THE FUTURE OF EUROPEAN SOFTWARE:

European Software Responses to Globalization[*]

Trevor H. Nakagawa

Department of Political Science

University of California at Berkeley

April 1999

---

[*] This chapter is part of a larger dissertation project entitled, *Creating Competitive Software Sectors in the New 21st Century Economy: Comparing U.S., Japan and Western European Responses.*

THE FUTURE OF EUROPEAN SOFTWARE:

Global Strategies, Regionalism, and Path Dependency

1. Overview

Rapidly growing markets, advanced high technology manufacturing facilities, skilled labor, and well-developed science and technology infrastructures make East Asia an attractive entree to capitalize on the emerging "information superhighway." While U.S. and Japanese firms and governments have collaborated with their hosts to produce world-class information-technology (IT) sectors, European firms have been slow to capitalize on Asian regional advantages and rapidly maturing computer hardware and software markets. As software connects more and more businesses through wired networks and the Internet, the advantages of leveraging one's global software solutions to virtually any industry appear unlimited. In the most rapidly growing segment, the packaged computer software market in particular, European complacency threatens to derail the future competitiveness of the entire Western European software sector.

Despite the lingering effects of the Asian Crisis, software growth and development continues unabated throughout the region. As the crucial technology linking spectacular advances in the technologies underlying computers, communications and components that permit efficient storing and transmitting of information, software has emerged as a major growth industry in the advanced industrialized world. Accordingly, the governments of virtually all Asian newly-industrialized economies' and big emerging markets' have given special priority to the

development of their own software industry. As the dominant first mover in an industry characterized by network externalities, U.S. firms continue to capture already existing dominant market shares throughout Asia. In contrast, a niche market focus of a fragmented European software sector has been ineffective at exporting its nationally-specific (and often idiosyncratic) customized solutions. Furthermore, with the advent of the recent microcomputer and Internet "revolutions," the U.S. dominance of software markets throughout the Asian and European countries steadily continues.

Since the late 1980s, each European country has seen its various software application and operating systems in multiple sectors steadily losing market shares to their American counterparts. Reflecting European "disintegration," latecomer European software firm disadvantages included fragmentation and specialization along national, environmental (platform), industrial and functional divisions. Numerous small customized solutions' providers for specific industries was the norm. Recognizing the strategic importance of this industry for overall economic competitiveness—as well as the ineffectiveness of related hardware developmental efforts at the "national champion" level—various ambitious European wide commitments to support software through active government promotion policies have been recently undertaken. Yet despite major governmental efforts to protect and promote European software firms for close to a decade, the results are unclear.[1]

Today, very few European software firms are major international players. Even the largest European software firms are primarily domestic producers for specific local market niches, lacking both an export-orientation and direct foreign investment commitments. But despite

---

[1] Dutta, S. et al. (1998). According to the authors, there were only two published studies of the state of Europe and success of European-wide initiatives that describe the real experiences of firms in the last five years.

European-wide consolidation that resulted in fewer, larger software firms, the innovative foreign packaged software products continue to cut into these domestic market shares as well. It has become painfully clear that even for niche markets, globally packaged solutions compatible with multiple environments are the wave of the future. What was once a comparative advantage—a large, diverse, domestic market serviced by specialized customized solutions—may become an overwhelming latecomer disadvantage.

On the other hand, one should never discount the importance of market familiarity in an industry that requires intimate understanding of local business operations, regulations and informal business practices. To capitalize on these path dependent legacies, it is not surprising to see why European software companies have focused and done well in computer services, consulting, value added reseller and localization roles. Recent trends suggest that demand for the software services business, which has been growing at rates that exceed traded software, will continue to grow as the localization requirements for implementing systems in heterogeneous environments becomes increasingly intense.[2] However, even short-term demands such as the Y2K bug and the Euro currency consolidation are pushing software companies towards creating integrated packaged solutions that can serve a global market. The "innovate or die" slogan means that the lion's share of the profit will not flow to value added resellers and systems integrators nor comprehensive IT service providers. Furthermore, as developing countries such as China and India continue to develop these labor and infrastructure capacities and the competitive NIEs' computer systems firms branch out to the software bottleneck, it is not unlikely to see East Asian software companies exporting to Europe in the near future.

---

[2] IDC data, Moscher 97, Malerba 96.

Of course, all of this is not lost on European software firms. Their ambitious plans to create a cutting-edge European Information Infrastructure based on developing innovative European IT and software companies indicate a long-term commitment to competitiveness. Given the present market structure and capabilities of European firms, D'Aveni's firm strategy prescriptions to find ways to disrupt the market through creating new ways to satisfy customers are apropos. As a follower in a hypercompetitive market, finding ways to leverage one's existing customer base through creating globally packaged solutions designed for speed and surprise is exactly how the leading European software company, SAP, came to dominate a growing software niche.

As an IBM "spinoff," is the SAP strategy applicable to firms in other segments? More generally, can other European firms leverage their local advantages in a European-wide restructuring that relies on entree into Asian markets before homegrown competitors emerge? Or should and do Europeans find collaboration directly with leading U.S. multinational firms a more feasible strategy? Furthermore, are current European policies that seek to coordinate standards, diffuse and develop technology, identify best practices, and enforce intellectual property rights sufficient to propel the software industry? Can collaborative business-government efforts overcome the major obstacles to capturing Asian market share? In short, what are the core elements of the integrated market and nonmarket strategies of the successful survivors of this rapidly changing sector? These are the questions that this study seeks to address.

This chapter will proceed in four stages. First, we will summarize the situation in the Asian countries in more detail. Rapid PC market growth, proliferating internet users, growing local hardware and component competition, high software piracy rates, U.S. multinational firm software dominance and active governments are the common characteristics of all Asian software

markets. Particular attention will be paid to the competitive situation, user trends, and government policies affecting market access and industry promotion. Second, we will specify the international competitive dynamics of the global software industry. Given the continuing dominance of U.S. multinational software firms, any discussion of competitive global dynamics must begin with an analysis of U.S. software evolution and development.

