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# The Turning Point For Japanese Software Companies: Can They Compete In The Prepackaged Software Market?

## A BUSINESS PERSPECTIVE

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Editor's Note: From time to time, the Berkeley Technology Law Journal receives submissions which, though outside the scope of articles typically published by the Journal, offer unique insights into the interaction of technology and law. The author of the following piece combines the opinions of Japanese computer industry insiders with her own observations of Japanese culture and insights into Japanese business practices to offer a business-based rationale for why the Japanese prepackaged software industry lacks the strength and vigor of its United States counterpart.

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## I. Introduction

Despite the success of Japanese hardware companies, Japanese software companies, with the exception of game software companies[1] such as Sega and Nintendo, have had little impact on the international and domestic markets. In contrast, the pioneering U.S. software industry has been the world leader, in terms of both technological innovation and business success. To illustrate, in 1992, prepackaged

software sales accounted for approximately 15% of software industry revenues in Japan; the same segment in the United States accounted for approximately 70% of industry revenues.[2] Historically, customized software has dominated the software market in Japan, while prepackaged software has struggled in this market.[3] Meanwhile, in the U.S., prepackaged software has experienced the glory of both consumer and business fanaticism, while customized software, though still important, has generally been viewed by companies as a last resort.

In the sections to follow, I will discuss some of the reasons why the Japanese software industry has developed so differently than its U. S. counterpart. There are many factors contributing to the dramatic difference. In his new book, Professor Robert Merges attributes the discrepancy to the relationship between comparatively weak intellectual property protection for software in Japan, and the industry structure there.[4] In Japan, a system of "cross-shareholdings," known as *keiretsu*, is prevalent; this includes "interlocking" banks and industrial companies. In contrast to Merges, Thomas Cottrell recently contended that the discrepancy is mainly a result of the fragmented hardware market in Japan, and the failure to standardize.[5]

In my view, some assumptions underlying Merges' and Cottrell's conclusions are at least partially incorrect. It is my contention that particular business, technology and cultural factors have combined to contribute to the relatively poor performance of the Japanese software industry. For example, unlike U.S. companies, Japanese software companies cannot rely solely upon intellectual property rights when seeking financing, because Japanese banks tend to emphasize real property holdings, and the venture capital financing industry is poorly developed in Japan. In addition, certain aspects of the Japanese culture have forced software companies to provide detailed *customized* solutions, rather than standardized ones, to business problems, and to avoid software bugs at all costs, even unreasonable costs. Furthermore, network externalities[6] created by *de facto* industry standards have given the U.S. software industry added advantage. Examples include the IBM PC, the MS-DOS operating system, and the Windows operating system.

In recent years, the Japanese demand for prepackaged software has been increasing. Sales revenues have been steadily growing in that market, while the still-dominant customized software segment has begun to shrink due to the recession.[7] Japan is also experiencing an increase in the demand for prepackaged software due to the popularity of personal computers. This trend will likely continue as the hardware market shifts to smaller machines and open systems.[8]

It is a major concern of the Japanese business community and of Japanese policy-makers that it may be the U.S. software companies, not Japanese companies, that will benefit from this growth in Japanese demand for prepackaged software. I will address these concerns in two parts. First, part II (below) analyzes the business reasons for the slow development of the Japanese prepackaged software market. Part III then explores the difficulties that Japanese software companies face in attempting to expand their domestic prepackaged software business, in the face of current U.S. domination of the market. I also discuss the recent attempts by the Japanese government and software companies to change traditional procedures in order to develop the prepackaged market, and conclude that this willingness to take a fresh look at deeply ingrained customs may help Japanese software companies become more successful in the prepackaged software market.

## II. WHY THE JAPANESE PREPACKAGED SOFTWARE SEGMENT DEVELOPED SO SLOWLY

Personal computers were already emerging in the U.S. in the late 1970's. Into the 1980's, operating systems (OSs) which enabled programs developed on one model of machine to run on another were installed on the 8-bit microcomputers available at that time. Various prepackaged programs were then developed for use with those operating systems.[9] With the use of operating systems came flexibility-U.S. consumers were able to use a variety of different application programs on the same hardware. Japanese systems lagged behind in the initial use of operating systems.[10] This contributed to a technical "head-start" for the U.S. prepackaged software industry, but this head-start alone cannot explain why, in the 1990's, the Japanese software industry continues to produce mostly customized, rather than prepackaged software.

In this part, five business factors that likely contributed to the slow development of the Japanese prepackaged software sector are discussed: (1) user preference for custom software; (2) software companies' preference for custom software; (3) heavy use of mainframes with split platforms; (4) the small and unique PC market in Japan; and (5) a high rate of illegal copying of software.

### A. Users Have Preferred Custom Software

One reason the Japanese market may be dominated by custom software is that Japanese users tend to prefer such systems. This preference may be traced to both operational and cultural elements of Japanese business. There are several possible reasons for Japanese users' preference of custom software: (1) secretiveness of custom software; (2) the desire to adhere to internal business procedures; and (3) financial incentives. Each of these reasons is discussed below.

### *1. SECRETIVENESS*

In the 1970's when "computers" meant "mainframes," large corporations were the major users of computers.[11] The corporations who pioneered the use of computers operated in-house information system departments and hired full-time software engineers. They did not want to reveal their business schemes to outsiders and tried to develop business software within their companies.[12] If the corporations did not have sufficient personnel to write the software, they sought help from their hardware providers or from other software companies within the same *keiretsu* group. Within this business environment, once the relationship between customers and the software developers had been established, it tended to be long-lasting. As a result, rather than seek out prepackaged software systems, the companies chose to depend on their in-house and closely related software developers to create custom software solutions. This served to preserve the secrecy of the corporation's operations while fostering its valuable business relationships.

### *2. THE Desire to Adhere to Internal Business Procedures*

Japanese companies' intense attention to detail may have led them to prefer custom software when automating their business operations. Mr. Eiji Kuge, an executive of NEC Technologies, Inc., mentioned that Japanese companies, more often than companies in the U.S., order custom-made software to precisely serve their own specific business practices.[13] In contrast, American companies may have viewed the implementation of prepackaged software as a way to improve the efficiency of or standardize their business procedures. In the 1980s, while the Japanese continued to depend on custom-built software, American companies were using and improving prepackaged software.[14]

Although prepackaged software is used with personal computers in the Japanese workplace, its use has been primarily confined to support of, rather than primary to, the company's business Examples include use in word processing and spreadsheets.[15] Custom-made software is more commonly used in tasks directly related to the company's core business.

These contrasts in how prepackaged software is used tend to reflect, to some extent, cultural differences between Japanese and American people. Japanese customers are demanding regarding details, sometimes to the extent of redundancy. Japanese users will be concerned about even minor bugs that may rarely interfere with their businesses. Since even best-selling prepackaged software has user satisfaction ratings of only 70-80%, prepackaged software does not meet the high standards of detail desired by Japanese users. American users, on the other hand, have demonstrated a willingness to accept occasional glitches as a trade-off for more economically priced software.

This cultural contrast may contradict the image that Japanese companies excel at coordination and cooperation. Actually, Japanese companies compete harshly with each other. A recent paper by Yasunori Baba, Shinji Takai, and Yuji Mizuta articulates the mentality of Japanese companies: the authors stated that Japanese users emphasize shop-floor knowledge when automating their operations, and do not hesitate to alter the software programs to fit existing procedures.[16] Because even Japanese companies that belong to the same industrial sector usually have different management policies and organizations, it makes more sense for the processes and their supporting software to be customized than to be purchased as prepackaged programs.

The Chief Business Consultant of Sanwa Research Institute, Mr. Shimamoto, pointed out that Japanese companies regard their business procedures as the result of accumulated improvements and believe their procedures operate better than others.[17] Thus, the companies tend to distrust prepackaged software which does not address all of the details of their own business practices.

