Title: Emerging Fast IT Technology will Change How Companies are Managed: Get on Board or Get Run Over

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***Abstract*— Since information technologies have become critical to business and engineering success as a tool of organizational innovation it is crucial that we look where these information technology networks and their associated innovational changes are going. That is, there are rapid business, technical, and legal changes that are molding the engineering management environment. Research planners and technology planners should take this environment into account during strategic planning, and product development.**

***Index Terms*— Client/server, information technology, alignment of competitive strategy, information technology management.**

I. INTRODUCTION

The exponential increases in computational power and speed provided by the emerging wireless and fiber optic technologies offer both a tremendous boost and a tremendous boon to information technology and in turn to engineering. This technology allows the engineer to work much faster, but engineers are now prone to more and bigger interruptions. Engineering managers want to keep their people working as efficiently as they can. Achieving that efficiency often requires two things, minimizing the interruptions and optimizing their communication speed.

This emerging wireless world through its faster data rates offers a tremendous increase in communication speed. While the wireless world comes in two main forms, voice and digital, it is the digital format that is now becoming predominant. Under the digital domain a new form of wireless data is LMDS. With data rates are high as 1 Ghz, LMDS can transfer data faster then ever.

Unfortunately, these massive data rates, if used irresponsibly, could quickly overwhelm us. If we describe engineers in computer terms the typical engineer operates somewhere between 100 and 1000 baud. With emerging computer data rates of 1 billion-baud engineers could due to email and other intruding data go beyond the occasional interruption to becoming too interrupted to be efficient.

This is not a problem that can be swept under the rug and hope that Microsoft will solve in "Windows 00." There are two opposing problems that will force engineering managers to face this issue very soon. First the mix of a strong US economy, and a weak Asian economy will soon provide the most competitive pressures that the world has ever seen. This will force the engineering manager to optimize staff efficiency to optimal heights. The second problem which will reduce the engineers efficiency is the Y2K problem. In a recent speech the deputy director of the FCC said that the biggest problem facing the wireless world is the Y2K problem. Most engineers are unaware of it and when that day arrives our communication networks will vastly change.

Unfortunately, in many companies the Information Technology (IT) issue is now crucial to success. Traditionally, business executives looked at information technology as something needed to keep the business and engineering running. Now, IT departments are demanded to work in partnership with the engineering and manufacturing to enable and to multiply the efforts of the staff in compressed timeframes.

Therefore the importance of IT department has grown in tandem with business expanded reliance on computer system. Overall, investment in IT has grown from three to five percent of company `s capital budget in the mid-1980 to about 17 to 25% today. Here the IT group is now working in cooperation to satisfy the tremendous computational needs of engineering departments. This introduces new problems; problems that will greatly affect productivity.

Now, suppose that you are the engineering manager in that emerging wireless environment. You find that the new computer wireless system allows a new much higher data rate, which gives you vastly greater access to information both in the company and outside. You already get so much E-mail that you run on the edge of not being able to properly respond to it. This paper will forecast how the emerging IT environment will affect the engineering environment. So you can modify your style to allow your group to take advantage of that increased ability to communicate and not be overwhelmed, or handicapped by it.

the World Wide Web in 1993. Communicators claimed that the Web was a communication medium while IT professionals defended their authority over a computer-oriented platform. They also clashed over IT terminology and content management. It is important, for communicators and IT staff to share mutual responsibility for the Web or the intent. They can achieve this thought discussion in order to develop a common set of objectives (Holltz).

The relationship between business manager and IT manager: Traditionally, IT and business managers have often deeply distrusted one anther. This was a main reason many companies marketed bad IT. Companies made bad decisions to due to the lake of communication between IT managers and business managers. Often, business managers did not know much about IT and left the purchasing decision to IT managers who, on the other hand, did not have adequate grasp of business needs.

The solution is to hold regular meeting between the IT department, engineering, business unit manager and top management to ensure that business judgment is balanced with technology knowledge. The group can discuss the basics of IT spending, which should ensure the use of technology to cut costs, improve corporate performance and generate new business (Pumo, Mcginn).

Also IT manager should find out more about business and engineering organizations, which might help in their particular complaint about changes to deadlines and budget specifications. Most companies spend 85% of their IT budget on utility function,12% on productivity enhancement and 3% for gaining competitive advantage. Each feels that the other does not understand, or give due consideration to, their own area of responsibility (Rosser) It is clear that the information technology path for improved engineering management will need better communications between the management teams with less distrust and more communication.

Information technology history of the hardware: Electronic information systems are a phenomenon of the second half of the 20th century. Their evolution is closely tied with advances in two basic technologies: integrated circuit and digital communication.

Integrated circuits are silicon chips containing transistors that store and process information. Advances in the design of these chips, which were first developed in 1958, are responsible for an exponential increase in the cost performance of computer components. For more than two decades the capacity of the basic integrated circuit, the dynamic random-access memory (DRAM) chip, has doubled consistently in intervals of less than two years: from 1000 transistors (1kilobit) per chip in 1970 to 1 megabit in 1987, 16 megabits in 1993, and more than 1 gigabit predicated for the 2000. A gigabit chip has the capacity of 125000000 bytes, approximately equivalent to 14500 pages, or more than 2 volumes, of Encyclopedia Britannica (Encyclopedia Britannica)

The speed of the microprocessor chips, measured in millions of instructions per second (MIPS), is also increasing near-exponentially: from 10 MIPS in 1985 to 100 MIPS in 1993, with 1000 MIPS predicted for 1995. By the year 2000 a single chip may process 64 billion instructions per second. If in a particular computing environment in 1993 a chip supported 10 simultaneous users in year 2000 such a chip could theoretically support several thousand users (Encyclopaedia Britannica).

