INFORMATION TECHNOLOGY IN JAPANESE FIRMS: ARE THERE LESSONS FOR THE WEST?

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ABSTRACT

IT In Japan

There is an apparent paradox about the adoption and use of Information Technology in Japanese Corporations. Visit factories and they are often hi-tech; visit most offices and the business beyond the factory and they are lo-tech. This paper seeks to explain the contrast and claims that it makes sense - both culturally and competitively. The authors also describe hidden strengths in the way Japanese companies manage IT.

The second half of the paper suggests that much is about to change. Organizational computing in Japan may well take off - and a new level of competitiveness will result. There are lessons to be learnt in the west, particularly about the match of IT and culture.

Keywords: *Information Technology; IT Management; Japan; Culture.*

Information Technology In Japan: Are There Lessons For The West?

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1. Introduction

Western visitors to Japan, studying what level of information technology (IT) applications is actually on the ground, tend to come back puzzled by what they see. While they have been exhorted for the last two decades to invest in IT with the promise of a better competitive position, they have seen their Japanese counterparts inexorably gain ground, yet without seemingly investing in new information technologies as much. How have Japanese firms been so competitive and indeed taught Western companies lessons on JIT (just-in-time), TQM (total quality management), concurrent engineering and global market-building without investment in modern IT? Is it really the case that Japanese firms lag behind their US and European competitors in organizational computing? If so, why didn't information technology take hold in Japanese corporations? Have they developed an alternative way to manage information? Is past Western practice a guide for Japanese managers or is Japan once again giving birth to a new paradigm for effective management with information technology?

2. The information technology picture: Japan A Laggard In Organizational Computing?

If we pause to project from what we already know about Japanese companies and imagine how these same organizations would leverage new computing and telecommunication capabilities, what would be the typical picture? We would probably think of advanced manufacturing technologies - robotics, CAD-CAM (computer-aided design/manufacturing), CIM (computer integrated manufacturing), FMS (flexible manufacturing systems) - in the factories. We might imagine heavy use of EDI (electronic data interchange) in supply chain management to support smoothly running just-in-time operations and close partnerships with components suppliers. We might be looking for the legacy of MITI-initiated research projects such as the 1976-1980 VLSI consortium (very large scale integrated circuits) or the 1982-1991 initiative on the Fifth Generation computing and would rightfully expect the might of Japanese consumer electronics and. their capability in

miniaturization to have moved from the factory shop-floor to the white collar office environment.

Each member of a typically hardworking, well-educated and computer literate workforce would have a personal computer on his or her desk, would participate in the sharing of data, information and knowledge and would take part in electronically mediated group decision making. In our picture, traditional Japanese interest in heavy data collection and analysis would translate into gigantic data warehouses, neural networks, executive information systems, and decision support technologies.

Yes, the level of factory automation is high in Japanese plants, and this is reflected in enviable levels of blue-collar productivity and manufacturing efficiency. But thereafter reality differs from imagination. Inter-firm communication is still primarily performed by telephone or through face-to-face meetings; electronic mail or voice mail have not yet completely moved beyond the firm's internal boundaries. What Japanese information systems or data processing managers call PCs (personal computers) would most likely be dumb terminals, typically linked to a mainframe on a hub and spoke configuration and rarely connected by a LAN (local area network). Senior managers do not entertain having a computer on their desk and do not see the need for EIS (executive information systems) or DSS (decision support system) specifically developed for them. Indeed Japanese information systems managers still see these terms as synonymous with transaction processing systems - just another word for processing data.

Table 1 displays data collected by US and Japanese government agencies and research institutions. This reveals the extent of the gap between organizational computing in Japanese and US firms. When we consider the total mainframe installed base, Japanese firms are at par with their US counterparts. The same does not apply to the situation in end-user computing, with a one-to-three deficit for Japanese firms. As for software, Japanese firms do not rely on commercial packages (one-to-four deficit) or database software systems (one-to-six deficit). Internal software development by the central information systems/data processing department is still the prevailing practice, with little interest in or experience of outsourcing or application packages. Relative to its population Japan still has 16 times less Internet sites, and 16 times less internet World Wide Web servers.

In a 1994 large survey of Japanese and US firms, the Fujitsu Research Institute (FRI) compared the role of information technology in the two countries. The results (Table 2) indicate a similar level of expectation toward information technology but less

involvement and commitment by Japanese senior executives in pushing a clear IT agenda. In both countries there is a strong consciousness and recognition of the strategic role and hence importance of information technology. However, Japanese senior executives are less aware and informed about IT in general, about IT in their own organization and the opportunities presented by IT for their businesses. When it comes to their own personal use, 8% of Japanese managers (against 64% of US managers surveyed) admit they must use IT to support their own job and see computers as a critical tool for themselves. These same Japanese executives (36% against 68% in US sample) are not involved in IT-related decisions (except setting limits on IT budgets). For their own needs for information and analysis they rely on a central corporate planning staff (73% against 26% in US firms) and rarely call upon their internal IS (information systems) department (2% against 28% in US sample). The typical Japanese corporation is at best anchored in the customs and practices of the data processing age or earlier typified by mainframes, transaction processing and reams of print-out. Yet, Japanese executives surveyed by FRI are dissatisfied with the performance of the investments in information technology made by their firm (only 5% are satisfied against 39% of their US counterparts). Another survey administered only in Japanese firms by the Japanese Institute for CIOs (chief information officers) reveals a strong emphasis on automation of routine tasks. In other words, the normal scope of computing in Japan is automation of structured information processing both in the factory and in the office.