### *3. FINANCIAL INCENTIVEs*

Financial incentives for purchasing custom software rather than prepackaged software have also played a role in the software-purchasing decisions of Japanese companies. In the early days, users were large, wealthy companies. During periods of economic growth in Japan, user companies had abundant funds for computerization. The latter half of the 1980's were especially prosperous days under the Japanese "bubble economy," an era of "cheap money" resulting from trade-surplus cash, very low interest rates, and a deregulation of banking. With a decreased incentive to keep costs down, it was easier for companies to order custom software than to research and compare the prepackaged software available.

For example, an executive of Software Engineering company recalls that, until 1990, many companies were willing to order custom software at costs in the range of $330,000. Software companies found that they could improve their revenues in the custom development business by saying that *prepackaged software was not any good* and thus steer customers away from prepackaged products. When the recession struck, the software companies were forced to shift more efforts to the prepackaged software business to meet the demand for less expensive options. By 1993, the price of popular prepackaged personnel management software was only $30,000.[18]

The Japanese companies have gradually learned to appreciate the benefits, other than a relatively low price, offered by prepackaged software. Prepackaged software is not only inexpensive because it targets multiple users, but it is also cost-effective because of the efficiency it offers. If prepackaged software is efficient, it ought to be popular regardless of an economic upturn or downturn. This has been borne out under the current Japanese recession during which the sales for prepackaged software are increasing while the dominant custom software segment is stagnant. While historically, the dominance of the custom software industry may have been promoted by the wealth of the Japanese business community, the recession has provided incentives to search out cost-effective prepackaged solutions.

### B. Software Companies Preferred Sizable and Riskless Custom Business

Japanese software companies welcomed custom business because the marginal revenue received for each dollar invested in development was sizable, and the custom business, unlike the prepackaged software business, involved limited risk to investment. Custom-made systems have historically been relatively large and complex, and the revenues per project were often huge. The attractiveness of the large revenues from custom software was increased by the predictable and manageable nature of the revenue stream.

Custom development is generally compensated by either an hourly-rate system, or by a lump sum payment upon attainment of certain milestones. Under either payment scheme, costs and revenues from a given project are easily predicted. Customers are guaranteed receipt of the developed software and software companies bear only operation costs until the last payment by a customer. In contrast, in the prepackaged software business, not only must companies bear development costs, they must also deal with the uncertainty of whether they can obtain adequate revenues through sales and licensing upon completion. Software developers who became accustomed to the customized model considered the prepackaged software business risky in comparison.

### C. The Fragmented Japanese Mainframe Market and Customization of Prepackaged Software

The computer mainframe market in Japan has not been dominated by a single supplier or one operating system. This "split platform" market in Japan was a disincentive for software companies to develop prepackaged software for a single platform.[19] In the U.S., IBM has been dominant in the mainframe market and other hardware vendors manufacture machines with IBM operating systems. This market dominance provided a sufficient incentive for software houses to develop prepackaged software for any IBM compatible system. In the Japanese mainframe market, a single dominant standard has not emerged. A half dozen makers of mainframes, including IBM, have fiercely competed in Japan.[20] In the split platforms market, it was not economical for Japanese software companies to develop prepackaged software for a single make of machine.

In the late 1970's, Japanese hardware manufacturers started to offer minicomputers called "*ofucon*s," an abbreviation of an office computer.[21] With these prevalent small business computers, it was standard business practice to make extensive customizations to standard prepackaged software provided by the machine manufacturers. Hardware dealers offered *ofucon*s combined with software and a high level of customer support. The shipment of *ofucon*s expanded especially from 1979 until 1989, and then leveled off. However, *ofucon*s still occupy a significant portion of the mainframe market.

Though *ofucon* manufacturers prepared standard prepackaged software for *ofucon*s, hardware dealers and software companies heavily customized them upon users' requests.[22] Many software companies were also hardware dealers. Thus, customization was economical for customers, and satisfied their insistence on using their own business procedures. Furthermore, customizing standard prepackaged software resulted in a software price of approximately half of the hardware price; in contrast, if completely customized from the beginning, the software would have been four or five times more expensive than the hardware.

The heavy customization in Japan deprived companies of at least one substantial advantage of prepackaged software. Since some customer programming was embodied in each site, maintenance and upgrades of those programs became difficult unless customers bore the high expenses involved with such maintenance.[23] Even when customers were willing to cover the expenses, the software engineers who customized the programs had to devote their time to upgrading them instead of developing new products.

During the 1980's, the U.S. manufacturers of machines similar to *ofucon*s, such as DEC, Unisys, HP, and NCR, withdrew from software development. The new minicomputer vendors, such as Sun, Tandem and Apple, focused on hardware from the outset.[24] Independent software vendors provided packaged software applications. Although these packaged programs were customized by the internal information systems departments, customization was recognized as a necessary evil.[25] Intermediaries, such as Electronic Data Systems and four of the "big eight" accounting firms stepped in to coordinate systems integration and software customization for large

companies.[26] In doing so, the intermediaries were able to exert pressure on the software development companies to incorporate the most commonly requested customizations into the standard product. Therefore, while U.S. companies did in fact customize as needed, the goal often remained to feed the customizations back into the standard product in order to enable increased dependence on prepackaged solutions in the future. To the extent that this "feedback" did not occur in Japan, perhaps due to the pervasive secretiveness discussed earlier, the customization of prepackaged software did not aid the development of the prepackaged segment in Japan.

### D. Small and Unique PC Market In Japan

U.S. software companies have succeeded not only in mainframe platforms but also in PC platforms, due in part to network externalities created through standardization.[27] Meanwhile, the prepackaged software segment in Japan occupies a far smaller market share than its U.S. counterpart. The question thus arises: what accounts for the difference between the Japanese and the U.S. prepackaged PC software industries? The difference can largely be attributed to differing market sizes.

#### *1. A Large Market is Necessary for a Profitable Prepackaged Software Industry and Provides Greater Incentives than a Small Market*

The existence of a sizable market is crucial for a high technology industry because a high technology industry requires a high ratio of R&D expenses to total expenses.[28] R&D expenses are fixed charges; therefore, the more units of developed products that are sold, the lower the R&D costs per unit. Thus, a large market allows a software company to spend more on R&D because these costs can be spread over a larger number of units.

In addition, a high technology company must earn large profits from a new product quickly, before competitors introduce similar products, so the company can both recover its investment at an early stage and invest in new R&D in a timely manner.[29] Early investment is also important for a company to enable it to generate revenue to reinvest in upgrade developments. In the prepackaged software business, a key to success is upgrading programs to better meet user needs, fix bugs, or adapt to a new platform.

In a huge market, a software company can achieve necessary sales revenues more easily in a shorter period of time than in a small market, even if its individual market share is small. Upon achieving the necessary revenues, a company can reinvest in new R&D. Thus, in a sizable PC market with a common platform, software companies can obtain dynamic economies of scale in R&D far more easily and quickly than in a small PC market.

Furthermore, in a large market, software companies can enjoy more "J-curve" profits.[30] Once programs are developed, production costs of the programs remain minimal regardless of the production volume, unlike in other traditional or high technology manufacturing businesses. Marketing costs and overhead become the main costs, and a huge additional production facility is rendered unnecessary. Therefore, the profit rate of a prepackaged software business increases at a steeper rate as sales volumes increase, like the letter "J." Increasing sales volumes is easier in a larger market, and so a J-curve profits profile makes a larger market more attractive to software companies.

A large market also induces existing custom software companies to shift to the development of prepackaged software. Custom software development is a low-risk business, requiring little up-front investment risk. In contrast, the development of prepackaged software requires the software company to invest in R&D before any sales are guaranteed. Also, a prepackaged software business requires continuing marketing costs and other efforts to bolster sales to the general public. If a potential market for prepackaged software is larger than for a custom business, taking greater investment risks may be worthwhile.