Third, we will examine the structure of the European software industry in more detail. This involves: (1) identifying patterns of development in firm strategies and structure; (2) analyzing relevant vertical and horizontal linkage relationships; (3) assessing the role of organizational and institutional factors such as national industrial and supranational EC policies; and (4) identifying the major players. This can be effectively done through examining European software market and nonmarket strategies through the lens of national, regional, and global environmental contexts (as discussed by Aggarwal in Chapter 1). These three sections will set the context for the focus of the analysis in the fourth section, the market and nonmarket strategies of major European firms in Asia.

II. Asian Software Beckoning and European Policy Responses

Despite the recent crisis and slowdown, no one wants to lose out on the enormous market potential of information technology (IT)[3] in the fastest growing region in the world, East Asia. Given the large direct foreign investment commitments that American and Japanese firms have made to the development of IT in the Asian region (East Asia in particular), the latecomer status of Europe is striking. With World Bank projections that the PC markets in Asian economies will

outperform the rest of the world's regions for at least the next ten years,[4] Asia does indeed

beckon Europe (See Table 1).[5]

Of course, European policymakers and practitioners have long understood the strategic

importance of software to such industries as banking, airlines, automobiles, insurance and

publishing as well as virtually all consumer products.[6] A recent EU survey estimated that 70% of

all software developed in Europe is for the non-IT sectors of the economy.[7] But how to promote

an industry with such peculiar characteristics is less clear. High research and development costs

(R&D), high training costs, increasing returns to scale, rapid technological change, extreme

uncertainty, and a craft-like nature all characterize the software industry.[8] In particular, the

emergence of the "network" or "virtual" firm to adapt to the growing complexity and uncertainty

of business activities represents a radical departure from the vertically integrated model.[9] This

vertical disintegration continues to be widely seen in the software industry, which is dominated by

independent vendors in alliance structures. In addition, there is a strong path dependent effect

related to the lock-in effect of users trained in particular software interfaces and developers

trained in particular languages and codes. For example, the amount of code in most consumer

products and systems is doubling every two to three years.[10] As a result, software developers

---

[3] Information Technologies are generally those facilities that produce, store and transmit information. In this chapter, I will use "IT" to include the entire industry of hardware computers, peripherals, software, multimedia-related products and on-line services.

[4] Cite recent NYTimes, September 15?, 1997. (Look in NYTimes 97 folder).

[5] Insert Table on both growing relative importance of Software to national economies in US, W. Europe and Asia-Pacific countries & projections

[6] In fact, the next major battle is currently occurring in the home appliance network sector that promises to enable one to interconnect all of one's home appliances into a single integrated interface.

[7] ESPRIT, Software Best Practices (ESSI), May 1997 at www.cordis.lu/esprit/src/essi.htm, p. 1.

[8] Saxenian (1994).

[9] Teece and Cheesborough, "When is Virtual Virtuous?," Harvard Business Review, 1997.

[10] Gibbs, W. Software's chronic crisis, Sci. Am. (Int. Ed.) 271, 3 Sept. 1994), 72-81.

struggle with coping with the pressures of systems that are not only a couple of orders of magnitude larger and more complex than those developed a few years ago but also have to meet ever-increasing demands for quality and performance. In addition, studies have also shown that the high research and development costs associated with software development indicate both a high failure rate and spiraling budgets.[11]

Pan-European Responses

In view of these recurrent problems in software development and the perceived central importance of the software industry, there has been both a European-wide technical and managerial response. In the words of the current European software policy:

> As the information age develops, software will become even more pervasive and transparent…the ability to produce software efficiently, effectively and with consistently high quality will become increasingly important for all industries across Europe if they are to maintain and enhance their competitiveness.

These statements linking software with overall European competitiveness are taken from the first page of the European Systems and Software Initiative (ESSI), established in 1993 by 14 leading European companies with support from the European Commission and the Basque government. Focusing mainly on the organizational and management challenges of producing software, ESSI seeks to create a cooperative consortium of companies to avoid duplication of effort, unnecessary competition related to incompatible standards and the promotion of best management practices. This initiative was designed in coordination with other EU-level efforts of a more technical nature such as SPECS (Specification and Programming Environment for Communication Software), a

---

[11] Ibid. According to Gibbs, for every six new large-scale software systems put into operation, two others are cancelled. In addition, the average software development project overshoots its schedule by half with the largest projects performing on the worst end of the distribution.

representative RACE (Research and Development in Advanced Communications in Europe) project. SPECS is a project designed to develop common methods and techniques for European-wide coordination of the development of the complex software needed to create the pan-European integrated broadband communications system (IBC). The approach is to use formal methods and maximum automation to support the multiple specification languages currently in use in various European countries across several industries.

To put SPECS in perspective, the IBC is the modern telecommunication infrastructure to usher in the 21st century system of terminals, cables, switches, computers and satellites that handle telephone, television, data transmission and services in an integrated way. RACE is the program funded 50.1% by the EU to design the architecture and provide the technology necessary to build it.

Finally, SPECS is designed to meet the challenge of providing the extensive, standardized and complex software necessary to make IBC operational. The central idea is to create SPECS tools such as formal methods to productive efficiency in an open environment. The development of common tools and methods in design, implementation, testing, execution, maintenance and adaptation promises has created a cooperative spirit among the various telecommunication, data processing and software developer participants that work at making the IBC a reality. Furthermore, several long-term efforts at providing matching EU venture capital funds, simplified and harmonized pan-European software procurement practices and the development of multilingual modules have all helped European software firms collectively coordinate their catch up efforts through sharing risk, research and development costs. But are such ambitious pan-European measures effective at propelling the homegrown software business?

To address this question, I will examine how firms in the most ambitious regional integration project to date cope with globalization pressures in one of the most rapidly evolving technological sectors should reveal important indicators of larger trends. Despite the rapid growth and economic importance of this industry, the absence of published scholarly research that analyzes the regional environment and industrial structure of the computer software sector is striking. With few exceptions, attempts at scholarly comparative analysis of this sector are rare.[12] In addition, published empirical studies of European software firms are virtually nonexistent.[13] This is not unusual given the inherent difficulties of accurately analyzing and measuring the processes of an industry currently undergoing radical change. Rather than make a theoretical contribution, this study seeks to help fill the empirical gap in the literature by helping us to understand the experiences of European firms from a comparative perspective. This should set the foundation for making informed policy prescriptions based on the framework presented in Chapter 1.

Why "Traded" Software?

