

GLOBAL PERSPECTIVE

Virtual Worlds Commerce

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The shift in the market toward the commoditization of virtual reality and the creation of on-line virtual worlds is explored in terms of their impact on business competitiveness and the changes taking place in supply chains. New developments in electronic commerce are identified which point the way toward new forms of business intelligence and new sources of profit. The implications for the telecom industry are analyzed in terms of the new technologies and capabilities required to support virtual worlds commerce. Opportunities and threats are also identified for the telco.

Rapid advances in communications and information technology and the automation of business systems are putting increasing pressure on the traditional business. Everywhere the pressure to automate in line with supply chains is causing havoc as organizations struggle to become more agile and competitive. With competitors squeezing into each other's territory, it becomes ever harder for the traditional business to sustain its historic ways of doing business. All manner of so-called *direct* businesses have already emerged, and these are attracting customers from all directions—mostly through the communication wires. How can a bank, for example, survive in its traditional form if its customers can be accessed through wire by direct competitors?

Products and services are also changing rapidly as they are developed using information- and knowledge-intensive techniques. Even money is changing. We are seeing the emergence of electronic commerce with new forms of currency. Digital currencies

are being developed which are unique to cybermalls and cyber products. Businesses are using fractional currencies, whereby the unit of currency may be a tiny fraction of the smallest reasonable unit that we might consider in physical coinage.

Shifts to Virtual Reality

Businesses have followed some fairly simple steps in responding to the digital revolution. Many supply chains have been re-engineered, shifting as much of the chain as possible into cyberspace. Technologies such as the World Wide Web have acted as a great stimulus to businesses in exploring the potential of the new on-line markets, not only for large corporations but increasingly for the medium-sized business and to a lesser extent the small business.

On-line multimedia has become commonplace, and technologies such as virtual reality (VR) are beginning to take off. For example, it is possible to build virtual reality factories and other enterprise facilities on the Internet. Many of these use industry-standard languages, such as Virtual Reality Modeling Language (VRML). This is the three-dimensional equivalent of HyperText Markup Language (HTML), the standard formatting language for the Web. Web sites which have become sprawling collections of two-dimensional text and image documents can be re-engineered as interactive three-dimensional virtual worlds, enhancing their value for on-line marketing and transaction servicing. The growing popularity of VRML is prompting the emergence of new authoring tools which will help in the development of virtual worlds and stimulate the market to mature rapidly.



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The main business users of VR today are those dominated by high production costs, such as defense, aerospace, automotive, architecture, engineering, and construction. Ford, for example, is developing virtual assembly lines which depict virtual workers stretching, leaning, and welding tools. Constructing virtual cars on virtual assembly lines enables the automaker to remove whole phases of building physical prototypes. Production lines can be built in VR. According to a report by OVUM, business applications represented 65% of the VR market in 1995, while entertainment applications accounted for just 35%.¹

Companies in other industries are also claiming significant increases in competitiveness through the deployment of desktop and Internet VR. Conoco has used monthly VR project reviews of the erection of a gas compression platform in the North Sea to save £3 million on a £70 million operation.² Being able to visualize and explore the new operation before it was built helped to improve team communication and customer service and avoid potential design and construction faults. For Merck, the pharmaceuticals group, VR enabled a 30% reduction in the time required to get a product to market.³ Given the competitive nature of business these days, such improvements provide an obvious route to competitive advantage. But how might a widespread migration to desktop⁴ VR and the on-line deployment of virtual worlds affect businesses in general?

The Impact of Virtual Worlds

The potential impact of VR and virtual worlds on businesses can be thought of in terms of supply chains. Consider a car manufacturer which decides to remove as many of the expensive physical prototyping stages as it can from the production cycle. The approach may be one in which only the final product is made physically. All other stages are accomplished inside computers and communication systems.

The final product is very complicated, and the car manufacturer may rely on hundreds or even thousands of smaller

businesses to supply components which it assembles on its production lines. If the manufacturer moves its prototyping stages to VR, it might compel its component suppliers (or at least its main ones) to do likewise. Ford, for example, will expect its largest suppliers to use the technology to design and develop assemblies and make sure that they are compatible with Ford's virtual systems. Thus, a constellation of businesses along the supply chain might simultaneously recast many of their business processes in VR. As one part of the supply chain does this, pressure will drive other parts to do likewise, especially those parts which may impact the development and delivery of rapid prototypes.