#### *2. The Japanese PC Market Is Small*

PCs occupied a much smaller portion of the Japanese hardware market than they did in the U.S. hardware market. Also, the absolute size of the Japanese PC market is approximately one-fourth of that in the U.S. (and about one-tenth of the IBM PC worldwide market) even though the Japanese population is half that of the U.S.[31] Prepackaged software is used more often for PCs than for larger computers because ordering expensive custom software for PCs is not cost effective.[32] Accordingly, a small PC market contributed to a small market for prepackaged software.

Four factors accounted for the small PC market in Japan. First, as previously discussed, mainframes, including *ofucon*s, were used heavily in Japan. Second, the NEC PC-98, which is not IBM compatible, garnered the majority of the Japanese PC market and kept Japanese PC prices high. The NEC PC-98's primary selling point was that it was a machine with excellent Japanese language capabilities and a large number of application programs. The popularity of the NEC PC-98 kept the Japanese PC market free from the

price wars abroad until 1992, at which time Compaq entered the Japanese market with low prices, thus slowing the expansion of PCs in Japan.[33] Therefore, some potential consumers balked at the idea of buying PCs.

The third factor was the significant existence and use of "*wahpro*s," specialized word processing machines for the Japanese language.[34] *Wahpro*s are convenient for new users as well as established users, and are easily supportable. Because *wahpro* hardware and software are integrated, users do not have to be concerned with software installation. Moreover, when users have trouble with their *wahpro*s, they simply call the *wahpro* manufacturers. The *wahpro* manufacturers provide good customer support, quite frequently sending engineers to user offices. Also, a *wahpro* was a more economical choice for word processing than a PC because many portable *wahpro*s were equipped with internal printers.

The fourth factor contributing to the small PC market in Japan was the failure of the NEC PC-98 to fully exploit the phenomenon of network externalities. In particular, NEC did not provide an open hardware platform, limiting the availability of compatible hardware and peripherals. The NEC PC-98 platform standardized the majority of the Japanese PC market. Due to the popularity of the NEC PC-98 platform, a sizable number of application programs were written for the platform, and it received priority in software development efforts. NEC PC-98 users thus enjoyed a variety of advanced application programs.

IBM adopted Microsoft DOS (MS-DOS) for its PCs and required Microsoft to make the interface specifications to MS-DOS readily available to the developers of application programs.[35] The large library of prepackaged application programs for the IBM PC, especially Lotus 1-2-3, made the IBM PC an attractive and popular platform. This was the case with the NEC PC-98 as well.[36]

IBM, however, designed the PC around an open hardware bus and published the specifications to encourage third parties to add value to it, such as through compatible machines and add-on products.[37] NEC did not adopt an open architecture policy, remaining hostile to its clone manufacturers until 1994. NEC also did not try to bridge the incompatibility gap with the IBM PC in Japan, although it sold IBM clones outside Japan. It was not until 1993 that the NEC PC-98 platform became virtually compatible with the IBM PC platform, with the release of the Japanese version of Windows.[38] Both companies are large hardware manufacturers and enjoy considerable name recognition in each country. But NEC's policies narrowed the NEC PC-98 market and further prevented it from gaining the widespread acceptance of the IBM PC.

### *3. Japanese Software Companies Were Isolated from THE Worldwide PC Market*

The Japanese PC market was technologically isolated from the worldwide PC market, which in turn limited Japanese software companies to the small Japanese PC market. This technological isolation was due in large part to the success of the NEC PC-98 in Japan.

The NEC PC-98 occupied a large portion of the Japanese PC market until very recently.[39] A sizable number of Japanese software companies wrote prepackaged software for the NEC PC-98, creating approximately 15,000 application programs for the NEC PC-98.[40] Meanwhile, the IBM PC did not become an industry standard in Japan. Though the dominant platform in Japan, the NEC PC-98 offered much smaller incentives for Japanese software developers than the IBM PC did for American software companies, because NEC's overall market was only one-fourteenth of the worldwide IBM PC market.

When introduced in 1982, the NEC PC-98 was a 16-bit BASIC machine that inherited software assets from NEC's popular 8-bit BASIC machines. Then, for marketing purposes, NEC started to bundle MS-DOS with application programs for the NEC PC-98.[41] Thus, users could start application programs with one floppy disk, without the extra labor of starting MS-DOS from another system startup disk.

However, the NEC PC-98 was not IBM compatible. Some devices and functions to deal with the Japanese language efficiently were built into the hardware of the NEC PC-98, and NEC modified its MS-DOS operating system to fit the NEC PC-98's hardware architecture.[42] The incompatibility continued even after IBM introduced DOS/V, the Japanese version of PC-DOS.[43] DOS/V added a Japanese language function to American hardware, but in software only, not in hardware.

The NEC PC-98 became popular because of its successful word processing program, *Ichitaro*. Ichitaro's module for *kana-kanji* conversion, which is necessary to write Japanese sentences in the combination of *kanji* and *kana*, could be used by other MS-DOS applications for the NEC PC-98.[44] Users liked this convenient feature, adding to the popularity of Ichitaro and the NEC PC-98.

With Itchitaro's great success, other software houses focused development on applications developed for the NEC PC-98. Meanwhile, IBM was the standard for the rest of the world but failing to make its PC a *de facto* standard in Japan due to its successive mistakes in

marketing and handling the Japanese language.[45]

*4. Without a Large Market, Japanese Software Companies Had Few Incentives to Develop Prepackaged Software*

A large PC market based on a common platform motivates software companies to develop prepackaged software, because the potentially sizable business provided the possibility for an excellent profit after recovery of initial R&D expenditures. Once software companies decided to develop prepackaged software, the NEC PC-98 offered them a common platform and an exceptionally large share of the Japanese PC market, compared to the other hardware types. However, the NEC PC-98's overall market size was not large enough to induce software companies to make the switch from the lucrative custom software business in the 1980s to the prepackaged software business.

The U.S. software companies could target the huge IBM PC market, including its clones, both inside and outside of the U.S. The U.S. PC market was approximately 4 times as large as that in Japan.[46] This sizable IBM PC market enabled U.S. software companies to pursue economies of scale in R&D and J-curve profits, while Japanese software companies were largely confined to the small NEC PC-98 market in Japan.

In fact, the 10 best-selling prepackaged software programs in the world in 1993 were all of U.S. origin.[47] This demonstrated that the U. S. prepackaged software companies could succeed in the world market, thanks to the vast IBM PC market. On the other hand, Japanese prepackaged businesses were locked into the far smaller NEC PC-98 market in Japan.

In order to achieve economies of scale in R&D (increased sales leading to reduced R&D costs per unit) and thus be able to make timely reinvestments in an R&D-driven high-technology industry, the existence of a sizable market is crucial.[48] J-curve profits (profit rate increasing at a steeper rate as sales volumes increase) due to the minimal production costs of computer programs further render a sizable market more attractive to software companies. U.S. software companies have achieved prosperity not only in the mainframe platform business, but also for PC platforms, as a result of network externalities arising from standardization. However, in Japan, as long as the large custom software market[49] offered lucrative and low-risk projects until the early 1990s, the NEC PC-98 market was still too small to induce custom software developers to make the shift to the highly competitive prepackaged software business.

### E. High Rate of Illegal Copying in Japan

In addition to the factors discussed above, the high rate of illegal copying has helped erode the potential market for prepackaged software in Japan. A survey by the Software Publishers Association estimated that the piracy rate for PC software in Japan in 1994 was 56%, resulting in a loss of approximately $1.3 billion.[50] In comparison, the piracy rate in the U. S. was 25 % and the loss was 1 billion dollars.[51] According to a JPSA survey of its members in May 1993, the average illegal copying rate per product was estimated to be three to four times the number of legally shipped products.[52] Word processing software suffered the most (five to six times), followed by spreadsheet, education, and game software (three to four times).[53] While the entire prepackaged software market for PCs in Japan was calculated to be between 250 billion and 280 billion yen at that time, JPSA estimated the losses due to pirating at nearly one trillion yen![54]

Although software protection methods existed to prevent illegal copying of software, users resisted these methods because of difficulty in installing and using them. Thus, the high rate of illegal copying continued, and has discouraged Japanese companies from entering the business of prepackaged software due to risk of losses from this behavior.