As a result, advanced manufacturing technologies have been embraced and effectively exploited in Japanese factories and this has created a 'hi-tech' image of Japanese business. In contrast, however, organizational computing and white-collar use of IT can be seen to be 'lo-tech'. Not only do Japanese firms lag behind in terms of their 'technical' infrastructure as captured by the number of networked-PCs, internet sites and modern versions of MIS, but in addition the personal computer, database and software industries of Japan are still immature. Add to this the data-processing culture and low level of IT literacy amongst corporate leaders, then the low level of IT-driven innovations outside the factory is not surprising. The automation mindset, referred to earlier, namely automating structured forms of information processing, helps explain both the low-tech image and reality of office and organizational life in Japan and the hi-tech image and reality in the factory. A Japanese finance director we interviewed shared with us his view of the IS department: "it has too many people ... these people are bloated. Their computers are just fancy calculators, and it is humans who should keep doing the most important things in the firm". He saw computers as calculators and IT as

automation, but he was hinting at other important factors too. We examine these next.

3. The Historical Constraints: Why Information Technology Did Not Fly Last Time

Why is this picture so bleak compared to what we would naturally expect from Japanese competition? Why is it that those same companies that changed the rules of competition in many industries through fundamental innovations in their 'strategic thinking' or approach and their management of processes and relationships, have not yet leveraged information technology in their conquest of global markets? Are there other more complex reasons for this lag? We would like to offer five explanations. While these are interrelated and reinforce each other, we can classify them three ways: the nature of information technology itself and its 'Japanese unfriendliness'; the structure of the Japanese IT market, and the specificity of the 'Japanese management system.'

i. Technological inadequacies in the Japanese context. The Japanese language with its Kanji character-set (in addition to its alphabet - in hiragana and katakana forms - Japanese written language requires multiple hundreds of graphically distinct calligraphic signs) has been a significant impediment to the widespread introduction of information technology. It requires a 2-byte representation capability which until recently was not catered for by Western hardware and software vendors. For instance, a Japanese version of an English Microsoft word-processing or spreadsheet PC package requires a machine with a bigger RAM memory to operate at equivalent performance levels. Manual input (via keyboard) and output (printing and screen display) of Japanese Kanji characters also imposes technical standards well above what *Western* vendors traditionally provide (we need to remember that after all information technology is an innovation born in the West and brought into Japan just as other technologies and their underlying values were in the 19th century). This makes input/output tasks more difficult and the design of graphical user interfaces more complex. In fact, this problem did not start just with the advent of computers. Japan did not benefit from the 'typewriter' or later 'keyboard' revolutions. Over time, this resulted in a 'keyboard-free' business culture where generations of managers have relied on oral communication. When needed, handwriting and the fax are the dominant written communication media.

In the large cities, space is at a premium. Open-space offices are the rule for all employees, other than the most senior executives. The same floor of a high rise building would typically house multiple departments within a division or even in

some cases multiple divisions with filing cabinets forming partitions. One section typically consists of a few desks put together into a large rectangle with the section chief sitting at one end of the cluster. There is little room for local technology. Moreover, the typically small desk-space provided for each white-collar worker does not allow a PC on each desk. Worse, it is practically impossible to accommodate at the same time an advanced workstation with complex Western-style applications and a Japanese terminal or wordprocessor, also known as 'wapuro.'

ii. Structure of the IT Market in Japan. Naturally, Japanese vendors initially developed hardware and software to cater to the specific needs of their Japanese customer base. The facsimile machine (fax) is of course a case in point, a technology which caters for Kanji characters and perpetuates preferences for paper. Vendors then having established a monopoly position on the Japanese market typically have little incentive to follow the high pace of innovation driven by their Western competitors. For example, Japanese-language releases of standard packages are few or late. Even American firms, who tend to lead the PC and its related software industries, are discouraged by the structure of Japanese markets, and have not developed nor sufficiently supported specific products to accommodate Japanese language. Packages not only enter the Japanese market late but rarely make it beyond the earliest releases, which further contributes to user frustration. Japanese companies therefore do not have a highly efficient market to source from nor do they have the experience to work closely with key vendors on new product development or R&D.

iii. Demographic and social factors. The majority of Japan's current office workers is part of a generation that not only did not use typewriters and keyboards, but also did not experience firsthand much of the computer revolution and the related new management ideas. They saw and experienced the early data processing era, based on mainframes and batch processing. Moreover, they did not keep up with the revolution that went on in the Western business environment, for example, the decision support system era of the 1970's, the PC era of the 1980's and the networked era of the 1990's. They tend to be skeptical of new business ideas which are supposed to leverage IT capabilities and change the way of doing business. The current generation of white collar workers does not see IT as fitting the Japanese way of doing things. Even when new technologies are introduced, they are interpreted within the traditional frame of reference. Thus client/server is confused with centralized computing and terminals are labeled PC's. It is still usual for new information technologies to be feared as another wave of Western business and intellectual imperialism.

iv. Japanese management culture. The norms and values of Japanese management tend to emphasize human and organizational forms of information processing. We can think here of management by walk-about, consensus decision-making, problem-solving through multi-disciplinary teams, mid-level management strategy-making, getting things right first time rather than monitoring and exception-reporting, tacit over explicit knowledge exchange, and similarly implicit and holistic rather than explicit and detailed performance measurement. Indeed the layout of offices referred to earlier is illustrative. Open plan environments for staff and open spaces for visitors and group meetings mean that it is difficult to avoid sharing or "overhearing" information exchanged primarily face to face or over the phone. This "forced" physical proximity and the resultant lack of privacy are entirely consistent; they reinforce and are reinforced by common Japanese management practices such as job rotation and participative, consensus-driven decision making. For example, a newly rotated employee naturally has to rely on his or her new co-workers to not only find the needed information (which potentially could be found on the information system), learn the tasks, routines and special way s of doing things in this section, but more importantly to understand the norms of behavior and the social and political structure of his or her new unit. Indeed, oral communication and its inherent high media richness are better suited to resolve the ambiguity and equivocality involved in the critical processes of building consensus, nurturing multiple internal coalitions and making deals.