For practical and methodological concerns related to data collection, the focus of this chapter is primarily on European firms in the "traded" software sector with secondary emphasis on the "packaged" industry segment. "Traded" software refers to software that is produced by one firm for sale to another.[14] "Packaged" refers to standardized software that offers general application solutions that are not "customized" for a particular end user, industry or business.

---

[12] Mowery, ed. (1996), Torrisi (1998).

[13] One exception is: Bandinelli, S., Fuggera, A., Lavazza, L., Loi, M., and Picco, G., Modeling and Improving an Industrial Software Process. IEEE Translation, Software Engineering 21:5 (May 1995), 440-454; and Torrisi (1998).

[14] Mowery (96: 5)

While all packaged software is traded, customized software may also be traded. Unlike packaged, custom software is normally sold in conjunction with broader "computer services."[15] Focusing on traded software intended for sale is practical since it establishes boundaries for the unit of analysis. Because a great deal of software development is carried out within user firms, it is not surprising that internationally comparable data on sales of different types of software do not exist.[16] However, data for traded packaged and custom software, the dominant type of software produced by European firms, does exist.[17]

Emphasis is given to "packaged" software because it is the fastest growing software segment in the world (see table 5). Furthermore, as increasingly sophisticated packaged products (including development tools) become available in line with rapidly growing PC and workstation environments, the market share of customized solutions is steadily declining (see table 6). Thus, it is not surprising that the dominant global players of the industry are "packaged" software firms, primarily from the largest market, the U.S. However, since few European players are global packaged players—and most are still years away from being able to offer competitive standard solutions, I will focus on the European software firms that satisfy two conditions: (1) have some degree (or potential) of export-orientation towards Asia; and (2) have established a niche in some type of traded software product. This allows for a much more manageable data set of a handful

---

[15] However, given the increasing complexity of some packaged solutions intended for large firms or organizations, the need for related computer services is growing at a rate that by some estimates, exceeds that of the packaged market itself. See USDOC, ITA, World Computer/IT Software/Services Best Markets Report, November 13, 1998.

[16] Steinmuller in Mowery, ed. (96).

[17] The OECD, the International Data Corporation (IDC), the U.S. Department of Commerce, the National Trade Development Bank, the European Commission, and many private consulting companies that specialize in IT collect data in both packaged and customized software. This does not imply that their categories are identical nor comparable without qualification.

of firms as opposed to the over 20,000 independent software vendors and services firms that exist in Europe.

The focus on traded software also makes sense for methodological reasons as well. First, the rapid diffusion of both cheaper workstations and microcomputers has generated widespread opportunities for creative software solutions in a broad range of highly specialized applications. As a result, at least four groups of firms are active in the traded software sector: (1) computer hardware producers; (2) independent software vendors; (3) independent computer service firms, including value-added resellers; and (4) IT consulting firms. Furthermore, telecommunications deregulation, the advent of the internet, wireless communications and other technological developments have resulted in even tighter coupling between the computer software business and "computer services/consulting" sector.[18] For example, Cap Gemini, one of Europe's largest remaining computer services/consulting company, does significant business in Asia (close to $70-80 million in 1997) that involves a suite of offerings of standard software products that also involve process and service operations as well. It's "telcom in a box" solution in fact involves a vast array of products, processes, and services more akin to a standard customized solution of which software is one integrated part. Although determining boundaries in the traded software sector does not escape these problems, the focus on firms that are primarily producers of traded software for sale to a global market allows us to track a specific commodity. Disaggregating the software creation value of a consulting or computer services firm that has a general IT contract for a large organization would be difficult to discern as well as compare. However, tracking the contribution of the packaged software component from services such as installation, systems

---

[18] Even the OECD and IDC are not in agreement as to what constitutes services, e.g. systems integration.

integration and maintenance is a more manageable task than Disaggregating a customized solution. In addition, only firms that have a packaged software product are likely to penetrate the Asian software market to any significant degree.

Global Industrial Dynamics and the Pervasiveness of Packaged Software

The dominant packaged software firm, Microsoft, has become the paragon of success. Despite being dwarfed by major total systems providers such as IBM in total sales and revenues (7 to 1 in 1998),[19] the impressive speed and projected growth of Microsoft generates fear even among much larger IT players. This is intensified by the fact that software development plays an increasingly crucial role in the overall growth of many industries. A few factoids illustrate the point. As early as 1985, the OECD reported that software costs accounted for over 80 percent of total (including hardware) costs related to new information technology applications.[20] A survey conducted in the Netherlands found that 23 per cent of total business R&D expenditure was accounted for by software in 1994.[21] Furthermore, five of the world's ten largest IT firms ranked by R&D intensity were software producers (only one, SAP, was European).[22]

Regardless of the current difficulty of accounting for such estimates given the increasing network alliance structure emerging in this sector, it is clear that software has become the core technological lever that drives the field. At a minimum, the detailed case studies of this chapter will complement an examination of the aggregate statistical trends to help us better understand the competitive dynamics of the industry. Such an analytic focus creates a comparative framework by

---

[19] Fortune, January 1999. Get specific cite…
[20] OECD, 1985.
[21] Torrisi (1998), p. 91.
[22] OECD, 1997.

which to orient these case studies of firm strategies along market and nonmarket parameters. As an industry engaged in a hypercompetitive environment, it is useful to utilize the D'Aveni framework to analyze European firm strategies in Asia. As a latecomer to the industry, the prescription that European software firms should focus on disrupting the status quo through a series of temporary advantages is apropos.[23] In addition, the D'Aveni prescriptions for firm market strategies can also be interpreted through a nonmarket lens (as discussed in Chapter 1). Envisioning a disruption can involve creating strategically placed niche products as much as lobbying the government to pursue a competitor for antitrust abuses. As Barron has clearly articulated, understanding the nonmarket environment is equally important to formulating firm strategy as market dynamics. As we will see, the few European firms that have been successful are masters at implementing an integrated strategy for multiple platforms.