## III. DIFFICULTIES FACED BY JAPANESE SOFTWARE COMPANIES IN EXPANDING THEIR PREPACKAGED SOFTWARE BUSINESS

Estimates for the size of the prepackaged software market in Japan by the beginning of the 21st century vary from 1,500 to 3,000 billion yen, significantly up from 330 billion yen in 1993.[55] Thus, there is little doubt that the market will expand significantly during the late 1990s. What is uncertain, however, is whether Japanese software companies can ever successfully compete against foreign companies in Japan's prepackaged software market.

This part describes the current market dominance of American companies and explains the challenges that potential Japanese entrants to the prepackaged market must overcome if they are to wrest market share away from their American competitors. Existing Japanese software companies will face technological, economic and personnel hurdles in their attempts to convert their operations from customized to prepackaged software. While newly-formed prepackaged software companies should have advantages over their custom software counterparts in the technology and personnel areas, they must surmount the formidable hurdle of obtaining financing for their

operations. If these barriers to market entry by Japanese concerns can be overcome, Japanese companies and the Japanese economy stand to profit handsomely from the explosion in prepackaged software.

### A. American-Made Software Presently Has a Strong Hold on the Prepackaged Software Market in Japan

Because language difficulties associated with importing foreign software into Japan were overcome in 1990 by DOS/V, made-in-Japan software and foreign-origin software compete on equal footing in the Japanese market. Currently, prepackaged PC software of foreign origin is selling much better than prepackaged software products made by Japanese firms.

Products made by American companies dominate the Japanese market for prepackaged software. In 1993, two of the top four companies in sales revenues were subsidiaries of American companies: Microsoft came in first with sales revenues of 22.6 billion yen; ASCII, Justsystem, and Lotus followed with respective sales of 13.4 billion yen, 13.5 billion yen, and 11.4 billion yen.[56] Most of the top 20 best-selling business software programs were developed by American companies, and American programs make up a majority of the UNIX-based relational database programs sold in Japan. While Japan exported only 13.5 billion yen worth of software (excluding game programs) in 1994, it imported 259.5 billion yen worth of such software - 19 times as much as the exports.[57] For bilateral trade with the United States in this sector, Japan has seen a trade gap of 25 times exports.[58]

The foregoing data demonstrate Japan's weak competitiveness in the prepackaged software market, and indicate that American software may be superior to Japanese software. Several factors account for this apparent superiority. First, American companies pioneered the software business and have tremendous experience creating and marketing prepackaged software. Second, software which is exported to Japan by U.S. companies has already passed a major test-it has survived in the highly competitive American market and gained popularity among demanding American computer users. These programs tend to be relatively sophisticated and easy to use. While Japanese custom software companies show great interest in entering the prepackaged software business, the products currently marketed by these companies are actually "repackaged software." Repackaged software refers to software that was originally developed for a specific customer and then modified for a specific industry. Repackaged software does not have wide applicability, and its users report low satisfaction levels. Thus, if Japanese firms are to compete successfully against American companies, they must begin producing genuine prepackaged software. The problems faced by Japanese software houses in making this transition are explored below.

### B. Difficulties Faced by Existing Companies Trying to Convert from Custom Software to Prepackaged Software

For the past two to three years, many Japanese customized software companies have attempted to enter the prepackaged software business but have withdrawn one after another. They were lost in this different environment. The major problems that customized software companies face as potential entrants to a prepackaged software business include a dependency upon *gaichu* and a lack of technological expertise critical to the prepackaged software business.

#### *1. Technological Hurdles Faced by Companies Practicing* Gaichu

Many large Japanese software firms suffer from profound technological weakness caused by the popular *gaichu* scheme of custom software development. The term *gaichu*, a word whose closest English equivalent might be "outsourcing,"[59] means ordering software development from other companies rather than developing the software in-house. Quite frequently, large software companies contracted out core work. Since only large companies were considered to be capable of handling sizable orders for the development of custom software, they earned easy commissions by serving as mere intermediaries between customers and subcontractors.[60] In addition to its profitability, *gaichu's* prevalence can be attributed to its convenience. *Gaichu* enabled companies to undertake large projects without having to hire additional employees whom they might subsequently need to dismiss.[61] The number of small firms willing to subcontract proliferated as *gaichu* gained popularity. Because little in the way of special skills or financial resources was required to start a small software company, quite a few employees left large software companies and started their own enterprises.

As the Japanese software industry grew rapidly, *gaichu* became multi-layered. Out of a total of 7,000 corporations in the information services industry, the 100 top companies generated 36% of the industry's sales revenues.[62] At the sub-subcontractor level, there were more than 3,500 companies with fewer than 30 employees.[63] Under this double structure, *gaichu* spread: the ratio of *gaichu* transactions to annual sales revenues continuously rose, from 14% in 1980 to 26% in 1991.[64]

Under the *gaichu* system, many custom software companies failed to accumulate crucial technological capability and expertise because they contracted out too much core work. Although the level of technological attainment varied from one company to another according to how much substantive development work they actually performed, large Japanese software companies as a whole seem technologically weaker than their counterparts in the U.S.. Such weakness impedes their ability to enter the prepackaged software

market in Japan.

Not all software firms in Japan participated in *gaichu*. Most members of the Japan Personal Computer Software Association (JPSA), a trade association of mainly prepackaged software companies, develop their prepackaged software in-house. Avoidance of *gaichu* allowed these companies not only to accumulate know-how but also to design future upgrades by themselves.[65] JPSA companies confine their *gaichu* use to instances when subcontractors have efficient skills with respect to some 'parts' of software such as a library. Thus, JPSA members have greater potential for succeeding in the prepackaged software market. However, these companies will still need to overcome other self-imposed barriers to entering the prepackaged market, some of which are discussed below.

*2.* Gaichu-*Independent Technological Hurdles*

Custom software companies attempting to enter the prepackaged software market also face technological hurdles unrelated to *gaichu.* For example, custom software is primarily developed for mainframe computers whereas most prepackaged software runs on personal computers. Because the technical knowledge of many custom software designers is limited to mainframes, these engineers must learn new programming languages and operating systems before they can create prepackaged software. They must also become adept at forming networks among different types of computers running different OSs and at choosing software appropriate for a particular network configuration.

Learning new programming languages, however, is not sufficient for success in the prepackaged software market. Only those programs which cater to the specific needs of the consumer will be popular, and the typical prepackaged software user is quite different from the custom software user. Custom software is operated by people with technological knowledge and training, usually personnel from a company's information systems department. By comparison, most users of prepackaged software have little or no training in computer science. Thus, prepackaged software must be easy to use.

Many former custom software developers have difficulty adjusting to their new clientele. Mr. Yoshiharu, a director of systems development at PCA, a company that has been remarkably successful in developing prepackaged software for accounting purposes, explained that programs developed by engineers trained in the custom-made software business often contain good functions, but are poor sellers in the prepackaged software market because they do not appeal to ordinary users.[66] He attributes PCA's success not only to its solid knowledge of accounting and relevant businesses but also to its emphasis on user-friendly interfaces and interoperability with industry standards, an emphasis that derives from the company's acknowledgment that users of prepackaged software are lay persons.[67]

Given their minimal technical abilities, consumers of prepackaged software and networked systems prevalent in hardware downsizing rely heavily on advice and instruction from software companies. While the demand for consultation is high, a JISA survey indicates that user needs are not being met-only 24 % of users rated the consulting services they received as satisfactory.[68] These statistics indicate that Japanese software companies are underinvesting in support services. Perhaps this is indicative of a general discomfort with the financial structure of the prepackaged software business.