As a result, information technology, and the values it stands for, enjoys a low status in Japanese corporations whether we look at it as a technology, an internal separate function, or a dispersed but everyday activity. There are few full-time CIOs in Japanese firms; fast-track managers avoid or minimize job rotation spells in IS (information systems); career IS professionals are mainly engineers performing the most technical tasks. In most of the large Japanese companies we visited we observed that the equivalent of the CIO in Western firms is in fact the finance director, the administrative director, the planning director or even the logistics director. Top managers as mentioned earlier avoid use of (or association with) information technology. IS departments are often set up as small bureau businesses, almost separate from the firm, reminiscent of structures employed by US and UK corporations in the 1970's.

v. Japanese "human pre-processing". The Japanese economy was very successful until the early 1990s and big name Japanese corporations outperformed many of their Western rivals. During this period following World War II until the financial bubble burst, Japan experienced a long and consistent era of economic growth and

cultivated a management system and culture that proved highly successful. Thus investment was made primarily in human and organizational processes and practices, rather than in IT, other than in large data and transaction processing systems. The human investments included implicit contracts for life-time employment, seniority promotion system, 'nemawashi' participative decision making, and 'bottom-heavy' pyramids. Even today, when we call and make arrangements to visit managers, whether front-line, middle or senior executives, we never find ourselves talking to a voice mail system or other answering machine. We are greeted by a person, namely the manager himself or one of the many, still omnipresent, office ladies sharing the same desk cluster.

We like to describe Japanese management as a system where 'human' pre-processing is important. In typical Western management, reaching the right decision is critical and various tools, techniques, information systems and external consultants are employed to support senior management decision making. Group decision-making techniques and systems help surface and analyze the manager's underlying assumptions, information systems applications collect and analyze data; decision support systems test for the rationality and internal consistency of the logic of decision. This is not to say that in principle these are unimportant and absent methods in Japanese firms. To the contrary, anybody negotiating in Japan knows how any little detail or unresolved issue 'gets beaten to death'. However, how you reach the decision is as important as the decision itself or its logical justification.

So by 'human' pre-processing we refer to the political and sometimes emotional process, whereby Japanese managers identify what is considered a fair compromise, elicit cross-divisional or cross-functional support and co-opt key stakeholders, in particular, those who will implement, execute or bear the consequences of the decision. This informal process - preceding the formal decision making exercise, also labeled 'nemawashi' - may affect the final decision itself. Instead of a rational, logic-driven, data-validated conclusion, it is a demonstrative, group-negotiated compromise and more importantly guarantees unwavering implementation, little risk of sabotage, and a strong collective commitment to make it work.

Under life time employment, employees develop skills and capabilities that are highly idiosyncratic to the firm and hence see their bargaining power decreased, and their switching cost increased; as a consequence they tend to display a strong commitment to the firm and its success. On the other hand, firms invest in training their employees and in rotating them within the firm without reverting to the external labor market. Japanese managers therefore benefit from highly loyal and

dedicated subordinates who will gather information from the market, from customers and suppliers, and who will share it within their organization. Just as in their Western counterparts, Japanese corporations have set up structural mechanisms, such as rules, procedures, plans, liaison persons and tasks forces to coordinate within and across their organizational units. However, these formal structures are embedded in a 'social and human glue' constructed over time through job rotation, loosely defined and ill-structured tasks, and high levels of interdependency and redundancy between individuals. Few Japanese organizations have rigid and documented job descriptions. Tasks are typically loosely defined, overlapping and inherently require information exchange between, and alignment of, multiple activities within a function or along a given process. When a junior employee has just about mastered his or her job, internalized the routines and established the needed personal relationships to be effective, he or she has to move on to another unit and do it again. Though not the fastest and most efficient coordination system, this practice does provide the extremely effective communication and coordination systems that lie at the core of the success of Japanese cross-functional teams, knowledge creation and exchange. One Japanese manager we met insisted: *"these [practices] not only compensate for but outperform Western style technology-based information system."*

We therefore see not only hi-tech practices in the factory and low-tech traditions elsewhere in the organization but two distinct faces to Japanese information processing: (1) an old-fashioned data-processing mindset with lagging technology, and (2) an highly effective tradition of oral, social and written communication together with a team or organizational approach to decision-making. In other words, Japanese firms have been very successful in the past without information technology because their human-based pre-processing was sufficiently efficient, but highly effective. This provided the same communication and coordination functionality that Western firms sought from information technology starting in the 1970's. It seems that Japanese firms have developed alternative mechanisms, primarily highly context-dependent and socially-embedded and -mediated, to manage information processing, while Western firms turned to technology.

4. Hidden Strengths

These same mechanisms which have helped Japanese firms succeed in the growth period also helped them manage the information technology they needed and avoid some of the problems that have plagued IT use in Western firms. Specifically we have identified five organizational characteristics of Japanese firms, five hidden

strengths, each of which seems to overcome classical problems of IS management experienced by Western companies.

i. Intermediate technology. Japanese companies have typically selected technologies which fit their way of doing things. It may not be the latest or most advanced technology and it may not be part of the newest management fad promoted by some 'management guru' or consulting firm (Japanese firms do not systematically call upon consulting firms; this is primarily a Western approach), but it usually represents common sense in the Japanese context. There has not been in Japan a technology for technology's sake movement and the latest piece of hardware or software is not automatically seen to be better that the last version. The Japanese management approach rather concentrates first on how to independently develop firm-specific operational and management processes then to incrementally improve them, thereby introducing IT applications when the request emerges from the 'gemba' (the front line, the operational level). As a result, large Japanese firms' information technology budgets have typically been 50% of those of Western companies. Then visiting CIOs from the USA and Europe are perplexed when they see superior competitiveness with less IT investments, particularly in the newest technology.

ii. Partnership between IT and the users. Problems of bad relationships between IS departments and their users are relatively unknown in Japan. Ask any local CIO or equivalent about how users participate in or influence system design and development, and they will be nonplused. They do not see where there should be a problem. Why? There are several reasons. First, IS personnel are usually co-located (in open-space offices) with their users. In one firm we studied, during the development of a new sales and marketing system, systems analysts had physically moved to the marketing area for the duration of the assignment. Second, problem-solving is done through teamwork. IS professionals and users work together on both problem diagnosis and application design. Third, job rotation of IS people in user functions and conversely of users in the IS department, helps individual workers build those personal exchange networks which appear instrumental in managing operational interdependencies. These factors contribute to a partnership-like working relationship between IS and its user divisions.

