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Impact of Information and Computer Technology On the Workers of Tomorrow

By

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Abstract

This paper should be of interest to people who are interested in information and computer technology and it relationship to the development of people to contribute in our society. This research project argues that information and computer technology plays a central role in the development and changes to our social, business, family and educational areas.

Using a grounded theory methodology, the data are gathered, analyzed and formulated into ideas and theories about what is happening and the role of information and computer technology. It reviews the information gathered through detailed research. The theories and generalizations are generated from and grounded in the categorized and coded data. This information is augmented by current theories to help develop new generalizations and theories. The explanations are specific to the area of study but could be further extrapolated to other areas with additional research or elaboration.

The information gathered indicates there is a gap between what people feel is important for developing a person into a functioning and successful human being and what organizations feel is required to develop a "worker" for today's organization. People understand the role technology needs to play for organizations in business, but they do not share the same eagerness to embrace technology when developing the skills, knowledge and learning for the children in the educational institutions.

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This paper is dedicated to

Chelsea and Jarrod

Chelsea and Jarrod, I embarked on this research project because of my concern for your future and your development into life long learners.

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GUI Graphical User Interface

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Introduction

This paper discusses the relationship between information and computer related technologies (IT) and the development of skills, areas of knowledge and learning. The following will introduce the purpose of the research and provide a brief summary of what is contained in the remainder of the paper.

In the years leading up to my thesis research, I observed many disturbing situations. The situations included the use of information and computer technology and the obvious lack of other skills or knowledge. These experiences were work and non-work related. This lead me to wonder:

> *What is the relationship between the introduction and use of computer and information technologies and the development of other skills and knowledge?*

It is apparent in all these situations that the people lack skills, basic knowledge, approaches and processes required to do their jobs completely or to function as active participants in society. Victoria Branden (1992, p.59) summarizes problems she sees in the following statement:

> "Education system is turning out people with such low skills and placing them in responsible positions, but that the people themselves seem contented with such low standards, and display no embarrassment or concern for their poor performance".

Postman (1996, p.173) questions the learning and development process of the student in the following excerpt:

> "How is it possible that no more than one in one hundred students has ever been exposed to an extended and systematic study of the art and science of question-asking? Students are exposed to a minimum amount of these studies. Is it because they are more time consuming, or that industry and technology don't deem them as important?"

The following section will describe some of the experiences leading to this research project. Over the past 13 years or so, in my work environment, I have observed many disturbing situations involving people and information and computer technology. All of

the situations appeared to be related to the introduction and rapid deployment of computer and information technology in the work place. In the first situation I was surprised at our inability to find people with "broadly based" general skills. We were looking for people to work on project teams with specific skills and areas of knowledge, namely analysis, design and development, but we could not find people with the right mix of skills and knowledge. Most of the people had been trained in specific skills but lacked the general and theoretical skills required to make them more versatile and adaptable in the project environment. A good number had trained to be Visual Basic or Powerbuilder programmers but they did not understand design and development theories. They were unable to adapt to new tools and situations without re-training or "re-tooling", to use a 'technical' term. Other candidates did not have interpersonal and basic communication skills, including writing and verbal skills. I began to wonder what these candidates were lacking.

A second situation occurred within the information technology department. We developed and supported different applications and systems. Different people were assigned to different teams. During these team projects I had the opportunity to observe many situations where team members could not relate to other people on the team or to people using their programs. These people could not see outside their "skill" area, their 'box'! For example, if they were programmers in Visual Basic, they did not understand or relate to (or care to relate to) the people using the products or the other IT people outside their "skill" areas. Nor did they understand the concerns expressed by others. They were unable to develop the "big" picture of the business, technical and people environment around the project. I wondered why they appeared to be unable to visualize this "big picture" and care for the impact they had on the world around them.

While on different projects on numerous other occasions, I observed situations where people would be given jobs within their specific skill area, however, when the projects evolved and the "jobs" changed, these people were unable to adapt and change to the new tasks at hand. They could not expand their "area" or "box". They did not know how to respond, how to start nor how to proceed with the "new" task at hand. When asked to resolve a problem outside their area they were completely lost. Why were they unable to adapt what they had already learned to the new situation?

Bob Davis (CBC, 1998/1999) states a good example of changes in learning in the following:

> "My job in the last four or five years has been to analyze what this is all about, this change, this playing down of knowledge and this playing up of skills. And what does it leave out? It leaves out the mind. Mentally skilled but mindless. It's using a little piece of the mind, because it's supposed to be mental skills. But the mind, in the sense of the part that is you and your feelings and your place in the community and the part of you that might change your situation for the better, is not really take seriously. The way I put it is, the skills aren't anchored."

Among my friends, family and acquaintances, I have observed many changes in children's skills and ability to play and observe the world around them. I have observed children who lack skills to read, write (writing or printing), communicate and articulate their ideas adequately to others. These children are advancing through school but they have not developed these basic skills. On other occasions I saw children who were unable to visualize things to do and play without computer technology at their fingertips. At a cabin on vacation, I observed children who did not know what to do with themselves, because there were no computers, video games or technical toys to play with. They were unable to decide what other alternatives were available to them. Moreover, I observed children (and adults too!) appearing to not understanding the impact of their activities on others, and not caring. Why are these kids appearing to be

unable to play without computer technology? Why are they not developing the basic skills? Why are they showing less care and responsibility for their actions?

Sarah Martin (CBC, 1998/1999) sites an interesting education example, involving the changes taking place:

> " What do you do if you're in this kind of situation when you've been taught some things, but you don't really have the tools to write a really good essay using good English. And she said, "Follow me," and we left the classroom and walked down this hallway to this closet that was locked. She unlocked it and went in to this closet full of old text books and pulled down this brown textbook from the seventies that said "Mastering Effective English." She handed it to me, and she said, "Now, technically this is school property, but you can have it because we don't use it any more."

These observations and questions initiated my research in this area. I began to formulate a list of questions to answer. These questions helped me to do my initial background context research and formulate my interview and detailed research approach. Below is a brief listing of some of those questions.

1. What is the driving force behind this change in skills and knowledge?
2. What is the role of information and computer technology in organizations and education?
3. What types of guidance and support are lacking for students?

After observing these things, I had many ideas and hypotheses on what was happening. But one thing was certainly apparent, several people did not seem to have the specific skills and areas of knowledge needed to do their jobs and effectively function in our society.

Before proceeding, I would like to define what I mean by society. "Society" as used in this paper refers to the people living on the North American continent. For the most part, this analysis concentrates on information technology, business, people and societal information for Canada and the United States. Some global information was available,

mostly from a historical perspective. Some discussion will focus on the current trends in global business and trading. Most of the findings could be extrapolated and validated through further data gathering and analysis to determine potential global effects.

This research commenced with a contextual literature review to determine what had been said and found to date in this area. A great deal has been written on the historical development of technology in civilizations, the changes to education and the impact of technology, but not a lot tying the three together. This contextual research helped me:

1. To understand the historical changes to civilization and how technologies evolved with civilization and how technologies impacted civilization and caused some of the changes.
2. To understand the changes to culture and society over time, including the impacts of technology, and more specifically information and computer technology.
3. To gain an understanding of what issues and concerns have been addressed to date.
4. To learn if other technologies had such a profound and broad reaching impact on all facets of society, in a relatively short period of time.

From this contextual research, an understanding was gained of how historically technology and civilization had evolved. This information was beneficial in helping to learn how the infiltration of computer and information technology is different and similar. This research assisted in organizing and structuring my thoughts in preparation for my detailed research. The interviews and detailed research followed a grounded theory methodology where theorizing is grounded in data collected, coded and categorized, and evolved as the research continues.

What the following will show is this issue is more complex than just the impact of information and computer technology on specific skills and areas of knowledge. The

paper begins with a description of how technologies could be classified to help everyone understand the subsequent discussions. It is followed by a historical literature review discussing the development of technology to date. This is followed by a description of the research method and approach and describes how it evolved over time. The next section discusses the information gathered from the detailed research. From the raw data, I begin to draw conclusions in a discussion section. I conclude with an attempt at theorizing what was found, supported by the raw data and the observations of other theorists. This section concludes with a discussion of where we go from here. The final section discusses my impact on this research project as the researcher.

The Literature Research

The first stage of my research project commenced with an extensive contextual reading exercise. I reviewed historical to present day information on technologies and their relationship to society and culture. This search included books; articles from journals, magazines, white papers and research papers; Internet information; special transcripts on related topics; and newspapers. All this information was documented and categorized for use in support of my detailed research project. The following summarizes the information reviewed in the extensive contextual reading:

- **Literature on the historical evolution of technology.** There was a desire to learn how technology had evolved with civilization. It was important to determine whether all technologies had such a profound and rapid impact on civilization and how technologies affect each other. This helped to evaluate if the infiltration of information technologies, we are struggling with today, are different than historical technological advancements, and what are the differences and similarities.

- **Literature on the historical evolution of education.** This was done to understand how education had evolved over time. It was considered important to understand the issues and concerns during this evolution. This helped to evaluate if the educational issues we struggle with today are different than those education historically faced, and what are the similarities and differences.
- **Literature on technology's impact on society.** This reading concentrated on technology's impact on society. It was important to understand how technology was impacting our society and culture. Also, how different authors predicted this impact would affect our future. This provided an understanding of some of the issues and concerns already raised by others and what they saw in our future. This was compared and contrasted with my findings.
- **Literature on education's impact on society.** This reading concentrated on problems and changes in education and education's impact on our society. It was considered to be important to understand how the evolution of education was impacting or being impacted by the cultural and social world around it. Also to understand what authors' felt were the underlying reasons for this conflict between education and society.

The next section is included to set a framework on the basis of which technology and its uses will be described. If we understand the historical development and evolution of technology, it will help us to explain how information and computer technology has evolved. This information can further be used to support and explain our research findings. It is not intended to be the only way of viewing and categorizing technology and its impact but as a simple easy to use perspective. This description of technology is based on Arnold Pacey's book *Technology in World Civilization (1996)*. Other authors like Neil Postman and Andrew Feenberg allude to similar categories in their works.

Technology and Its Historical Context

Technologies have been around since the start of civilization. Technology according to the Webster dictionary (1987, p.1015) is "the science of technical processes in a wide, though related, field of knowledge". All facets of our life use technologies, some are simple technologies -- tools for gardening -- others are more complex technologies -- technologies for generating electricity or telecommunications. We have been adapting and using technologies to better our society, to grow food, to advance health sciences and to expand our knowledge of the world and universe around us.

Types of Technology

There are many different types of technologies. There are many ways to classify and categorize technologies. To aid in the discussions, the categories outlined by Arnold Pacey (1996) have been chosen. This is not an exhaustive list of categories but will serve our purposes in this research project as many of his categories are commonly used in our society. What is interesting is different pieces of the earlier technologies, largely on the scientific side lead to the computer, telecommunication and information technologies of today. The types of technology are summarized in the following list:

1. Survival technologies: "basic support for increasing numbers of people" Arnold Pacey (1996, p.1).
2. War technology: developed during times of war or conflict -- guns, ammunition, canon, armour and swords. Often these technologies were used in innovations and inventions in other areas of society, including organizational and manufacturing business procedures and processes -- industrial and manufacturing technologies.

3. Science technologies: Astronomy, medical, natural and social sciences. Some of the technologies evolved from the science technology are Environmental technologies, Railway and transportation technologies, Public health technologies.

4. Information technology: Evolved from the science technologies and other earlier technologies, and includes telecommunication and computer technologies. It is concerned with the creation, storage and transmission of information from person to person, and place to place, over greater and greater distances.

How Technologies are Adopted or Developed

This section is important to discuss here because it helps us to understand how information and computer technology has been transferred and adopted in organizations and education. It helps support my discussions of how and why technology has a big hold on our lives and imaginations.

Technology develops in many ways. The first is by pressures to resolve a regional problem. This leads to innovation and independent invention. Independent Invention (Pacey, 1996, p.51) occurs when "people with comparable environmental problems will often come up with similar inventions quite independently" (Pacey, 1996, p.59). Independent invention occurs without any recognized transfer of knowledge. The second occurs when technology, information or equipment is taken directly from one society to another. This is called a Transfer of Technology (Pacey, 1996, p. vii). The third occurs as a follow up to a transfer of technology. When a transfer of technology

occurs it often sparks new ideas, adaptations of the technologies to local conditions or an invention of a new technology more suited to the local conditions. This is called Responsive Invention (Pacey, 1996, p. vii).

Adoption of new technologies by a geographical and social region often caused resistance and disruption to the social order. Transferred technologies from one region to another, as Arnold Pacey (1996, p.viii) suggests, was often met with resistance. Programs designed to encourage the transfer of technology from industrial nations to "less developed", "under-developed" or "deprived" countries have often been frustrated because they have not allowed for "responsive invention" in the countries on which they are "imposed". Industrialized nations often equated the lack of "engineering" endeavours with a lack of "technology". Often, the technology transferred does not function well and is ultimately abandoned. This is due to the technology not being "a good fit" for the area's social and geographical conditions, or the region's people do not accept it. This has been repeated throughout history especially amongst Western civilizations. The following is an example of this.

> "Western agriculturists too often tended to think in terms of imposing transfers of technology from supposedly more 'advanced' regions without allowing for local knowledge, experiment and innovation. Too often, also, they appeared to think about agricultural techniques developed in more northern climes as if these were based on universal principles to be applied everywhere without regard to 'ecological particulars'. For example, they tended to advocate large fields, each planted with a single crop rather than a mixture of crops, despite the ecological advantages of the latter and the good results obtained that way by African farmers following their own tradition. ... Nearly all these projects were disappointing and some were ludicrous failures. Tractors broke down, irrigation schemes were less productive than expected, there was a loss of diversity in cropping and a failure to appreciate the importance of trees in African agricultural ecosystems." (Pacey, 1996, p.196)

What people fail to understand is there are many different types of technologies, some require more mechanical equipment and more defined processes and others require more knowledge and refined expertise. If the technology suffices for the situation, it is

deemed successful. Arnold Pacey (1996, p.190-191) says we require an approach sensitive to local environments and techniques. Perhaps this is a lesson to be reflected upon for the issues being addressed in this paper. Is there a correlation between the disruption and turmoil many feel during a transfer of technology and what is happening today with the expanding use of information and computer technology?

Technology and Its Current Context

The following section outlines some of the information other authors have written about technology. This information is important to help explain and support the findings later in the research paper. The discussions here help us to understand how technologies have evolved and help evolve our society. This information is later used to help support and explain why information and computer technologies are impacting organizations and education the way they are today.

According to Postman (1993), there are three different cultures, developed around tools and technologies: tool using, technocracies, and technopolies.

Technologies developed to aid human beings to complete tasks, to survive or remain healthy are part of a "Tool User" culture. The technologies and tools were developed:

1) To solve specific and urgent problems of physical life (plows, shovels, spinning wheels, waterpower, windmills, etc.); or
2) To serve the symbolic world of art, politics, myth, ritual and religion (castles, cathedrals, clocks) (Postman, 1993, p.23).

With some exceptions, tools did not prevent people from believing in their traditions, in their God, in their politics, in their methods of education, or in the legitimacy of their social organization (Postman, 1993, p.23). For example, the earlier clocks were

invented for astrological purposes to help track the movement of the sun and stars and to help track religious holidays.

Postman (1993) refers to the second culture as a "Technocracy", where the tools and technologies in this culture are not integrated into the world but attack and change the culture. Samples are mechanical clocks, telescope and printing press. The tools become part of the culture and eventually appear as a natural part of the culture. Traditional and technological worlds co-exist in a precarious balance, often in conflict and continuous battle for position. Tools bid to *become* the culture, giving us easier ways of doing things and challenging the traditional techniques. As a consequence, traditions, social mores, myth, politics, ritual and religion have to fight for their lives (Postman, 1993, p.28).

Postman (1993) refers to the third culture as "Technopolies" where technologies and tools are allowed to advance to the point that they eliminate the traditional world and display the technological as the only world. In a technopoly, the technology makes alternatives illegal, immoral, invisible and therefore irrelevant. There is structure or basis for order in Technopolies. Technophiles are advocates for the technopoly as they "see only what new technologies can do and are incapable of imagining what they will undo" (Postman, 1993, p.5). In a Technopoly, technology takes control by redefining what we mean by religion, by art, by family, by politics, by history, by truth, by privacy and by intelligence. Technology becomes institutionalized and rationalized into society and endorsing itself as the only solution or way of achieving our goals. People define things in relation to technology instead of based on traditions, social, moral, and ethical standards. Postman calls the United States a young technopoly. This tendency in the United States is important for us to recognize, as we tend to follow in their footsteps. In

a technopoly, human beings are, in a sense, worth less than their machinery (Postman, 1993, p.52). Historically, the industrial revolution did this on a smaller scale when machinery displaced many of the workers, and was justified based on how it benefited commerce and improved profits and was not necessarily evaluated for its negative impact on the family income.

Andrew Feenberg supports Postman's views when he discusses technology and its power and impact. Feenberg (1991, p.79) says it is a dangerous situation where technologies have the power and control to make strategic choices among alternative rationalizations without regard for customary practice, workers' preferences or the impact of decisions on their households. Andrew Feenberg (1991, p.28) further supports the breakdown in our social system in his statements about the advancement of capitalism:

> "As capitalism shatters traditional social units, the force of collective incentives increases. The modern individual emerges as an isolated economic agent motivated by private incentives and expecting no payoff from loyalty to any larger social unit."
>
> "Never before have human beings organized their practice in fragments, and left the integration of the bits and pieces to chance."

Franklin (1992, p18) provides us with an alternative view of technology when she classifies technologies in two ways: holistic or prescriptive. Holistic technologies are technologies where people work together or individually and each individual has control over a particular process of creation or doing something. Craftsmen and artists are examples of people working in holistic capacities.