For exploitation of this development for the realm of information system requires comparable advances in software disciplines. Their major contribution has been to open the use of computer technology to persons other than computer professionals. Database management system (DBMS) software today incorporates high-level programming facilities that do not require one to specify in detail how the data should be processed. The programming discipline as a whole, however, progresses in an evolutionary manner. The complexity of the data processes that comprise very large information systems has so far eluded major breakthroughs, and the cost-effectiveness of the software development sector improves only gradually (Encyclopaedia Britannica).

Impact of information systems on management organization: The matrix organization, a structure in which departments can communicate directly with other organizational units, is an increasingly popular alternative to the hierarchical structure. Loose organization imitates the observed principle of nature and social organization suggesting that a unit size of roughly 150 persons communicates optimally and requires minimal managerial overhead (Wong).

As business expansion and mergers extend the authoritative reach of large corporations and as the use of standard techniques of electronic document interchange forges flexible networks of firms in most industrial domains. Leadership by consensus replaces authoritarian management. Information sharing and communication are the principal factors

bringing about these changes and information system constitute the foundation that makes such sharing and communication effective (Wong).

Architecture of a network information system: The exponential growth of the use of computer networks in the 1990s provides significant changes in systems and techniques of information retrieval. In a wide-area information service, a number of which began operating at the beginning of the 1990s on the Internet computer network, a user's personal computer or terminal, client, can search simultaneously a number of databases maintained on heterogeneous computers, servers. The latter are located at different geographic sites, and their databases contain different data types and often use incompatible data formats. The architecture of a network information system illustrated in figure 1 (Encyclopaedia Britannica).

Impact economic level on information technology: Nearly every company `s IS cost have increased during the last decade. No only do skilled network administrators and desktop support staff cost more than ever, but also more of them are required to maintain the all-important computing infrastructures.

That cost has increased is indisputable, and IS budgets are larger than ever, but that does not mean companies are throwing their hard-earned dollars down a bottomless pit. Almost universally ignored in these calculations of spiraling networking and support costs are the increased efficiencies that these technologies and services have brought to all employees from mail-room workers to the CEO (Surkan).

For example, Atoms Energy Bob Best says the $41 million the company spent to overhaul its IT operations has helped it increase earning, which reached $37 million in its most remake the company, allowing it to be more efficient and to integrate an acquired company in three months rather than five years. The new systems reduced Atoms Energy's payroll by 400 workers, which will save the company as much as $100 million over 10 years, and the new system has the capacity to support twice the number of customers within five years (Gaudin). However, the world is suffering a series of economic blows that have the potential to erode corporate IT`s economic standing. Stock market uncertainty, the Asian and Russian currency crises, eruo conversion, and Y2K have led corporations to sharply scrutinize IT spending (PC week).

In a growing economy, new IT projects are considered a necessity. In a shrinking economy, they are something considered a luxury- or of the things that can be done without.

IT managers should seek products that cut inventories, optimize the supply chain, cut direct-purchasing costs and let employees service their human needs. Even a modest product that can cut a small percentage of the cost from each transaction can save millions.

Different aspects related to new Information technology: The spread of computers and electronic means of communication has clearly transformed contemporary workplaces. Computers now sit on the desks of virtually all office-based workers, linking them to one another though local area networks (LAN`s), electronic mail, and complex information systems. Employees whose jobs involve significant amount of travel are increasingly armed with an electronic arsenal of laptops, pagers, and cellular phones. Computer-aided design, computer-based inventory systems, and other innovations have reshaped industrial processes (Meiksins).

Reaction to these innovations has been sharply divided between those who believe that they represent a radical transformation of the capitalist order and those who believe that they are just more of the same. Some take optimistic view of new technology, stressing its ability to empower workers by providing them with information and arguing that complex technologies require better education, and more autonomous workers. Futurists such as Alvin Toffler predict the replacement of bureaucratic, centralized workplaces by home-based work in what he terms "the electronic cottage".

Most progressives, however, take a darker view of new technology, emphasizing its capitalist character and its tendency to extend and deepen the harsh consequences of capitalist relation of production. They point to use of computerized technology and networks to extend employer control over workers, even over long distances, and to create automatic systems that can replace the judgment and discretion of expert employees (Meiksins).

IV. ENGINEERING AFFECT OF INFORMATION TECNOLOGY

Electrical Engineering approaches will be the first and strongest area to be affected by the new innovation technique (Kamo). Kamo's study of

the innovation phenomenon is so thorough that this section is generally based upon his study called "the evolutionary organization as a complex adaptive model" In his article he studies how the product and development life cycles changed. We go on beyond his model and discuss how fast computer systems affect:

Innovation
Research
Development
Design
Implementation
Marketing
Maintenance
Technology Transfer

The near future of IT can be extrapolated from some of the recent trends in IT performance. Gordon Moore, founder and chairman of Intel Corp has observed that (computer) chips have historically doubled their speed every 18 months. Yet their costs remain the same. Ten years ago the average small company would take about 20 man hours to do the month's accounting activities. Now it takes only a small fraction of that time. Soon, one of the next computer types to come out will be the wireless network computer. They have no drives, and small memories. They use the server to provide all those functions. They will be small and very portable. The software would be managed by the server people. Some will be as small as the palm top data bases, but allow almost full computer power, with less installation and maintenance hassles. Intranets already connect entire corporations, but soon these nets will connect much more. (McCollum) Other changes will be the Computer-TV hybrid which is a computer that doubles as a television. Applets are very small software programs. Java is one which allows people to create their own software. Software assistants, are software made people that come on the screen and help people. Seemingly the greatest improvement may not be hardware but knowledge management software.