The Hypercompetitive Market Environment

Today, the availability of software increasingly drives the production of hardware products in computer and microelectronics. Growth continues to flow from widespread adoption in diverse industrial application settings. As microprocessors continue to improve, the rapid reduction in hardware costs fuel the widespread global diffusion of multiple computer platforms, especially workstations and microcomputers. The recent eclipse of Moore's Law with the advance of chip technology highlights the likely continuation of the decades long trend of a "software solution explosion" that has led to the rapid expansion of market niches with an array of virtually endless

---

[23] See Aggarwal,Chapter 1 for more detail.

applications and application tools.[24] The firms that establish first mover advantages in the mature industrial markets in East Asia will find themselves well-positioned to benefit from this rapid market expansion. As the global de facto standards setters, it is not surprising to see U.S. companies such as Microsoft, Oracle, IBM, and EDS topping the market share list.

Given the fragmented "craft" nature and high fixed developmental costs associated with this producer market, it is no wonder that both home and potential host governments have become actively involved in the promotion of the software sector. While developed countries focus on standards/process coordination of the private sector, developing countries pursued direct foreign investment and export promotion strategies. Both have also launched long-term educational policies as well as programs designed to encourage interfirm collaboration. To understand the motivations behind these policies, we must first examine the experience of the world software leader, the U.S.

American Dominance

Although U.S. "first mover" advantages in hardware led to the emergence of the first domestic packaged market, the links between hardware and software development are not yet clear. But it is clear that the first mass market for hardware gave U.S. software companies a competitive advantage in tools and operating systems development.[25] That is why it is only in their own applications solutions market that both European and Japanese firms have managed to remain competitive in. Primarily due to the local market needs for both "user friendliness" and adaptation to local operation conditions such as non-English language and character

---

[24] Selected NYTimes articles on both Intel's doubling and IBM's breakthroughs....
[25] Flamm, 1987, 1988; Mowery, 1986, 1995, 1996; Siwek, 1993

considerations, European firms have maintained an edge in supplying custom software to local firms in their home market. See Table 2.

(Insert New Table 2 here)

Table 2: Software and Computer Services in the United States, Western Europe and Japan, 1985, 1992, 1994, 1997 (in US$ billions) ——See file for new table: softstats.doc

	Packaged Software		Custom Software		Processing Services
	1985	1994	1985	1994	1985
United States	12.60	44.46?	4.17	35.60	11.1
Western Europe*	5.21	39.85?	4.72	26.57	5.33
Japan	0.27	9.96?	2.74	5.95	3.77
East Asia**					

Source: 1985 estimates are from OECD, 1989; 1992 and 1994 estimates are from IDC, 1993, 1995; and East Asia estimates are from _____. Original source: David Mowery (1996:7).
*Western Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the United Kingdom.
**East Asia includes China, Malaysia, Thailand, Singapore, Taiwan, Indonesia....

(MORE TEXT TO FIT IN TABLES AND CLARIFY GLOBAL MARKET)

*Table 3: Packaged Software Market Shares of U.S. and non-U.S. firms by region and product category, 1993--see Mowery.doc:8

*Table 4: Packaged Software's Worldwide Market Share: revenues by Vendor Category, 1993-8

Table 5:   Largest Western European IT Markets

	1992				1996
	Value	%		Value	%
Hardware	73.8	47.2		83.8	44.4
Software & Services	65.2	41.7		86.13	45.6
Hardware Maintenance	17.2	11.0		18.92	10.0

Total   156.21   100   188.87   100

Source: EITO (1993, 1997) US$billion at constant exchange rates,

Although national customized market niches continue to incrementally grow (see Table 4), it is not clear that they will survive the next wave of technological products. Neither is their projected growth anywhere near the levels expected in the packaged market sector. A recent survey of European firms found that over half of the respondents expect their customs markets to decline in the near future (Malerba and Torrisi, 1996).[26]. With the advent of new computer languages and object-oriented programming, software firms whose core competencies lie in the packaged market may eclipse them entirely. In fact, internationalized packaged producers have demonstrated the ability to exploit both economies of scale and scope in the mature East Asian markets. As existing East Asian international production networks (IPN) continue to generate world class OEM and ODM facilities through MNC DFI in cooperation with host governments),[27] infrastructures continue to improve and labor bottlenecks become less of a concern. But European examples of success in the packaged realm remain few, and ICL--one of the only "European" major players--is a British company that has been owned by Fujitsu since 1991.

III. Challenges for Western Europe

Domestic Structure

The Western European software sector has generally benefited from having what is the largest overall domestic IT market in the world, but has suffered from the national and associated

---

[26] But there was no systematic methodology to this study and it was heavily biased toward Italian firms, which are only the fourth largest market.

[27] (Ernst, 1995, 1996; Zysman and Doherty, 1996, Zysman and Borrus, 1997) Revise.

sectoral diversity of its market needs. With software and services markets constituting over 40% of the total, large U.S. and European hardware manufacturers dominate the rapidly growing packaged market in 1994. (update and show trend over 10 years) Although independent software suppliers control about 80% of the largest segment, the custom software and services market, producer concentration is extremely low.[28] As already discussed, this is also the segment that is declining the fastest and not expected to survive the shake-out in lieu of technological developments. The spin-offs from packaged products that take advantage of new computer languages and programming is where commercial success lies.

Most European firms sell primarily in their domestic markets for highly specialized national sectors. Even the largest software and services firms are only minimally involved in either exports or foreign direct investment. Primarily due to many historical, cultural, linguistic, fiscal and legal differences--coupled with the craft nature of this industry--national diversity has worked against the development of economies of scale and scope that are crucial to commercially successful software packages. As long as the respective domestic economies grew, the small number of craft-like firms could continue to thrive in their specialized, custom software niches. But with the European union, the homogenization of national policies, and international progress of technology in both hardware and software, packaged software has revolutionized the game of survival and the European software sector has been slow to adapt.

Observers have generally attributed poor European packaged software performance to the custom software specialization and diverse national market differences discussed above. But equally important were: (1) the early entry by U.S. firms at the technological frontier; (2) the lack

---

[28] Create Table to illustrate trend

of extensive interactions between industry and universities in Europe that were key to U.S. defense-related spin-off, software success; and (3) extensive government support for formal training in computer programming and the creation of the discipline of computer science.[29] Another closely related factor is the absence of internationally competitive European computer hardware firms which would have enabled potential European software entrants in systems and packaged software to benefit from interaction with hardware producers at the cutting edge of technological and commercial success. The early cooperation between Microsoft and IBM in the development of DOS is the most well-known example. In addition, U.S. software firms with ready access to venture capital markets could make large R&D investments in new standard software packages because they had such high internal market demand. Finally, U.S. firms have been able to exploit their first mover advantages to capture large segments of the East Asian markets through a broad array of collaborative arrangements ranging from licensing agreements to precompetitive R&D investment.