Looking at the whole chain, we can envisage a VR thread winding its way through the chain, connecting businesses together and spreading through their processes. If the chain's product is going to be shipped to market faster than competing products, additional pressures are created to communicate in real-time, indicating that Intra- and Extranets will be increasingly important carriers for on-line VR.

We can imagine VR prototypes bouncing along the supply chain through the communication wires and being modified and adapted until the chain (or part of it) decides that it is time to make them a reality. The whole chain (or constellation) may appear to operate as though it were a single enterprise. Where are the business boundaries along the chain? They may become very diffuse as the supply chain moves toward convergence on the new common technology.

Individual Businesses?

Imagine a business in the middle of the supply chain. It maintains its position by adapting to the pressures to build its contributions as parts that will be slotted into virtual worlds. Its business cycles, by necessity, would be in tune with the business cycles of the whole chain. Its accountability and management systems may have to be re-engineered to support the real-time operations of virtual worlds. Customers and

suppliers in the chain may insist that the business's facilities, such as electronic files and communication networks, be accessible 24 hours a day.

Already, it is becoming commonplace for businesses to give their customers some degree of control over resources in the business. It's happening in the physical world as companies insist on control over facilities in their suppliers' factories so that production cycle follow-on effects along the supply chain can be minimized. Distribution companies are giving customers access to and some degree of control over the distribution networks. Federal Express, for example, enables customers to track items electronically as they pass through the organization. Communications companies are deploying customer-managed networks using technologies such as Asynchronous Transfer Mode (ATM). This represents quite a culture shift in an industry still dominated by the philosophy of the *central office* in the management of telecom exchanges.

What we are seeing is a significant shift toward supplying capability and the increasing importance of delivering capability compared with delivering product. This is understandable in view of the dramatic shift in mature markets in favor of information-based transacting and virtual organizations. Under the new conditions, it is the agility with which relevant capability can be delivered that may determine business success. In mass production, for example, the production resources define the product, which leads to a marketing plan to reach the customer. In today's virtualizing markets, however, it is becoming commonplace for the customer to work with a team that pulls in resources through a virtual organization to create a customized solution.

The formation of VR-based constellations represents a maturing stage in the reconfiguration of the markets in which many previously distinct and separate businesses offered their resources and capabilities into enlarged, but temporarily stable, business groups. For the most part, the first VR-based constellations to emerge were, as in the example of Ford, derived

from and based largely on existing supply chains in traditional markets. This is not surprising since the uncertainties associated with adopting new technologies can be better managed if other variables (such as the definition of business processes, products, and workflows in the supply chain) can be held reasonably constant. In second- and third-generation systems, however, significant hybridization of constellations will occur, and these are expected to serve as the foundation of new superindustries that will emerge in the early part of the 21st century.

The implications of this shift are profound. For example, in a supply chain in which virtual worlds are shared through cyberspace and different enterprises use resources and facilities from many parts of the chain, where does one business start and the next finish? Who is the customer, and who is the supplier?

Perhaps one way of looking at the formation of these new business constellations is to think of them as cybernetic partnerships. In many of these partnerships, especially the more intimately connected ones, businesses may find that much of their individuality or scope for individuality is diminished. This may become particularly acute if business processes (e.g., virtual worlds) and the infrastructure supporting those processes (e.g., VR network, management, and administration systems) have to match up and interwork along the chain.

Adapting to Virtual Worlds

How might these developments affect traditional management systems in business? Let's focus on one example. One of the important aspects of the management of a business is the maintenance of brand. A good brand enables a business to differentiate its products, support its advertising, encourage customer loyalty, piggyback other products, and assist in market segmentation. In the virtual environments which have been described, the ways in which businesses go about cybernetic brand management will need to be thought through very carefully.

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Within the extended VR environments, businesses may well be cooperating very closely while, at the same time, competing fiercely to maintain their particular brand. Imagine a virtual world which simulates all of the businesses connected together in the supply chain and which supports shared working. How might “corporate image” be determined within the shared VR environment?

- One business might try to use its corporate VR “office layout” and “furniture” as the standard background.
- Another business may insist that its logos are superimposed on every virtual component that the chain produces.
- Yet another business might try to get its private currency and risk management machinery used for all transactions within the chain.
- Still another might try to dominate with its “look-and-feel” corporate image rendering as the standard rendering on virtual components.