Prescriptive technologies are technologies where the tasks and processes are broken down into clearly identifiable steps. A different worker, or group of workers, carries out each step. The worker needs to be familiar only with the skills of performing that one step. There is little latitude for judgment. Prescriptive technologies are control-related technologies, addressing the process of workflow and increasing control over the

operations. Prescriptive technologies are the dominant technology today. They have helped develop the dominant management techniques in production, administration, social services, government and industry. The logic of technology begins to overpower and displace other types of social logic, such as the logic of compassion or the logic of obligation, the logic of ecological survival or the logic of linkages into nature (Franklin, 1992, p.95). Technology treats this logic as irrelevant and masks its visibility and importance. This comes with an enormous social mortgage and loss.

Technology's impact can be further discussed in an isomorphic framework that helps to explain organizational and competitive behaviors. According to DiMaggio and Powell (1991):

> "Elaborate important mechanisms by which institutional effects are diffused through a field of organizations, and they emphasize structural isomorphism (similarity) as an important consequence of both competitive and institutional processes". (1991, p.31)

DiMaggio and Powell (1991, p.67) outline three types of isomorphism – coercive, mimetic and normative. Coercive isomorphism (DiMaggio and Powell, 1991, p.67) results from both formal and informal pressures exerted on organizations by other organizations upon which they are dependent and by cultural expectations in the society within which the organizations function.

Mimetic Isomorphism (DiMaggio and Powell, 1991, p.69) occurs when organizational technologies are poorly understood, when goals are ambiguous, or when the environment creates symbolic uncertainty, organizations may model themselves on other organizations.

Normative Isomorphism (DiMaggio and Powell, 1991, p. 70) stems from "professionalization". We interpret professionalization as the collective struggle of members of an occupation to define the conditions and methods of their work, to control

"the production of producers", and to establish a cognitive base and legitimacy for their occupational autonomy.

Capitalism, Globalization and Technology

This section is included because it is important to understand the relationship and interdependencies between capitalism, technology and globalization. It also helps us to understand how information and computer technology is influenced by capitalism and globalization.

As processes and management of profits developed, largely after the industrial revolution, so did the foundations of capitalism. Capitalism is defined in the Webster dictionary (1987, p.146) as "an economic system in which the means of production, distribution and exchange are privately owned and operated for private profit". Capitalist ideas are rooted in Social Darwinism. Social Darwinism encourages self-assertion, will, power, domination and elimination. According to Martin Bowles (1997, p. 789), when a society and economy becomes monopolized by will and power, it can only promote regressive individual and social experience, due to its one-sidedness. This could equate to "survival of the fittest" or "profit for the fittest". It encourages a war of all against all where any sentiment of care and love has virtually disappeared. Also, in a capitalist society, excellence and competence are rewarded. Companies gain more market share, influence over others, and global recognition, making them more eager to adopt new technologies and do what it takes. It gives them justification to proceed in this fashion.

Many of the gains of capitalism have been accompanied by many negative creations. Postman (1993, p.44) states "Technocratic capitalism created slums and alienation". Though these were perceived as evil and should be eradicated, it has not been accomplished to date. Martin Bowles (1997, p. 786) discusses the Myth of Social

Darwinism that states as the frontiers of capitalism have expanded globally, competitiveness has increasingly become the hallmark of organizational life in the 20th century. The drive for performance, market share and penetration, return on investment, and profit are the critical indicators through which organizations and management assess their competitive positions. Technology plays a key role in this process-oriented and measurable environment. As capitalism develops, rivalry and competition between people increases. Technologically, capitalism tends to encourage mass control and dissemination with little consideration for social and cultural impact. Andrew Feenberg (1991, p.142) suggests in our future a need for a "new pattern of technological progress yielding innovations that overcome the sharp division of mental and manual labour, characteristic of capitalism". Competition leads to the application of new knowledge to the economic system, such as the use of technology to improve profitability. Also, capitalism and competition can help generate needed capital for societal and cultural benefits.

As competition between companies, people and countries has increased, a global market place has developed. People, businesses and countries are trying to develop a common ground for sharing technologies and trading products to aid in their country's survival and economic prosperity. Globalization is still in its early childhood but will likely pave the way to common trading and standards, adjusting the importance of culture, society, meaning of country, and community. Telecommunications and advanced computer technologies have aided the advancements in globalization by making trading and communications more accessible by bridging the distance gap. Globalization is diminishing the importance of political boundaries between capitalism, communism and socialism. Though global economic activities are important, social and cultural requirements must not be overlooked. Ursula Franklin (1998, p.14) warns that nothing

short of global reformation of major social forces and of the social contract can end this historical period of profound and violent transformations, and give a manner of security to the world and to its citizens. Postman (1996, p.66) states globalization further encourages interdependence and global cooperation, of what is at the core of humanness; a story that depicts waste and indifference as evil; need for "all" people, cultures and races to work together for common goals.

As capitalism grew it used information and computer technologies to gain control of the organizational environment. It developed procedures and processes based on information collection and manipulation. It managed the direction of the business based on the information made available through statistical analysis, real-time on demand availability of information, increased use of applications and other computer technologies, control of processes, increased electronic communication and the sharing of information. As globalization has increased the power and spread of capitalism, it has increased the power and infiltration of information technology, used to help control, analyze, measure, disseminate and manipulate information. This has changed the social and cultural business environments to support and manage business in ways numerically and statistically measurable, using information and computer technologies.

Education and Its Current Context

Technology has further infiltrated into the educational sphere. As technology spread throughout the rest of society, the pressure on education to comply has increased. There have been many changes and transitions within education. Many of the changes have been caused by demands of the business community. In the 19th century, there was a significant extension of the public education system. It was believed that by further educating people they would be more employable. Beginning with the industrial

revolution, the "right" to an education was a very powerful shift in society's beliefs. Children would not be expected to earn a living. This change in thinking was aided by the development of the labour unions. After this change was implemented, there was a rapid diffusion of literacy, further enhanced by the opening of public libraries and the increased availability of magazines.

There have been many shifts since then on what should or should not be taught in schools. A melancholy development of the Sixties decade, which has contributed materially to the degradation of language, was a belief that good grammar, correct pronunciation, precision in the use of words all that gave English its elegance and clarity -- were no longer important (Branden, 1992, p.150). Many schools decided that it was not necessary to teach grammar and they used ill-advised methods for teaching reading and almost precluded the mastery of spelling (Branden, 1992, p. 18). This movement may have been one of the factors that initiated today's increasing problems with the lack of reading, writing and grammar skills.

Victoria Branden (1992, p.60) says "there is a push today to not teach spelling at all in early grades, just to teach sounds." The impact of this will not be recognized for years to come. She says this will just aggravate the current literacy problems. Branden says there is confusion about the importance of education. People either feel it is not important to their job or life, or they are so busy with work, they are not paying attention to the problem. Trends in the disintegration of grammar and language are seen in educators, government officials, writers and journalists as well. An example is:

> "Recently I heard a politician demand that the Prime Minister be required to give "a more fulsome answer" to some parliamentary questions – terrifying suggestion. Mr. Mulroney is fulsome enough as it is, in all conscience. Surely the man didn't *really* want an answer that was more "offensive to normal sensibilities; cloying by excess of flattery, servility, exaggerated affection," did he?" (Branden, 1992, p.8)

Another problem is children progressing through the education system with sub-standard skills. Postman says students, being passed through the system without the basic skills, are often blamed on the large class sizes where the students' sub-standard skills are not recognized, due to lack of individual attention and evaluation. According to Postman (1996, p.60):

> "Our citizens believe in two contradictory reasons for schooling. One is that schools must teach the young to accept the world as it is, with all of their culture's rules, requirements, constraints and even prejudices. The other is that the young should be taught to be critical thinkers, so that they can become men and women of independent mind, distanced from the conventional wisdom of their own time, and with strength and skill enough to change what is wrong."

However today, these reasons for schooling are often over shadowed by technology and industry requirements. Postman (1996) summarizes the "gods" that students currently serve, as follows:

1. Economic Utility: "if you pay attention at school and do your homework and score well on tests, and behave yourself, you will be rewarded with a well paying job when you are done" (p.27).
2. Consumerism: "Goodness inheres in those who buy things, evil in those that do not" (p.33).
3. Technology: "People believe technology works, that they rely on it, that it makes promises, that they are bereft when denied access to it, that they are delighted when they are in its presence, that for most people it works in mysterious ways, that they condemn people who speak against it, that they stand in awe of it, and that, in the born-again mode, they will alter their lifestyles, their schedules, their habits, and their relationships to accommodate it. If this be not a form of religious belief, what is?" (p.38)
4. Tribalism / Separatism: "'Multiculturalism' aims at is not reconciliation with Eurocentric history and learning, but a thorough rejection of it so that a new beginning may be made, a new narrative constructed."(P53)

Today, the world is struggling for new "gods", new scientific recipes, new ideologies, new control systems and new social and family structures by which to live.

As the world struggles to make sense of things and the changes taking place, the education system struggles with many curriculum issues. A primary question is what should and what should not be included for a good education? Bob Davis (CBC, 1998/1999) indicates our education is confused over the meaning of skills.

> "The emphasis is not on how this will help us as citizens to understand our society and its past and what its future could be. It's, we're learning how to do it, if we need to do it. And this is shot through the whole of this new 'conventional wisdom of education'."

Victoria Branden (1992, p.83-87) suggests there are movements, often rights or extremist groups, that are trying, for reasons of political correctness to ban literature (from writers like Chaucer, T.S. Eliot and Shakespeare, to books like Huckleberry Finn and Roots), and language. They are attempting to prevent people from studying and learning of those historical times, such as the holocaust, slavery or racism, and learning of the hardships endured. Nevertheless, supporters of the historical literature and language, like Branden and Postman, say we are better to study and learn from history then to repeat the same mistakes. The attempts by groups to suppress the studying of historical literature and language is just making matters worse, increasing the multicultural fighting and often causing segregation and racism to flourish. Postman (1996, p.84) adds that by failing to reveal the story of human beings as world-makers through language, they miss several profound opportunities. As Ursula Franklin (1998, p.127) warns,

> "To *marginalize* or *discard* such direct evidence *removes* an important source of knowledge from the task of decreasing the domain of ignorance".

As the availability of information increased, the pressures on education to utilize technologies increased. Technology in education has had mixed acceptance over the

years. Technologies are being introduced without an assessment of the impacts on students, teachers and education. As Marital Moll states (CBC, 1998/1999),

> "In Canada, the Department of Industry set up a 'School net' to oversee and encourage the computerization and networking of schools. The board of directors included a number of large computer and communication companies. No clear distinction was drawn between the public good and the private. The consequence has been increasingly close links between schools and corporations."

As Neil Postman (1996, p.189) says, "Technology may have entered schools, but not technology education".

Technology education would include: learning about the evolution and history of technology, how and why it works, and the benefits and costs of such technology. The skills the educational system is designed to deliver can be obtained, with or without computers. Postman (1996, p.26-27) warns too much apparatus, like too much bureaucracy, only inhibits the natural flow of teaching and learning. Interpersonal environments in education tend to foster learning and currently teachers have the control to monitor and nurture this environment to help achieve those goals. Ursula Franklin (1998, p.28) says

> "The magical moment when teaching turns into learning depends on the human setting and the quality and example of the teacher -- factors that relate to a general environment of growth rather than on any design parameters set down externally".

She wonders, "If we remove the teacher's style or alter the environment, will learning be jeopardized?" Education is very important because it develops the workers of the future. We cannot afford to waste the energy and potential idealism of the young. As Chris Brazier (1999, p.24) indicates:

> "Teachers, like children, nave become subject to the productivist view of education which runs the risk of seeing teachers as just another 'input', not quite as costly as a classroom but much more costly than a textbook."
>
> "Education's success can only be gauged according to what children have learned, in the skills, lively minds and values they carry with them into life beyond school. The teacher is no less vital to that learning experience than she or he has ever been. The modern world may be bursting at the seams with information but: 'You need a teacher to sort out the information from the data that surrounds the student; you need a good teacher to sort out

> the knowledge from the information; you need an excellent teacher to sort out the wisdom from the knowledge."

Postman (1996, 46-48) warns us not to allow technologies to work against learning of "social values", including an understanding of democratic process. Technologies cannot teach the "making civilized people".

Andrew Feenberg suggest that to develop a knowledgeable workforce, we must "over invest" in education now to get the skilled workforce required in the future. Feenberg (1991, p.28) concludes that we want to avoid creating a work force where

> "Technological advance not only subordinates workers to capital, but disenfranchises them. Society has no incentive to teach and they have none to learn the knowledge that would qualify them to participate in the social decisions that concern them. This is the knowledge deficit."

Education is viewed as a key part of achieving the highly skilled work force. Andrew Feenberg (1991, p.153) advocates:

> "The initial 'over investment' in education would lead to the introduction of new technologies adapted to a highly educated work force. Not technology but democratic social change would lead the transitional process, with technological process an outcome rather than a cause of establishment of new social relations."

Scope and importance of education would broaden accordingly and in this context the acquisition of knowledge and skill would no longer appear as a subtraction from individual welfare but as a component of it. In other words, knowledge can be seen as intellectual capital which when properly invested and applied will produce relevant technology.

This section indicates that the effects of technology on business and education are multi-faceted and complex. The authors warn about an over reliance on technologies and an under-reliance on interactive personal teaching and our own experiences and instincts. They warned about the changing of education for the benefit of capitalism, organizations and technology. They indicate people need to carefully look at the role technology plays

in our society and critically determine how to best utilize it to benefit society. People agreed there are other considerations for developing a person to work and function in society. The interesting thing is everyone was talking about technology in the different facets of life but not so much in the "big" picture scheme. It is also interesting to note the over all trend of "change" – changing organizations, changing direction and changing social values. As will be shown in the raw data section, the respondents are seeing and being impacted by "change" and "uncertainty" in similar ways to those indicated in this section. I used the literature review information to develop the questions and strategy for the remainder of my research. From the initial literature research, an initial set of questions evolved. The primary question I set out to answer was:

How was information technology impacting literacy, language and culture?

Since this question needs to be addressed, a list of basic questions was created for my interview research. The interview questions focus on answering the following questions:

1. How and why are the industry (IT) and education changing?
2. For industry and education, what skills are important? Of those what is lacking or should be focused on?
3. What is or should be information and computer technology's role, now and in the future?

This literature helped me to focus my questions and detailed research. It helped to outline the information on computers and information technology and the development of skills and areas of knowledge. This information also helped me to understand the issues and organize my strategy to find out more about the role of technology. The following section identifies how my research project was structured.

Research Method and Approach

The following section describes the approach taken in this research project, the research scope, and the reasoning behind using this approach. It will also outline the evolution of the approach and the reasons behind the changes.

This research project follows a grounded theory methodology. I chose to use a qualitative approach for the following reasons. First, qualitative research allows one to gather, through the interview process, current views of people within our social setting. This information is largely qualitative in nature and cannot be represented in a quantitative format without losing its depth, meaning and validity. Second, my approach to information gathering was a combination of field research through interviews and historical – comparative research, both of which are qualitative research methods. Third, qualitative research allowed me to come in direct contact with the people struggling with the problems and to gain a better understanding of the issues at hand. Fourth, qualitative analysis gathered through the interviews provided information about detailed personal experiences and supports the inductive approach to information gathering. What I began with was an idea, gathered detailed information around the idea and moved toward more abstract generalizations and ideas. This is a natural progression tying in nicely with grounded theory and qualitative research.

Since it is related to a large topic area with tremendous amounts of historical information it was extremely important to approach this qualitative research in stages so the detailed new research could be structured in an informed and organized fashion, while allowing ideas and direction of research and inquiry to evolve and change. The methodological approach outlined by Glaser and Strauss (1967) was followed.

As stated by Glaser and Strauss (1967, p. 5), "grounded theory is derived from data and illustrated by characteristic examples of data." To them, this approach leads to generating the theory, substantive or formal. Grounded theory is different from other approaches as its concern is with data being used to generate theory not with the verifying of theory.

According to Glaser and Strauss (1967, p.3), "to generate theory that fills this large order, we suggest as the best approach an initial systematic discovery of the theory from the data of social research." Grounded theory in their view is an approach to generating theory. According to them, the roles of theory are: (1967, p.3)

1. To enable prediction and explanation of behaviour;
2. To be useful in theoretical advance;
3. To be usable in practical applications – prediction and explanation should be able to give the practitioner understanding and some control of situations;
4. To provide a perspective on behavior – a stance to be taken toward data; and
5. To guide and provide a style for research on particular areas of behavior.

For generating theory, I chose to use a comparative analysis approach. This approach has many benefits. First it is useful for creating accurate evidence, through replication and based on conceptualized categories and properties derived from the evidence gathered. These categories and properties remain until proven theoretically defunct. Second it is beneficial for creating empirical generalizations. Glaser and Strauss (1967, p. 24) state, our goal of generating theory also subsumes this establishing of empirical generalizations, for the generalizations not only help delimit a grounded theory's boundaries of applicability; more important, they help us broaden the theory so it is more

generally applicable and has greater explanatory and predictive power. Third, it helps to generate theory, as categories and properties evolve. According to Glaser and Strauss (1967, p. 28),

> "Generation of theory through comparative analysis both subsumes and assumes verifications and accurate descriptions, but *only* to the extent that the latter are in the service of generation."

Comparative Analysis through data gathering, coding and categorizing leads to generalizations and theorizations.

According to grounded theory, data is gathered until theoretical "saturation" is reached. A category's theoretical saturation (Glaser and Strauss, 1967, p 61) means no additional data are being found where by the sociologist can develop properties of the category. According to Glaser and Strauss (1967, p. 62), theoretical sampling is done in order to discover categories and their properties, and to suggest the interrelationships into a theory. This is different from statistical sampling that is done to obtain accurate evidence on distributions of people among categories to be used in descriptions or verifications (Glaser and Strauss, 1967, p. 62).

Theoretical sampling was used in the interview process. Interviews were continued until common threads were determined in the information being gathered. Glaser and Strauss state "Our strategy of comparative analysis for generating theory puts a high emphasis on theory as process; that is, theory as an ever-developing entity, not as a perfected product"(1967, p. 32). The information I have gathered could become part of a continuously evolving and expanding theoretical process.