Integrated Strategies

What have the European firms and governments learned from this? Early on, there was consensus that survival was becoming increasingly reliant on more aggressively attacking the systems and packaged software markets. The wave of recent mergers and acquisitions beginning in the mid-1980s on has reflected the concern for European software producers to consolidate to take advantages of economies of scale. Heavy R&D commitments to software development combined with extensive sales and marketing networks are widely regarded as essential to success

---

[29] Steinmuller, Edward, 1996.

in this fast paced industry. However, given the necessity of having staff skilled in both the technical and marketing aspects of the industry, firms require skilled labor and technology transfer on a mass scale--and it is not yet clear that East Asian economies can fulfill this need. In fact, EC-level policies reflect an inward regional approach as opposed to an outright internationalization strategy. Thus, the high costs and risks associated with the long-term capital commitment seem to require a pooled risk strategy to which the EU seems to be a potentially good candidate. With a larger internal European market composed of government bureaucracies, agencies and large corporations committed to European hardware firms' proprietary systems, this path dependent regional disadvantage can be turned into a competitive advantage.

European governments, through software sector lobbying, generally recognize this need and the central importance of the software industry to the long term vitality of their national economies. Accordingly, since the early 1980s, software has increasingly come to enjoy a central place within the coordinated EC-strategy of developing common standards, diffusing the latest technologies, and improving the overall level of human capital. In complementary fashion, national strategies aimed at promoting interfirm and university collaboration in pursuit of these common objectives have been adopted. But how effective have these nonmarket approaches been? The view from the firm level provides a useful lens from which to gauge the effectiveness of both national and EC-level initiatives.

European Firm Strategies

While most have long since exited the market to focus on services and consulting, a few European firms have adapted to the new hypercompetitive dynamics of the international software market. Of course, this exit by both major hardware players and independent software vendors

makes sense from a purely market-based strategy. Services are a booming industry with expected growth levels that exceed even packaged software. Particular factors such as the Y2K bug and the Euro have created short-term incentives for developing software tools and standardizing automated accounting processes. But the long-term competitive dynamics reflect a high turnover rate associated with rapid technological advances and constantly evolving installed base. Under these circumstances, most companies do not want to be dependent upon a customized solution that will become quickly obsolete from a company that may not exist in the next technological product cycle.

As opposed to services, software restructuring is a highly costly process. It is not easy to package one's own custom software to multi-client markets. New developmental tools such as object-oriented programming and Fourth Generation Languages (4GL) offer distinct advantages since they expand reusability of software modules for different uses, thereby lowering entry costs. Large manufacturers like Olivetti, SGS-Thomson, and Groupe Bull have all undertaken radical restructuring and reorganization to focus on services, components and telecommunications to maintain their IT presence. Major software producers like Cap Gemini, the Sema Group, and Logica have also been concentrating more and more on servicing the faster growing packages software market segment. It is much easier to teach people how to use and adapt packaged suites to fit their needs than to undertake the huge R&D gamble that software production has become.

In addition, it is also simpler to leverage the local market knowledge advantages that have made the software niche business so lucrative in the not so recent European past. The localization, implementation and adaptation associated with modifying existing standardized solutions involve less risk, less investment and higher profit levels. Even with both national and EU policies to help spread the risk of developing software from both a technical compatibility

21

standpoint and capital provision, the recent Internet explosion and U.S. innovative competitiveness have only underscored the uncertain nature of this endeavor.

But more specific to the theme of this volume, what types of obstacles have European software firms faced in breaking into new markets in Asia? We have already mentioned the increasing returns' factors associated with having dominant de facto standards and a large installed base further reinforced by technological developments such as networks and the internet. The primary barriers to entry in the systems, services and packages software markets are: (1) the lack of in-depth knowledge of users' needs which are normally developing through long-term relationships with customers; (2) extensive marketing and distribution networks; (3) long-term access to capital; and (4) reputation, which is particularly crucial to potential clients. Recent surveys conducted over the past decade have indicated the importance of reputation as the consistently most critical factor.[30] This advantage alone has enabled the dominant U.S. players to overcome their deficiencies in the other areas such as establishing long-term relationships.

Like highly internationalized firms (with the exception of Microsoft), most European firms are not highly diversified, mostly consolidated in specific market niches. As such, the historical development of specific patterns of specialization of European firms appears to be their primary competitive advantage to consolidate and create a wedge into their own U.S.-dominated packages and systems markets. This led to the tendency of locating internal R&D activities in countries that have a comparative advantage in these activities.[31] Not surprisingly then, there is a tendency for European firms to "turn American," not only for market access objectives but for venture capital

---

[30] Higgs, 1997.

[31] Vernon, 1985; Dunning, 1995.

as well as end user and producer interaction. In addition, learning from their American and Japanese counterparts, they have also been able to tap into the skilled labor pool of software engineers, value added resellers and local consultants.

However, a recent survey of European firms found that most continue to attach little attention to R&D citing that the vast majority of their business is related to incrementally modified products rather than entirely new ones (Malerba and Torrisi, 1996). They are more concerned with—in order of importance—identifying clients, monitoring competitors, and the hiring and training of personnel. In fact, statistics indicate that from 1989 to 1992, only one-fourth of all firms derive the majority of their sales from totally new products (IDC, 1994). With the exception of SAP, this is a trend that has continued.[32] In this sense, firm strategies and organization of innovative activities generally remain consistent with the specialization of the European software industry in custom services and software. There are indications that this will continue to be a viable strategy for persistent niche markets, but also evidence that such companies are likely to disappear either through buyouts or mergers.