iii. Hybrid managers. There have been calls in recent years in the USA and Europe for developing hybrid managers. These are business executives who have enough information systems experience to make them interested in exploiting information technology and confident and competent enough to champion IS projects. Clearly the

life-time employment, and resulting commitment of an employee to his or her firm, combined with job rotation as a natural part of personal development have provided Japanese firms with a large pool of highly dedicated (not likely to go on the external labor market to be poached by competitors) hybrid managers. A manager's career development will naturally include two to three years in IS. He or she may not have enjoyed them and few will become technical hot-shots or hackers. However most managers will have become experienced in systems analysis, design and implementation.

iv. Decision-making process. Decision-making in Japanese companies is still generally done by consensus. This also applies to information technology related questions and investment decision. A major IT application is unlikely to proceed without information exchange with, and support of, all those involved or affected. Indeed if there is a crucial business problem to be addressed, a solution -maybe involving IT - will only emerge after the problem has been carefully examined by a multi-disciplinary team. Agreement to proceed and settlement of the financial investment required will be the responsibility of all the heads involved, especially the department or function most affected. We heard of one large project in a food and drink company which had not been in any systems plan or budget. However, the chief financial officer, and corporate planning director were brought in and once the business case was agreed, the IS budget and long range plans were amended.

v. Integration. It is not unusual in Japanese firms for the CIO to be outside the general management team or excluded from critical decision-making or influencing bodies. This situation is improving as information technology is seen to be more important by companies and as CIOs win their general management spurs. We have noted that full-time CIOs are rare in Japan. Is this a problem? Paradoxically, often not. Why? Because the senior executive ultimately responsible for IS may also be responsible for other functions too - he is naturally integrated into the teams through his multiple hats. One CIO we met is also administration director, logistics director, corporate planning director and finance director!

To summarize, it becomes apparent that Japanese business in many ways is behind in IS/IT - from a technological perspective. This is what puzzles so many Western visitors to Japan. However, there are also some interesting organizational strengths in Japan which seem to overcome many of the perpetual problems encountered in managing information systems in the West.

5. Forces for Change

Is Japan going to be at a disadvantage as we accelerate into the information economy? Is information technology and the ability to leverage its capabilities going to be the Achilles' heel of Japanese firms? Indeed as the economy and most large Japanese corporations have been suffering since the bursting of the financial bubble there is an emerging view that the traditional management model has reached its limits and that reform is needed. Is reform possible without exploiting IT in less traditional ways?

i. Economic Forces. Corporate profitability and growth statistics in Japan are not what they were. Japanese firms suffer from a heavy cost structure and the typical problem of an advanced, high-wage economy competing in a region where NICs (newly industrialized countries) provide a cheaper labor force. Naturally, Japanese firms have been moving production offshore, with the risk of 'hollowing' the Japanese economy, and imports of both industrial and consumer goods have been on the increase. Indeed, Japanese firms have only recently been discovering the cost pressures US and other European firms had to face six to seven years earlier. Japanese consumers, at the same time, have become more price-conscious supporting foreign firms in their effort to lower trading barriers. There are also structural changes at work. In retailing, for instance, some new players, in particular, convenience stores, discounters or foreign firms are changing the rules of the games, thriving in a fast moving quick response world.

ii. Recognizing the need for transformation. Faced with these domestic and global challenges, Japanese firms are currently busy working out their responses: Having successfully improved blue-collar productivity to world class levels over the last four decades, the focus is now on white-collar productivity. The answers are not clear, but some managers talk of the need for organizational transformation and have task forces working away. For example, senior executives attend conferences on, and read books about, business re-engineering. They reject the hype, but they do not reject the goal. They sense that information technology will play a role in this transformation not only in seeking productivity gains, but in speeding up decision making and being able to compete in a quick response world. So middle managers understand that speedy communication and access to information are becoming critical.

Some sectors already are using IT more aggressively with knock-on effects for others. For example, retailers like 7-Eleven Japan having installed point-of-sale technology are now, like their Western counterparts, exploiting the data to out-negotiate their suppliers. The sales manager of one supplier we interviewed saw lack of sales information when he met the buyers at the retailers as his number one problem. In

other words, computer-based data and information are entering some aspects of managerial life.

Also subsidiaries of foreign multinationals see opportunities to leapfrog competition by transferring technology and application ideas and applying Western know-how. One such company we studied was busy equipping their sales force with state of the art multimedia technology and presentations and receiving applause from customers. We can be sure that Japanese rivals would soon be imitating this innovation

So while they may have not needed IT with the pre-processing tradition and capabilities of the old way of managing in a fast growing economy, the future will be different. Traditional 'nemawashi' and the seniority system will not be sufficient to provide the fast decision-making and higher levels of capability and motivation required for a quicker turn around. The transformation of Japanese management is not a question anymore; neither is the potential contribution of greater use of information technology. Indeed, we see Japanese firms entering a new era of organizational computing under the joint effect of (1) a more Japanese friendly technology, with favorable demographics and IT industry structure, and (2) the pressure for firms to reform, in particular to become more efficient, make decisions faster and cut fixed costs (especially labor costs).