**C. Financing Problems Facing Innovative Small Software Houses**

*1. A Few Innovative Small Software Companies In Japan*

The trend in the United States has been for the most innovative software application development to occur in small software companies.[69] Although this is not the trend in Japan, a few small software companies have in fact been able to turn software innovations into business success. Two of these developers are Justsystem and Dynaware.

Justsystem began as a husband-and-wife team working out of a spare bedroom and grew to six employees in 1985 when it developed Ichitaro MS-DOS, a word processing application for the NEC PC-98.[70] Justsystem continuously updated Ichitaro and introduced new products, becoming the third largest prepackaged software company in Japan in 1994.[71]

Justsystem differed from most other Japanese software companies in a couple of important ways. First, Justsystem was not reluctant to develop word processing software on MS-DOS systems. In contrast, most software developers preferred to write programs in BASIC, Disk-BASIC and/or Assembly, which used less memory. Justsystem's early acceptance of the MS-DOS system put them in an advantageous position when that system became more common. Second, Justsystem's entrepreneurial approach is also evidenced by its early perception of the importance of open systems, which motivated Justsystem to develop expertise independent of a specific hardware manufacturer.[72] At the time, nobody could predict the technical specifications of Windows. Yet, Justsystem developed its

own window, *Just Window*, to gain experience developing in a windows environment. Thus, when the specifications for Windows developed, Justsystem was well poised to take advantage of the market.

Dynaware is another innovative Japanese software developer, which was formed by recent university graduates in 1984.[73] Two of their software programs, Dynapers, the first three-dimensional graphics program for Macintosh, and Ballad, a music program, were introduced in the United States and received positive reviews.[74] Like Justsystem, Dynaware created its own windows program entitled Dynadesk. Dynadesk included both word processing and graphics functions.[75] Dynaware is now a leading company in the Japanese graphics-related prepackaged software business.[76]

*2. Prepackaged Software Companies Need Strong Financial Backing*

The prepackaged software business requires both higher initial investment and a higher R&D investment (in proportion to sales revenue) to support innovation than the customized software business. Therefore, it is crucial for prepackaged software companies to have strong financial backing to start up and succeed. In fact, successful software companies, like Justsystem and Dynaware, intend to spend more for technological development than other software houses.[77]

In addition, expenses in the prepackaged software business are increasing. *Nikkei Computer* estimates the average development cost for the first version of a new prepackaged program is 100 million yen (1 million dollars), regardless of the applicable hardware for which it is developed.[78] While the need for investment to cover growing costs is increasing, Japanese prepackaged software companies often have a difficult time finding financing.

a. Financing Problems Facing Japanese Prepackaged Software Companies

Multiple factors combine to create barriers to prepackaged software companies finding financing in Japan. Specifically, the Japanese venture capital industry is less developed than its American counterpart, and Japanese bank lending relies on real property for collateral.

i. Venture Capital in Japan Is Not High-Technology Oriented and Does Not Actively Invest in Earlier-Stage Companies.

Although the amount of venture capital investment in Japan rivals that in the United States, the quality of that investment activity lags behind the U.S. in the areas of high-technology investment, early-stage investment, and management advising.[79]

First, Japanese venture capital is not oriented toward high-technology because it has difficulty assessing its value.[80] The profits of software companies offer a high return because huge additional production facilities and resulting operation costs are unnecessary.[81] In order for venture capitalists to accurately assess if an investment in a software company will pay off, they must be capable of valuing the technology that is the core of the business. Japanese venture capitalists generally lack this capability.

Second, Japanese venture capitalists avoid early-stage investment in emerging companies because Japanese companies take an average of 30 years to go public, thus significantly delaying venture capitalists' expected return on investment.[82] This 30-year period stems from the fact that the Securities Companies Association in Japan has special rules that make the actual listing threshold for the over-the-counter market much higher than is apparent from the written rules.[83] While the written rules require a recurring profit of 20 million yen and net assets of 200 million yen, the actual threshold is said to be a recurring profit of 300 million yen and net assets of 1 billion yen.[84] By contrast, NASDAQ requires profits of more than $750,000 before tax or net assets in excess of $12 million, and even unprofitable companies can be listed.[85] In the U.S., successful new businesses go public, typically on NASDAQ, in three to five years, thus attracting venture capital investment.[86] These fast investment cycles do not exist in Japan. As a result, Japanese investment in start-up and emerging companies is about half that in the United States.

Third, Japanese venture capital generally does not provide management consulting to young venture businesses. Japanese venture capitalists focus more narrowly on lending and giving financial, as opposed to management, advice.[87] By contrast, in the United States it is common for venture capitalists to provide management advice to start-up companies which usually cannot afford to recruit capable management. For example, successful venture businesses in the U.S., such as DEC and Apple, received advice and know-how from their venture capitalists.[88]

The failure of Japanese venture capital to provide management advice has been attributed to the Antimonopoly Committee, which until 1994 prohibited venture capital from appointing a member to the board of the companies in which they invested.[89] Japanese

venture capitalists have had other means of providing management expertise, however, by placing their employees in venture businesses as executives or managers through *syukkoh* or worker leasing.[90] So, the Antimonopoly Law alone cannot be held responsible for venture capital's failure to provide management expertise.

Most importantly, venture capital has been able to transfer its managers to venture businesses in the form of *syukkoh*, a system in which a transferred employee has dual employment relationships with a sending firm and a receiving firm.[91] *Syukkoh* is allowed when the sending and receiving firm are related, as a venture capital firm and its investment company are considered to be. Thus, venture capital can send its employees to venture businesses as managers simply by coordinating another employment relationship between the employee and the venture business.

More recently, since 1994, venture capital has been able to "lease" as managers its employees aged 60 years or older to firms in which it has invested. In the worker leasing system the worker has an employment relationship only with the sending firm.[92] Originally, the Japanese Worker Leasing Business Law[93] limited worker leasing to 16 designated jobs, with managers being excluded.[94] In 1994, the law was amended to lift the prohibition against leasing managers with respect to employees aged 60 years or older.[95] Now venture capital firms are able to send certain of their managers to the businesses in which they invest.

How venture capital views its mission as investors determines to a great extent how much they will provide management advice and expertise to venture businesses. *Syukkoh* and worker leasing exist as methods of providing management expertise, although they are underutilized. This suggests that the focus of Japanese venture capitalists on lending and giving financial advice is primarily responsible for their failure to provide the management support that is typical of venture capitalists in the United States.

ii. The Importance of Real Property in Bank Lending

Most Japanese banks require real property as collateral for loans, and only rarely are intellectual property rights used instead. Most prepackaged software developers rent office space and lack real property.[96] Although the issue of collateral is not as critical a problem as the poorly developed venture capital industry is to software developers, it is important because almost 40% of Japanese industrial finance lending is from banks.[97] The only software companies that can easily borrow from banks are those that are *keiretsu* companies, and most prepackaged software companies are not part of a *keiretsu* structure.[98]

iii. Recent Attempts Have Been Made to Ameliorate the Financing Problem Facing Venture Businesses in Japan

Some experiments have begun to enable venture businesses in Japan to obtain financing more easily. First, MITI has established an evaluation system to determine the value of software and patents in order to facilitate their use as collateral in lending arrangements.[99] Second, MITI has established a fund to support promising software development, which allows software companies to repay borrowed funds by giving MITI a fixed percentage of sales revenues (2%).[100] Third, Japan opened its second over-the-counter investment market in July 1995.[101] Although intended to raise funds for fast-growing small companies, as of February 1996, no company was listed on this market.[102] Finally, it appears that the traditional banking industry might be becoming more receptive to using intellectual property rights as collateral in certain instances.[103]

**D. Human Resources Problems**

Software development companies face problems associated with human resources development. Specifically, they have trouble recruiting well-qualified people and then fostering the innovation that is necessary to create high-quality software.