A focus of this paper is to describe how the organization changes company as the IT system evolves. It will be shown that the company changes parametrically as you evolve the capability of the IT system. Many people tend to think that the IT system will evolve in a linear projection of computers historical path. That is faster and more powerful. It is the wireless case that is true on a simplistic level, but in corporations computers will adapt in a very complex parametric way.

This can already be seen. Wireless Week of Oct 12 1998, Microsoft and others are converging in the wireless 98 information technologies 98 conference. At this conference Microsoft is announcing a wireless controlling software that connects peoples palm top computers more effectively to their home network. What does this mean? It means that we are moving into a world where we will be continually tied to our computers, whether in the lab or on the road.

The development of products in a new age will be a cause of the formation of the evolutionary organization as a complex adaptive electronic complex system. A complex adaptive system is where the company learns, adapts, and makes decisions simultaneously. Sometimes called an amoebae movement where the company is constantly moving to optimize itself. To see how the company moves we describe the new approach to product development.

INNOVATION: It is illuminating to see how this adaptive mechanism works by studying innovation. In typical organizations and engineers have innovated using pen and paper, or performed linear studies on computers. This limits the depth to which an engineer can model performance. As computer systems and we have evolved, we begin to move to more and more nonlinear simulation using innovation tools. The nonlinear analysis provides a much more descriptive model providing the direction to adapt. As companies become more and more adaptive, through the great increase in communications we are moving beyond non-linear. Through the influence of others working together we become nonlinearly parametric. Here we begin to look in many directions at once in a very complicated manner. This extended model allows the researcher to move away from the localized minima to the optimal solutions. To take advantage of that ability the innovator uses parallelism which is the action whereby the innovator moves in different planes simultaneously. This parallelism forms an invention machine by using independent agents which act nonlinearly with each other. Expanding that concept we find the innovative thought process is decentralized, and operating at the edge of chaos. Thus as the system operates at the edge of chaos it exhibits nonlinearlity where an input may have an output that is totally different from what might have been expected. This allows an optimization in innovation that tends to find the absolute best output Vs a local minima. The innovation using advanced IT system also provides an advantage where groups of people can innovate together. In

such a case innovation will be faster, more complete, and concurrently satisfying the needs of all the innovators.

Research is then more complete first because the innovation phase found the optimal solution field, and second because the advanced IT system allows concurrent development. The research phase is directed by organization completely connected. That is concurrent development moves all of the way back into research through an IT connection to all parties. So the research is not in a vacuum but is now evolving as a result of interaction among its agents and between the research system and the overall environment. (Kamo). At this point there is a stable core of ideas that were developed during the innovation phase. The system or design at this point is still quite complex. The system is still non linear, though not operating at the edge of chaos. The adaptive system allows a recombination of the thoughts that are made of internal rules that constrain the future development to a subset defined by rules generated as the idea moved from innovation to research.

Development and design in the evolutionary organization is based upon the four innovative keys of parallelism, novelty, recombination and diversity. Here the rules or boundaries have again been tightened as the product moves from research to development. Even more concurrent engineering is involved. The development now moves into the data base where every organizational element or group is involved in the step by step process of the design. Here the IT's ability to display the DWG's, simulations, cost estimates and artistic renderings are available to all so that all parties can give their input. This procedure allows a product that satisfies the production builders a producible product. A perfect example of that was the development of the Boeing 777 Jet. This jet was entirely developed on the computer. Little was built until all parties agreed upon this approach. (Kamo)

As we move into the implementation phase a series of new management data-bases affect the course of the product. The modern IT manager searching the web will inevitably search ISO 9000 data bases turning up useful input on the quality control standards influencing factors upon the implementing (Bates). There are nearly a dozen different data bases that provide different inputs to the ISO procedure such as quality standards, quality management, assurance. There are ISO standards on the business ethics, and social and corporate responsibilities of the innovation process. (Birkinshaw)

Marketing: IT affects marketing through new negotiation tools that improve negotiation abilities by allowing the marketer to see the whole negotiation picture. One particular program "Now you can negotiate like a Pro" allows you to put into the program the negotiation environment. That is the characteristics or profile of the people other side of the table. It goes beyond the training to help you see the nature of the negotiation. (Angus)

Another software solution provides help to the organization by use of Enterprise Resource Planning software. Hierarchical companies are loosing ground in the competitive arena. The evolution of computer architecture motivates the high level reexamination of ERP software. Client/ server technology has had a significant impact on reapportioning work modules among the desktop, mid tier systems and enterprise server platforms.

Technology transfer: It is in the technology transfer where a large improvement of IT growth will win it's biggest improvements. Technology transfer is one of the most difficult processes to develop. Technology transfer requires an in-depth recording of all designs and processes, and a way to transfer those in a way that protects company secrets, but allows the sales of technology.