6. Enabling forces

We highlight seven enabling factors behind a resurgent Japanese embracing of information technology.

i. Information technology market structure. A more open and more competitive information technology market is emerging in Japan and is better addressing the idiosyncratic needs of the Japanese industrial market. Western vendors, large companies such as IBM, Compaq or Microsoft as well as smaller Silicon Valley companies are finding their way into the Japanese market and taking market share. Software companies, like Germany's SAP, have developed products highly attractive and fitting Japanese firms needs. The pressure is therefore mounting for Japanese competitors to shape up and keep up with Western ideas.

ii. Government policy toward IT awareness and fluency. Recognizing the importance of IT as a skill for future employment the Ministry of Education has been aggressively introducing computer literacy and management information systems courses starting at junior high school. A majority of today's Japanese top university

graduates use their personal word-processor and carry a PDA (personal digital assistant).

iii. 'Japanese Friendly' technology. If we project the current trends in new technology - hardware, software, telecommunications and their integration - in particular in more user friendly voice and hand-writing recognition, touch screen input, intelligent agents, language translation software, interactive multimedia systems, we can notice that input and output devices are becoming less of a barrier for Japanese people. At the same time, as mentioned above, demographics are working in favor of Japanese firms, supplying them with white collar workers who can already easily jump the old and higher 'keyboard' barrier, not to mention the new and lower multimedia one. The technology hurdle is lowering and new Japanese generations can jump even higher.

iv. Demographics and social predisposition toward IT. In addition, a look at the sales data of new IT-based commercial products (e.g., mobile telephones, PDAs, car navigators), video games and consumer electronics should suffice to demonstrate the strong and positive predisposition of new Japanese generations to technology and the associated life-style. Indeed, Japanese electronics companies have become very adept at recognizing a wave of interest in a technology in the high school generation and then adapting a prototype or even slow-selling business-oriented technology product into a consumer electronics product. Furthermore, Japanese consumers are often the first in the world to see and adopt new consumer electronics. In the past Sony launched the walkman and the portable video; more recently Panasonic launch a home bread cooker. The beeper became a social phenomenon among high school students; similarly, mobile telephones and the new PHS (personal handy-phone system) already are for popular and home use. These changes in the demographic structure of Japan, in particular the emergence of a new generation of Japanese managers with hands-on experience with keyboards, and other electronic and video technology may provide the grounds for the belated take-off of organizational computing in Japan. In fact, we would like to suggest that the Japanese firms are starting to embrace the next wave of information technology and add it to their core competencies. However they seem likely to do it without destroying the traditional organizational characteristics and management processes we associate with Japanese companies. This could be a powerful combination.

7. Japanese Management Of Information Technology

Japan and its economic system at large are in the midst of a critical period of soul searching. While we met some Japanese leaders questioning the old system and

proposing a radical turn towards more Western style practice, others argue for some adjustments without questioning the fundamental values and principles of the traditional system which has proved so successful. Among these adjustments we see information technology playing a major role. However, given the lags we observed in the Japanese corporate IT base, can Japanese firms quickly achieve IT-enabled transformation? After all we know it is difficult to catch up or leapfrog in the information systems field. Managers and organizations seem to have to learn by experience and through mistakes and it may take some time for benefits to be realized from IT investments Furthermore, since in Japan IT has been unimportant in the past and information systems departments have had a low status in the organization, what chance is there, we might ask?

Right now the 'technology' tide is turning. In 1995 five million PCs were sold in Japan setting the stage for an information technology explosion. As they are catching the wave late, Japanese firms, once again, can invest in the newest equipment and software. They do not need be constrained by prior commitments to platforms, standards and practice of previous eras, and they may learn from the problems faced by US firms, which under the impulse of a US-dominated IT industry, proactively adopted organizational computing. The necessity to reduce costs and the fear of being left behind other Japanese firms is pushing followers to catch up with recent highly publicized stories of successful use of IT applications by Japanese firms such as Kao, 7-Eleven Japan, Mitsubishi Electric or Fuji-Xerox or by the influence of Japan subsidiaries of Western multinationals.

Just consider the trends outlined above in the type of information technology currently being developed (e.g., multimedia, voice-activated and -mediated applications), the continuing improvements in the price/performance ratio of commercial and organizational computing and the favorable position of Japanese companies in the emerging multimedia industry (e.g., consumer electronics, video games). Also consider the evolution in Japanese industrial policy (e.g., deregulation of the telecoms market, gradual opening to foreign competitors of the IT and telecom markets; IT education and literary on the national agenda), the changes in Japanese society, in particular the general demographics (an aging population - and thus a need to accomplish more with less people - and new generations familiar with new technology) and ask yourself whether these trends further impede the development of organizational computing in Japan or whether they represent a new chance for Japanese firms to capitalize on their traditional strengths and the possibilities offered by new more timely technology.

We see increasing fit, in particular as Japanese firms stick to the key concepts behind their traditional management system. Some observers have been indicating that Japanese firms are questioning the concept of life time employment and the seniority promotion system. Life-time employment may no more be the norm. However, it is not to be replaced by Western style employment contracts with the possibility of discretionary laying off. Most often we observe senior management support for the benefits of long term (and not life time) mutual commitment between employers and their employees, which contribute to the development of trust and high levels of loyalty and to effective coordination. And the seniority system is being amended not abandoned. Firms increasingly do allow for some pockets of promotion through meritocracy for those highly capable and motivated employees. However, these changes do not add up to collapse of the traditional employment and industrial relations contract which underlies traditional Japanese management style. Decision making will remain consensus-based, though information dissemination will be accelerated and therefore increasingly IT-mediated, and intermediate management layers may disappear.

Not only will Japanese firms benefit from maintaining in their management practices the fundamental values and social information processing traditions underlying the typical Japanese management system, but also they will apply these to the way they manage IT, as demonstrated in the past (referred to as 'hidden strengths' above). In other words we see Japanese business aggressively capitalizing on the next stage of the information revolution as the response to the convergence of two forces: (1) the technology hurdle is lowering, as technology improves and (2) competition is forcing Japanese firms to become more efficient, cost efficient and faster to respond. In essence, when we put together these technological trends with their own traditional management and organizational strengths we foresee the possibility of Japanese business capitalizing on the next stage of the information revolution. The promise (or threat?) of this scenario suggests not only that Japan can catch up, but more importantly it raises the possibility that Japanese management may embrace the new world of electronically mediated business and exploit its opportunities more effectively - indeed more intelligently - than Western companies have done so far. Might we soon be witnessing the enactment of another Japanese miracle in Japanese competitiveness - IT-mediated this time?