The following details the gathering of information. I use the grounded theory approach to guide me through the information gathering and analyzing. It was a very iterative, continuously evolving and very interesting process. According to Glaser and Strauss (1967, p. 31), grounded theory can be presented either as a well codified set of propositions or in a running theoretical discussion, using conceptual categories and their properties. I have chosen to use the running theoretical discussion approach throughout the detailed research section and the generation of theories and conclusions.

Following the grounded theory methodology, the detailed research followed. During the detailed research, the literature review was continued to support and enhance the information found in the detailed interviews. Further literature research focused on the areas highlighted in the interview process. A CBC transcription of education discussions was used to gather current views of experts in education, society, culture and technology, and views of parents, teachers and students, that may not otherwise have been captured. Articles on organizational issues (like workaholics, job stressed, technology impacts, etc.), family and social issues were also reviewed. Most of the current research and information was from periodicals, transcripts and research papers. The next section will discuss the interview process.

The Interviews

This section discusses the interview process and how it evolved from start to finish. The information gathered in the literature review helped to formulate the initial interview questions used. The interview was a semi-open process and was taped with the interview Respondents' permission.

Respondents were chosen from the Information Technology (IT) business and education areas. The 16 interview participants are listed in Appendix A. This selection is acceptable in grounded theory as we are trying to get theoretical sampling not statistical sampling for the purpose of theory generation. The candidate selection was narrowed from the business/organizational community to the IT business. This allowed a focus on the issues at hand without an unmanageable number of respondents from which to choose. It was felt the impact and the problems faced by technology's infiltration are directly felt in this area. The IT business people were from all areas of the industry including programmers, network support, application development, project management, management, head hunters/contract companies, and consulting firms. This vast coverage was to ensure the views obtained were not representative of just one area of IT.

The selection of respondents, however, was not predetermined and was determined by the interview process itself, the information developed from those interviews and where I wished to investigate next. This process began with interviews of consulting company management personnel. Their statements about lack of "skills" and "knowledge" left me wondering whether other people who concentrated on hiring people for the IT industry were finding the same thing. I pursued interviews with IT headhunting or resource placement companies to investigate this possibility. After discovering their concerns were the same as those of the consulting firm, my investigation broadened. It was decided to investigate whether the people working in the industry felt the same way. This led to interviews with people working in the industry both fulltime and contract workers, and all age groups and years of experience. It was discovered that the

common trends continued throughout the groups. Some people had more experiences because they had worked a greater number of years but the trends were the same.

The education interview candidate selection process worked in the same way. Again respondents were not predetermined but were determined as the interview process proceeded and the direction of my inquiries changed. The respondents were selected from the many facets of the industry from government positions to education boards to public school to university and other post secondary institutions.

The process began with university and other post-secondary interviews, as they were the last contact for the people before they entered the work force. From there I worked backwards through the education system to determine when and where and how and why issues were developing within the education system. Government-education-related officials were interviewed to determine if they saw the same issues and problems as other education people. In most cases their views of the problems were the same, however they did not have as clear a picture of the issues and problems as those directly involved with the education of children. I interviewed people in the grade schools system to determine whether their views were similar to the others. The respondents chosen at the grade school level included teachers and educators from many schools who had worked in many schools in many areas of the city. The goal was to determine not only if they had similar views but also if they have seen different issues and problems in the different areas and schools they had worked in. Interestingly enough that was the case. Though the same views and issues were prevalent in all schools the magnitude of each issue or problem was different in different schools. This

helped to outline some of the socio-economical and family oriented concerns related to the technological impact being investigated.

The questions evolved from the literature review were used in the interviews to solicit responses from the participants in all the information areas. All the interviews opened with demographics to help structure some of the information and determine if there were differences in views based on age, experience and education. The "initial prompting" questions evolved as I moved from one candidate to the next looking for more and more information. Initial questions were more focused on skills available and required. I assumed there would be gaps emerging between what education taught and what IT required. Things were not that simple and as the interviews progressed the gap became very apparent. The initial questions on skills are a good example of this evolution.

Initially, the complete focus was on "skills". I thought of skills as all the things people required to do their job and function in life. No distinction was identified between specific skills and general broadly based skills. I knew the skills were different but did not differentiate. But as the interviews proceeded I realized there was a distinction made by many of the interview respondents between "skills" and "knowledge", so the questions were changed to reflect this. A distinction was made between specific skills learned to complete a task, like Visual Basic, and areas of knowledge that had a more general broadly based use in many tasks and situations, like problem solving. What was realized is there was more to it than simply having, or not having, skills and areas of knowledge. It was realized that the problem was much more complex and multifaceted than was imagined. The questions were expanded to collect more details about skills and areas of knowledge. The number of questions on impressions of education,

government, social changes, family and cultural impacts, and business were increased. The goal from this exercise was to help create trends and interrelationships between interview respondents and clarify their responses.

The interview process evolved as the interviews continued and it became apparent that the issues were multifaceted and more complex than originally thought. This evolution caused by analysis to shift direction and focus, and expand with the interview group. My investigation direction changed from one focused on the presence of information and computer technology to an issue focused on the role of people and organizations and the role the information and computer technology is playing in this relationship. I refined interview questions along the way to get more detailed information from the respondents. This helped me to keep focused on what was important, separate and study all the information and trigger my understanding and evolution of my theories and generalizations.

My own knowledge and understanding was broadened and deepened in this process. As with most people I had an idea of what was happening but I had not delved into it deeper than that. The interview process did help me to develop my ideas and reinforce them with the information the respondents provided. One concern a person could have with the grounded theory approach is that the research gets taken in many directions and gets too unruly for a person to handle I had to be careful to regroup after each interview to ensure I was still focusing on the area of interest.

The research may have evolved differently if a different interview group had been selected, but this testing of the theories and generalizations is for another paper or

research project. Another group might have responded differently because of their different proximity to information and computer technology. Another group may have identified different questions and issues as important in the interview process. The groups chosen are being directly impacted by this influx and may be more aware of the issues at hand. However, I believe that other groups may be seeing the same issues but may not fully understand what may be involved in the issues they face.

The following section summarizes and analyzes the information gathered in the detailed research. The information from respondents, along with the information gathered from literature, will be used to generate theories and generalizations in the final discussion section.

Detailed Research Findings

This section outlines the findings from the detailed interview research supported by the literature research, historical and present. As with most research, the research began with an idea -- there was a problem with the literacy of the younger generation, who are in school now or within the first 5 years of employment. It appeared to be related to their heavier use of technologies at play, work and school. My original theoretical concern was:

> *Information and computer technology was adversely affecting the literacy, language and culture.*

Some interview questions were developed to help determine if others saw the problems I was seeing, what others thought was causing this shift in skills, whether they saw the "key" skills improving or diminishing and why, and how and why others felt we had evolved to this point. To my surprise as the interview process continued, I learned the issues were far more complex than technology being there or not. I had thought

technology must be taught and used in schools and other skills were being replaced. But what I had found is that, "yes", funds were being taken from other education areas to fund technology and teachers did not have the training and time to use technology effectively, but technology was still not excessively common in schools a the classroom level. So what else was happening?

Data Categorization and Its evolution

The following section discusses how the raw data was categorized, initially and after the analysis was completed. The categorization evolved as my interviews and analysis continued and my understanding of the data improved.

Initially, the categorizations were fairly broad and with little inter-related structure. The data categories are represented in Figure 1.

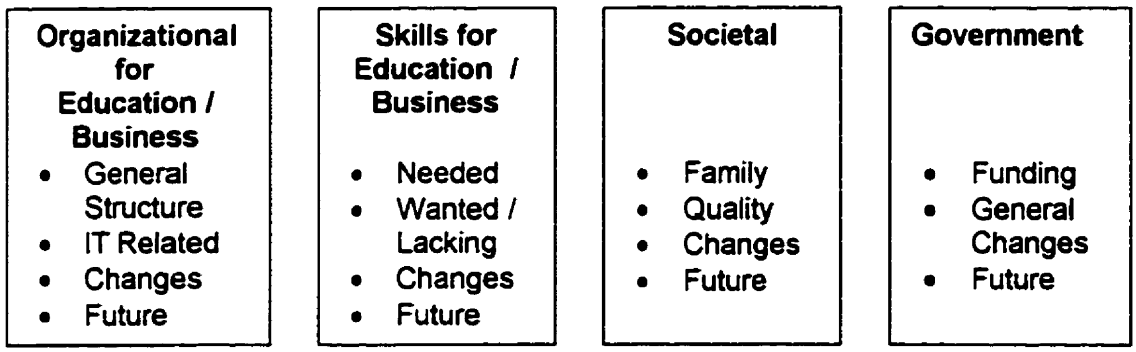

Figure 1: Initial Categorization of Data

Initially categories and themes were formed from the different types of information. As interviews continued and my ideas and understanding of the data and awareness of the trends and issues evolved, the categories and codes were refined. As analysis continued, it became apparent that the ideas at the upper level were focused on change and a feeling of loss of control associated with change. All respondents identified changes for business and education. Business and educational changes were further broken down into organizational, skills and knowledge, society, and government. Each

interview helped to support and to refine the categories and themes and helped to develop and build toward the generalizations and theories. This refinement helped me to focus on the trends and issues and develop my generalizations. The theories and generalizations were evolved and tested during this process. The data to follow will support this categorization and structure. The final categorization is represented in Figure 2.

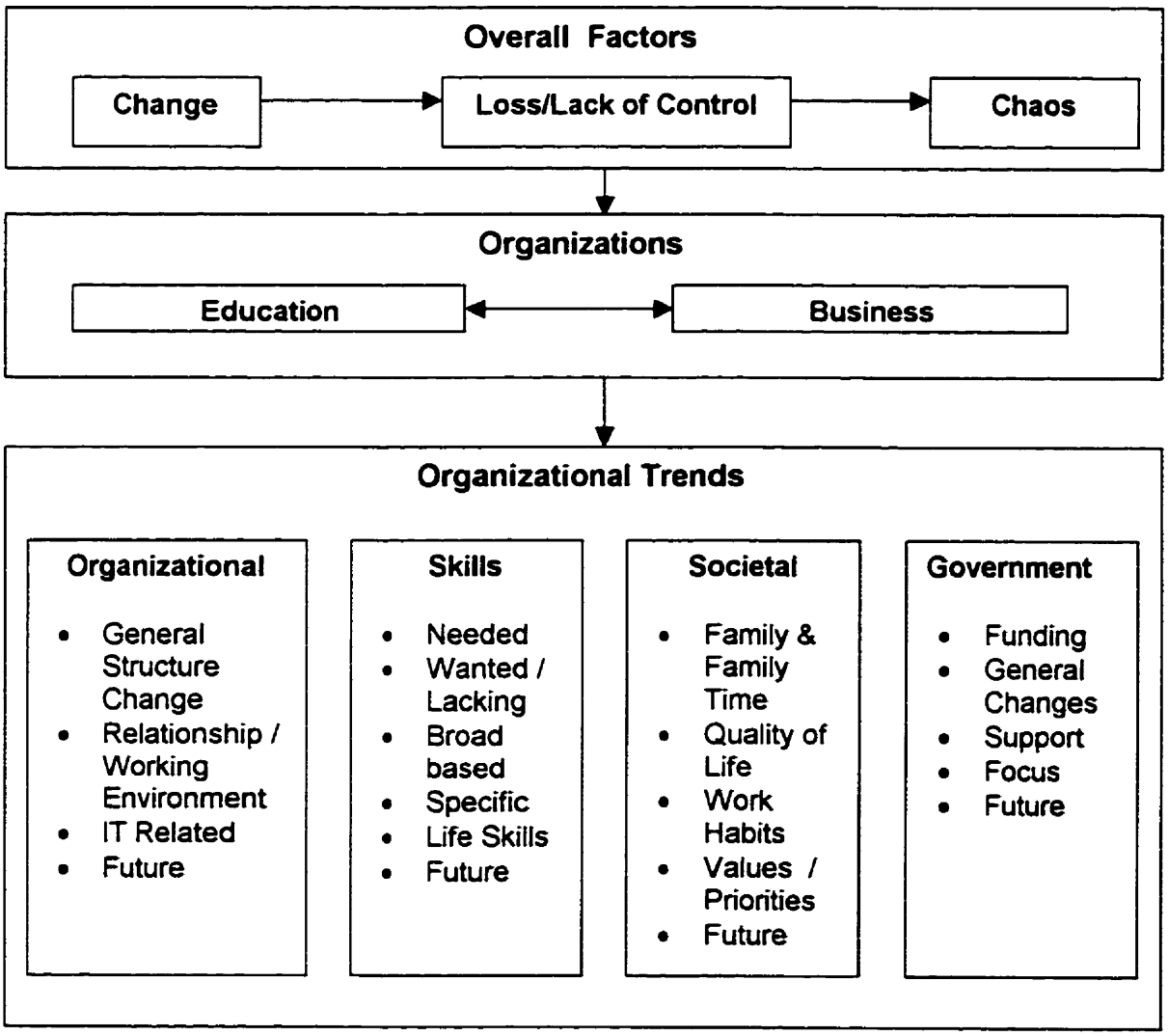

Figure 2: Final Categorization of Data

The interview data was further analyzed and supported in conjunction with the literature review. What I found was the issues and problems were very complex and information and computer technology played a central role but it was not the only player in the game. Technology has been around since the start of civilization, why has information and computer technology had such a different and much more extreme and broad reaching impact on our society? What was identified from the analysis and categorizations was an emergence of three broadly based trends. First, there is an overwhelming sense of change from the respondents. People in the interviews identified many things relate to change. Second, there is a sense of loss of control. People gave many examples of feeling they were unable to control their destiny and their work environment. Third, related to the loss of control, is an overwhelming feeling of chaos, rest and uncertainty about the future. The following section will discuss the raw data findings in relation to the categorization outlined in Figure 2.

Detailed Findings – The Interviews

Below is a discussion of the data from the interview process. It has been grouped into several sections based on the categories defined during the interview process and previously shown in Figure 2. The information was gathered, categorized and coded as it was received.

Organizational / Structural / Institutional Changes

This category was used to determine in the business and education institutions what people felt were the changes in the environment and why they felt those changes were taking place.

The business respondents felt the business environment had changed drastically over the years. They stated the business environment had changed in many ways, some good and some bad. The following ideas indicate what respondents perceive as change and how they see it affecting them. They are feeling a loss or lack of control. Their feeling of loss or lack of control is largely because of reshuffling of the organizational environment, the refocus on non-people oriented organizational goals and the inability of respondents to influence organizational focus.

The first area of change relates to the whole organization. The first change identified was the dramatic increase in organizations' motivation to achieve goals focused "on profitability, much more conscious of the shareholder and the shareholders demanding greater PV". This is reflecting Postman's thinking of a technopoly where the focus is on technology, profits and information rather than on people. Many remembered when there was a lot of company loyalty. Companies were willing to hire "long-term" employees and train them on the job. Their focus was on the long-term achievements and contributions of the persons. Now, they felt there was little attention given to the people environment of the company. Companies want to hire people who are fully trained, not wanting to do further development of skills themselves. They often hire for the short-term goals only. As one says:

> "We would hire people right out of school thinking about long term development. I don't know how much that happens with companies today, but if you look at the model it's a huge number of consultants and the consultant model for the most part is you are already trained. It's not a development process. Generally speaking I don't know how that is going to work in the future, if that continues, if more and more companies go into this contracting model, how do people start out in the field?"

With the focus on organization and profit, respondents felt there was no loyalty and trust between employers and employees. Some indicated the organizations are so goal oriented they do not see the breakdown in relations. Along with this focus on dollars,

return on investment and shareholder needs, there is a push to achieve and achieve and achieve. Workers say they feel pressured to work longer and harder than ever, with much more stress and insecurity. They indicated many are afraid of losing their jobs if they do not work more and more. Many stated companies made them feel "expendable" if they did not perform. Many respondents felt stressed and pressured and were thinking of changing careers as the "burn out" was getting to be too much. Many felt the pressures, the lack of trust and the lack of loyalty were among the reasons turn over and attrition is so high in the business community, especially in IT. This is well said by some respondents who say:

> "Employees are working harder and longer, in the long run now, more than ever have before, because they are scared they will lose their jobs."
>
> "It is very demoralizing for individuals to feel pressure or having "we're going to lay you off" hung over their heads. It has created a very disloyal environment."
>
> "Lot less personalized for the most part. Most employees have been reduced to being numbers."
>
> "Most employees have been reduced to being numbers ... their view point is, you do what I want you to do, if you don't like it we'll replace you because there are a lot of people out there looking for work."
>
> "A lot of companies seem to be moving more toward being very impersonalized."
>
> "An environment where employees are no longer loyal to their employer because their employer is not loyal to them."
>
> "Really hard to build business because people don't trust employers anymore."

It is interesting to note what are the possible consequences of this to the work place. Things like erosion of the corporate structure, and the breakdown of teams, commitment and long-term relationships are possible outcomes to be considered.

Many respondents indicated organizations were big bureaucracies where a worker cannot make decisions. Coupled with this, the respondents indicated, there is poor communication effecting responsibility and accountability. They said workers are

deterred from taking responsibility and accountability for their actions. Others stated the latest drive to do big collaborative projects allows poorly skilled people to hide in the teams and to deflect accountability and responsibility to elsewhere in the organization – no one is held directly responsible for anything. The respondents also indicated the collaborative efforts, because individuals did not have control over the success or outcome, caused people to care less and be less responsible for their actions. Often, respondents stated, on the big collaborative projects you got a small piece to work on and you did not have a clear understanding of the goals. The goals they said were competition driven and often the projects were to be completed with unrealistic deadlines, increasing the stress and hours on the workers. As some indicated:

> "Nowadays I think everything is basically collaboration. You work with others. I think the projects are of a size now that you cannot do them on your own anymore they are far more complex and because the world is complex the solutions are also complex. For an employee the pressures to be able to in influence other people -- the full range from very gruff people to very friendly people, people that work very hard to people that don't work very hard. People that look very good but don't do much, people that do a lot but don't look very good and all these different types."