*1. Problems Recruiting Engineers to Software Development Companies*

The general recruiting strategy for most Japanese companies is to recruit recent graduates from universities or professional schools and give them an implicit contract for lifetime employment. Traditionally, hardware development companies have hired most of the computer science graduates from the best universities for OS and specialized software development. This reduces the number of qualified graduates available for hire by prepackaged software developers.[104] Part of the problem is that software companies' real wage level, taking long working hours and the lack of fringe benefits into account, are not competitive with those of hardware manufacturers.[105] In addition, software houses fall behind hardware manufacturers with respect to financial stability, technological innovation, social reputation, and brand images.

*2. Formalized Salary Structure Does Not Reward Innovation*

In general, Japanese corporations, including hardware manufacturers and software companies, do not heavily reward high achievers. Japanese wage systems are structured on the assumption that employees will work for the same company from right after graduation until retirement. As a result salaries are based on seniority. Such salary structures may be unsatisfactory for young, talented software engineers.

An exception in Japan is the software game industry. Competitive international game software companies have the revenues to pay high salaries to engineers. For example, a 27-year-old engineer in an international game software company earns an annual salary of $150,000, more than twice as much as similarly situated engineers in large electronics companies.[106] As a result, many young software engineers left large electronics companies such as Toshiba, NEC, and other software companies to join game companies and take advantage of their higher salaries.[107]

Small, prepackaged software companies cannot offer these high salaries and so cannot draw talented software engineers away from more established companies like the game companies can. The inability to offer high salaries is typical of startup companies in the United States as well as in Japan. In the U.S., however, venture businesses attract employees and give them incentives to innovate by providing stock options. Such options are not readily available in Japan.[108] The formalized wage system in Japan, in combination with start-up companies' inability to offer stock options, creates recruiting difficulties for Japanese prepackaged software companies.

*3. Individual Innovation Goes Against Japan's Group-oriented Corporate Culture*

Innovative individualism, necessary for developing high-quality software, conflicts with the group-oriented corporate culture in Japan.[109] The history of software development, especially that of the leading software companies, has shown that technological innovation can be achieved by a capable individual or a small group as long as they are willing to be creative and innovative. In Japan, however, such individualism is not encouraged. A Japanese proverb reflects this attitude: "A nail that sticks up is hammered down." Mr. Kazuhiko Nishi, president of ASCII, feels that Japanese scientists and engineers do not respect things that are different and tend to avoid them, while familiarizing themselves with those things that are more familiar.[110] A director of Dynaware explained that they had two successful engineers whose innovation and strong personalities would not have been appreciated or well received in an ordinary Japanese corporation.[111] Overall, the individualism that seems to be required for technological innovation in the prepackaged software business is not respected or cultivated in Japan.

## IV. CONCLUSION

Many factors contributed to the slow development of the prepackaged software industry in Japan. Business customers relied on mainframe computers and, historically, preferred customized software that was capable of conforming exactly to their internal procedures. This demand meshed nicely with software developers' twin desires to create expensive software without incurring up-front R&D expenses and then to sell that software to a guaranteed market.

In addition, Japan's split platform mainframe market and the lack of a large PC market made the development of prepackaged software an unappealing avenue for software companies for a long time. The Japanese PC platform of choice, the NEC PC-98, with an exceptionally large (60%) share of the Japanese PC market, was incompatible with the IBM PC and controlled a market a mere one-fourteenth of the size of the worldwide IBM PC market. Developing for the PC-98, Japanese software companies were catering to a market insufficient in size for them to recoup their expenses and to timely reinvest their revenues. Meanwhile, their American counterparts flourished in a huge market maintained by network externalities and widely accepted standards.

Recent developments in Japan have begun to encourage the development of Japanese prepackaged software, but software developers willing to enter this new business area will face certain obstacles. Prepackaged software developers will need to overcome historical industry structures that tend to impede innovation. For instance, prepackaged software companies will need to encourage and retain innovative developers, perhaps at the expense of the traditional, group-oriented Japanese corporate culture, and they will need to quickly increase both their productivity and their internal expertise in software creation. Most significantly, they will have to find ways to obtain venture financing in spite of the forces against them such as the reluctance of Japanese venture capitalists to invest in high-technology or early-stage companies, the lack of a NASDAQ-type capital market, and the continuing focus of banks on real property collateral.

Although some of these factors seem culturally ingrained, there appears to be a recent willingness on the part of Japanese government and industry to engage in introspection and to attempt to change traditional procedures in order to compete in the prepackaged software market. This willingness to change and to approach the market in a fresh manner is necessary for Japanese companies to achieve the level of success in the prepackaged software segment that they have achieved in the hardware and game software industries.

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**1**. Game software is excluded from the scope of this business perspective, for the following reasons: (1) game software is typically far less expensive than other types of prepackaged software; (2) the product cycle of game software is much shorter than for business software; (3) many users of game software are children, meaning that the target-market is different than for other prepackaged software; and (4) large game software companies such as Sega and Nintendo sell game software in combination with hardware they manufacture. In short, the game software industry is quite different from the rest of the prepackaged industry, and must be analyzed separately.

**2**. JAPAN INFORMATION SERVICE INDUSTRY ASSOCIATION (JISA), JYOHO SERVICE SANGYO HAKUSHO 40 (1994) [hereinafter 1994 JAPANESE WHITE PAPER]. The Ministry of International Trade and Industry (MITI) supervised the preparation of this paper. The Japanese software industry revenues totaled $42 billion in 1992, while the U.S. software industry earned about $42 billion in revenues in 1991 and was expected to earn $100 billion by 1995. *Id.;* Robert P. Merges, *A Comparative Look at Property Rights and the Software Industry*, *in THE INTERNATIONAL COMPUTER SOFTWARE INDUSTRY: A COMPARATIVE STUDY OF INDUSTRY EVOLUTION AND STRUCTURE* 273-274 (David Mowery ed., 1996).

**3**. The software industry can be divided into two main market segments: prepackaged software, sold "off the shelf" as a commodity product; and custom programming services, or customized software, referring to comparatively large software programs created for a particular client. Merges, *supra* note 2, at 273.

**4**. *Id.* at 275, 282-290.

**5**. Thomas Cottrell, *Standards and the Arrested Development of Japan's Microcomputer Software Industry*, THE INTERNATIONAL COMPUTER SOFTWARE INDUSTRY: A COMPARATIVE STUDY OF INDUSTRY EVOLUTION AND STRUCTURE 131, 157 (David Mowery ed., 1996).

**6**. A network externality is that the marginal value of a product increases with the number of people using it. One example is the telephone-the more people that own telephones, the more valuable and useful they are. *See, generally, id.* at 137-38.

**7**. Until 1991, the Japanese computer software industry enjoyed between 20-30% annual growth. Recently, though, the industry has experienced severe setbacks for the first time. In 1991, its growth rate fell to approximately 10%, then fell to negative growth in 1992. 1994 JAPANESE WHITE PAPER, *supra* note 2. *See, generally*, Hidehiko Oguchi, *Asunaki Soft-gyokai* (*No Tomorrow for Software Industry*), NIKKEI COMPUTER, Aug. 23, 1993, at 48.

**8**. *See* Wayne Arnold, *Why is Japan Finally Embracing PCs? Try This: They're Fun*, ASIAN WALL STREET JOURNAL, November 5, 1996 (discussing trend of PC purchases by Japanese consumers, and noting that in 1995 Japan's PC sales grew 70%).

**9**. For example, Digital Research (DRI), an independent software company, introduced the CP/M operating system in 1976 for use on microcomputers. It was very successful in the 8-bit OS market, garnering 70% of the market share by 1984. Robert T. Fertig, THE SOFTWARE REVOLUTION: TRENDS, PLAYERS, MARKET DYNAMICS IN PERSONAL COMPUTER SOFTWARE 114 (1985).