8. A New Paradigm Of Information Technology Use.

Organizational computing is not necessarily contradictory with the underlying logic behind the Japanese management system. It is rather a matter of how IT is meshed

with the underlying values and principles. As figure 1 displays, we represent the Japanese management system as an onion where the external, most visible layer of practices, techniques and tools can be easily observed, benchmarked and thus imitated. For example, Western firms quickly recognized the importance of and bottom-line benefits of practices such as JIT, TQM and SPC in explaining the success of Japanese firms. However, when trying to copy these techniques, many often fail to recognize the importance of the management principles (i.e., the second layer - the critical role of 'gemba', the obsession with quality and customer satisfaction) and the cultural norms and values (i.e., the core layer at the center of the onion - dependence, groupism) within which these practices are embedded. For instance, at their origin quality circles were a 'bottom-up,' grass root movement whereby factory workers on the Toyota line spontaneously were trying to improve their daily work conditions. This practice or technique is a natural outgrowth of the underlying Japanese principles of 'gemba' (i.e., the respect, status and importance given to people from the field or the front line) and group-orientation. Overtime, these highly participative meetings organized around problem-solving became institutionalized in Japanese manufacturing firms. Western managers, however, introduced them into their organizations in a typical 'top-down' approach without modifying the practice to accommodate a different local culture and set of management principles.

Our research suggests that IT-enabled change in Japan is happening in a sort of Japanese way ('where the baby will not be thrown out with the bath water') consistent with those values, norms and principles which previously led to the successful practice of factory management, comprising JIT, TQM, concurrent engineering, SPC, CIM, design for manufacturability, supplier partnerships and multi-disciplinary new product development. In each of these practices we can recognize a few core values and management principles which once again will prove effective in IT-enabled transformation.

For instance, as opposed to using information technology to substitute for people, the underlying logic of "*chowa*" seeks to place people and processes at the center and develop tools and systems to support their activities. "Chowa" means "harmony" or "harmonization" and can be seen as a typical socio-technical view of the world. However, in this case it is the technical systems that have to fit the social system and not the other way around, as too often practiced and prescribed for Western firms. This approach is reflected in the nature and characteristics of the systems developed, but is first expressed in the way information systems and applications are initiated, designed, developed and implemented. Unlike a typical top-down design process, Japanese firms involve final users and potential stakeholders in the development

process early on. This practice also reflects two other related Japanese management principles: the importance of 'gemba' as users drive the process and the promotion of a 'partnership' between the users and the IS providers.

Seven-Eleven Japan provides a good example of these Japanese management values and principles augmented (i.e., this is an 'and/and' logic in contrast to an 'either/or' logic) the power of information technology. The Japanese retailing industry, long seen as an extremely closed and inefficient sector, is undergoing an IT-driven revolution led by new convenience store chains, discounters and supermarkets. These firms are using IT to squeeze hitherto powerful suppliers and revolutionize the supply chain, particularly Japan's traditional multi-tiered and complex distribution system. Some aspects of IT get easier as telecommunications is deregulated and competition is encouraged.

Former 7-Eleven Japan president Toshifumi Suzuki used to insist that his company is not in the retail business but rather in the "information business." For him, the soft drink can sitting on the shelf at a Shizuoka store is a bundle of information. This vision of the retail industry led 7-Eleven Japan, a subsidiary of Ito-Yokado, to be the first retailer to install in 1991 an ISDN (Integrated Service Digital Network). From the creation in 1973 of the company, Suzuki invested heavily in information technology (IT) applications to link its business processes to those of his business partners: his franchisees' stores, the wholesalers and the manufacturers. When Suzuki first brought from the USA the concept of the convenience store, he adapted it to the Japanese distribution context and to the evolving needs of the Japanese customer. He took advantage of the rigidities and inefficiencies of the traditional Japanese distribution system to create a large franchise of small retail stores, and heavily invested in information technology to support frequent and just-in-time deliveries of fresh products to the stores, thereby providing quality and convenience to the customer.

His fundamental belief in the importance of customer satisfaction is repeatedly reinforced in all of his policies. In particular, the obsession with customer satisfaction was the origin of the practice of continuous item-by-item control (and not by product category), frequent delivery and the heavy use of information technology (IT) applications to achieve reduction of lost sales opportunities and supply of products just-in-time and in the quantity needed. In 1991, 7-Eleven installed, in collaboration with NTT and NRI (Nomura Research Institute), the first ISDN network in Japan, integrating all these separate information systems into a common network platform. This network links all the franchise stores to corporate offices in Tokyo and all

around Japan via optical fiber. Headquarters has access to daily sales data on every single item for each of its 5,000 stores the afternoon of the next day.

(1) 7-Eleven divided Japan into 66 districts, serviced by a total of 600 Operation Field Counselors (OFC). Reporting to the district managers, these OFCs provide the human back-up to the 7-Eleven franchise system. Each of them supervises 6 to 7 stores, providing (i) advice on ordering and on the use of information systems, (ii) information on the portfolio of available items. The person-to-person contact with store managers is also a key element of the 7-Eleven franchise system. The counselors convey information, criticisms and suggestions for improvements from and between store operators, all the way back to headquarters. Their frequent visits, two or three times a week, also have the effect of motivating the owners and staff of small remote stores. 7-Eleven Japan spends more than US$ 1 million per year holding weekly meetings that bring together all the OFCs from all over Japan to headquarters in Tokyo. "*It is not enough to exchange information. The information has no value unless it is understood and properly integrated by the franchisees and makes them work better*", Suzuki would repeat at each meeting. Before starting a new store, the new franchisees and their wives are first brought to the central training center for a month and then go through a two-month on the job training in one of the regular stores. Training is not only about operating the systems but also helps diffuse corporate policy and explain the importance of daily operation and service quality. In other words, 7-Eleven franchisees respond to the customers faster and more effectively thanks to the use of information systems, databases and data analyses made available to them by 7-Eleven. However, the key to the quality of the data input into the systems by each retail store around Japan and the quality of the analysis made locally by each store owner is the result of the more important investment in training and weekly face-to-face visits by OFCs, who themselves coordinate their action in the weekly 'team' gathering in Tokyo headquarters.