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All manner of effects can be imagined because the shift toward real-time, VR-based supply chains, at least for the computer-based prototypes, may make the supply chain look rather like an interactive movie business! The VR business choreography has to be designed; VR scenery has to be built; designs and imagery must be created; scripts (i.e., business protocols) have to be agreed upon and learned; different situations (e.g., product positioning and competition scenarios) have to be acted out. The list could go on forever.

Although partnerships may lie at the heart of the formation of the new cybernetic constellations, there remains within these formations some quite powerful competitive forces. If the cooperative and competitive forces tend to balance, then the constellation may be stable and reasonably long-lasting. However, such constellations cannot exist in isolation—they must, in practice, connect into the wider economy, and it is such connections which may lead to instabilities. What if a business outside the constellation

can offer better virtual components into the virtual worlds than some of the existing businesses? How long will it take for the constellation to recognize alternative futures, reconfigure, and adapt to a better way of doing business?

As corporations begin to conduct more of their business in virtual worlds, they will need to develop new capabilities to enable them to survive and prosper. Compared with doing business with physical products, such as cars and washing machines, doing business in virtual environments is like being in another world.

One of the most important capabilities that a business will need to develop is awareness of its situation. If we imagine a business operating inside the VR constellation, it is clear that it must keep adapting to changes within the constellation to avoid being rejected. Therefore, the business needs to maintain awareness about the constellation, as well as the environment in which the constellation operates. But what if rejection does take place? What if some *new kids on the block* are about to blow the entire constellation apart with some of the most exciting virtual worlds that have ever been developed? Such a situation is quite common in the games industry as new players with new talent emerge with ever more exciting interactive multimedia products.

As the level of virtual worlds expertise grows with commoditization of the technology, what might appear as an exciting VR business system today may appear drab and old-fashioned tomorrow. There are important implications for the VR constellation. A business sitting in the constellation cannot afford to be locked in without maintaining a capability for constructing and investigating “what if” scenarios. Such scenarios would need to address all sorts of issues. For example, what if an improved image rendering technique comes on the market. Should the entire chain adopt the new tool, and will the others agree to do it? What if the end-product of the constellation is about to be made obsolete by competitors’ products? When might be the best time to break

free of the existing constellation and connect into other virtual worlds? What if several members are about to break loose? How quickly can other businesses be substituted in their place, and what might the implications be?

The Birth of Virtual Worlds Commerce

At present, businesses are going through the process of automating their existing processes, substituting as many elements as possible with information technology. However, once virtual worlds really start to take off, the nature of business and what we understand management to be about may go through some quite distinct changes. One of the most far-reaching changes will be the increasing dependence on pictures, rather than masses of text. This transition is expected to bring the benefit of making systems more understandable to a wider range of people because, in general, pictures help to improve communication.⁵ They certainly help to speed up the communication process.

Imagine a virtual world showing strategy scenarios in which the products and capabilities of the business can be inspected and manipulated at the same time as competitors' products. The virtual world could be built as a shopping mall with your business next to the cybershops of your competitors. Your business team could examine its products in VR and make comparisons with simulations of the competition's products. Marketing and customer response information could be built into the virtual components, and enterprise models with intelligent cyberspace agents⁶ could be used to estimate what might happen to market share as changes are made to the design of your virtual products.

The more that the business strategy virtual world can be used to illustrate the business and its opportunities and vulnerabilities to the widest range of people in the business and its constituency, the more the business can develop a better understanding of how it could or should be operating. Virtual worlds can then become a stimulus

to doing more in virtual worlds. Because markets are becoming so competitive, virtual worlds are being built as a means of differentiation and of establishing coherency and improved performance across supply chains.

The example of Ford illustrates this point. These new markets may enable some degree of multi-enterprise stability to be engineered and therefore serve to maintain profitability. However, when the density of virtual world constellations is very high (as it is bound to become), we may expect significant disruption of such formations as interactions build up between virtual worlds in different networks. These interactions may develop in the form of electronic markets, with buying and selling of virtual worlds and their components. Under these new market conditions, the virtual world itself may become a basic tool by which the business learns how to operate and remain profitable in virtual worlds. This critical transition represents the birth proper of virtual worlds commerce (VWC) and will accelerate the creation of business intelligence.