There are many programs that allow the storage of technology. In knowledge management market analysts say most user companies have a lot of the core technologies in-house for technology transfers. Furthermore analysts mention Lotus Notes and the World Wide Web as the two primary backbones for a knowledge management system. A data warehouse, document management and electronic mail are other common pieces of a knowledge management system. As the IT E-mail system gets more sophisticated more complex database E-mail functions are providing search-and-retrieval products and technology transfer help.

The difficult part is that technology transfer software needs to have not just fact control, and but knowledge management. Technology transfer can be done by transforming information into knowledge through collaborative, filtering and semantic technology, using the following tools:

Open interoperable computing platforms,
Communication networks, including the internet, intranets, and extranets,
Knowledge and internal content,
Collaboration tools,
Enterprise wide messaging,
Web Management tools (browsers and search engines),
"Push" and pull technologies,

Intelligent agents,
Case-based retrieval,
Portable documents,
Object databases,
Document management,
Process management tools.

The task is to connect these tasks together. The higher power computers perform the connection better by their greater power, and the options which are available through the web links (Bates)

Corporations have enormous amounts of knowledge. It is not typically controlled nor is there access to it. There is an enormous amount of knowledge that could be used if it were available. Knowledge management is the process of making that tremendous amount of knowledge available across the company. Knowledge management is the process of taking technology components and applying them to a business process. Knowledge management software helps improve the entire process so successfully that many companies created a new corporate management position called the knowledge manager. One interesting tool of that system is a web crawler that supports searches across the Internet and alerts users when specific information is captured. A similar piece of software will search across the net with a single command. These knowledge management tools often overcomes the weakness of engineering. It is the machine that helps engineers find information, that may otherwise require study for days. (Walker)

A short survey of engineering issues was developed and sent out to engineers and engineering managers. To determine the state of the art and the direction that companies were going. The system that most engineers use is a client/server network of PC's, and UNIX work stations on a network with a powerful server. Most companies did not feel constrained by the computing power they had. If they were short of power they just added more computers on the network. Most engineering companies desiring to obtain the best design efficiency made the fastest server network they could. They used the most powerful software they could. Often the software could take months to solve and thus the faster the computer the faster the solution. The majority of simulation was nonlinear effects. The more advanced the company the more nonlinear the software.

Much of the survey was carried out in the research triangle region in North Carolina. One company a genetic engineering company was surprisingly the weakest computer wise, while an electronics company nearby was the strongest. The genetic engineering company lacked computing power even though computing power is quite inexpensive. Its nearby neighbor an multifunction IC design firm could not only do nonlinear engineering, and electromagnetic engineering, but also nonlinear and magnetic optimization of highly complex structures and to do it all over their network with other design engineers who were based all over the United States. They had a Unix back bone distributed over six stations, and 60 very high power PCs that allowed data, models, layouts, fabrication designs to be transferred easily building to building. The entire facility had access to everyone's plans, designs, models, layouts et cetera.

Conclusion: Engineering groups are advancing more and more toward nonlinear simulation. This simulation requires enormous amounts of computing power. The additional power is coming from using a network to do the calculation. And increasing the power of the network by additional processors.

V. SECURITY, LEGAL AND ETHICAL ISSUES

Introduction (Abstraction): Over the last several years, Information Technology (IT) has changed to an almost purely global networked environment, but the technical aspects of information protection have not kept up. As a result, the successes of information security programs have increasingly become a function of our ability to make prudent management decisions about organizational activities. And it requires the most sophisticated management skills and supports due to the innumerous anonymous attackers from everywhere. IT security is a complicated and such a wide subject, historically, only tackled by well-trained and experienced experts. However, as more and more people become ``wired", an increasing number of people need to understand the basics of security in the IT world. It becomes a big matter for the IT or engineer manager to educate their employees to protect their data information being stolen undesirably. This section is addressing some issue that is affecting the engineer or IT manager due to the fast growth of today's technology and trends in IT fields.

The Scenario of the Security Issue on Information Technology. According to the report from FBI Computer Crime and Security Survey, it is estimated that the FBI believes some 122 countries around the world have infrastructure necessary to

support hacker attacks on US networks, with an estimated 22 million hacking attempts made worldwide each year.

Today's IT crimes, including Computer Network Crimes, are one of the contingency growth areas in many organizations and societies. It becomes the huge threat on every firm around the world because the population of the IT has been increased tremendously year after year. For example, the users of the E-mail messaging are 70 million and the money spent about $13.5 billion in 1994. However, $62 billion will spend on sending E-mail messages by 2000 (Computer policy).

The growth rate of using telecommunication has been increased rapidly in the past couple of years. However, the influences of the attacks on IT are so fatal and are becoming more sophisticated crimes, due to the complexities of the attack level and the sophisticated automated hacking tools, which are very easy to download from a web site. Thus, one of the major concerns of the modern engineer or IT manager is how to protect their data from being stolen by the ways shown as follows.

Threats are attacking us from everywhere. Hacker, Cracker, Phracker, or Spy is the common terms that, at least once, we might hear from somewhere. Then, can you ever imagine about being attacking by anyone of the listed persons? They are the people who exist on the Internet all the time and who can attack us whenever they want or need to.

A Hacker is the one who is intensely interested in complex computer systems and whose characteristic is very similar to Cracker, whose interests include unauthorized entry and modification of computer information systems [Phacker]. Crackers are synonymous with Phrackers or even Uebercrackers. Crackers are simply the computer equivalent of musicians whereas Uebercrackers are the Cracker whose skills are much superior [Phracker]. In the Appendix IV, some data stealing methods are shown how the data information can be lost with using daily activity on the telecommunications.