In summary, at 7-Eleven Japan, innovation is driven by the shared obsession for customer satisfaction and service, and IT is a critical tool to provide the information for the 'gemba' to make the proper decision. IT also makes it possible for headquarters to analyze customer needs across time and regions and share the learning and the improvements with the 'gemba'. However, the success of 7-Eleven Japan's use of IT comes from the quality of the data collection and analysis done by the 'gemba' and this is achieved only through the heavy investments in human support and training in the form of the 600 OFCs. This is what we mean by "chowa", namely harmonizing information technology to the organization and its employees.

Conclusions

Japanese firms have been lagging between their Western counterparts in organizational computing not so much in the manufacturing control area or use of mainframes and large internally developed applications, but rather in the domains of white-collar and knowledge workers. With a 'data processing era' culture and mainframe centered infrastructure, Japanese firms have been successful in spite of information technology. Not having implemented modern IT did not matter at the time. With a human pre-processing management of information they have benefited from effective coordination during the high growth period until late in the 1980's.

However, new threats and competitive forces are questioning the traditional model and calling for faster decision making and a more efficient white-collar sector in general. We believe that Japanese will adapt without necessarily throwing away the key values and principles behind so called Japanese management, those very practices that made Japan successful. The time is in fact ripe for Japanese firms to embrace new information technology, in particular at the time where the technology itself is developing to be more 'Japanese friendly' on the one hand, and newer Japanese generations are more 'technology friendly' on the other. These trends are being engineered or reinforced by the efforts of MITI and the Ministry of Education and by the advances of Japan 'high-tech' consumer goods manufacturers. Further, we argue that the coming success of Japanese firms in leveraging information technology will stem from the very combination of a 'Western' tool, information technology itself, with the Japanese traditional way of integrating technology and new ideas; namely through "chowa" (or harmonization) and maintaining the focus on "gemba" (or the front-line or end user). We also suggest that Western firms can learn from these principles and thereby increase the business benefit from IT investment.

Figure 1: Three levels of Business Culture

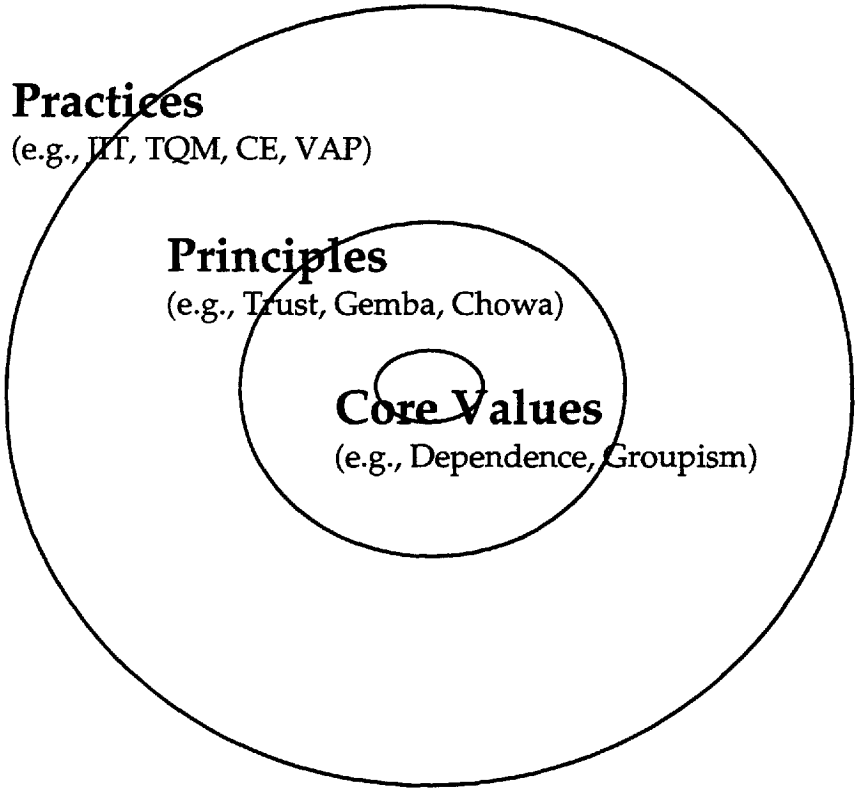

Table 1: Comparison of Japanese and American Infrastructure

		US	JAPAN	RATIO US/JAPAN	DATA SOURCE,
Hardware	Computers Shipments & Installed base (millions US $, 1993)	62,500	28,909	2.2	US ITA, Japan's MITI
	PC Shipments & Installed base (1994, thousands of units)	180,605	30,050	6.2	IDC
	Number of PCs per thousand employees (1994)	551.4	146.5	3.8	IDC
Networking	Numbers of PC networks subscribers (1994, thousand people)	6,197	1,964	3.2	
	Numbers of subscribers for the Top 2 networks providers in each country (1994, thousands of people)	4,660	1,430	3.3	US: Sept. 1994 CompuServe had 2.3 millions members, Prodigy 2.3 millions, in June 1994 in Japan PC-VAN has 0.76 million and Nifty Serve had 0.67 million subscribers
	Internet sites (Jan. 1995,)	3,179,170	96,632	32.9	Internet society, last year's US growth rate 215%, Japan growth rate 226 %
	Internet WWW servers (March 1995)	8,7928	306	28.8	
Contents	Sales of software packages (1992, 100 Millions Yen)	42,200	6,600	6.4	
	Sales of databases (1993, 100 millions Yen)	11,800	2,100	5.6	