Opportunities for Telcos

What role might the telecom industry play in these exciting developments? The industry is already undergoing considerable transformation as deregulation in the mature markets, especially in the United States and Europe, gathers pace and competition begins to develop. Convergence between industries is accelerating, and already the markets are busy with all sorts of merger and acquisition activity as technology and market barriers topple. The computer industry, for example, is on the verge of destabilization as margins on products become razor thin and insufficient to sustain the sort of price-cutting that has become the norm. Its collision with the telecom industry has already been signaled by the explosive growth of the Internet and derivative technologies.

Since the opportunities associated with VWC will be highly lucrative, we can expect the computer and software industries to sharpen their focus on delivering many of

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the enabling technologies. Much of that technology depends on raw processing power and smart architectures. This will encourage the market to shift toward servicing value-adding business processes based on VR and will also create new markets for virtual worlds outsourcing and facilities management. We can also expect the increasing shift of VR into the on-line world to pull through many of the new media players, especially those which have developed expertise in the games and edutainment arena. After all, if companies can make a lot of money out of selling new media products for VR games, why shouldn't they develop business games and business systems for the business market? The more that those VR business processes are made to be entertaining and easy to use, the more that the businesses which use them will be able to overcome the cultural, mindset, and knowledge shifts required in their own organizations and throughout their supply chains.

The issue is a strategic one. Incumbent telcos, for example, want to keep their ducts jammed with old copper technology so that competitors can be kept out and forced either to invest in new holes in the ground (a very expensive⁷ business for anyone to engage in) or invest in bypass technologies such as wireless and satellite. As competition builds up, however, the cash cows derived from the old technology and the restrictive and often lousy services it is being used to deliver will become increasingly vulnerable. At some point, it will become more profitable to have the technology in place which will enable the telco to profit from VWC. If existing ducts were shared—itsself a good business opportunity—then numerous fiber optic broadband networks could be installed quickly. But that would create intense competition and a powerful stimulus to create and deliver the high value capability that businesses (and others) are waiting for.

We can imagine, for example, a corporate customer requiring the virtual world of a town on the other side of the world where a new factory is about to be built. That virtual

world, perhaps traded from a Virtual Worlds Server Farm (VWSF), may need documents and other information systems to be switched in so that decision makers in the business can inspect planning schedules, local laws, regulations, and trading conditions. In effect, we can envisage a vast range of new services associated with virtual-worlds-on-demand (VWOD and near-VWOD). All of this will need fast-media technologies and service delivery systems. It is not just an issue of the bandwidth starvation policy maintained by telcos.

Making It Happen

Digital convergence of industries and sectors is creating an on-line market whose timescales for dramatic change are much shorter than most of us are used to. How often have you been surprised by products appearing that you may have guessed would have been a year or two away? If a telco is going to take advantage of the remarkable opportunities which VWC will bring, there are many strategic issues that need to be addressed now. The most pressing issue has to do with appropriate technology.

Technology trials for video-on-demand (VOD) have shown that servers can be rather temperamental, especially when loaded too heavily. The challenges which VWOD will raise are going to be much harder to tackle, but it is precisely those challenges which will provide the new sources of competitive edge for telcos. Will emerging systems based on electronic markets⁸ and other potentially adaptive systems, such as neural networks,⁹ be the answer? Will artificial intelligence bring the software breakthroughs which everyone hypes and hopes for? The development of VWC will probably push existing telecom technology and infrastructure beyond its adaptive range. In view of the fact that the amount of software being piled onto telecom exchanges is fast approaching limits which the military sector deemed not to be viable for its own systems,¹⁰ might we expect telecom exchanges to crash as they are used more and more for delivery of visual and VR services?

The evaluation of these critical¹¹ technology issues must be built into the telco's business strategy. Finding the solutions will become a matter of sheer survival not only for the telcos but also for the businesses and communities which rely on a functioning information infrastructure. The issues affect the entire telecom equipment supply industry and will have follow-on effects throughout numerous other high-tech supply chains as digital convergence accelerates. All manner of businesses and markets will be affected—today's Internet service providers, resellers, content packagers, and tomorrow's virtual world creators, movers, users, regulators, legislators, and policy builders.