Challenges: Many modern technology-driven corporations support their customers via networks, mostly the primary concern is how to support the customer by protecting their information servers. Often such information represents official policy of the organization, or might be depended on for critical activities. Protection from modification or destruction is critical. These following figure [Phracker] are well shown what is really happening out side of the real world.

- 64% reported security breaches within the previous twelve months.
- Of those who acknowledged unauthorized access, 74% reported from one to five incidents originating outside the organization;
- 70% reported from one to five incidents originating inside.
- Some reported 50 or more total incidents.
- The annual cost to each organization averages $580,000.
- Some organizations reported an annual cost of more than $1,000,000.

*Policy Activities (case example of/by IBM: "Protecting Privacy and securing data)*Most high-tech driven corporations like IBM obviously had complex internal systems and made extensive use of telecommunications networks and satellites to exchange information among units around the globe. Thus, investing in the security of data assets is more than prudent; it is a vital component of national and economic security. Then, how do they protect and secure their information?

In the Protecting Privacy And Securing Data Report by IBM, it is well described and directed to their employees and to the public that the data information security policies of IBM are emphasized confidentially classification and the restrictions as well as physical and other asset controls. IBM computer systems incorporate controls designed to prevent unauthorized access and to detect and trace systematic break-in attempts. They are also equipped with devices and programs to prevent the propagation and execution of viruses and other harmful codes.

Their Telephone systems and telecommunications networks are designed to safeguard IBM information resources and to protect against deliberate or inadvertent interception of network traffic. Using firewalls to insulate the connections between IBM's systems and external systems against unauthorized entry are really well implemented and helps defend IBM's data from unintended disclosure, modification or use, which also protects against damage from viruses and other criminal or hostile behavior.

For the customer network supporting purposes, IBM developed the Data Encryption Standard in the 1970's. This 20 years old the Resource Access Control Facility is helping to protect customer-computing resources.

Appropriate Education necessary for

employees: The battle between hackers and security policies of the corporation using new enhanced technology will go on establishing the best strategy for fighting against them becomes the IT manager's responsibility. Hackers will continue attacking the network system by finding better ways based on the many users' unrecognized habits. Also, there will be constant efforts that users and security experts are wary of deploying technology that offers incomplete solutions. Even if the technology was available, the recent many study suggest that there would be little motivation or interest in using it. It applies that users tend to ignore the danger or do not connect out of fear. The absence of security awareness within the IT community and its managers at large points to the need for better education independent of whatever technology is available. For instance, well educated employees who work in R & D environment of the corporation will help to protect and secure the information that is the most sophisticated and unanticipated as knowing or learning how to remote login or transfer file confidentially.

In the survey attached in Appendix III, twenty-one out of twenty-two people answered that they at least agree that, periodically, the security issue related seminar or education is necessary for the data security purpose. Even, a few people replied that employees tend to fail to deal with confidential documentation files in the field. The appropriate education or seminar should be provided employees to minimize the unexpected data lost in the field. It must be the major responsibility for the engineer or IT manager to educate their employee with updated and accurate knowledge.

The scenario of the ethical issue on information technology: It is often said that we are living in a computer age or Information Age. It implies that computers become daily and friendly tools to get, share, or distribute the information domestically and globally. There are about fifty five million people using E-mail and its population has been increased year after year.

In this reality, one of the prior issues is to protect privacy in the company, on the Internet, or anywhere. In this country, privacy protection has been considered an approach that addresses separately various ways that privacy is threatened.

``Privacy legislation that is specific to the Net is probably attacking symptoms rather than the disease," said President and CEO of Junkbusters Corporation, Jason Catlett. He pointed out that Americans still lack the right that most Europeans were guaranteed more than twenty years ago to examine and change the records kept about them by businesses. ``People should have a free, simple and legally enforceable way to tell all companies not to sell or `share' information about them, regardless of whether that personal information goes on the Internet." Then, how much does the IT manager need to be sensitive about keeping the privacy of each individual?

The matter is that many people do not realize that they are traced while surfing on the net and marketers use these fact without their knowledge. This addresses increasingly widespread concerns that marketers are using ``cookie" technology [Computer policy site] to turn the World Wide Web into a global surveillance device. This is obviously ignoring the privacy of an individual, even abusing it. Originally, cookies were created for a useful purpose by Web browser companies such as Netscape to capture preferences of individual users and store them on those user' hard drives. In this way, whenever a user pulls up a page, it reflects any customization he/she has performed on it in the past. But because cookies collect their information secretly, they have proven useful in other ways.

The unconcerned problem by a user is that marketing companies are building long-term comprehensive profiles of everything that people search for, what they click on, and what sites they visit. Whenever he/she visits a cookie page, he/she leaves a calling card that reveals the type of computer, its Operating systems, network location, and many details. This information can be sold to others, and the sold information can be used in numerous purposes in the reality. Not surprisingly, without the permission of the actual users, the personal information is giving out, basically, everywhere throughout a wire.