> "Nowadays what I find happens quite a bit is that you put a quote in for time and because of the competitive pressures maybe your company doesn't have the best tools or doesn't have the best methodology to do something it's unacceptable to give in some cases an absolute valid estimate of time but what they try and do is compete with processes or methods or skills of other people that you really can't match and the only way you can compete is you effectively either work overtime or you hire consultants where you have a higher price."

> "There is a big increase in pressure on employees to perform. I think the goals are a little less clear for all the projects."

> "It is possible especially in large organizations for people more or less to hide a bit and I'm not disparaging them but perhaps they are not as competent but obviously they can't go to their boss and say gee I really don't understand this so they contribute as much as they can but how do you measure the strength of a team of 20 people ?"

Another area of change identified by the business interview respondents was the restructuring of organizations. Organizations have changed from very top heavy to flatter and more streamlined. Many saw this as a result of information being more readily available to the upper management through technology so fewer reporting

management layers were required. Other saw this as a move to replace people with technology. One candidate noticed the "departments do not have secretaries any more" or administrative assistance, except at the senior management level. As one person said:

> "A lot of the middle managers started being tossed out because the technology from the PCs allowed senior managers to have a much better handle on what was happening. I think as the world got more complex the middle managers performed the function of controlling and reporting and keeping senior managers informed about what was happening when the computers took over from that, the middle managers to some extent lost a big part of their function."

Organizational planning within these flatter organizations has also changed from long term to short term. Many indicated the planning is now for the short term, within the year, instead of five years down the road. This concerned many as they felt the companies weren't preparing themselves for the long haul, but were living from day to day, jumping from one strategy to another causing confusion and chaos in the company. This may be because of the globalization of the business and economic environment, where competition is greater and personalized business strategies are less important. As one indicates:

> "Focus has changed very substantially from a longer term focus to a much shorter term, bottom line, shareholder return, quarterly profits, cash flow type of focus. Day to day operations they operate very much " on a return to shareholders" basis, and one of the reasons for that, at least I think in my industry, the oil and gas industry, is that it used to be, years ago that most of the larger, at least the larger oil companies were controlled by foreign entities, or by, they were sort of subsidiaries of a, of an international outfit, and in that respect they didn't have the same responsibility to shareholders that companies now do. And without that same responsibility they could plan, they could take on a 3 year project or a 4 year project expecting no return for at least 3 or 4 years. That is very difficult to do now, and as a result it has caused some changes in the way the companies operate."

A final area they noted is the change in the availability of technology. Computer technology in the 80s was available only to a select group of people and was very centralized. As one candidate said: "It operated as a black box to the rest of the company".

Part of the change is the organization of IT. Part of the centralized IT world was the use of consolidated computing on mainframes and terminals. Now they say it would be surprising not to see a computer available for everyone in the organization. As computer use increased, computer and information technology moved closer to the business community in a more decentralized structure. This move from centralized to decentralized has changed the way IT operates within the business environment. Some of the areas of change identified were:

1. More aligned with the business units
2. Multiple focuses of IT within a company to better meet the needs of the business areas.
3. Segregation of technological goals to focus on business units.
4. Disjointed and non-centralized standards.

Another IT organizational change is the change in how IT groups are managed. Traditionally, respondents indicated IT managers were people who had worked their way up through the different roles within the IT group, understanding all the facets of the IT world. Today, many say, the IT managers are non-IT managers who are not from the IT discipline. These managers often have little IT experience, but a lot of general manager expertise. Some suspect this is business' way of getting IT under its control and supervision, and more aligned with business. Many indicate these managers make decisions not conducive to the IT environments. Here's what some had to say:

> "In to-day's world in the IS shop you may have a guy who is in charge of your whole department who has not written a line of code. Well does that person realize when you come back to him and say we need to take more time or this is not going well, we are not happy with this part or are they just going to say gee well we don't have time to do it so let's live with what we have."

> "Focusing their IT organization, very much on the bottom line of the company in terms of how you'd been looking at a project, how is this going to help the company make more money."

Another IT organizational area identified by the respondents was the role IT people played in the organization. People interviewed said IT in the past was very technology

oriented and was not expected to interact with the business side of the organization. The IT professional was not expected to communicate with others. It is interesting to note that this ties in with the perception of change and change in control felt by those interviewed. As some say:

> "In the old days I think it was largely just one department that did the whole thing and they had little sub teams and stuff but they basically didn't really split the business into functions it was more a one solution for the company and they had many years to evaluate the technology. Technology might have a lifetime of 10 years."

> "IT was kind of like put out in some back room and everybody called them geeks and they did not really have to interact with the users. No one really knew what they did. They couldn't talk. They couldn't relate to people."

Now, IT is expected to be more business and people oriented, changing the type of people in these positions. They indicated many IT people are having trouble adjusting to their changed roles, requiring them to understand the business and have people, interpersonal and communication skills. They see a split in the Information technology profession. One group is technically oriented and specialized in specific technologies. The other group has a broader knowledge base blending business and technical knowledge. They indicated the real growth and opportunities are in the area of the generalist, with business knowledge and interpersonal skills. Many indicated it is becoming more and more difficult to be an expert in all parts of IT, most people are forced, because of the complexity and diversity of the industry, to focus on either the technical or the business side of IT, but not both. It is interesting to note this supports the overall perception of change. It also alludes to the unsettled nature of today's business environment, increasing the feeling of uncertainty. Respondents indicated there is increased change, increased stress, increased hours, increased workload and increased burnout in the IT industry. Some respondents indicated:

> "I think you are going to find that there are going to be two splits in IT. There is going to be the technical experts, the people who really understand the technology and then there is going to be the business people that have acquired IT skills that they must know how

> to programme or do simple programming just as the requirement of virtually any job from insurance to whatever."
>
> "[IT] split into people who are more concerned with future technology, protocols and the sort of infrastructure and those in the business that are more concerned with exactly what the programme is doing or what it is doing for the customer."
>
> "I wouldn't be surprised if somewhere along the way IT splits into two parts, hard technical and business skills, and the business skills start migrating towards the businesses that they match."

Along with the availability of computers, respondents felt there has been an increase in the collection, analysis, manipulation and disbursement of information inside and outside the organizations. The responses indicate dissatisfaction and a feeling of information overload when they discuss information availability, and information and computer technology. As some respondents say:

> "I can't keep up with the deluge of information. I have no idea what is the most important information."
>
> "I think because the information is there, we are inundated with everything. We know everything. We can watch our wars now. You don't hear about it on the radio, we can see it on TV. Everything is right there. A lot of this stuff has always been there but, I think, it is our face all the time, now."
>
> "I think there is too much media information and its all bad. I think that it has desensitized us as a society, we care less and less."

It is interesting to recognize that this information overload is partially responsible for the loss of control felt by many. A first example is the amount of information sent and received through e-mail, reports, and the Internet is overwhelming. It is often difficult to decipher what is important or not. Many felt technology has taken over, whether people realized it or not, and is driving the business. As some indicate:

> "Technology has taken over peoples' businesses without them really understanding that"
>
> "We are controlling business and we are telling people right from the developer up to the senior IT leader are telling people how to run their business because we presume that we know best."
>
> "I think in a global society in which we live it's more apparent now that there is a lot of information out there. That there is a lot of information available and therefore there is more pressure I think for people to prepare themselves to seek this information and bring it together."

Another example cited by the other respondents is the huge amount of information available on the Internet, like on-line libraries, but some are concerned about the validity and correctness of this information, as it is not monitored or critiqued like the writing in scholastic institutions or by recognized experts in a field.

> "She still goes to the library but she can find everything on the Internet."

> "The electronic world and the information base there has a long way to go to get the quality up to where it should be to use these systems in a way that's going to match the quality control we would like to see in the systems."

Many say IT is recognized as power, through the benefits of available shared information and advanced technologies. Others felt technology has changed the way business is conducted. Some examples are:

> "The communication patterns and the ability to kind of get information across the world much much faster."

> "The world is complex, the solutions are also complex."

They indicated earlier technologies created efficiencies and cost savings, but newer technologies have changed and advanced the way business is conducted. Some examples provided are the way companies use telecommunications, Internet and e-mail to conduct their business. For example:

> "[There is] a lot more integration between IT solutions and the business as a whole to a certain extent I would anticipate that the businesses are going to allow the technology more than opportunity to drive what a business can do. Things like the Internet are a good example of that. Everybody has a sense I think it's a whole new channel for doing business. They don't know how it's going to work yet. They don't know if they are going to make any money yet but they know that everybody else is looking into it and I don't think anyone wants to be left behind. It's an opportunity for IT to lead business to a certain extent."

The examples cited above support an overall felling of loss of control and perception of change happening today. This will be further discussed in the conclusions of this research paper. Competition has increased. Companies are driven by the financial goals of the shareholders. As this competition has increased so has the need to

effectively and efficiently manage information throughout the company. Business has been greatly impacted by technology. The next section discusses the educational organizational changes identified by the respondents.

The educational organizational environment has changed in other ways as well. The education respondents stated there have been many changes over the years. There has been increased pressure on education by society. The information below will identify many issues related to change, government regulations and conflicting requirements. It is interesting to see an increased focus on regulation and how attention to societal issues is diminished. Pressures to manage what many teachers would call traditional family problems, such as discipline problems, ethical, social and moral guidance and support, and resolving general family problems. As one educator says:

> "Much of this development must come from the family and there may be an over-emphasis on expecting the institutions such as schools to fill a void which families have left"

Teachers say this has complicated the classroom environment and is often disruptive and counterproductive. The teachers say they are not equipped to deal with these problems, especially when they have a class of 25-30 children. Teachers feel children are not getting adequate attention from their families and this is where the problems begin. They feel parents work too hard, either out of want or need, to make money and sacrifice their time with their children, leaving the children as family orphans. Teachers say they deal with more and more dysfunctional families than ever before and everyone expects the schools to fix the problems, but they are not trained for this. Many kids they say enter the school system unprepared for interacting with teachers and other children. Other kids have behavioral problems. Today, many say there is too often a push for the quick fixes where drugs are used (A.D.D.) or kids are expelled, because resources to deal with these challenges are gone. As one teacher says:

> "Christine, who was our resource teacher – I just talked to her a little bit – but she's doing her Doctorate and it's on ADD and she – I think it was – she titled it something like the – 'The child inside the label' or something like that and I'm saying, 'yeah, she'd be interesting to talk to but that' – she is kind of saying, 'cause she, apparently was considered ADD as a kid, saying "Yeah, a lot of these kids – they're not ADD, they're just, you know, our generation goes for the quick fixes"

Many of the teaching aids and support structures designed to deal with these situations have been removed from the educational structure, blamed on monetary constraints. Teachers also indicate that many parents are unavailable or unsupportive to help resolve these problems.

Another area of change that respondents are concerned about is the rapid increase in the demand for schooling. As one educator says:

> "The evolution of education in Canada and, indeed around the world, and you can see that there is an increasing demand for people with further and further training all the time which means that you have to have places for these people to go if you are going to successfully in accommodate them, and so I think that's the big challenge."

Schools, from grade schools to post secondary schools, indicated they are not prepared or do not have the resources to handle this increased demand. Another issue with this rapid demand is the lack of teaching aids to help teachers with ESL (English as a Second Language) students as our multicultural population increases.

With the changes and transitions respondents feel today, respondents are indicating that students are not receiving what they require from the educational environment. Respondents are concerned that the environment students are working in is high quality and wholesome. They feel the environment should foster learning in areas of humanity, history of the country and of the world, and what it is to be a citizen. They are concerned about the quality of the information being provided for the students, especially with the Internet and the re-writing of history for political correctness. As one indicates:

> "The issue of understanding historical events is becoming a great concern. We seem to have embarked upon an era where revisionists are rewriting our history to ensure political

> correctness rather than historical fact. If this continues, children are going to increasingly have difficulty in clearly understanding the development of our social and cultural world."

They feel some of the literary sources, like sources on the Internet, have not been evaluated and scrutinized for correctness and validity, as with other scholastic research. Teachers are concerned about the changes in literature, both the sources and the authors, and the proper representation of facts, especially historical. Others expressed concerns about the education institutes changing in response to pressures and studies conducted outside the immediate region, and super imposing values from elsewhere. Many feel we need to focus on the traditions and values of Canada and Western Canada. As one educator puts it:

> "I think what happens is that the values that got us to where we are will become dissipated, I think we will be superimposing values that are values from Chicago or from Paris or from Los Angeles and we will not understand the values of Western Canada and its part in Canada, and Canada and its part in the world. It's going to lead to a lack of understanding that I think in the long term can be detrimental because all societies are facing problems that involve their future and if we don't have people working from a strategic position of knowing what we stand for and where we want to go, then of necessity then the decisions reached will in most cases be incorrect decisions."

Respondents feel we can learn from the mistakes in the USA, and do not want to make the same mistakes. The following respondent demonstrates some of these concerns:

> "I think we need to do more looking at what works, even looking at the American model, you can see some things happening with our education in terms of the way its eroding, crumbling and failing and all that. They've made mistakes ahead of us and we should be learning from their mistakes not making the same mistakes, not jumping on that wagon and saying 'This is the latest and greatest thing.' "

They feel changes, like pressures to use technology, should be researched and dealt with in a democratic way.

Another broad area identified is around resources and funding. It is interesting to recognize that funding is a key control factor because it creates dependencies on the fund source. This source can direct as they desire what is to be taught, making that a condition for receiving the funding, leaving the education system with no choice but to

comply. This control and management through funding of education is a form of DiMaggio and Powell's coercive isomorphism.

Teachers indicated they do not have adequate resources and supplies to do their jobs. Governments say education is a high priority but the funding available continues to decrease. Businesses complain about paying taxes, used to fund education, but also complain they are not getting the skills they need. Teachers say somehow funding issues must be addressed.

Teachers say government, families and businesses need to listen to the teachers and learn what is going on in the schools and how teachers think it can be resolved. They say these groups need to understand it is their tax dollars supporting education so they need to continue to pay their share so education has the funds it needs. These groups need to understand the challenges and complexities faced in education and become more supportive. It is interesting that the funding battles and the lack of understanding of each other's needs and goals has created a gap between the educators and the funding organizations. The following respondent illustrates this very well.

> "I think both sides are suspicious of each other. I think business views education as not being accountable and I think education just views business as having no understanding..."

They indicated there is less money being made available by government, but they are expected to do more with less. As a respondent says:

> "What's happening in the states which makes me sad because, you know, public education is eroded .... What I see is aligning with the States – it's more tied to the money and how they put money into education. There just isn't as much money as there used to be. They're staffing schools differently. That's where I see alignment with the states and how they're pulling back and saying 'no you can do this with less'."

In the past, teachers indicated they had lots of dollars, some even said it was too much. They were asked to spend it no matter what. Now, they say there is not enough.

Respondents are frustrated because organizations and government says education is so important, but they do not want to provide the money to properly fund it. Teachers are frustrated by the financial burden placed on the educational system to support the influx of information and computer technology into the school system. As some say:

> "While the needs and expectations rise, the resources available dwindle and the biggest challenge the education system will face in the next few years is not just affordability, but the daunting decision of what the priorities will be within the financial constraints."

Many experienced situations where computer technologies were purchased and there was no funding left to purchase other supplies for the schools. As one educator indicates:

> "I see a lack of resources in the school for things like library books and gym equipment and – there's only so much money so if you spend 10-20,000 dollars on computer equipment well, then you don't have it for your library or your Phys. Ed. or other fine arts things or for text books or whatever it is your school needs to run on."

In the next section, respondents are concerned about the focus in the education system. The most common area focused on by the respondents was the over emphasis on high stakes testing. The following is an interesting example of a separation of institutional powers that mandate the testing and the educators who are asked to administer the testing. High stakes testing is a sample of how governing bodies gain control. The testing and the information generated is institutionalized and regulated by governing bodies to control the outcomes. Their focus is on measurements and numbers, using information technology tools. The educators appear to indicate the information and measurements are made more critical than addressing the children's needs. As seen in this area of discussion, the educators feel a loss of control and feel forced to conform and powerless to stop it.

High stakes testing are exams used to determine the final grade of a student. Teachers do not feel the high stakes testing is a good indication of how much or how well a child is

learning. It indicates in their view the socio-economic makeup of the communities attending each school. It indicates which children can write or not write tests. As with other areas of society we look for ways to categorize and build information and statistics to base our successes on. This group appears to have similar concerns to Bowes (1997) when discussing information technology and our need to make a process-oriented and measurable environment. This also reflects the writings of Ursula Franklin (1992) when she discusses the over powering trends to use prescriptive technologies and processes. Our need to gather information, statistics and "hard" facts to analyze with technology appears to be a driving force behind high stakes testing. Teachers fear if the emphasis on high stakes testing continues, the children's learning will be compromised, just to get "high" scores. Teachers insist the grading process needs to combine high stakes testing with other grading schemes to provide a complete picture of the child. High stakes testing, they insist is only a numerical indication (statistics to be manipulated and studied using computers) and does not accurately reflect the full picture. Teachers struggle with this approach and insist there are other ways of determining a child's advancements and achievements. There is a qualitative side to be considered that is not as easily graded through standardized tests. It only grades a part of what a student learns and what is valued in education.

Educators feel people's expectations are too high. They are too concerned about seeing test results, measurable statistics and accountability, analyzed using information and computer technology tools. However, they indicated the learning environment is not as structured and predictable as most business environments. Respondents feel education is heading down hill, unless it recognizes some of the problems it faces, with issues like those identified here with dependency on high stakes testing. As some teachers' state:

> "The more it leans towards the testing, the more I think people are compromised and the more it leans towards the other way, I think the more they have the chance of being enriched life long learners."
>
> "The high stakes testing that all high standardized testing shows is the socio-economic background of the community and it doesn't matter, every year when you look through the papers, identifies the socio-economic background."
>
> "We're teaching to have all of these people be successful at that level, yet only 10% of them are choosing to, to carry on in that vocation and that means 90% of people, who's needs maybe we haven't meet, or needs we've tried to tailor to a mandated government objective because it's accountable, its measurable and I'm not sure that we should be valuing accountability and measurement over the needs of children."