Table 1a: Comparison of Japanese and American Information Infrastructure

HARDWARE & INFRASTRUCTURE COMPARISON ITEMS	US	JAPAN	US/JAPAN	DATA SOURCE & COMMENT
Value of computer shipments (1993, 1 Million $)	62,500	28,909	2.2	US: Estimates by Department of Commerce ITA; Japan: MITI's survey on computer deliveries (1$ = 111.18 yen)
Number of PCs shipped (1993, 1000 units)	18,605	3,005	6.2	US: Data Quest Japan; Japan: JEIDA (domestic shipments only)
Accumulated number of PCs installed (1994, unit/1000 persons)	551.4	1,46.5	3.8	Estimates based on the above data on the assumption that the US and Japan have 120.66 million employees and 64,32 million employees, respectively, at the end of 1993.
Computer Hardware Expenditure				
General Purpose machines	45	60	-	OECD IT Outlook
(1992 %) PC, WS	55	40	-	*Japan lags behind in downsizing due to priority on general-purpose machines
Share of global semiconductor market by enterprise HQ location (1993, %)	41.9	41.4	-	Quick data from Data Quest Japan's "News Release" * Japan and the US were reversed again since 1986

Table 1b: Comparison of Japanese and American Infrastructure

Network Related Infrastructure Comparison Items	US	Japan	US/Japan	Data Source & Comment
Number of PC communications subscribers (1994, 10,000 persons)	619.7	196.4	3.2	US: As of end of Dec.94 SIMBA Information Inc.; Japan: Jun 94 New Media Development Association (commercial networks only)
Number of subscribers for top 2 PC communication companies (1994, 1000 persons)	4,660	1,430	3.3	In the US, Compuserve & Prodigy have the same number of subscribers (2.3 million), as of Sept. 94. In Japan, PC-VAN and Niftyserve have 760,000 and 670,000 subscribers respectively (Same data source as above)
Number of systems connected to the Internet (Jan 1995)	3,179,170	96,632	32.9	Internet Society (ISOC) *The growth rate from previous year is 215% in the US and 226% in Japan
Number of Internet WWW Servers (Mar. 1995)	8,798	306	28.8	http://www.netgen.com data as of Mar 95 *The number of servers is an indicator of information transmission power.
Number of mobile telephone subscribers (1994, 10,000 units)	1,928	213	9.1	US: As of Jun 94, CTIA (Cellular Telecommunications Industry Association) Data Survey; Japan: As of Mar. 94 MPT
Number of subscribers telephones (1993, 10,000 units)	14,866	5,883	2.5	US: Dec 93 USTA yearly statistics; Japan, Mar 94 MPT
Charge for leased lines (1994, yen)	420,515	2,738,000	-	Monthly rental charge for a 500km line of 1.4 bit (1$ = 100 yen) *NTT applied for 26% reduction on average for medium and long-distance leased lines in Mar 95.
Number of CATV subscriber households (1993, 1000 households)	57,000	1,629	35.0	US: Dec 93 NCTA (National Cable Television Association) Japan, Mar 94 MPT (limited to urban type CATV)
Percentage of CATV subscribers (1993, %)	61.5	4.7	-	Same data source as above. Japan: Urban CATV subscribing households/Number of NHK contract households
Number of subscribers for top CATV company (1993, 1,000 persons)	12,000	99	121.2	US: TCI, Japan: Number of Nippon Network Service subscribers
Sales of software packages (1992, 1,000 persons)	42,200	6,600	6.4	US: INPUT; Japan: MITI's survey (1$=100 yen)
Share of software packages in sales of information services industry (1992, %)	34	9.3	-	Same data source as above. *The Japanese package market has not matured

Table 1c: Comparison of Japanese and American Information Infrastructure

Contents and Others Comparison Items	US	Japan	US/Japan	Data Source & Comment
Sales of databases (1993, 100 million yen)	11,800	2,100	5.6	US: Link Resources; Japan: MITI's Survey. DPC "Database White Paper" 1995
Number of database producers (1993, company)	1,500	130	11.5	Same data source as above DPC "Database White Paper"
Number of domestic databases (1993, number of DB)	5,100	1,000	5.1	
% Schools using computers for education (Figure in parenthesis: % of students having no experience of using a computer) (1992,%) Primary School Secondary School High School	100 (1) 100 (3) 100 (3)	36 (42) 71 (44) 93 (35)	-	IEA (International Associations for the Evaluation of Educational Achievement/National Institute for Educational Research. *In Japan, the percentage of primary schools is especially low * In Japan, the percentage of students with experience of using computers is low for the percentage of schools using computers probably because the number of computers installed per school is small.
Computers installed per school (1992, number of students per computer)	24.1	53.6	-	US: 1991 Statistical Abstract for the US; Japan: Ministry of Education
Information budget per Central Govt employee (1991,10,000 yen)	146	68	2.1	US: Quantum Electronic Database (QED); Japan: Management and Coordination Agency (1$=100 yen)
Percentage of government in sales of information services (1993, %)	17	9	-	US: Percentage of vertical industries based on INPUT; Japan: MITI's Survey (Central Government & local government organizations included)
Use of computers by business managers (1994, %)	64	8	-	Percentage of responses "Essential for work", Fujitsu Research Institute for Advanced Information Systems and Economics Questionnaire on Effective Utilization of Information for Business Management (Nov.94)

Table 2: FRI 1994 Questionnaire Findings

Do Top Executives Use Computers?

	MUST	EVERYDAY	SELDOM	IN THE FUTURE	NO PLAN	NA
JAPAN	8%	16%	27%	37%	12%	1%
US	64	21	7	3	5	-

How is Computer Strategy Formulated?

	Top Exec's Own Decision	Discussions in Corporate Committee etc	Business Unit's Plan is Respected	Other	NA
JAPAN	31%	48%	15%	6%	-
US	5%	38%	46%	6%	6%%

Are Top Executives Involved in Corporate IS Strategy?

	Actively Involved	Only in Investment Decision	Leave it to People in Charge	Others	NA
JAPAN	36%	47%	13%	4%	-
US	68%	10%	15%	6%	1

Are Top Executives Satisfied with Corporate IS?

	Satisfied	No Major Complaint	Dissatisfied	NA
JAPAN	5%	47%	48%	1%
US	39%	37%	23%	1%

Most Important Source of Information for Top Executives

	IS Department	HQ Staff	Business Units	None	NA
JAPAN	2%	73%	8%	16%	2%
US	28%	26%	17%	25%	4%