The rapid growth of VR and the development of VWC means that customers will soon be asking for technology to enable them to maintain a competitive edge. If the telco cannot deliver the capability to enable virtual worlds commerce to happen, the customer will soon find out! Might we see a rebalancing of the lucrative outsourcing market for corporate business as these powerful customers reassess the threats and opportunities of handing their value-adding business systems for VWC over to the telcos? The frenzied M&A activity that now characterizes the telecom industry could merely be a distraction. What is the point of creating a telecom group to chase a market if the telcos in the group merely dissipate themselves on managerial restructuring and corporate redecoration and overlook the fact that they should be racing to create the technological capability to deliver VWC?

The potential mismatch between the capability of existing telecom technologies and those required for the fast-approaching VWC must be addressed. That means getting down to basics: building engines, capability servers, and infrastructure for VWC. Given the breathtaking speed of the changes taking place and the fact that the first VR constellations are already operating, the telco's invention and innovation strategy for VWC must be built into the current five-year business plan. It will otherwise be too late.

Summary

In summary, businesses in all sectors may pass through three fairly distinct phases:

- Phase 1 Rush to automate business processes.
- Phase 2 Construction of business constellations.
- Phase 3 Development of new forms of business intelligence.

Phase 1 is now well underway, and there are many signs that Phase 2 is beginning to take off as businesses deploy virtual worlds in order to differentiate themselves, gain competitive advantage, and establish new forms of business supremacy. For example, a business may impose real-time virtual worlds along its supply chains to make substantial improvements in supplier relationships, cost reductions, competitiveness, time-to-market, and profitability.

When virtual worlds become commonplace and conditions for business operations subsequently become much more volatile as numerous networks connect to one another, it is predicted that virtual worlds will develop as a critical means for understanding how to develop cybernetic business strategies. This is Phase 3 in which virtual worlds will come to support the development of business intelligence and strategic management in an increasingly complicated and fast-changing cybernetic environment.¹²

The telecom industry must respond to these exciting developments, which require a new generation of robust technologies for fast media. This will mean a fundamental shift of emphasis from telecom servicing to telecom capability enablement. If the industry does not rise to the innovation challenge, new players will move in from digitally converging sectors and take over from those unwilling and/or unable to respond. The new players, taking responsibility for the new age of communications and intelligent business, will position themselves with technologies and capability which will enable Virtual Worlds Commerce to flourish. 

This will mean a fundamental shift of emphasis from telecom servicing to telecom capability enablement.

¹ J. Leston, K. Ring, and E. Kyral, *Virtual Reality: Business Applications, Markets, and Opportunities* (OVUM, July 1996). Available on-line: <http://www.ovum.com/pr/virpr.html>.

² J. Bird, "Not Just Toys for the Boys," *Management Today* (October 1996):80.

³ *Ibid.*

⁴ Isolation technologies such as immersive VR are not considered, as their appeal and application within businesses may be limited. The focus of this article is on VR and multimedia which can be displayed on a flat screen (e.g., PC screen or wall display) and which can be viewed and discussed if necessary by several people.

⁵ G. B. Thompson, "The World Turned Upside Down. Information Technology and the Linguistic Constraint," *Telecommunications Policy* (March 1977):153.

⁶ For example, see the Xerox PARC site at <ftp://parcftp.xerox.com/pub/dynamics/dynamics.html>.

⁷ D. Y. K. Ko and M. Gell, "Cable Franchise Growth in the UK," *European Transactions on Telecommunications*, Vol. 6, No. 4 (1995):397-406.

⁸ M. Gell and I. Adjali, "Markets in Open Telecommunication Service Systems," *Telematics and Informatics*, Vol. 10, No. 2 (1993):131-147.

⁹ For example, see J. Alspector, R. Goodman and T. X. Brown, Eds. *Proceedings of the International Workshop on Applications of Neural Networks to Telecommunications* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1993).

¹⁰ M. Gell, "Self-Organization and Market-Based Systems in Telecommunications," *Adaptive Methods and Emergent Techniques For Signal Processing and Communications*, D. Docampo and A. R. Figueiras, Eds. (Universidade de Vigo, 1993), pp. 62-74. This paper provides an estimate of software growth in telecom exchange systems from 1980 through 2010 resulting from digital convergence of previously separate industries. Has your business quantified the technology challenge it faces and worked out a strategic response?

¹¹ Gell and Adjali, "Markets in Open Telecommunication Service Systems."

¹² For example, see <http://www.mbz.u-net.com/>.



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