge growth, provided that these multiple activities do not, as a whole, force the firm to operate outside of or hurt 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 chain formations.

In this regard, the birth of new value chains in general can be linked not only to existing 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 fluid 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 interfirm integration pushes forward, only time can tell the sheer magnitude of organizational restructuring in which this movement will ultimately result. ❍

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