The educators indicated the curriculum is too complex, with too many choices and options to be covered. As some said the curriculum is too thin. There is so much to be covered there is little time for children to become engaged in learning. Others indicated the curriculum does not meet the needs of the children. Two teachers say:

> "[Teachers] can't get through all the curriculum and I think that's a real sad statement of the fact that we're trying to put too much on kids' plates and too much on teachers' plates so it becomes very thin"
>
> "Unless, they can do some writing, they can't do anything else though sometimes I think we make things too thin by offering too much so – And I speak from personal experience with my own daughter going onto grade 7 and trying to make a choice for Junior High and looking at 4 or 5 Junior Highs and looking at trying to assess tri-semester or continuous schooling and assessing the situation as opposed to just two semesters and then looking at options, like some of those schools are offering 16 options over a year and these kids come in from grade 6 having never experienced those kind of choices to having to choose those kind of choices. They don't know where to start. So, I have to say, we went with the school that said, 'You can take four' and it was simple, and again it was simple kinds of things like how much extra experience do they need?"

Teachers indicated the enlarged curriculum shortens the time per topic, affecting the time students have to get deeply into any one area of interest. As one indicates,

> "A lot of the external pressures that have been applied, societal pressures that have been applied, towards education in terms of accountability and high stakes testing, etc. That type of – what I would consider to be real good teaching exciting and engaging and everything, isn't the norm any more, nor is it a really well respected outside of the education field."

As another indicates we need to foster:

> "Student engagement and, rather than surface covering up curriculum but really focusing in and allowing children to go deep into some of the processes of learning."

Many indicated the education boards do not clearly defined objectives and ways to meet those objectives. Educators indicated the need to stop jumping on "every band wagon that comes along" and spend time to evaluate the new information and really determine if it is beneficial to learning or not. Note, this loss of focus on objectives may be a factor of the changes and control shifts respondents are feeling. They cited failed examples, such as whole language versus phonics. Here is what some educators are saying:

> "All sectors of today's education system are more likely to respond to the need of the teacher and the funder and the parent than they are of the learner".
>
> "If the people who are leading the advance of technology into the classroom are not the people who have the best insights into where the best knowledge is and how to have young people become excited about the quest for knowledge, if they are not the people who are able to do that well then it's the wrong group that's doing it. So you must be very careful that there is that sort of quality control that it is an evolutionary thing. The technology must be seen to be opening doors that are important doors in seeking information and not something where the doors are just opened to let the wind blow through the room."
>
> "The whole argument for phonics and the whole language thing, you know, its been so misconstrued ... Kids don't learn to read any differently than they did – the content has changed, or materials are changed but they're changed in a good way. I think the styles are, you know, its still all there in place."

At the post secondary level, other curriculum changes are occurring. For example, the University of Calgary developed from a 3-year program to a 4-year program to allow students to explore and determine their strengths in a first year general studies format, where students can try courses from various disciplines to find their niche. The pressure from organizations, now, is to remove this general studies first year and stream people directly into fields of study. Some educators are concerned about this, as it makes it more difficult for a student to move between fields of study if they decide they do not like an area and it forces them to decide, possibly prematurely, what they wish to study. As one educator says:

> "First year is the general studies year the way the University of Calgary is set up and the intent of that when we went from 3 year programmes to 4 year programmes was to have a system that let the students learn to know themselves better and learn to understand their strengths and their weaknesses and their interests and so the general situation was that they came into university, took the first year. Now there seems to be a trend into

> direct entry so that a student has to know whether he or she is interested in science and if they are interested in science, then they can go into biology or chemistry or geology or geophysics or whatever, directly and in doing that they are taking away some of the diverse opportunities that were designed into the system in the beginning. Those that want to make changes will have greater difficulty if they have a system where they have direct entry because this assumes that people know out of high school what they want to do."

Educators say there are also some good changes happening. Children, as indicated, all learn differently at different rates, so curriculums must be able to account for this. There is an increase in child-centred learning, and a better understanding of how "people" learn. There are different approaches being tried like looping and multi aging where children learn together for two years, and pods where multiple groups are combined to enhance the learning experience across age groups. Teachers still say the primary focus should still be on developing life long learners with strong foundations in reading, writing, math and sciences. The interactive, group environments are key to the education environment and learning from each other.

Information and computer technology was introduced into education in the 1980s. However it has had a much different evolution in education than in organizations. It is also interesting to note that respondents feel its acceptance and adoption has been met with limited success to date. First there is an uncertainty of what role information and computer technology should have in the education system. There are lots of technology advocates who say kids need to be taught about how to use technology. However, no one has been able to provide clear goals and objectives and guidelines for the use of technology in education. The teachers interviewed felt not enough time has been spent researching the best way to use technology in education or the long term affects of changing the curriculum to include technologies at the expense of other areas of learning. One teacher says:

> "We got a whole lab of computers and we did not have pencils, we did not have paper, we did not have basic things in that school but we invested a huge sum of money in this computer lab because, we were told, there would be a computer on every kids desk in 5 years. This was in '81. Right? And boy, we had to be ready for it."

It was touted as the future. Some said this introduction was disastrous. Others felt technology's introduction was the "biggest marketing scam in the history of mankind" by information and computer technology manufacturers and government. Though educators agreed students needed to learn about technology, there is a lot of disagreement about when it should be introduced, in what grade, for what purpose, and for what desired result. The business community pushes government to teach about technology. Government mandates the education boards to teach "technology". However the teachers interviewed say the government does not provide detailed guidelines, does not investigate the long term effects, does not provide software designed for the different levels of students, does not setup an adequate support structure, and does not help the teachers get trained to use the technology effectively. Educators indicate the information and programs available via computer technology have a long way to go and cannot replace books and other hands-on methods. As some teachers indicate:

> "I don't think that a teacher can be replaced by a computer, I mean, unless they come up with artificial intelligence, you know, that can read emotions, that can recognize the needs, that knows the baggage the kid showed up with that morning, that can adjust and accommodate and assess and knows when to push and knows when to support and all of those human traits. I doubt it'll ever come close to that."

> "I'd rather a kid sit with drawing materials and draw... you certainly have much more creativity and it's much more open. If you're trying to draw something with that mouse, it's hard to get it to do exactly what you want, where as their work is much finer, much more detailed. They can add their own colours. They can, you know, and they're not struggling to manage the program. They're working to manage the materials in a creative way on the paper, which I think just works way better for them. I mean the work they do – artwork they do on the paper is far superior to the stuff they bring off the computer. For me, they may be drawing there but it's just more an exercise in figuring out how to work the program."

> "It is perceived to be important for grade 3's and 4's to have Internet access, the most important skill that they're supposed to achieve is sending e-mail. And while I don't

> disagree that that's an important skill, I have a really tough time thinking that it's a hard skill 'cause frankly a little chimpanzee can send e-mail".

Educators say information and computer technology is a good "tool" in business and education. This technology has changed the culture of education from a focus on teaching, where teachers are the centre for learning, to one on learning, where the children are the centre of learning and have access to alternative ways of learning, such as interactive computer learning tools. However, they say this does not mean technology can teach all the skills and knowledge a child requires. Teachers say it is being pushed as the main focus. As one teacher indicates:

> "One must be very, very careful that it does not intervene in a way that stops human communication one with the other because the, the learning process whether it's in a team context or an individual still depends on receiving information from other people and accessing that information through human communications. So a lot of learning takes place within groups from one human being to the other, and so it's important that as we move ahead with technology that we don't start to depreciate that aspect of the learning process."

Others indicate people must recognize the need to properly support and train teachers to use technology more effectively in their classrooms and with their students. As some teachers indicated:

> "I think huge expense is being put out for computers and teachers – they're sending us running to take these computer courses and the money, and actually the computer courses we're taking, we're paying for out of our own pocket and we're expected to do that."

> "Lots of schools I see where computers are in schools – they break down, nobody can fix them, they don't have the time to fix them, they have to send them away."

The software and programs are not very well developed. They are either not developed for the grade levels or do not assist with the development of skills important in the curriculum. As one educator indicated we need to:

> "Make sure that in the programming of these there are things that stimulate artistic and cultural interests and things that make the child develop into a well rounded human being a very thoughtful person and considerate person and this means that one has to be very careful at all times that they don't get locked into a system that removes the student socially from the rest of the group or divides the group up in various ways."

As another educator says, we need to avoid inappropriate software tools.

> "There'd be these really simple programs, supposedly, for 4 and 5 year olds who aren't necessarily reading and there were pages of text and instructions. And it was so complicated for the kid to move from – to know what to do – where as now they're much more obvious and easier for them to work and user friendly but the kids couldn't use them. There would just be page after page of text and there'd be all this stuff saying 'OK, if you want to do this – do this!' Well, they can't read!"

Teachers indicate society must gain a better understanding of complexities within the education environment. They must understand what is happening in schools and what it is like to deal with the variety of issues, behavioral, development and learning problems teachers face today. They say the problems often start with the families, but when people do not understand what the education system is facing, how can these problems be addressed? Some educators realize it is partially their responsibility to increase this awareness but other areas must also be willing to learn and understand as well. Teachers say all groups must come together and learn from each other to help our children to successfully develop into life long learners. This section illustrates the recurring sense of loss of control and a definite feeling of confusion and turmoil identified by the respondents.

Teachers indicate there are many complex and contradictory issues to be addressed during the years to come. Education's role and success is reliant on society understanding and learning what is required for children to learn, to expand their minds and to become engaged.

This section summarizes the information on business and education organizational changes identified by the respondents. It is interesting to note that these changes between the working levels in an organization and the formal and upper management layers, and changes in information flow and control, are contributing to respondents feeling of decreased control. Upper manager depends on reporting and information systems for information instead of traditional management structures. Information

technology's role has changed to a more decentralized and business oriented focus, changing its role and power in the organization. Information technology has enhanced business' ability to compete and work in the competitive global marketplace, enhancing business processes, communication and control. Focus of education and organizations on dollars and technologies, is having negative impact on people-oriented activities and needs. There is an increase in collaborative efforts, altering individual's control of their work and their accountability and responsibility. It is a more process and techno-centred approach. Information and computer technology in education has had mixed success. Educators feel there is too much emphasis on information technology and the use of measurable testing without concern for the students' learning. These findings will be further discussed in the conclusions of this research paper.

Skills and Knowledge and Learning

Educators and IT business people had a great deal to say about the skills, knowledge and learning required by people to work and function in society. Since the responses are fairly similar they will be discusses and contrasted together. Below is a discussion of the information obtained during the interviews. It is important to identify that the skill and knowledge discussions are important. It is the development of the skills and knowledge and changes in this area that appear to be affecting our ability to cope with the perceived changes, aiding the loss of control felt by the respondents.

Respondents outlined many skills, knowledge and learning required to function as people at work and in society. The first area is the core skills or areas of knowledge they felt are critical for working and functioning in our quickly changing world. Many of the skills are called soft or broad-based knowledge skills by those interviewed. They indicated the technical skills or the hard skills are less important in the working world today, as they can be learned. Those interviewed outlined the following skills:

- Interpersonal, social and communication skills
    - Reading, writing, and spelling
- Project Management and business knowledge
- Thinking Skills
    - Analytical and problem solving and critical thinking
    - Capacity to learn and adapt
    - Mathematics and scientific skills, including methodologies and theories
- In addition to these skills, education respondents also identified the following skills as critical:
    - Life long learning and being engaged
    - Life, family, community and social skills

The first core skill area discussed was communication, communication, and communication. Everyone interviewed indicated this is a core skill, often lacking in today's workers, students and recent graduates. The people interviewed indicated children need the ability to articulate, both verbally and in writing, ideas clearly and concisely to others. This communication includes speaking, reading, writing, and spelling. Listening is another core communication skill. Most indicated it is poorly utilized and needs to be better developed. Related to listening skills is the ability to hear and understand the information being communicated. IT people interviewed indicated this skill is not as well developed, as it should be. As some state:

> "We have got to know how to speak English or explain things in reasonable terms to business people cause business people aren't stupid. IT people need to learn how to listen -- we need to be able to listen for what the business person cannot articulate but is, in fact, still saying. Written communication's starting to become a biggie. You have to be able to say what something does or what is required and you have to say it in a manner for the person who doesn't know what you're talking about can understand."

> "I ride the bus to work most days and most days I am catching it at the same time as youngsters that are maybe, I don't know 12, 14, 13,15 years old. And I hope to goodness when they are in class they are different than when they are on the bus. I can hardly stand to listen to them because they are just so all over the place, ill informed ideas, ideas that are just contrary to what is. Like they seem to have, they seem to have a skewed view of the world. And they don't express themselves that well either. They're

> always saying " like you know" and "I'm don't know, don't know". Sometimes I wonder about this whole grammar thing and spelling thing."

As one IT respondent indicates, spelling and writing and grammar are important, like when writing a resume. It is a reflection on you and who you are, so it is important it is well articulated.

> "If you're going to write me a resume, you'd better have proper grammar and proper spelling."

Another skill area is interpersonal and team work skills. Education respondents indicate it is important to learn skills for relationship building, acceptance and tolerance of others and their culture and beliefs. Communication in groups also required children to learn to interact and participate in groups where views and ways of doing things may vary. The interpersonal and group interactions helped children to learn about respect, accountability and responsibility for their own actions and the actions of others. One of the areas of learning developed from these interactions is a broadening of knowledge based on learning from each other. Two respondents expressed this in the following way:

> "The ability to be able to receive communication in the way of verbal communications, to be able to read well, to be able to accumulate information that you read, to be able to summarize that, condense it. Seeking information from very broad sources and bringing it together and condensing it."

> "Literacy and communication skills seem to be the most important. The ability to read, write and communicate are basics, whether you are looking to the business community or to other ventures."

IT respondents agree and say it is important to have good interpersonal, social and people skills. IT people indicated this area needs to be improved and advanced as IT moves from a highly technical skill area, where hard technical skills were of primary importance, to a more business, people and process oriented role. Other skills, respondents indicated as required, are patience, good negotiation and influencing, and

team abilities to work in groups on collaborative efforts. Strong language skills was identified as critical to interpersonal and team situations.

Additionally, respondents identified that it is important to gather, find, analyze, summarize, and create meaning from this information. This helps them to develop problem solving, analytical, critical thinking and decision-making skills. As some indicate, there is more to these skills then just learning to memorize, there is a need to learn how and why they are learned, extracting meaning and purpose. As some say:

> "I think we have to, not just be able to decode, but enjoy reading and see reading as a really meaningful and purposeful thing."
>
> "You have to really understand what you're reading, be able to make sense of it, be able to discuss it with others, be able to get information from other people, know how to do that."
>
> "Grades 1 to 6 – it should be reading – primary language, social studies, science and math – unless they can read, they can't do anything else."

A related skill area identified by IT respondents is project management and an understanding of the business. This area included the ability to adapt, change, plan, organize, develop the big picture and understand the business and its processes. Understanding the business has become a really important skill in today's fast changing world. The "understanding" encompasses understanding the business, its plan and its direction, and who can contribute what and how to the plan. As one said:

> "They no longer want help with the little things, they want you to help them do their business better. So, they are looking for people to come and do project management."
>
> "Some specialization for some folks with really deep technical skills but I think that the real growth will be in people who understand business, who can implement a solution, who can put pieces together you know and you do need to know the project management, not how to write an Oracle data base but how to design a data base, right, not how to write a GUI but what should it look like, how should it attract the client, you know, at that kind of level."

A skill area indicated as important and related to the increase in project management and business knowledge skills, are the thinking and process skills. These skills require the ability to apply knowledge and are not fully developed without it. Those interviewed

indicated thinking and process skills are critical to develop people who are adaptable and flexible. These skills include methodologies and theories for information technologies, process (re) engineering, project management, problem solving, decision-making, analysis, critical thinking, and development of life cycle skills. They indicated theoretical backgrounds were more important than specific technical skills. Some say it is more important to "understand the database theory, at a really deep level", "how to design and develop an application or database or web page" and "why it is best to design or do things in a particular way". IT is interesting to note that even though respondents agreed on the skills some were more certain of specific skills and areas of knowledge than others who used more general terms. Many called this "broad-based knowledge", adaptable and usable in many situations. They feel this area of IT will continue to grow, where IT can understand the business and not just the technology. They said the specific skills are limited to special jobs and are not as portable and adaptable to other situations. As one indicates:

> "I wouldn't be surprised if somewhere along the way IT splits into two parts, hard technical business skills and the business skills start migrating towards the businesses that they match."

Additionally, education respondents indicate it is important to have a historical understanding of who we are, where we came from, and how our country and the world evolved. It is felt to be very important so children understand how society is formed and what occurred to get there. It is important they understand the facts and not transcribed or massaged versions of this information. This historical understanding is also identified as important by Feenberg (1991) and Ursula Franklin (1992), so history is not repeated and we advance as a society. As some educators indicate:

> "The issue of understanding historical events is becoming a great concern. We seem to have embarked upon an era where revisionists are rewriting our history to ensure political correctness rather than historical fact. If this continues, children are going to increasingly have difficulty in clearly understanding the development of our social and cultural world."

> "Able to understand where humanity has come from, what the history of the world is, what the history of humanity is. They want to be prepared to make a contribution that will move society forward and to do that one must be as well informed as possible in various ways and as broadly as possible."
>
> "If the text books being used, if the electronic material being used is not balanced, is not valid and this gets back to the quest for truth and the integrity. If they are in fact studying material which is skewed and distorted then that is of course a picture which will cause them damage in the future because they will not be prepared to really understand problems in a wholesome way."