For the European software industry, this is a disturbing trend given the increasing importance of software to continuing economic growth and development. Although its potential ubiquity in virtually every business sector integrated into a global information highway remains a vision of the future, it is one that practitioners and policymakers all over the world dare not ignore. Not surprisingly, all European and Asian governments have viewed catching up with the American software sector as of the highest priority to ensure national competitiveness in an increasingly globalized economy. With the advent of the internet and telecommunications

---

[32] Economist, 1997, Software Survey.

technologies, the line between computer hardware, software development, business consulting, systems integration and information services promises to get even blurrier as global merger mania continues.[33]   Accordingly, rapid technological innovation, shortened product cycles and the increasing returns characteristic of this industry make the process of software development a complicated task subject to high levels of uncertainty and risk. Yet it is still not clear that national and regional programs, policies and initiatives will be sufficient to propel a hypercompetitive software industry. The next section will examine five case studies of successful integrated global strategies of European firms. We shall see that they have all share three characteristics: (1) global strategic vision; (2) skillful and creative leveraging of regional advantages; and (3) building upon their path-dependent organizational resource capabilities to leverage specific market niches into an integrated strategy.

Case Studies

Two central questions must be addressed before determining the entry mode into the higher risk area of the Asia-Pacific. First, what level of resource commitment are they willing to make; and second, what level of control over the operation do they desire. When risk is high, there is a reluctance to invest resources and rely on local contractees (Vernon, 1985). Conversely, when risk is low, there is a tendency to desire more control and run a wholly-owned subsidiary. However, in highly competitive industries, where many competitors exist and entry and exit are easy, managers perceive higher control risk, both because there is much more competition and because the actions of the large number of competitors tend to be unpredictable.

---

[33] NyTimes article on value of mergers at 1.2 trillion in 98 vs. value of internet stocks 250 billion…get article cite

In addition, in highly competitive industries the pool of trained and knowledgeable managers in the country increases, thus the firm can obtain local contractees with sufficient knowledge and skills to reduce the need for control (Anderson and Gatignon, 1986) and the transaction cost of using non-integrated entry models decline (Gomes-Casseres 1990). Therefore, in highly competitive industries firms will likely use low control modes to expand internationally (Harrigan, 1985).

Nonmarket risks

Both international and domestic firms face many of the same risks. But for international firms, many of these risks are nonmarket (see Ravenhill and Dupont 1999). General environmental risks include nationalization, import restrictions, restrictions on the repatriation of profits. Industry uncertainties include import restrictions, access to government owned resources or contracts and competitive uncertainties due to government support for certain industries or firms. Finally, international firms face greater firm-specific uncertainties related to greater operational and behavior risk associated with being foreign, i.e. buy local pressures.

Given the context of the current discussion, Business Week's ratings of SAP as the top software company and #3 overall performer in the IT world is surprising.[34] The German software maker of programs that automate the major functions of a company—finance, manufacturing and inventory control is the undisputed global leader in enterprise resource planning (ERP) software. How did this niche player become a dominant global player?

---

[34] Business Week, November 2, 1998, p. 109.

Case Study 1: SAP—Global Virtuality

SAP has become the world leader in Enterprise Resource Planning (ERP) software offering a full line of applications software for business computer networks, the hottest growth area in office computing. SAP is now a thriving $4.7 billion company that continues to make inroads into the enormously profitable $23 billion ERP subindustry.[35] It is the only European company to have a majority market share in any software subcategory and continues to roll out new packaged suite offerings tailored for specific types of businesses. SAP is also the only European company with a widescale presence in Asia that continues to grow and expand throughout the region. With a strong commitment to training and software localization through the development of local value added resellers to implement their complex systems, SAP continues to grab market share despite the lingering effects of the Asian Crisis.

The original impetus for SAP's creation occurred in 1972, when five engineers working for IBM Germany were not given permission to work on developing an order-entry program they wrote for a customer. It was a vision of disruption that has propelled SAP into the top ranks of the independent software vendors of the world. (Integrate file cases.doc)

Why has SAP been successful while all other European software players have fallen by the wayside? Like their European counterparts, SAP began as a company offering a customized solution to a specific application problem—reducing time to market through an integrated order-entry program that could work across multiple platforms. In consolidating the domestic European markets, they also followed a familiar IT trend, focusing first on reengineering and saving money by streamlining operations. But unlike other European software developers like Cap Gemini, they chose not to specialize in the area where their competitive advantage of local market knowledge could best be exploited—the lucrative services and

---

[35]Kirkpatrick, David, "The E-Ware War," *Fortune*, December 7, 1998, p. 103

consulting businesses. Instead, they chose to attack the innovation bottleneck itself through creating packaged software products designed for a global marketplace. This meant having a broad "market-disrupting vision" (in D'Aveni's terms) that foresaw the reengineering mania that took over corporate America in the early 1990s. It's newest line of flagship products, the R/S, is a software package that integrates a company's accounting, payroll, supply-chain management, marketing and other activities on networks of personal computers.

In many ways, SAP would seem to be the textbook case of D'Aveni's 7-S's of hypercompetition in an industry considered prototypical of such an environment. According to D'Aveni, software companies need to focus on disrupting the status quo through a series of temporary advantages rather than maintaining equilibrium by sustaining advantages.[36] After the creation and implementation of envisioning disruptions, one needs to build the capabilities to quickly capture opportunities and surprise competitors. Furthermore, one should develop tactics to shift the rules of the game in one's favor and leverage them through strategic signaling and simultaneous and sequential strategic thrusts. All of these elements can be found in SAP Co-CEO Hasso Plattner's keynote speech at the high profile Enterprise 98 confab for top ERP companies.

According to witnesses, Plattner outlined an aggressive 7-S strategy: "We dominate the most important category of enterprise software. We intend to control all the enterprise software our customers use. We will select a handful of partners to work with. If our partners cross us, we will crush them into dust."[37] (See Table xii)

---

[36] D'Aveni (1994: 244).

[37] Fortune, p. 102.

Dynamic 7-S Analysis—to be written

S-1   Stakeholder satisfaction   SAP saw the need for companies with global operations to go from procurement to customer in the shortest possible time through the fewest organizational points.