In the definition of term on the Electronic Communication Privacy of 1986[Ubercracker], it is defined as "intercept . It is clear that it is illegal to intercept the non-voice portion of a wire communication such as the data or digitized portion of a voice communication". [Ubercracker] In this sentence, the Non-voice portion refers to electronic communication which is defined as any transfer of signs, signals, wiring, images, sound, data, or intelligence of any nature transmitted in whole or in part by a wire, radio, electromagnetic, photoelectric, or photo-optical system. The Act was designed to protect the contents of stored electronic mail, voice mail and remote computing services.

Today, many people who often communicate via electronic devices strongly feel that electronic mail as well as any type of electronic communications

should be protected. According to the GVU's WWW surveys (attached at Appendix II), 89% of respondents agree that they should be able to communicate over the Internet without others reading the content and 75% strongly agree. Experts agree even more strongly (93% agree, 81% agree strongly).

Tons of information race across networks today in our reality, carrying the messages, records, personal tastes, and secrets of individual. Some of this data may be shared to make a purchase or close a deal, even though most people consider most of this information private. Thus, it is true that many people, obviously, want to have their own privacy while communicating via popular telecommunication devices such as E-mail, radio pager, or cellular phones. However, the reality does not allow them to have the privilege. It is a serious ethical question for marketers whether it is necessary for them to ignore their customers' privacy and steal their information without knowing to maintain their business.

If you were a manager of the company, what would you do for gathering thousands of people's preference to implement a survey or send a catalog to introduce new products? Would you like to use the cookies method even it is unethical? Would you prefer not to use technology unethically?

It must be a hard question to answer even though it becomes a serious ethical question when it is directly linked with the company's revenue matter or with strategy to compete against your opponent.

However, one obvious thing is that it is needed to regulate the collection and use of digital data to keep the privacy of an individual or a company's confidential contents. Also, web surfers have to realize that the cookies become instruments of surveillance that build long-term profiles of online behavior, and this information is being sold to marketers. From the individual's perspective, it needs to be considered that installing appropriate software can free to block the surveillance.

Many people believe that it is time for the government to establish the powerful law or regulation, which can protect the privacy. Seventeen people (77.6%) agreed in the survey that the strong governmental supports are needed to protect the privacy. However, interestingly, three people (13.6%) disagreed with the idea because they replied that sophisticated software can keep their privacy in the Internet and the rest of people (8.8%) strong disagreed that any laws or regulations will not make things to be changed. Because, no matter how the government tries to establish the law, there will be someone who always steals important information with tons of reasons and methods, the IT manager needs to establish the good privacy policy for their employees or clients. And also the governmental powerful support needs to be implied in the field.

The scenario of the legal issue on information technology: As we can see from the driven issues above, today, security requirements are vital because of the growth of new trends and many risky factors in computer uses. Also, many companies have a dynamic environment of intercorporate networking systems to communicate among teams, departments or even outside vendors. Client-server applications such as E-mail, faxes, data warehousing, electronic banking, on-line transaction processing and electronic filing of tax returns are now as common as the use of the telephone. It is estimated that by the year 2000, information security will be a $13.1 billion business.

There are too many legal issues introduced on IT to talk about and it is impossible to talk about all of them. And it is even harder to define an issue specifically in this section. One of the hottest legal issues that many high-tech driven company's concern is called, "cryptography". The term is defined that "cryptography is a powerful tool that can help to assure the confidentiality and integrity of information in transit and in storage and to authenticate the asserted identity of individuals and computer systems". Also, it includes such procedures as encryption, decryption, digital signatures (also known as authentication), key management, and key certification.

The idea is that information that has been properly encrypted cannot be understood or interpreted by those lacking the appropriate cryptographic "key"; information that has been integrity-checked cannot be altered without detection. Properly authenticated identities can help to restrict access to information resources to those properly authorized individuals and to take fuller advantage of audit trails to track down parties who have abused their authorized access.

In our real world, some consumer-level cryptography products are now so powerful that law enforcement officials say they can't crack them, even with massive supercomputers due to recent developments in software and hardware.

However, the problem is that there are currently no restrictions on the use of cryptography technology within the United States, though the Clinton administration, citing national security, has long prohibited U.S. firms from selling their best

products overseas. And, unfortunately, other nations do not have such restrictions, U.S. software companies are worried about losing out on business to foreign competitors.

However, the U.S. government, particularly the FBI (Federal Bureau of Investigation), is concerned that loose export rules could put encryption technology in the wrong hands, making it tougher to chase terrorists, drug smugglers and other criminals.

For past a few years, several pieces of legislation have been introduced in Congress, but the results have not given us successful answers so far. At the same time, many researchers and high-tech companies invest money and effort to address the issue.

In spite of the fact, the reply of the survey reveals that fourteen people (63.4%) agree that using cryptography needs to be regulated by the government with powerful law punishment when it is broke with unwanted or forceful circumstances. However, four people (18.2%) disagreed with the idea that cryptography is the answer to secure the data. Not all of them replied with the reason they do not agree. However, the main idea is that it becomes the risky when the technology is used by lawbreakers. Another four people did not want to answers; one person does not really follow what the cryptography is and the other three simply gave no reasons.

Constant efforts and attempt will be done from many directions with various methods to find the best answer to secure the data information in modern IT society and for future IT society. Because cryptography is an important tool for protecting information and because it is very difficult for governments to control from national security and the law enforcement points of views, many companies in US and other nations will also join the establishing use of a cryptography law soon or later. Therefore, one thing we strongly believe that U.S. national policy should be changed to support the broad use of cryptography in ways that take into account competing U.S. needs and desires for individual privacy, international economic competitiveness, law enforcement, national security, and world leadership.