Educators emphasized the importance of life long learning skills or the ability and desire to learn. Getting children interested in learning and being engaged in new ideas as a part of everyday life. Included in this is a need to have kids see themselves as life long competent learners. This emphasis relies on many of the other skills previously discussed like reading, problem solving and analysis skills, so children can gather and understand and draw conclusions on the information presented to them. This process serves to empower children and build their self-confidence as achievers. This helps them develop into the "doers" of the future. It will help them to adapt to the fast paced changes in our world today. Educators felt the life long learning was better developed in a broadly based education where they gain insight into the world around them.

Educators feel it is important to help develop children into well-rounded persons. People who are prepared and willing to adapt, learn, work in and advance society in a productive way. This means developing people into good citizens who understand and support the needs of society and others. This would mean a movement away from the current "me-first" movement.

Educators indicated there is a need to have children understand and work with information and computer technology. But when, how and why the technology was used was not clearly understood. Many teachers felt technology was a secondary tool and skill and not the primary focus of the education industry. Note here their feeling of

frustration at the changes and their feeling of loss of control. They are not against technology but they feel it is not being introduced and utilized properly. They did indicate there is tremendous pressure on them from parents, government and industry to use and teach technology. As they indicated:

> "Technology should not be a stand-alone initiative but should be integrated into the classroom as a learning tool. In many cases there is a mythology that technology will be something magical when, in fact, it is no more than an information access tool and a communication device. Emphasis should be placed on using the technology to assist in learning to access information and to communicate rather than having a process to "teach" technology."

> "A lot of the pressure for computer stuff comes from businesses. We want people who know how to use technology and yadda, yadda, yadda, yadda. I think they put pressure on government to do things that aren't always the best for schools and I don't think people in business understand the climate of schools."

Some final skills stressed by respondents are: accountability, responsibility, willingness and ability to learn, and respect for others. These are all related to workers within their environment in society and at work. Another part of this skill area is learning about the importance of community and society and being a good citizen.

Most indicated these were the primary skills to work and operate in society. Other skills they indicated were important but not critical. Most emphasized the need to interact and work with others in groups and project teams. Technical skills were considered not as important as the other skills. The respondents interviewed indicated technical skills can be learned as required and are tools for interacting in business but are not the primary requirements for a good citizen and worker.

IT people indicated that in the past it was more important to have technical skills and specific skills in an area or specialist skills. They also indicated, in the past, the focus was solely on the 3 Rs – reading, writing and arithmetic. They felt that now it was important to go beyond the 3 Rs and have more general and versatile skills to be used in

a variety of jobs and situations. It is interesting to note here that the 3 Rs is exactly what I felt was missing. So the issues may go deeper in this area and may benefit from further analysis at a later date. Most indicated these same skill areas should be taught in education. They felt the primary focus should be given to reading, writing, math, sciences, problem solving, critical thinking, learning about yourself and the world around you, creating life long learners, and life skills. They felt children needed to learn responsibility and accountability and the ability to interact with others in groups, social and business environments.

To summarize the findings for skills and areas of knowledge and learning for education and business, I will first discuss how the term "skill" is used. While interviewing, I discovered the interview respondents made a distinction between skills and what I will call "areas of knowledge and learning". In simplistic terms the distinction was between the learning of a specific skill for a specific task, and learning a skill applicable in numerous situations in numerous ways. A sample listing of skills and areas of knowledge and learning is in Appendix B. It is not an exhaustive list.

Both education and information technology business respondents made this distinction and further elaborated by saying a specific skill can be learned as required. Specific skills can be learned without the person understanding the theoretical basis of "why" this is done a certain way or "how" the tools and skills are developed and derived. True understanding of areas of knowledge requires many different types of skills to be used. Areas of knowledge or learning normally take more time to develop and nurture. The learning in these areas helps us cope with change and survival. It helps to develop the basis for our very existence. There is a difference between teaching a child to add two

numbers together and teaching a child how mathematical and scientific methods are developed. As one says:

> "Math has become more 'hands on', more, you know, learning about the process of math and how it works rather than just memorize the stuff and do it on paper. We're understanding that kids really need to use objects and do real life kinds of things for these math concepts to make sense."

The areas of knowledge and learning are transferable and portable from one experience to another and one job to another. They teach a child to be adaptable and a critical thinker. Another example is the difference between learning to use a database, like Oracle, and understanding database theory. Understanding database theory means you can adapt the theory to any database, whether it is Oracle, Sybase or SQL Server, and you understand the underlying principles about databases, how they are created, designed and used. Business people indicated the learning of areas of knowledge is more important than ever because it helps us to adapt and change in this fast paced world, where specific technologies change from day-to-day. Note here that even though the business people feel this understanding is important, it runs counter to what I see occurring in spite of the fact that everyone agrees that this should happen. We must try to determine why.

The final area to be discussed and summarized is the society and government changes recognized by the people interviewed.

Societal and Government Changes

Since the views in this area were very similar, they will be documented without the split between business and education, using excerpts and examples from both. It is interesting to take note of the feeling of change, and its consequences. Is it really a lack of control or are people encountering change and ignoring some struggles while they cope with others. The following will discuss these ideas from the respondents' social

and governmental views. Many of the statements below indicate a struggle for control maybe resulting from the rapid changes occurring today.

First, both groups feel education is touted as very important by society and government but is not sufficiently funded. Inadequate funding is available for the expanded curriculum, basic resources, resources for special needs and special equipment for sciences and technology. Special needs includes educational assistance for English as a second language (ESL), aids to work with the mentally or physically challenged and other special needs programs. As some businesspersons say:

> "The government keeps cutting back funding, education funding keeps getting cut back."
>
> "The school system in Calgary is trying to shrink itself to work within the budget that has been provided by the provincial government. As far as the provincial government knows they have provided adequate funds to do all the things that everybody says they should be doing. Somewhere in there, there is a misunderstanding either the school system and the parents are expecting too much from themselves or from the school system or they are not willing to ante up enough money to actually make it happen or the people doing the work value their services too highly and they should not be expecting so much money."

Educators felt people's expectations are very high for education but funding parties are unwilling or unable to provide the funding for such an education system. Some of the educators said:

> "In Canada the changes to the education system are to a large extent being driven by the expectations of the business community, as well as the financial constraints faced by governments. [We are] finding changes to the education system similar in each province as governments grapple with growing expectations and fewer resources."

One educator says government and taxpayers have to decide whether they want educated people or not. It is interesting to note that the taxpayers are often people within the organizations who are funding and controlling education, who are also the same people who are complaining that education is failing, but they don't see the connection. Demographics show many do not have any relationship with the children

who are learning, so do not understand or recognize the importance. They have to understand the funding has to come from somewhere, but as was indicated:

> "Demographics of our society have changed to the point where some 75 percent of the tax-paying public have no connection with the school system as they do not have children in school. Therefore, many do not wish to appropriately fund education and question the dollars being spent on education."
>
> "I think the tax base has to continue to support, to a greater degree."

Second, respondents indicate there is the push by government for technical education without the government really understanding and supporting this initiative. As some IT people indicate about schools and government:

> "The Universities are getting confused about why they are there."
>
> "It's a confusion of motivations I don't think they know why they are there."
>
> "The government's changing their ideas faster than people are having a fair chance to try things and implement them. And governments respond to wanting to be elected. They don't necessarily respond to the best things about teaching and learning."

Most feel "teaching" technology was a government decision to keep voters and the business community happy without understanding why and how to use and incorporate it. Others say the problems with education today, should lead governing bodies to ask:

> "How is the school system not adequately providing those schools to the kids and rather than making it the kids' fault? Where are we failing in our scholastic endeavours? Because I don't think we're getting that many more untalented children. I think something else is kicking in."

Third, many changes are identified with our society and family environments. In this section respondents indicate there is an overwhelming sense of struggle to deal with change and the feeling of a loss of control over our lives and our children's education. The first are the changes in the way we deal with our children. Many felt there is a lack of community and family involvement in the daily activities of the family, especially the children. This is interesting to connect these views and feelings to their feelings in the organizational environment. Parents are working more and spending less time with the children. Many say the definition of "community" is changing. Some felt the trend is to

expand the notion of community to a global term, due to improved communication, and others felt the community sense is narrowing, with people moving toward family or common groups for protection. As one says the:

> "Definition of community is being changed to that around which a child centers his or her social life".

Another stresses the dangers of the new community.

> "Narrower focus of community can lead to a ghettoization of social life which allows little understanding, tolerance or respect for social structures different from one's own experience".

Others say the children are "raising themselves" and not getting enough care, involvement and interaction from their families and other adults. Many are raised by day cares or through the education system, which are not prepared to deal with this role. Overall many felt the "family unit is not valued in our society any more". As one states this problem is multifaceted:

> "Many children do not have adequate family involvement and this can lead to a lack of social and ethical support. Schools have increasingly taken upon themselves a family role and provide much-needed support which at one time was provided by families. It would appear that there are no magic solutions to this problem. There does, however, need to be an understanding that lack of family involvement can leave a gap for many children and schools cannot be expected to substitute for all families, particularly in a diverse multicultural society."

Fourth, respondents identify a related problem that is caused by the availability of too much information and how it is being used. Information is being collected and used for consumer research. There is a concern the information is being used inappropriately, especially private information collected through various means. Another effect of the information glut is people being desensitized and overloaded by the volume of information presented to them. Many felt this has caused people to withdraw and cocoon themselves around their families to protect them from the world and information around them. This desensitizing has had other effects as well. Note this may be example of a coping mechanism for dealing with the change and loss of control.

The group identified a concern for the increased use and acceptance of crass and lewd language and symbols. This indicates an erosion of moral and ethical standards. The information glut is desensitizing us to the world around us.

> "Society's tolerance of others has lead to a tolerance of a crassness and an inconsiderate behavior by a lot of people and this is based supposedly on the premise that people should have the freedom to do what they want and this has lead to a lot of changes in society. Some of the fundamental tenets of society were for instance when one is in another person's home, out of respect for that home, one would take one's hat off when you entered the home."

Fifth, respondents identify issues involving consumerism and the resulting stresses. The ideas in this section are examples people choosing between options and trying to cope with change and uncertainty. Many respondents say the increased consumerism has lead parents to work longer and harder to buy more and more. Some say:

> "They will sacrifice their family for their careers"

> "It's like it's not enough, when is enough enough? Its like our generation has gone crazy and it's never enough?"

Many indicated the media advertising and propaganda are a primary push for consumerism. Children also are pushed and influenced by consumerism. Many say:

> "Kids just expect everything, now. Life is just handed to them on a silver platter."

As some say about young people entering the workforce:

> "Their expectations are just crazy."

> "B.Sc. grads in computing science and they were wanting like 50,000 bucks a year just right off the cuff, with no experience".

Most say the work environment has changed. As one IT respondent indicates:

> "It is an employers' market. It has been an employers market for quite a long time. And, I think the employer is taking advantage of that fact. Their view point is you do what I want you to do, if you don't like it we'll replace you because there are a lot of people out there looking for work."

People are concerned about their jobs, so they work harder and longer, sacrificing their families. As two respondents says:

> "There seems to be a conflict between what an organization wants out of someone and what people really need to deal with their family."

> "It's really just a lack of appreciation of the value of human life and the responsibility that individuals have to make a contribution and to help others who are not as fortunate as themselves".

From many of the problems listed above, the group identified several other social and moral and ethical impacts resulting in a loss or change of the meaning of community. The first is the increase in lack of respect and care between people. There is an obvious reduction in community involvement. The respondents felt there is an obvious reduction in the value of human life. People appeared to feel they are less responsible for contributing and helping others who are less fortunate, feeling it is someone else's job.

The shifts in values and sense of community have caused rifts to form in the tolerance for differences between people, groups, religions and cultures. Many say this lack of tolerance stems from too much information and not enough understanding between people and groups. They feel this intolerance is developed by examples set by adults, especially parents, as they interact in society. Children learn lack of tolerance from adult role models. As some say, adults and society are causing the children's problems.

> "Those kind of comments coming from adults are being modeled for children and you hear the comments out on the playground. It's a lack of tolerance."

Other say tolerance, social and ethical guidelines are lacking because families do not spend enough time together so children can learn. The decreased tolerance is seen in all facets of our society from the education system where the children not fitting the mold are removed as troublemakers, to the family units where the children not fitting the mold of the "perfect" child are drugged or institutionalized.

The respondents' comments on business, education, government and society show many trends and indicators affecting our children. Some felt the changes are a result of

technology. Others felt they are the result of other changes in society. Below is the discussion section of this research.

Discussion

This research paper investigates information technology's impact on skills, areas of knowledge and learning. It discusses the role information and computer technology has played in shaping or changing the organizational, social and learning environment. The paper discusses the methodology and research methods used, the findings from the detailed research and the conclusions drawn from the findings. The detailed research investigates information technology with respect to society, business and education. The following will attempt to make some sense and generate some theories about what it all means.

As indicated earlier this research project uses a grounded research methodology and most of the research follows a qualitative research approach. The research began with an extensive contextual literature review to identify what had been written in the topic area up to now. This was followed by interviews with respondents from the education and business communities. This information was categorized, consolidated and analyzed along with other literature to develop the generalizations and theories to follow. The information was gathered in a fashion, supported by grounded theory in an evolving iterative approach, allowing the data to determine the direction of investigation, until theoretical saturation was reached. It is important to note that this approach uses a smaller data set and may limit the findings, without further analysis and data collection, to the data set discussed here. In the beginning of the data collection my ideas were very simplistic, indicating information and computer technology was too much a part of the children's world today and other skills were lacking because the other skills were not

taught or practiced. It is also important to recognize, though we focus on information and computer technologies impact and role, there are other factors that are also impacting society such as environmental management groups, and changing global economy and trade. So information and computer technology is acting in conjunction with other influences on society.

The following is a brief summation of the information gathered from the business and education communities. What is apparent is information and computer technology has impacted all facets of society. Business and education are not exceptions. What also is very dominant in the data collected is everyone's sense of change, loss of control and struggle to keep up with change. At the working level in both areas the common trends and concerns outlined are apparent. It is important to recognize that information and computer technology has provided society with may good things over the years, even though we are addressing many of the side effects that are negative in nature. Please keep in mind while reading this section that our use of the term 'technology' refers to information and computer technology. The first table outlines the information about the organizations, society and government.

Table 1: Comparison of Organization, Society and Government Findings

Description	Business workers	Education workers	Comments
Suspicion of the other	Education not producing workers. Education is disorganized, w/o clear goals & objectives.	Business is not supportive, including financial. Funding continues to decrease while demands increase.	Lack of common direction, goals & understanding is obvious.
High Stakes Testing & Measures	Does not measure learning, pushed by organizations, not even focused on the development and learning of the children.	Does not measure the whole child, pushed by organizations, threatening to compromise learning.	All workers see the ineffectiveness but organizations do not, technology is pushing measurability
Technology @ Work	Controlling information and business direction.	Depriving education of other necessary resources.	Focus is masking importance of other resources and factors
Technology in Education	Focus needed on core skills, not technology. Too many dollars on technology.	Focus needed on core skills, not technology. Secondary tool, too many dollars on technology.	Too much focus on technology, focus needed on core skills to develop "people".
Organizational Structure	Treated like resources, distrust and disloyalty between employers & employees.	"Voice" ignored in discussions about "learning" and "teaching" technology. Technology threatens their role.	Need more recognition of the problems and efforts of workers. Organizations ignoring the "voices" of the workers. A gap?
Focus	On dollars, shareholders, technology and information, people just a resource.	On technology, funding organizations, parents and government, instead of the student/child.	Focus on process, technology and dollars, not on people. Focus needs to change.
Structures	Organizations flattening, IT integrated in business, IT prevalent in all areas, critical to global marketplace.	Business, government, educational administration pushing more process-oriented, prescriptive, measurable management.	Focus on non-human factors negatively impacting learning, families and social areas.
Introduction of technology	30+ years ago in business, importance growing ever since	Introduced in 1980s but slow to evolve	Technologies impact quicker in business where global and competitive impacts felt first.
Family Impact	Parents working too much, not enough time with children	Parents working too much, not enough focus on children	Parental involvement required to aid children's development
Professions	IT splitting – technical focus and business focus	Teacher's role altered by technology, uncertainty	Roles changing as technology introduced
Social Focus	On technology, contrary to needs of people, don't care about people and families	On technology, not on needs of children, don't care about people or families	Making safe for technology, not people?
Desensitization	People desensitized and demoralized by reduced control, feeling of community diminished	People desensitized to right and wrong, torn between family and work obligations, community diminished role	People care less and feel have less control
Consumerism	Out of control, driven by information overload,	Out of control focus on money instead of social	Need some way of gaining control over our

	forcing people to work more	needs.	social lives again.

Below is a comparison of the information gathered on skills in the interviews. It outlines the concerns and similarities outlined by both groups.

Table 2: Skills Comparison

Description	Business workers	Education workers	Comments
Technology	Increasing need for IT skills in all jobs, but this can be learned anytime.	Children need exposure to technology, uncertain when this needs to happen	IT is needed in all facets of lives, when it is introduced is the question
Technology in school	Not required, waste of money until later grades, too much focus on IT	Mixed success using in classroom, hands-on and interactive work better.	Agreement on focus on other skills, other skills are more important.
Skill Changes in recent years.	Focus on people, communication, and technology.	Focus on child-centred learning, interpersonal and technology.	Focuses don't match. Education's focus on technology not shared by workers and parents.
Primary skills to learn	Knowledge and learning areas with specific skills later	Knowledge and learning areas with technology and other skills later	Same ideas of what should be learned, say focus currently is wrong!
Curriculums	Too complex, learning too thin	Too complex, cannot become engaged, too thin.	Same ideas – too complex without focus on key areas
Organization's focus	Focus upper management on "teaching/learning" technology, blind to other needs, workers want core skills	Focus administration on "teaching/learning" technology for votes, blind to other needs teachers identified	Focus is on wrong skills, driven by organizational goals not developmental goals.
Child development	Unsure what education is doing, pushing testing instead of learning, advancing children without basic skills	People don't understand complexities and issues in education – disciplinary and behaviour problems, pushing testing instead of learning, told to keep children with their peers	Seems like confusion between the needs of organizations for measures and children's true needs.