**10**. While the progression in the U.S. was BASIC etc. to CP/M (8 bit) to MS-DOS (16 bit), the trend in Japan was BASIC etc. (8 bit) to BASIC (16 bit) and then Assembly and Disk-BASIC (16 bit) to MS-DOS (16 bit). Correspondence with Mr. Michio Tomita, Author of PASOCON SOSEIKI, *infra* this note (Jun. 11 and 30, 1995); Internet Correspondence with Mr. Shozaburo Nakamura, Systems Engineer (Jul. 31 1995) (on file with author). In the BASIC-based systems, the monitor program controlling the hardware environment was much simpler than what is labeled an "operating system" in industry parlance. Telephone Interview with Mr. Eiji Kuge, NEC

Technologies, and Mr. Akira Tanaka, former Chief Engineer, NEC (Mar. 1996). The CP/M OS did not become prevalent in Japan. CP/M had some reputation among engineers, but it never gained popularity in the business application sector. Correspondence with Professor Katsuya Hirose, an experienced PC user since the early 1980s (Jun. 1995); Correspondence with Nakamura. Some game machines used the CP/M OS, so game software was written for that environment. Written Correspondence with Ms. Miyuki Yasucka, Assistant Manager of Intellectual Property Department, SEGA Enterprises, Ltd. (Mar. 12, 1996). But almost all of the application programs for the NEC PC-98, introduced in 1982 as a 16 bit machine, were written in BASIC. MICHIO TOMITA, PASOCON SOSEIKI 254 (1994). Mr. Shozaburo Nakamura, who had been a Software Engineer at Kanri Kogaku Kenkyujo, the company which developed *Matsu*, a popular word-processing program introduced in 1983, stated that many top-selling programs ran on the BASIC/Disk-BASIC runtime environment. They were written in the hybrid of BASIC/Disk-BASIC and Assembly language in the mid-1980s. Correspondence with Nakamura.

**11**. Interview with Mr. Yukio Ohno, General Manager of Legal Affairs, Japan Research Institute (May, 1994).

**12**. Interview with Mr. Eiji Kuge, Senior Vice President, NEC Technologies, Inc. (May, 1995).

**13**. *Id.*

**14**. Cottrell, *supra* note 5 at 133-134.

**15**. Interview with Mr. Yoichi Shimamoto, Senior Consultant of Business and Information Systems, Sanwa Research Institute (Aug. 1994).

**16**. Yasunori Baba et al., *The Japanese Software Industry: The 'Hub Structure' Approach*, 24 RESEARCH POLICY 474, 484 (1995).

**17**. Shimamoto, *supra* note 15.

**18**. NIKKEI COMPUTER, Aug. 9, 1993, at 51.

**19**. *Information Service Industry-Creating New Strategic Value*, NIKKEI SHINBUN (U.S.), June 6, 1994, at 36.

**20**. The largest competitors, other than IBM, include Hitachi, NEC, and Fujitsu. Bob Johnstone, *Japan Tackles its Software Crisis,* NEW SCIENTIST, Jan. 30, 1986, at 60.

**21**. *Ofucon*s were used in mid-size or small companies to deal with routine business transactions such as sales management (issuing invoices and bookkeeping), accounting, and wage calculation. Until recently, PCs were not capable of handling these tasks.

**22**. Written correspondence from Mr. Akira Tanaka, former Chief Engineer of NEC (Mar. 10, 1996) (on file with author).

**23**. NIKKEI COMPUTER, Feb. 7, 1994, at 55.

**24**. W. Edward Steinmueller, *The U.S. Software Industry: An Analysis and Interpretive History, in* THE INTERNATIONAL COMPUTER SOFTWARE INDUSTRY: A COMPARATIVE STUDY OF INDUSTRY EVOLUTION AND STRUCTURE 31 (David Mowery ed., 1996).

**25**. *Id.* at 40.

**26**. *Id.*

**27**. *See* Cottrell, *supra* note 5, at 131.

**28**. Motoshige Itoh, KOKUSAIKEIZAI NYUUMON 295 (1989).

**29**. *See id.* at 298.

**30**. Hisashi Washiyama, *Kawaru Beikoku Sangyo*, NIKKEI SHINBUN (U.S), Feb. 15, 1996, at 26.

**31**. Hisatsugu Nounaka, *Changing U.S. Industry*, NIKKEI SHINBUN (U.S), Jan. 18, 1996, at 28.

**32**. Interview with Mr. Akira Uchinuno, General Manager, Hitachi Information Systems, Ltd. (Aug. 1994).

**33**. *Gekisen Pasocon Shijo*, NIKKEI SHINBUN (U.S), Jan. 19, 1995, at 12.

**34**. In 1989, approximately 2.7 million *wahpro* units were shipped compared with 1.6 million PCs. Japan Electronic Industry Development Association (JEIDA), Computer Data Book 40 (1994).

**35**. Jonathan Band and Masanobu Katoh, INTERFACE ON TRIAL 29-30 (1995).

**36**. Initially, NEC obtained a free license from Microsoft to bundle MS-DOS with application programs for the NEC PC-98.

**37**. Stephen Manes and Paul Andrews, GATES 152 (1993).

**38**. 1994 JAPANESE WHITE PAPER, *supra* note 2, at 268.

**39**. *Id.* at 270 (citing a survey by Dataquest showing the statistics for retail level sales but not reflecting NEC's direct sales to companies).

**40**. *Id.* at 218.

**41**. Written correspondence from Professor K. Hirose, Hosei University, Tokyo (May 26, 1995) (on file with author).

**42**. Kuge, *supra* note 13.

**43**. Telephone Interview with Mr. Takayuki Torii, Massachusetts Institute of Technology (Apr. 30, 1995).

**44**. TOMITA, *supra* note 10, at 423-33. *Kana-kanji* conversion is necessity for Japanese word processing because Japanese sentences are written in the combination of *kanji* (Chinese letters) and *kana* (Japanese alphabets). Nouns and core parts of verbs, adjectives, and adjective verbs are written in *kanji* and the rest (including counterparts of prepositions in English) are in *kana*. In word processing, people first type some words, phrases, or a short sentence in *kana* or alphabets. Then, people use *kana-kanji* conversion function to translate all *kana* or alphabets into the combination of *kana* and *kanji*. The better the conversion function is, the longer the phrases that can be translated all at once.

**45**. Written correspondence from Mr. Kazuhiko Nishi, President, ASCII (Jul. 20, 1995) (on file with author).

**46**. Hisatsugu Nounaka, *Kawaru Beikoku Sangyo*, NIKKEI SHINBUN (U.S), Jan. 18, 1996, at 28.

**47**. 1993 Sales Revenues for PC Applications (in millions):

1. Microsoft Office for Windows $493
2. Microsoft Word for Windows $407
3. WordPerfect for Windows $390
4. Microsoft Excel for Windows $292
5. Lotus 1-2-3 for DOS $257

6. Lotus 1-2-3 for Windows $207

7. WordPerfect for DOS $204

8. Microsoft Office Professional for Windows $177

9. Lotus Notes $149

10. Borland dBase IV $117

1994 JAPANESE WHITE PAPER, *supra* note 2.

**48**. For example, Mr. Kauzuki Kagemasa, President of KONAMI, a successful game software company, attributes the robust growth of theJapanese game software industry to the existence of a large market in Japan even in the 1980s - there were millions of people with game machines. Interview with Mr. Kauzuki, Dec. 4, 1994.

**49**. Four to seven times as large as the prepackaged software market in sales revenues. 1994 Japanese White Paper, *supra* note 2, at 40.

**50**. Theodore G. Bryant, *The History, Development and Changing Environment of Protecting Computer Software Against Copyright Violation in Brazil*, 8 Transnat'l Law 375, n.175, (1995) (citing *PC Software Industry Lost $8.08 Billion to Pirates in 1994: Piracy Rates in the U.S. Declines*, SOFTWARE PUBLISHERS ASSOCIATION, News Release, Feb. 24, 1995).