VI: RESEARCH METHODOLOGY

Our research methodology was to study state of the art companies through literature search, then survey employees of related companies from which we made an extrapolation of future trends. Each subject area was studied and surveyed differently due to the inherent differences of that area. That is we used varied techniques, survey questions and approaches.

Case selection was based upon the conceptual framework of business strategies, product innovation, IT system development, and legal repercussions as they are and as they will change due to an enormous change in IT capabilities. The kind of companies that we selected were fast growing companies that would have a benchmark or state of the art IT systems. Therefore we chose wireless electronics research companies for the engineering portion. IBM, Intel and other similar companies for the strategy and security portion of the paper.

Survey Methods: The IT arena is changing so fast that the only way to get the latest data is by survey. It is not possible to find up to date articles. The best articles are typically based upon year old data. While the half-life of IT technology is 18 months. Therefore a year old article is inadequate.

We needed information from specialists. Specialist, as the name applies, are very familiar with a limited knowledge sector. Therefore, the need for specialized surveys.

Data Collection: We collected retrospective, and present data by e-mail surveys of various employees to provide multiple sources of evidence. There were more than fifty people that were surveyed. Though none were asked questions from all the areas of study. They were only asked data from the areas where that person was proficient.

Level of analysis: The level of analysis is not deep. We wanted to determine patterns and trends at a survey level while not getting in depth to see every little detail.

Survey Results: Each area of study required a different survey. Therefore detailed survey results, relevant to that area of study, can be found at the end of each major section, and the appendixes.

Survey summary: We performed three separate surveys via E-mail. The surveys were of three subject areas: IT strategies, IT security, Innovation verses IT surveys. We received a total of 55 responses.

The survey revealed several important facts. In the area of IT strategies. 75% of business unit managers felt that IT was not adequately accountable to the business. For better accountability 83% of not IT managers request the IT department report to the business VP. While

55% of IT managers thought they should report to the business VP.

The survey reveled in the area of IT based innovation that all engineering groups surveyed had a client server system. Most systems had a Unix backbone. 90% of all engineering groups used as powerful of computer as possible. These systems also allowed rapid technology from engineering to drafting and production. Only twenty percent of all engineering groups ran nonlinear parametric modeling, while 90% of all planned on using nonlinear design tools soon.

The survey in the are of IT security reveled that 96 % of IT professionals thought security education, at least once per year, was essential. 63% of the IT professionals thought that we should encrypt all E-mails.

VII: CONCLUSION

The explosion of IT capability is changing so fast that most companies have not taken advantage of the speed and power. Fearing the quickening obsolescence of their computers and software, many have taken defensive and not offensive postures.

Our surveys showed that "the wait and see people" do not have access to the latest marketing data. They do not have adequate protection against the abundant number of computer attacks. These companies still engineer by on-paper methods or by using linear simulation methods. These methods require many design iterations to achieve even a limited success.

The "wait and see people" tended to have inadequate IT staff. This resulted in poor relations between the IT group and the business, and engineering. It also resulted in bad IT hardware and software investments.

Engineers in those companies were overwhelmed by the abundance of tasks brought on by the inefficiencies of their design efforts and the excessive requests through E-mail.

On the other hand, those companies who have embraced the technology have tended to fare better than those who have taken a wait and see attitude. The companies who had the most advanced systems also had the highest quality technology, and the highest revenue growth. They had the best technology transfer of data into production, and the best relations between engineering and the business. Their engineers seemed to be less overwhelmed and those engineers seemed to enjoy their work much more.

Future study proposal: The surveys in this paper were small and general. There was not time for a second round of surveys. If there were we would have studied the relationship between business success and the IT function in more depth.

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Appendix I:

SURVEY QUESTIONS FOR INNOVATION, ENGINEERING, AND SYSTEM DESIGN

System parameters

1. What kind of Information technology system do you have? Is it workstations, mainframe, or client server? What kinds of IT software do you use?
2. What are your managers doing to take advantage of changes in the IT system

Innovation parameters

1. Is your system adequate and useful for engineering
2. How are your engineering development procedures changing with IT?
3. In what ways are your technology transfer approaches being changed?
4. Do you use computers to solve very difficult problems?
5. Could you simulate non linear problems
6. How do you use your computer to improve your engineering design and development efficiency
7. Do you use computers to solve very difficult problems.?

These questions were sent out by e-mail to 15 engineers. Seven responded.

Appendix II The Questionnaire used for computer legal, ethical and security questions.

Please read following questions carefully and pick a number from the given scale below to show how much you agree or disagree with each questions. Or answer it briefly for an additional explanation.

Scale:

5 – Strongly Agree
4 – Somewhat Agree
3 – Do not care / Do not know / No answer
2 – Somewhat Disagree
1 – Strongly Disagree

1. How long have you been in the Technology related filed?
   - 1 ~ 5 years
   - 5 ~ 10 years
   - 10+ years

1. Today's IT management has been emphasized to protect the data information being stolen with any reasons. There are many ways of protecting it and how do you strong feel that it is necessary that the periodic education or seminar should be given to the employee about the data security related issue periodically? If you want to add, please briefly explain.

2. Many ethical issues have been addressed lately. In many cases, for the business purpose, the privacy of the individual users tends to be ignored many times like **cookies**. A cookie is a mechanism that allows a web site to record your comings and goings, usually without your knowledge or consent. However, these cookies on your PC have been sold our somewhere. What do you think about establishing the strong

3. privacy of law or regulation from the government?