The information identified in the detailed findings identifies many issues and trends. First, the changes and trends all point to occurrences at both the institutional and individual levels. Second, to help explain the changes and trends we need to include some institutional analysis to help theorize the information from my interviews, to integrate the findings related to business, education and technology, and to help explain

and understand the development of organizations and the relationship with individuals, institutional theory was employed. Institutional theory states:

> "Formal organizations are generally understood to be systems of coordinated and controlled activities that arise when work is embedded in complex networks of technical relations and boundary-spanning exchanges". (Meyer & Rowan, 1991, p.41)
>
> "Institutionalization involves the processes by which social processes, obligations, or actualities come to take on a rule like status in social thought and action." (Meyer & Rowan 1991, p.42)

Formal organizations adopt practices and procedures from other organizations and society. Technology's use is one such practice. According to Meyer and Rowan (1991, p.41):

> "Professions, policies and programs are created along with the products and services that they are understood to produce rationally. This process permits new organizations (like heavy technology users) to spring up and force existing ones to incorporate new practices and procedures. Organizations are driven to incorporate the practices and procedures defined by prevailing rationalized concepts of organizational work and institutionalized by society".

Franklin's prescriptive model supports Meyer and Rowan and reflects the tenets of institutional theory. It indicates how things get processed, controlled and rationalized through pre-defined rules and techniques. It is a more structured format encouraged and rationalized by the institutional environment. Prescriptive technologies and techniques help organizations to establish and rationalize their approaches in the institutionalized environment.

Institutionalization includes the use of institutional rules. Once concepts or activities are institutionalized, institutional rules develop to support and enforce the position of the concept or activity or thing. Institutional rules are distinguished sharply from prevailing social behaviours. Institutionalized rules are classifications built into society as reciprocated typifications or interpretations. Such rules are simply taken for granted or may be supported by public opinion or the force of law. (i.e. Stop signs, No smoking signs). As Meyer and Rowan (1991, p. 45) state:

> "Technologies are institutionalized and become myths binding on organizations. Technical procedures of production, accounting, personnel selection, or data processing become taken-for-granted means to accomplish organizational ends. Quite apart from their possible efficiency, such institutionalized techniques establish an organization as appropriate, rational, and modern. Their use displays responsibility and avoids claims of negligence."

But how does the organization separate itself from the individuals? Meyers and Rowan (1991, p.41) introduce the concept of decoupling. As defined by them, decoupling is used by organizations "to build gaps between their formal structures and the actual work activities". Decoupling is the separation of organizational formal and ceremonial activities from the day-to-day process and individual activities. This helps explain why the organizations were so focused on dollars and information and were less focused on their operations and people. In times of change the focus of organization is on the formal structures visible to society and they use resources and ideas that are rationalized by society. As they struggle to keep up with change, they choose to focus on the tasks which society has said they should, leaving little time or resources to deal with the informal and people level in the organizations. The decoupling of organizational formal and informal level makes it easier for organizations to do this and justify it.

This also could be seen as the organizations' way of retaining control, exclusive of its workers. As competition has increased so has the importance of organizations to present themselves in certain ways to increase their legitimacy and their survival. Institutional theory also discusses the reason why organizations adopt procedures, processes and practices, often without analyzing the impact on their organizational environment. According to Meyer and Rowan (ibid), organizations, to be accepted and legitimized:

> "Incorporate the practices and procedures defined by prevailing rationalized concepts of organizational work and institutionalized in society."

Technology is one of the concepts institutionalized in society. It is a symbolic indication of success and advancement and a way of prescriptively organizing and controlling the business information environment. Organizations are driven, by competition, societal pressures, organizational association influences, rationalized approaches and regulatory agencies to use information and computer technology as much as possible so they can succeed in accomplishing their goals, legitimizing their existence. This would help explain why technology has a major role in all organizations, whether it is supportive of the work activities or not. The advancement of information technology and its rationalization in society is supported and enforced by globalization of our economies, advancements in capitalism and competition. The globalization is helping to create the institutionalized framework in which information technology can operate, because without information technology much of the global marketplace and commerce would not be easily achieved. This role is legitimized and rationalized, often impacting other parts of the organization and taking priority over the people. This legitimizing of technology also helps to explain why technology is being moved closer to the business and being given a more central role in business' decision-making. This also develops the image of technology "driving" the business, rather than facilitating the fulfillment of objectives.

The individuals interviewed within the organizational structure understand the need for technology in the organization. At an individual level, they understand there is more than technology required to complete the work at hand and develop a person to work within the organizational environment. Educational organizations are a good example of this decoupling of organization and individual and the struggle individuals face. The educational administrative bodies are rationalizing their use of technology because it is being supported and requested from government and other organizational groups, who often fund and influence their goals and direction. Teachers and school administrators,

who are removed from the rationalization influences and pressures, understand the need to use and expose children to technology, but also understand other learning areas and techniques are more suited and important to the development of the "whole person". A lot of the educators have tried and failed to influence and develop a better-balanced curriculum through associations and board committees. The budget money remaining after purchasing information and computer technology is inadequate to fund all the other activities in the schools, as many examples indicated in the raw data – no pencils, paper, art and physical education supplies could be ordered. The decoupling has created a communication void, potentially causing the misunderstanding between the teachers and the education administrative organizations. It is also prevalent in the business world where the needs identified for business by the organizational structure are different than those identified to support the development of a person. This decoupling may be so severe in organizations, including educational, that something major must be done to draw attention to the problem so it can be resolved.

Like other formal levels of organizations, the education administration is being asked to legitimize their existence and incorporate rationalized procedures and practices, like technology. This legitimization process is seen in their bid for funding and the process they go through to get curriculum changes supported. Funding is reliant on the fundraisers agreeing to the curriculum that is put forward, representing their degree of control over the whole educational process and the loss of control the educators feel. It also leads education administrators to compromise so funding can be secured. They are additionally being asked to standardize practices and use a prescriptive process, like a business. Administration is wrapped up in this formal process while the teachers and educators at the children's level in the schools see a different reality, where the children

learn better in a child-centred hands-on environment. The teachers see little use for the large complex curriculum and the use of technology, especially in the earlier grades, except as a supplemental tool. This gap is further evident when the "voices" of the teachers are not being heard by the education administration, because they are not part of the "formal" level the education administration is participating in. Their statements in the detailed findings section indicate that their concerns and suggestions are not recognized as important at the administrative level, and that the information from the governing and funding bodies is recognized as more important.

Information and computer technology plays a different role for the organizations and the individuals. The importance of information and computer technology to organizations is based on control, process and profit. Organizations adopt technology because they feel they need to use technology to make money. Their focus is not on individuals, but on profit and satisfying their board of directors or shareholders. They are less focused on their workers and how the work gets done. They rely on information, process and controls to manage the day-to-day work.

The importance of technology to individuals is one of communication, convenience or entertainment. Respondents like and use technology, but feel torn between using it and not using it. Respondents realized it does not develop the "whole person" or satisfy our socialization needs. Respondents understand the needs of the organization and why it needs to use technology, but also they understand the needs of a person. People understand the need to develop persons with broadly based learning and knowledge so they have the expertise to work in an organization with the required technology. They understand technology is important but as a tool, a means to an end. It is a supporting

role, other skills and areas of knowledge are considered key to the development of the person, to fill the working roles. It is the skills and areas of knowledge developed over a lifetime of experiences and learning that develops these people into who they are today. It is not only information and computer technology.

When all this information is reviewed, it becomes apparent there is a discrepancy between what people perceive as important to the development of a human being and what is important for the operation of an organization, such as a business or institution. This responsibility rests with organizations as they are role setters for society and often fund and influence the direction of people's education and lifestyles in society. This discrepancy between the two has widened over the years and has become even more apparent in the last 10-20 years with the boom in information and computer technologies. Information and computer technologies have altered the way people transact business and interact with each other. Our whole society has been affected by information and computer technology. The "gap" that exists is causing turmoil, confusion and conflict between the needs of organizations and the needs of individuals. The organizations are businesses, government, educational administrative bodies, and formal professional organizations. The individuals are children, educators, workers and parents within our social environment. The respondents indicate this change has negative impacts, including erosion of loyalty and trust, lack of long-term relationships and unwillingness to train and develop workers within the organization.

A "Gap" Theory

Through this investigation, analysis and discussion, many ideas have been developed. The following statement attempts to summarize what I feel is happening between

organizations and individuals. This generalization evolves from institutional theory and is further supported by other theorists in the sections to follow.

> ***The institutionalization of information and computer technologies has created a gap between organizational needs and the needs of the individual to develop as a "whole" person, capable of functioning effectively in social and work environments.***

It encompasses the impact of information and computer technologies on our education and IT organizations. It encompasses the information about the gap between the organizations and their heavy use of information technology and the individual development of people to work and function in that framework. As my discussions have indicated, it is vital to allow people to develop so they are able to function and contribute. Currently I think we are lacking some of the understanding and recognition of the existing situation. I think we are also lacking recognition of the importance of people in the institutional framework.

Many other theorists help explain and support these research observations. Information and Computer Technology has been evolving and expanding rapidly for the last 10-20 years or so. While this has been happening computer associates and computerization movements have been evolving with it. The computer movement organizations, as they collect members and users, gather strength and influence within the political and social and economic arenas. The movements also help to rationalize and formalize technologies place in organizations and society in general. As indicated by Kling and Iacono (1996, p.91):

> "These organizations are entities capable of taking social action. They can raise money, mobilize resources, hold meetings and formulate positions."

As the computerized movement organizations expand they begin to influence and alter the social work, becoming rationalized and supported by organizations and governing

bodies. This supports the institutionalization of computer and information technology. They create what is called:

> "Technological Utopianism – a framing device used by movement entrepreneurs to envision the renewal of society through technology" (Kling and Iacono (1996, p.92)).

Early adopters of the technologies and supporters of the computer movement organizations, serve to support and restructure the "rationalized" and acceptable practices. They gather further support and eventually begin to evolve what is determined as the "normal" business practices. These companies also begin to evolve the business practices so other companies are required to follow so they can continue to do business. Walmart is a perfect example of this process at a company level. It is an example of DiMaggio and Powell's coercive isomorphic framework. Walmart became heavily computerized and would not do business with any suppliers who could not transact business through electronic Internet based applications. Walmart could be considered a leader in the technology movement and its influence is altering the way its suppliers conduct business. The suppliers in turn will effect the way their suppliers do business, causing a ripple effect throughout the effected business area.

Information and computer technology practices are being defined with set roles and responsibilities and practices acceptable by society, largely through computer movement organizations (C.I.P.S., I.S.P., etc.). Computer movements themselves are the result of change and a need to ensure quality. They also are an attempt to control information and computer technology. This is an example of DiMaggio and Powell's normative isomorphic framework. Technology and its related organizations have developed standards (ISO9000), e-mail standards, protocols, regulations on e-commerce (X.25, EDI, Java, Html, XML) and Internet acceptable practices. Through the support and expansion of technology's influence it is being institutionalized in our society, and

becoming a "norm" for organizations and individuals. Organizations and individuals, wishing to function in this environment, must adhere to these standards.

Organizations wishing to be legitimized and accepted enforce the use of technologies. People wishing to participate in society begin to use technology, like information and computer technology. The mere use of technology is not the issue, the issue is when it is used to the extreme and causing negative impacts on human progress and development. Many technologies are pushed upon people because of changing business practices. One person cited a good example of how technology is becoming institutionalized and pushed on people, similar to how it is pushed upon organizations. This example is representative of DiMaggio and Powell's mimetic isomorphic framework.

> "Computer Technology is going to continue to spread out into the home. I think more and more is going to be offered through the house. You can do your banking over the Internet. You can do the banking over the telephone. You can do a lot of stuff out of your house. Eventually you can shop from your computers at home as well. I think as much as we would like to hope that we can control technology, I think technology will control our lives, more so. It is frustrating too, because if you can't keep up with the technology you're left behind. You used to go to your bank teller to do your banking. Then they brought in the instabank machine now we do all your banking through the instabank. Then they brought out telebanking, so you did all your banking over the telephone. Then you've got the Internet. So it has become more and more where they start eliminating services that you used to use, and you have no choice but to go to the new service because they don't offer the old ones any more."

As Kling and Iacono (1996, p.92) indicate there is:

> "Little or no articulations of the underlying technologies, the costs associated with actually implementing such a vision, or the political struggles that will certainly ensue, the government invites public identification with and participation in the mobilization of support for the expansion of computer networking into every facet of people's lives – in their homes, workplaces, and schools".

This helps to explain why and how technology has become so rationalized and accepted as a "norm" in our society. With the support and endorsement of government, organizations feel it is a requirement so they can rationalize, validate and legitimize their approach to using technology. It also explains why education organizations feel the

strong urge to incorporate the use of technology so they can legitimize their existence, supported by other organizations.

Another idea prevalent from the rationalization of information technology, and it is introduced in the previous paragraph, is the introduction without any reflection and investigation into the negative impact on the organization or the people. We, in fact, tend to adopt it without validating it as an approach, or its long-term ramifications. There is little time spent investigating the impact on people, the costs to implement the technology, the risks and the benefits associated with technology. This is nicely stated by Postman in the epigraph of this paper "A bargain is struck in which technology giveth and technology taketh away."

Another observation is the formal structures do not really account for how children learn best. Educators have proof in their classrooms that children learn best with hands-on tasks and interaction with others. The skills learned on computers are good supplementary tools but do not develop the children's skills as completely and as well as the hands-on process. The teachers feel the gap will continue to widen if the formal organizations do not begin to listen to what they have to say. The teachers feel, if this gap is not closed, the children will be the ultimate losers in this situation. Another idea to note is what is good for administrative levels of organizations may not be suitable to enforce at the working and learning levels. There are two kinds of institutionalization going on here. The first is the institutionalization in education of technology, being enforced by the organizations influencing education. The second is the institutionalization of education itself that is growing as teachers identify how the learning process should be done.

Both education and business workers are critical of the push to learn technology. What is interesting is we confirm the gap between the informal and formal organizations. We confirm the formal organizations are pushing technology and lots of diverse ideas in the curriculum, but the workers, who are often parents too, see the core areas of knowledge, skills and learning as most important and requiring more focus. The impression is the formal top organizational structures just keep asking or demanding more and more to be covered in school curriculums, without really understanding what is required in the informal work areas or for the development of individuals. What also must be recognized is that when new items are added to the curriculum, other items must be left out. The time is finite for children to learn.

As the interviewed respondents indicated, organizations rationalize the use of technology in all they do. It is supported and validated for their use by society, even if it is not necessarily the best way of doing things. This also helps to explain why organizations focus on technologies and ignore the issues and problems with the people in the organizations. As Postman indicates technology changes the focus to itself. This causes the workers' frustration, as their "voice" is not heard.

> "Institutionalized rules may have affects on organizational structures and their implementation in actual technical work that are very different from the affects generated by the networks of social behavior and relationships which compose and surround a given organization." (Meyer & Rowan, 1991, p.42)

Technology's rules and use in an organization may be different from those in the world around it. In other words, the use of technologies by an organization in its formal role and processes is different from the use of technologies by individuals. This is what my research indicated. The individuals say their need and use of technology is different from the organizations. The people interviewed felt organizations view technology as a solution to the many people, process and control problems they face. They felt

technology was reducing the corporate environment to processes and numbers to be controlled, manipulated and monitored by technology. Success and performance was being gauged on the use of technology and the revenue generated. Business views technology's potential in quantitative terms. Individuals on the other hand saw technology as a tool. There are other parts of life we valued more highly. People accepted technologies role, but did not surrender to it entirely. Individuals view technology's potential in qualitative terms. According to Pacey (1996), this struggle, social turmoil and resistence is a common result of technology transfers from one social structure to another.

Institutionalized rules and myths become isomorphic with organizational structures. Globalization plays a role in institutionalization and the borrowing from other cities and countries. Technology is such an institutionalized rule and myth. DiMaggio and Powell (1991, p.66) indicate isomorphism is a constraining process, forcing one unit in a population to resemble other units faced with the same environmental conditions. This would explain the explosion in the use of technology throughout organizations and all of society. It would also help to explain why education is feeling pressured to use technology more and more as it is part of the same societal environment as other organizations. The people interviewed outlined examples of all three types of isomorphism occurring in our society. Coercive isomorphism is prevalent in the pressures and push for education to use and teach technology. Education feels to continue to be supported and legitimized it must agree to incorporate technologies, even if it is not understood completely how, why and for what it is being used.

Mimetic isomorphism can be seen in the educational adoption of technology, where educators do not understand or see definite goals and uses for technology but it is being pushed as a primary objective because other organizations are using technologies. There is some rationalization, legitimacy and comfort felt in doing what others are doing.

Normative isomorphism is seen in the information technology professionals, who are pushing technologies to rationalize and establish their position in the organizational world. Another indication is the increase of Information Technology designations, regulations and certifications, designed to control and structure the profession, increasing legitimacy, visibility, and lead others to copy and adopt their policies, procedures and practices. Designations like the MSCE, CNE, and I.S.P. are examples of this professionalization.

As we see with the progress and infiltration of technologies into every facet of our lives, each of the institutional isomorphic processes can be expected to proceed in the absence of evidence, increasing internal organizational efficiency. In other words, what we are seeing with the advance of technology will happen regardless of the efficiencies or benefits it brings to the organization (DiMaggio and Powell, 1991, p.72). This is seen in the educational organizations where technology is being adopted but it is unclear if there is or will be any efficiencies and benefits gained. This lack of clarity indicates a loss of control and an inability to clearly respond to change and define our direction. With more analysis and research the decision on how and where and why to use information and computer technology would likely be more clearly defined, increasing the success of its integration.