(see file softD'Aveni.doc for complete analysis)

Case Study 2—MICRO FOCUS

Throughout the 1980s, Micro Focus had few challengers in the specialist field of software development tools using the COBOL development language, allowing it to become the technological darling of the UK stock market in the 1980s. But with growing PC and network platforms emerging, there were nagging questions beginning in the late 1980s as to whether this competitive advantage would enable it to sustain both its growth and profitability.   Furthermore, in spite of continual revision, it remained a primitive and awkward language, seemingly ripe for replacement by more modern languages. But resistance to change in the computer industry and the huge investment computer users had made in Cobol and software specialists skilled in Cobol meant that large corporations were willing to work with their existing environment. As late as 1991, there were over 1 million programmers worldwide, all of whom could benefit from Micro Focus's special tools to make writing Cobol programs easier. Micro Focus has just begun to penetrate this vast market in the late 1980s. The fact that it continually sells more of its products (53 per cent) in the US than in either Europe (36 per cent) or Japan (11 per cent) meant that it had to behave like a global company. Accordingly, it capitalizes research and development expenditure, a practice generally shunned by European software firms but common among US companies, and it does not pay dividends. By 1991, close to 25 per cent of its stock is held by US investors in the form of ADRs and by two (?) years later, it was quoted on the US Nasdaq electronic stock exchange.

Thus, in order to compensate for the lack of a European Nasdaq equivalent and understanding of the software market at home, Micro Focus used a sustained high-profile presence in the US market to get informed US investors on board to fund its vision of growth. But what gives US investors such confidence in a small UK software house whose stock-in-trade is unrivalled expertise in a 30-year-old computer language which by most measures should be dead and buried by now? The network externalities factors discussed earlier are particularly relevant to Micro Focus. With the largest installed base of Cobol clients in the world, it made sense to focus on the U.S. market. In addition, since the dominant hardware producers were major U.S. companies, it was a stable investment to commit to the creation of a large Micro Focus's US subsidiary to ensure both user and producer interaction to meet market needs (i.e. the first D'Aveni S). By the early 1990s, Micro Focus had some 440 staff in Palo Alto, Philadelphia, Chicago and Los Angeles and licenses its Cobol products to every sizeable computer manufacturer in the world. Envisioning the virtual ownership of the microcomputer Cobol market, building capabilities for both speed, surprise, market positioning and simultaneous market thrusts enables Micro Focus to stay one step ahead of the game. In 1988, Micro Focus launched a product called Micro Focus Cobol/2 Workbench in 1988 that enables users to work on their mainframe program with micro computers, the new global networking standards. This innovation saves money and enhances productivity, because it is much easier to work with a desktop computer than an unwieldy mainframe. Indeed the success of the group's products has given a whole new lease of life to Cobol, a computer language invented in the 1950s. The product's appeal is irresistible even in a recessionary climate, and sales to corporations all around the world have grown explosively. About two- thirds of group turnover is now generated by Workbench, and profits have grown from pounds 1.6m in 1988 to an expected pounds 12m- 14m this year.

Yet this Newbury, Berkshire-based company has a demonstrated track record of successful adaptation. For example, one it's most important achievements to date was the 1990 announcement of an

extensive strategic marketing and development agreement with IBM. By becoming an IBM business partner, it not only gets access to working with the world's largest computer manufacturer to create better methods of developing business software, but it also gets access to tap into the top tier, worldwide IBM distribution and marketing network for its products.

Since Micro Focus' version of Cobol, the world's most-used business computer language, is the official IBM language for use on computer workstations, this ensured a steady revenue stream from which to leverage into other markets. Even Microsoft was still using Micro Focus' version of Cobol until it fully committed to Windows NT in the early 1990s.

Through leveraging its competitive advantages in Cobol-based products to become the world leader in key market niches, it was able to remain innovative in finding new ways to satisfy customers with old systems by allowing them to take advantage of recent technological developments. Through an aggressive global strategy centered on satisfying the large installed base of Cobol users in the U.S. market, Micro Focus is not necessarily well-positioned to do well in Asia. But that it is an innovative player capable of designing products to link old and new systems ensures that it will be able to expand beyond Japan. In fact, its workbench products have proven to be equally satisfying for microcomputer link ups to Japanese mainframe and minicomputer systems as well. As a result, the company has managed to stay competitive, serving the U.S., European and then Japanese markets respectively as entrees into developing Asian countries.

But in the short-term, it is focusing on consolidating its U.S. market share, the core of its operations. In 1998, in an effort to build on its previous success as a Cobol tools supplier, Micro Focus has bought Intersolv to create a company capable of providing a complete tool set for IT departments.[38]

---

[38] According to CEO Martin Waters. Financial Times (dates?).

Both companies have profited from the high demand for tools to fix the Y2K problem. The combined venture will be aiming to compete with leading tools vendors, such as IBM and Sterling Software, which recently bought out UK-based Synon. It is also intended to create the basis for serving the booming internet market.

Intersolv specializes in decentralized computer systems and developing software for the expanding business Internet market. In the first three months of its financial year to 31 July, Intersolv's profits tripled over the previous year to $ 2.1 million (GBP 1.3 million). For Micro Focus, which is listed on both the Stock Exchange and on the US technology -dominated exchange NASDAQ, this is the logical next step to become one of the largest concerns exclusively focusing on developing software tools for large corporations which desire a single supplier providing both tools and services for their computer.

In addition to assembling a computer package with special manufacturing tools, large corporations also need development tools for creating software applications, as well as the ability to provide services for putting a final package together and testing it. Intersolv now gives them the capability to integrate the latter into their now comprehensive operations.

Since the company had been doing business together since 1988, the merger was a natural fit. According to Micro Focus chief executive Martin Waters, who will head the combined company, "what drove this [deal] was being responsive to our customers. Neither company could offer a total solution before."[39] Since IT applications are often written in various languages and run on a variety of computer platforms around the world, Mr. Waters believes that this alliance will now enable the two companies to generate more market share through the capacity to eliminate language barriers between computer systems.

---

[39] Ibid., p.

The stunning success of Micro Focus provides a useful model for other European software companies. Typical of their European counterparts, Micro Focus was founded in 1976 to design software for proprietary hardware makers such as Siemens, Bull, and Alcatel using COBOL. As their growth slowed, so did Micro Focus. But because they were committed to a vision of developing tools for open systems in their research and development, they were well-positioned to take advantage of the short-term demands generated by the millennium bug and the need to equip computers to handle transactions in Euros when the single European currency is launched. In the words of one analyst, "… reservations about Micro Focus were based on the fact that the company was too reliant on Cobol as the main computer language for the main-frame environment; its growth was confined to the Y2K problem; and the level of services was not sufficient."[40]

Buying Intersolv addresses all three of these issues. By broadening the range of products and services, the deal gives Micro Focus a growth market beyond 2000. But more importantly, Intersolv, which operates in different computer languages, will take Micro Focus into a service area from which it has been absent. Although service and maintenance will now provide 45 per cent of the combined group's revenues, which on a pro-forma basis would have totaled an estimated $ 380m for the past year, the capacity to sell a combined software and services package to the booming Asian markets is now a reality. Currently two-thirds of total revenue comes from North America, but a strategy based on building long-term alliance partners—following the SAP lead—appears to be in the works.