**51**. *Id*.

**52**. JAPAN PERSONAL COMPUTER SOFTWARE ASSOCIATION (JPSA), DAMAGE CAUSED BY ILLEGAL COPYING 2 (Nov. 1993) [hereinafter JPSA DAMAGES]. Out of its 249 members, 109 companies which develop and sell prepackaged software replied to this survey. *Id.*

**53**. *Id.*

**54**. *Id.*

**55**. JPSA predicts that prepackaged software will become the majority of the software market and that prepackaged software market will increase almost ten-fold between 1993 and 2001. The basis of prediction is the market growth rate of PCs from 1992 to 1993 (16.4%). JAPAN PERSONAL COMPUTER SOFTWARE ASSOCIATION, SANGYO-NO SHORAI VISION HOHKOKUSHO [PERSONAL COMPUTER SOFTWARE] 4-6 (MAR. 1994).

**56**. NIKKEI PASOCOM, Aug. 29, 1994, at 151. Novell ranked 7th and Borland ranked 13th. In 1992, the ranking was Microsoft, ASCII, Lotus, and Justsystem.

**57**. NIKKEI SHINBUN (U.S), Nov. 2, 1995, at 11.

**58**. *Id.*

**59**. Using the word "outsourcing" to translate *gaichu* is misleading because outsourcing is used in a specific way in Japan. That is, an information service company (including a software company) takes a customer's information system or computer system, and manages and operates the system for the customer. Economical efficiency is brought in by co-owning hardware between the company and the customer.

**60**. 1994 Japanese White Paper, *supra* note 2, at 88.

**61**. Employee lay-off or dismissal is uncommon in Japan.

**62**. 1994 Japanese White Paper, *supra* note 2, at 71 (data from 1992).

**63**. *Id.*

**64**. NIKKEI COM., Aug. 23, 1993, at 54 (based on Tokutei Service Sangyo Chosa of MITI).

**65**. Interview with several executives of JPSA member companies (Mar. 1995).

**66**. Interview with Mr. Yoshiharu Ohi, Director of Systems Development, PCA (Mar. 16, 1995).

**67**. *Id.*

**68**. 1994 Japanese White Paper, *supra* note 2, at 132.

**69**. Merges, *supra* note 2, at 289.

**70**. TOMITA, *supra* note 10, at 395.

**71**. NIKKEI COM., Feb. 7, 1994, at 59; NIKKEI PASOCOM, Aug. 29, 1994, at 140.

**72**. NIKKEI COM., Feb. 7, 1994, at 66.

**73**. Interview with Mr. Yoshinobu Watanabe, Director of Dynaware (Mar. 17, 1995).

**74**. *Id*.

**75**. The program was graphics-based and ran more slowly than a text-based program. Therefore, this program and a similar integrated program were not commercially successful until desktop publishing later became popular. *Id*.

**76**. *See generally*, TOMITA, *supra* note 10.

**77**. Watanabe, *supra* note 73; Interview with Mr. K. Ukigawa, President, Justsytem (Nov. 1, 1996).

**78**. NIKKEI COM., Feb. 7, 1994, at 62.

**79**. NIKKEI SHINBUN (U.S), Apr. 17, 1995, at 16.

**80**. *Id*.; BABA et al., *supra* note 16, at 478.

**81**. Hisashi Washiyama, General Manager of JAFCO America NY, NIKKEI SHINBUN (U.S), Feb. 15, 1996, at 26.

**82**. NIKKEI SHINBUN (U.S), Apr. 17, 1995, at 16.

**83**. NIKKEI SHINBUN (U.S), Jan. 4, 1995, at 15.

**84**. *Id*.

**85**. *Id*.

**86**. *Id*.

**87**. Telephone Interview with Mr. George Hara, Accel Partners and DEFTA Partners (Mar. 3, 1996). Mr. Hara is a Japanese venture capitalist with more than a decade of U.S. work experience.

**88**. NIKKEI SHINBUN (U.S), Apr. 18, 1995, at 23. Hara, *supra* note 87.

**89**. NIKKEI SHINBUN (U.S), Apr. 18, 1995, at 23. In 1994, the Committee revised its Guidelines to lift the restriction. Unlike in the U. S., venture capital's ownership of more than a 50% share of a venture company is against the Japanese Antimonopoly Law (Article 9).

**90**. NIKKEI SHINBUN (U.S), Apr. 14, 1996, at 27.

**91**. Written Correspondence with Kazuo Sugeno, Professor of Labor Law, Tokyo University (Mar. 11, 1996) (on file with the author).

**92**. *Id*.

**93**. The literal translation is "worker dispatching" but "leasing" more accurately describes the concept in English.

**94**. The jobs are included depending on whether they are jobs that require special expertise and whether they are difficult to cultivate under the long term employment system. Sugeno, *supra* note 91.

**95**. *Id*.

**96**. Yasuhisa Tashiro, *Chitekizaisanken-no Tanpo-toshiteno Katsuyo-nitsuite* [Use of Intellectual Property Rights as Collateral], in RESEARCH OF BASIC PROBLEMS ON THE ECONOMIC EFFECTS OF INTELLECTUAL PROPERTY RIGHTS 283 (Institute of Intellectual Property 1993).

**97**. *Id*.

**98**. Interviews with JPSA member companies (Mar. 1994).

**99**. NIKKEI SHINBUN (U.S), Jul. 23, 1995, at 1.

**100**. NIKKEI SHINBUN (U.S), Dec. 18, 1995, at 1.

**101**. This market is called *daini tentoh kabuishiki shijoh*. It allows a company without a history of earnings to be listed as long as their R&D spending equals at least 3% of their revenues. The minimum required net assets is 200 million yen. NIKKEI SHINBUN (U.S), Jul. 19, 1995, at 3; *Japan Launches Small-Firm Stock Market*, WALL ST. J., Jul. 19, 1995, at A5.

**102**. *Stock Option Seido, VB Dohyu daiichigo Tanjo*, NIKKEI SHINBUN (U.S), Feb. 7, 1996. {295}

**103**. In March 1995 Dynaware was granted a loan of $150 million by a commercial bank after using its word-processing software for Macintosh (MacWord) as collateral. Daisuke Akiba, *Michinori Kewashii Chitekishoyuuken Tanpo Yuushi*, NIKKEI BUSINESS, May 22, 1995, at 120.

**104**. BABA et al., *supra* note 16, at 480. Telephone Interview with Mr. Akira Tanaka, former Chief Engineer of NEC (Mar. 30, 1996). A study showed that, among those newly hired by the information service industry in 1990 with a bachelor's degree or above, 58.6% had majored in economics, law, or other subjects in the social sciences and humanities, while only 3.6% were computer science majors. BABA et al., *supra* note 16, .at 479.

**105**. JAPAN PERSONAL COMPUTER SOFTWARE TECHNICAL LABORATORY (JPL) AND JAPAN PERSONAL COMPUTER SOFTWARE ASSOCIATION, JAPAN'S PERSONAL COMPUTER SOFTWARE MARKET: 1990 229 (1991).

**106**. NIKKEI SHINBUN (U.S), Jan. 8, 1995, at 1.

**107**. *Id*.

**108**. Though stock options became available in Japan in autumn 1995, only corporations that the MITI certifies have developed innovative technology under the new business law, Shinkijigyoho, can provide stock options. Only thirty-one companies were eligible

as of February 1996. *Stock Option Seido, VB Dohyu daiichigo Tanjo*, NIKKEI SHINBUN (U.S), Feb. 7, 1996.

**109**. *See, e.g.*, NIKKEI SHINBUN (U.S), Jan. 9, 1996, at 13.

**110**. NIKKEI SHINBUN (U.S), Jan. 4, 1996, at 15.

**111**. These two engineers exhibit characteristics typical of successful engineers in Silicon Valley. For instance, their enthusiasm for computers and software led them to concentrate on their work day and night, except when they took time out to sleep in sleeping bags at their office! In addition, one declared himself a "genius." Watanabe, *supra* note 73.