4. "For past a few years, several pieces of the legislation have been introduced in Congress, but the results were not give us the successful answers so far" to secure the data information while using any types of telecommunication tools. How strongly do you agree that establishing cryptography law helps to secure the data information in the modern society?

Strategy parameters survey:

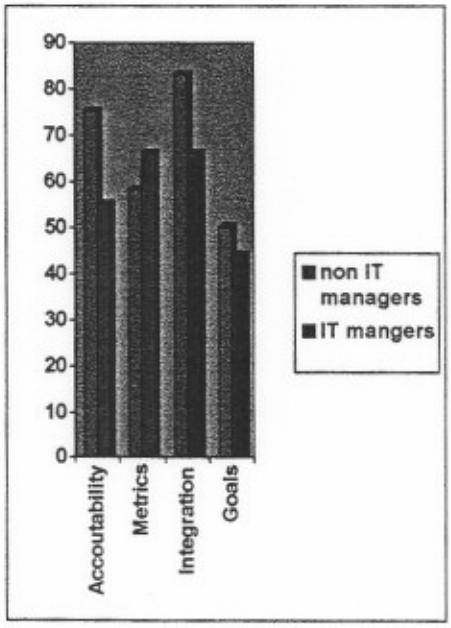
This questionnaire was developed based on the study done by IBM, previously referred to in this paper. The purpose is to compare the data we get from this survey to the IBM's survey, and see if we can draw any conclusions from comparing the data from the two studies. We might also show that companies are still facing the same problems in trying to align IT with the business strategy, since the IBM's study was done in 1994
This questionnaire was mailed to 23 managers from five different high tech companies. We received 21 responses. Nine it managers and 12 non IT managers.

1. What Information Technology weaknesses would hinder you from achieving the objectives in your business plan?
2. What Information Technology strengths would help you in achieving your business plan objectives?
3. List some objectives that could help integrate Information Technology into the company's business plan.

We only received responses from three IT managers, so the data is probably not accurate. But just as a comparison we put the data in the chart.

Enablers:	non IT managers	IT managers
• Accountability to the customer (Business units)	9 (75%)	5(55%)
• Developing Metrics for IT' performance.	7 (58%)	6(66%)
• 3. Integration into the working groups before the VP level.	10 (83%)	5(66%)
• IT goals should be consistent with other business units.	6 (50%)	4(44%)

From this chart we can see the importance of integrating IT into the working groups before the VP level. We can conclude from the responses that upper management is integrating IT into the business strategy, but it seems that there are small or no integration plans at the projects level.
Accountability to the business, customer satisfaction, and consistent support levels are three other issues brought up by our survey.
Comparing it to the study done by IBM (even though it is not the same magnitude of research), we see that five years later Information Technology department and companies are still dealing with same problems trying to align IT with the business strategy.



Appendix IV The methods of the data information stealing

1. Steal the source code

One of the common attacks is to steal the code off from the Internet. For example, some automated mailing list tools, the cyber punks mailing list and the bug track list, often have source code that exploits a particular vulnerability. These mailing lists are used by the good-guys to quickly hunt down and repair vulnerabilities, but let us supposed that the information also gets out to the bad guys, who create automated attack tools. The situations can be worse when the confidential documentation is lost.

2. Remote Port Scans

It is a method of scanning valid user IDs and start guessing passwords. It is quite often getting other important information used in break-ins and remote entry without a password may be possible via remote procedure calls, such as scanning of all the UDP (User Datagram Protocol) and TCP (Transmission Control Protocol) ports on the remote host. The loss of the data information can be neither predicted or be recovered.

3. Anonymous ftp login

Many organization sites are configured to allow anonymous users from over the Internet to use the File Transfer Protocol (FTP) as a means to get and store files. For example, many archive sites use this protocol to grant remote access to freely available software or digests of mailing lists. Depending on the version of FTP and how it is configured, many attacks are available. A simple tool can be built in a few minutes to try anonymous login, type a series of commands, and store the results for later analysis.

4. Fake Mail

Fake electronic mail is easily created, easily stopped, highly valuable as a tool for abuse, and commonly overlooked. Writing a program to fake mail can be done by simply looking at the specifications of how electronic mail works, which takes a few minutes. There are widely available pre-made scripts for faking mail, and they have been around for at least ten years. The fake-mail script allow altering incoming mail so that the return address routes through attacker's server. It is very crucial for an organization when its competitors attack with fake-mail to get the information that should be confidential.

5. Send-mail Bugs

The send-mail bugs found over the past several years has been posted to widely read mailing lists and it is the most common program that anyone can get from the Internet. The bugs can hack the source code was posted in an organization and the attack became accessible to anyone.

6. Remote Procedure Calls

Remote procedure call vulnerabilities are almost universally caused by improper configurations on hosts. These vulnerabilities are designed into systems as features to increase the convenience of remote access. If improperly set, they may allow remote access without passwords from anywhere on the Internet.

7. Intercept signal of the mobile phones/pagers

One day, Mr. Smith has to be astonished by his/her monthly charged bill of his cellular phone since total amount that he needs to pay is a couple thousand dollars. So, he calls up the service provider and finds out that he has to pay those air hours intercepted by somebody. It is true that these kind of signal intercepting crimes become so popular in the metropolitan area and is very easy to buy the signal intercept device from the Internet.