Although Intersolv did not come cheap—Micro Focus paid almost three times its sales for the company (52 per cent to the expected combined revenues)—investors signaled their approval in Intersolv trading on the NASDAQ as a cheap way into Micro Focus. In fact, Mr. Waters said the deal would lift

---

[40] Ovum…98, p….

earnings per share and increase revenues in the first full year. As a result, in building capabilities for speed and surprise, Micro Focus has already announced plans for further acquisitions of similar technologies. By buying the privately held XDB Systems of the US, a provider of development, maintenance and connectivity tools for the DB2 database standard, Micro Focus makes a credible commitment to aggressively pursue several markets at the same time. Holders of XDB shares will receive Micro Focus shares based on a formula that values XDB at $ 13.4m (£8.1m) with a special allocation of $ 3.1m for certain assets of XDB. Because of XDB's dismal performance in 1998, which lost $ 3.2m on sales of $ 10.1m and had assets of $ 13.1m, Micro Focus attained valuable complementary assets. Furthermore, Micro Focus acquired Proximity Software of the US $4.1m (Pounds 2.6m), to be satisfied by the issue of 120,000 new shares in late January of this year. The acquisition was described as a pooling of interest since Proximity technology already uses Micro Focus's products.

Case Study 3—SYNON

In many respects, SYNON of North London is a classic U.S. entrepreneurial story. Early on, this small company founded in 1983 by engineers who saw a need for making application programs easier to develop. Synon was convinced that the U.S.-led PC revolution and cost-conscious European spending habits translated into a global market for applying engineering techniques to develop software making tools for various platforms. As a result, Synon became one of the pioneers in the design of computer-aided design engineering (CASE) tools. Although initially targeting tools for proprietary platforms for European markets, plans to develop a global product were assisted by both UK science and technology policies as well as European initiatives. Through the provision of favorable tax policies from the former and development funds from the latter, this small company became the software darling of the country, winning the prestigious Queen's Award in 1991. Later in that same year, their new CASE tool, Synon II, designed

specifically for the mid-range IBM AS/400, earned the firm recognition from IBM as "business partners"—the first UK company to do so. Buying an initial stake of 10% in the company, IBM gradually increased its shares as revenue streams drastically increased throughout the next five years.

Synon's global strategy was shaped not only by direct association with IBM, but also by the hiring in 1993 of a high-level executive from IBM. Following the U.S. model, efforts were made to expand capabilities to deliver solutions quickly and effectively. In line with the 7-S's, a CASE-centric vision of the world was envisioned and an aggressive pursuit of market share required a simultaneous strategy of acquiring smaller software firms to consolidate their temporary market niche lead, setting up strategic alliance with multiple partners in various countries, and building the capacity to serve multiple platforms. Accordingly, three small U.S. companies were bought out between 1991-95 and alliances with Microsoft and CCCL were created to launch new case tools for Windows NT where Malaysia was one of the first intended markets.[41] By the end of 1996, over 500 new clients in Malaysia and the U.S. were using Synon CASE tools. However, Synon's successful run finally ended when Sterling Software Inc. agreed to acquire the privately held Synon Inc. for $79 million in stock. Sterling Software, based in Dallas, provides software and services for applications management, systems management and Federal systems. It had revenue of $489 million in the year that ended on September 30. Synon, which had already "turned American" for the majority of its operations, was based in Larkspur, California, providing AS/400 application development products. It had revenue of $79 million in 1997. Shares of Sterling Software leaped up $1.3125 yesterday at $27.875 on the New York Stock Exchange.

(BAAN and Intentia case studies not included in current presentation.)

---

[41] Financial Times, 3/?/96, p.?.

Implications

Our initial discussion began with a story a dying, customized, segmented, and craft-like European software sector. But as discussed in Chapter 1, firms do not exist in a vacuum and are dependent on their path dependent institutional history. The successful case studies above illustrate how a firm can leverage a specific market niche to simultaneously and sequentially attack multiple platform markets across the globe. True to D'Aveni's prescriptions, they built organizations designed for speed and surprise, aggressively pursuing international strategic alliances and various types of interfirm arrangements to minimize time to market. In this marketplace characterized by self-reinforcing network externalities, market share and an established base of installed users is crucial to surviving in the hypercompetitive software industry.

As discussed in earlier sections and other papers, the primary barriers to entry in the systems, services and packages software markets are: (1) the lack of in-depth knowledge of users' needs which are normally developing through long-term relationships with customers; (2) extensive marketing and distribution networks; (3) long-term access to capital; and (4) reputation, which is particularly crucial to potential clients. Recent surveys conducted over the past decade have indicated the importance of reputation as the consistently most critical factor.[42] Many of these obstacles were overcome through international strategic alliances and direct foreign investment. But given the increasingly massive costs of research and development in an industry of rapid technological change and shortening product cycles, pan-European initiatives help firms amortize the transaction costs, avoid wasted duplications of efforts through coordinated standards bodies, create a cooperative environment necessary to mitigate high risks and uncertainty, and

---

[42] Higgs, 1997.

mutually envision a pan-European information superhighway.   Concerned with these common internal integration issues, it is no wonder that Asia beckons Europe but few players are answering.

The global niche players discussed in the cases have found that the market moves rapidly and survival means attacking multiple fronts simultaneously. All of the firms in the case studies linked their global strategic vision with the skillful and creative leveraging of regional advantages; while building upon their path-dependent organizational resource capabilities to leverage specific market niches into an integrated strategy. Given the rapidly increasing size of Asian markets and intimate connection with telecommunications, entrée into Asia will enable new global players to capture the potentially self-sustaining benefits associated with the network externality dynamics of the industry. To do otherwise and let the U.S. continue to dominate these markets could result in magnifying pan-European initiative moral hazard problems and result in a further decline in competitiveness across the board.   However, the success of SAP, Micro Focus, BAAN, Synon and Intentia provide useful case studies that offer much hope for other European software vendors.