Franklin (1998) indicates technology has made it more difficult for people to obtain what is important to them. Technology does this by controlling larger and larger portions of our daily activities, leaving less time for the other. Disintegration, though it started long ago, has been escalated through the increased changes and loss of control felt by people. The introduction of information and computer technology has assisted this rapid change. There is strong evidence information technology is evolving and being transferred from one society and organizational group to another, causing turmoil as it spreads. As indicated earlier by Arnold Pacey, (1996):

> "Adoption of new technologies by a geographical and social region often caused resistance and disruption to the social order".

Neil Postman (1993) supports this by saying:

> "Technologies began to effect and intrude on theology, cultural and metaphysics causing shifts in or disruptions to the culture."

The erosion of leisure time, longer working hours, breakdown of family and social structures and less time for enjoyment of life supports this disintegration. Franklin (1998, p.97) further warns as the technologies and supporting infrastructures advance, they become:

> "Institutionalized, users often become captive supporters of both the technology and the infrastructures".

Our dependency continues to grow and our control over our destiny continues to erode. Andrew Feenberg supports the findings and concerns when he says as companies continue to develop in a capitalistic world the social system is disrupted and people begin to fend only for themselves, ignoring and not caring for others around them. This refocus on ourselves may be a way of coping with the change and loss of control. We focus on smaller pieces of our lives trying to maintain control and direction.

Richard Scott (1995, p.87-88) quotes Tolbert and Zucker on how structures, like technologies, become institutionalized.

> "As an increasing number of organizations adopt a program or policy, it becomes progressively institutionalized, or widely understood to be a necessary component of rationalized organizational structure. The legitimacy of the procedures themselves serves as the impetus for the later adopters." Tolbert and Zucker (1983, p.35)

This would explain how technologies once introduced have continued to progressively infiltrate and become rationalized and normalized in our society.

Franklin also helps to support the "gap" theory with her explanations of holistic and prescriptive technologies. Information and Computer Technology is a prescriptive technology, developed based on non-human pre-defined processes, procedures and techniques. The use of computer and information technology is very structured and leaves little to the control of the user – they must do things the way the technology wants to do it. It is a reflection of our attempt to take control of our environment but it also indicates how things taken to extreme are not helpful to our advancement. A balance is needed. Franklin indicates there are issues and problems associated with defining everything based on prescriptive technologies. Technologies are becoming a practice that formally links technology to the culture.

The people interviewed create a view of education and business organizations supported by Franklin's views. Their views suggest we are using a prescriptive model for our business and educational environments, perhaps in places where it is not suited. Martin Bowles further supports Franklin's explanation and my findings. He (1997, p.793) states:

> "Strategic Planning, a result of control and prescriptive thinking, has become not just one approach to managing an organization's future but *the only* conceivable one in the modern period".

Bowles further states what this approach supports is everything reduced to processes, numbers and facts. He says anything not fitting the mold is considered unimportant or not worthy of attention. Human and social factors are discounted and trivialized, leaving the people disenfranchised, de-moralized and a resource for another's purpose. The replacement of people in organizations with technology causes layoffs and downsizing, temporarily relieving the burden but not helping to develop expertise and personnel for the future. Interestingly, strategic planning defines objectives, ways and means of doing things. It needs to involve people in all stages to be effective, but the focus tends to be on planning for organizational advancement not a focus on human advancement.

In education, supporting my findings, there are similar issues around the technology and prescriptive techniques being adopted. Education is being molded more and more like a production / prescriptive model, where structures, processes and technologies are used that do not necessarily work in that environment. Ursula Franklin indicates this type of structure is not conducive to the learning environment. Franklin (1998, p.28) indicates:

> "Although we all know that a person's growth in knowledge and discernment proceeds at an individual rate, schools and universities operate according to a production model."

Strict processes, timetables, calendars, set tests may not produce the educated and knowledgeable work force. Postman further supports Franklin's explanation, but says structure and systematizing procedures encouraged by prescriptive technology cannot refine or mimic human skills, such as: thought processes, analysis, experience, interaction, and teaching interactive techniques. They can, however, assist in reaching decision points more quickly, as a tool. The process of analysis and decision-making still requires the people to understand and make sense of and verify the information this tool provides.

These changes effect the teachers who feel the pressures of structure and process. Their activity is restructured through technology to reduce their autonomy, independence and control over their work. Alison Taylor (p.11) warns there is a "potential for technology to displace and to deskill teachers who are seen as "guides on the side". Is this to the benefit of the students? According to many, the answer to this question is "no". We are getting away from fundamental ideals of teaching and learning where the teacher and the student share a reason for "school". Postman indicates if "school" is to exist it must have a role definition and a reason.

According to my research, the government and education administrations' confusion over the purpose and role of education is further supported by literary information. Ultimately education should be "the eternal quest for truth". Today, government and educational boards are sending mixed messages to the people. On one hand, they state education is the answer and it is a social responsibility. There is a push to expand and distribute knowledge. But, what is knowledge? Alison Taylor's (1998, p.5) analysis warns industry is pushing the education system to produce "employable" people, even if they are not employed. On the other hand, governments and industry do not want to help fund this endeavour. Alison Taylor's (1998, p.2-5) analysis states the government considers education and "investing in the people" as a top priority. However, she says no one wants to provide the funding and resources for teachers to become trained in computers and technologies and to provide funds to buy equipment and technologies to be used in the classrooms. So even though technology and computers are being incorporated, as the interview findings indicate, there is no indication of efficiencies gained or lost from this. There is also a lack of proper support to purchase and

implement the structures and equipment required to completely facilitate this approach. This illustrates the confusion as we try to deal with change.

This disruption is further evident as Canada matures as a "technocracy" and moves toward a "technopoly". As indicated by the people interviewed and other reviewed literature, the introduction of information technologies has caused the same disruption and confusion in societies all over the world today. The only difference is the magnitude and speed of the transfer of technology. This appears to be advancing at a much faster and aggressive rate then any other in history to date.

A historical example with a similar impact to information technology is the birth of printing. The printing and printing press technologies, considered to be the start of the information age, had a similar impact on societies, but the magnitude of the impact was not felt as quickly as it was slower to spread and evolve allowing societies and cultures to adapt and adjust to the change. This example indicated to me the following changes:

- Information availability improved between people and between cultures. History and products and procedures were documented for others to read.
- Social structures were impacted, as the information was no longer available from a select group of "wise men". This altered the power of individuals in society.
- It altered the way people interacted. People could exchange information in letters and books, instead of relying on infrequent interpersonal exchanges. Information was exchanged more frequently.

Finally there is the techno-centred focus of our society. As society becomes more and more technologized and techno-centred, technology continues to gain more control over business and all of society. It changes the focus within the organization from people-oriented to technology-oriented. Aiding in the feeling of alienation in the organization.

This techno-centred existence also supports and plays a key role in the institutionalized organization described earlier. Postman says technology alters what is considered the norm and the reality building, encouraging people to trust in technology. We are evolving into a mature technocracy, speeding dangerously toward being a young technopoly, unless we regain control. Computer and information advocates in businesses and computer movement associations are the Technophiles, encouraging society to adopt and trust technology. While associations and technology companies try to help define and make sense of information and computer technology and skill requirements for all to see, their information needs to be reviewed within context and managed as it can be over extended into areas where it does not pertain, but society lets it venture. Perhaps it is also because we are all reeling with change and struggling to keep up.

Postman's theories support the institutionalization and rationalization of technology in today's society. He indicates technology as it becomes more infiltrated into our society, begins to change and mold it in ways supportive of its endeavours. He notes that as technologies become more ingrained in our everyday activities we begin to trust more and more in it and rely less and less on our own instincts and beliefs. This is supportive of our findings and the fact that information and computer technology is being pushed into areas where it is not necessarily adding benefit, just because organizations and its leaders indicate it should be there. He supports the trends we see being pushed in education at the organizational level to use and teach technology, without regard for the individual needs or how learning is achieved. It is blindly incorporated, much like other institutionalized rules and practices. His work supports the findings there is a gap between what organizations and individuals require and desire. He identifies the overwhelming push technology has over the needs of individuals. He indicates in a

technologized world, people and their needs are low on the priority list and are to be controlled. Though it is organizations, not technology directly that are placing individuals low on the priority, it is the focus on using information and computer technology, that has accentuated this problem, drawing organizations' attention even further from the individuals.

The turmoil and social unrest can also be explained by Pacey, who indicates with every technology transfer there is social resistence and disruption. We are definitely witnessing that here. This can also be linked to feelings of loss of control and the struggle to deal with change. There are also other indications of change and loss of control in the respondents' discussion of historical and literary revisions contrary to the children's learning of "truth". This erosion of the "truth" is felt to be an indication of loss of control and rationalized and organized change, but people feel helpless to stop it.

The following will summarize the discussions and revisit the questions outlined in the literature section. The questions were answered through the gathering and analysis of the data, using grounded theory.

What is the role of information and computer technology in organizations and education?

The changes to the organizational environment have been dramatic. Organizations are focused on information, information management, shareholders and profits. Technology has played a key role in this evolutionary process. It has changed the way organizations interact. It has changed the way the organizations are internally organized.

What is the driving force behind this change in skills and knowledge?

There are many factors contributing to this change, including technology and globalization. Technology has been accepted and rationalized as a necessary tool to compete in the global marketplace. Globalization and the rapid pace of business today have also contributed to the rationalization of technology in its role. Technology helps companies to participate in the changing and competitive marketplace.

The goals of organizations and education are confused and disorganized. Individuals understand the developmental needs of the person, but the organizations support the push for education to focus on technology, accountability and dollars. These two goals are in conflict, as the funding organizations are pushing prescriptive and structured processes that educators state are not conducive to the learning environment. Individuals appear to be struggling between their organizational role and their individual role – perhaps due to the loss of control and difficulty managing the rapid changes taking place today. Educators identified many issues impacting their continued focus on life long learning, including the complexity of the curriculum and the push to use and teach technology.

What types of guidance and support are lacking for students?

Information and computer technology is the focus in companies. They are pushing for it to be taught and utilized in schools. But the respondents identified this is an issue because even though it is a primary tool in business, it is not the primary tool required to develop people to work and function effectively in organizations. Skills and areas of knowledge identified as the most important to develop are problem solving, critical thinking, analysis, reading, writing, math, sciences and communication.

There are many other problems identified. The unrest, confusion and the lack of clear goals in the organizations have caused a lot of uncertainty. People distrust organizations as their needs are ignored while the organizations focus on profits, shareholders and technology. Family units are impacted because the people are working longer and longer trying to retain their positions in the organizations, leaving little time for their children. Inevitably this is impacting and resulting is students having very little guidance and support from the family and educational structures around them.

Institutional theory helps to explain these changes and why the changes have occurred. The evolution of technology and computer movement organizations that promote and support the information and computer technology have further solidified technologies role in society, organizations and education. This control is causing traumatic changes and turmoil in society, causing people to re-evaluate our values, roles and responsibilities. This process will continue until we regain control of our destiny. Though our research focuses on the information and computer technology sector and the education industry it could potentially apply to other areas. With further research and data collection, it could be verified if the theories and generalizations identified here are valid in other areas.

The information presented here indicates problems with the introduction of information technology and it appears from data from respondents and authors that we have little chance of controlling technology and its advancement. However, the more aware of the situation we are the better prepared we can be and the better we can guide and support our children. The more chance we will have of controlling the direction and development of our future in a techno-centric world. Another way to think of this is to recognize that

the big problem is how technology has become invisible and we need to make it visible so we can deal with it. The following section discusses some ideas about where we go from here, what we can do to live and work successfully, and raise families successfully in the techno-centric world. So for now, let's identify what we can do to effect change and help shape our future.

Where Do We Go From Here?

Many of the people interviewed and other literary sources, indicated things we should do to determine our future and increase our successes as a society.

A Common Understanding and Support for Education

Educators and business face a challenging and changing future. Educators feel business has increased its demands for people with work skills at the sacrifice of real learning. Teachers feel education is being pushed to produce workers, defeating the purpose of education. Educators feel business does not understand what is involved in teaching children and how to best develop their core areas of knowledge and the desire to be life long learners. As a solution, business and education need to sit down and learn from each other. We can go forward and develop a learning environment, maximizing the benefits to children and supporting their life of learning. To do this we need to build a common understanding. We need to agree that there is more to learning then "getting a job". Respondents indicate, business needs to trust education to provide the people of the future. Currently with government and business involvement, the educators feel they cannot do their jobs and they fear for the future of education.

The role of technology in education needs to be defined and agreed upon by all. Educators say "technology" is nice but it is not the only thing that is important in the education system. They say to use technology to its fullest, the children need well-developed knowledge in other areas. A critical evaluation of high stakes testing is

required. The business community who want to see measurable numbers, statistics and grades needs to understand what educators are suggesting may be a better way to measure the success of a child, blending testing with other more qualitative measures. In order to make education and the development of children more successful, parents, government and businesses must better support the children, including financially. The children deserve more than superficial support. People and businesses must recognize the importance the "family unit" plays in the development of the children to be the workers of the future. Right now, respondents feel our future is frightening. More time needs to be spent involved in the children's lives, helping them develop and grow for life.

A Better Definition and Understanding of "Learning"

Schools face a need to evaluate the effects of computers and technology in the education system. I feel people from education, parents, organizations, and all facets of society need to be involved in these discussions so everyone understands and supports the issues at hand. First, a definition is required about what constitutes good schools and strong communities and more broadly, within a serious discussion of the goals of public education, within a democratic society. Once a definition is created, then and only then, can we evaluate the position and role of technology in schools. Second, the effect of technology on teachers, classrooms and learning environments must be evaluated, I suggest looking at things like:

1. Teaching styles -- which are effective and which are not
2. Learning and preparation times for teachers
3. Expectations of parents and students
4. What is the best learning environment
5. What life long learning really means
6. What skills, knowledge and learning is most important
7. How do we develop life long learners

Awareness of Affects of Technology

Each part of society appears to be struggling to determine its place in this rapidly changing world. As was apparent in the earlier literature review, no technology in the past had so rapidly changed and advanced society, and our social, family and economic structures appeared to be struggling in its wake. Unlike other technologies that slowly evolved and impacted parts of the social and economic worlds, Information technology, including computer, telecommunication and communication, impacts and touches all facets of our lives simultaneously. The infiltration in the last fifteen years or so of information and computer technology has been faster and more rapid than any other technology before it, escalating the rate of change and impact felt by all of society.

All the people interviewed indicated it was critical for people to increase their awareness and regain control over their lives so they can assist their children and prepare them for the future. This means businesses and other organizations need to be more flexible and supportive of the social obligations of the individuals, including the developmental needs of the children. This could be a difficult route to follow, as some say:

> "The task of redress requires the reintroduction of people into the technological decision-making process. Action is required on a number of levels, including the refusal of consent to our governments to proceed with heroic technology such as nuclear energy, gas and oil mega-projects, or work in space." (Ursula Franklin, 1998, p.127)

> "The world of technology is the sum total of what people do, its redemption can only come from changes in what people, individually and collectively, do or refrain from doing." (Ursula Franklin, 1998, p.123)

> "We must stop being slaves to technology and become its masters instead. A good starting point to liberate people and organizations in the information age is the obvious conclusion that many people have already arrived at, namely that we are drowning in a sea of email, voice mail, reports, data – we have so much information these days that it's hard to get one's job done." (Earl Hickcok cited by Bronstein, Richard, 1999, p.8)

We need to understand and recognize the impact and role technology plays in our lives. By recognizing its role, we can better support, guide and nurture our children. Our awareness will help to ensure our children are better prepared, increasing the probability

they will make better more educated choices. If we nurture this awareness our children will have a better chance of developing into "whole persons" and life long learners. We must recognize there are problems in society, beyond just the introduction of information technologies. We must overcome as citizens these issues and becoming more aware of the problems is the first step toward achieving this goal.

Taking Control of Our Future

We need to take control of our children's future learning, determining and understanding the role we want technology to take. By better understanding education, learning, the workplace and our social and family needs, we can better develop an educational system to meet those needs. It is important for us to control and manage technology to ensure our future! Ultimately "taking control of our future" means we are accepting responsibility for the future.

I think behind the problems information technology has caused is a larger societal problem, where we do not value and nurture the successes of humans. We focus too much on external things and not enough on the advancement of our society, its people and its future.

This research area is very broad and encompasses a great many areas and a lot of information. When the area of interest impacts such a vast audience, at best we can touch a small segment of this group and attempt to extrapolate the results to the general audience. I hope my research indicates to those reading it that we have a problem involving technology in relation to learning and what is learned and what is important to the person to function in the work and social environment. Technology's role is complex and multi-faceted. We need to learn to live with technology.

From the information in this paper we have a starting point to expand, critique and explore the planning and development of the future for our children. Their future is reliant on our increased awareness and development of good educational programs and support structures. Our awareness should help people to better control their involvement in the work place, perhaps even facilitating change so the family unit does not suffer.

The Influences of the Researcher

This paper is concluded with a discussion of the role I played in this research project. The purpose of this section is to identify how my role in this project impacted and was impacted by the research project. It also serves to round out the picture painted in the discussion section.

First I would like to acknowledge the fact I am not outside the project. I recognize I am part of the project and impact and influence the information gathered during this project. My observations are very much from a particular value system. I acknowledge I bring personal biases and assumptions with me to this project. Below I will outline a bit of my value system.

I was aware there were some problems with the education of the younger generation before starting this research project as I indicated earlier in the paper. For me, education is extremely important. Developing people with solid basic skills who can operate effectively in society and in the workplace is essential. I feel education is a life long learning experience. If you are interested in advancing and bettering yourself you continue to learn and evolve as you go through life. The ability to learn and grow makes

us better citizens who can adapt and change with all the challenges we face. The depth of this belief was not fully understood until I completed this project.

Because I understand the impact I can have on the interviews and information gathered, I tried to control my impact in the interviews. I used literature reviews and personal interests to help develop the questions to draw the information from the respondents. I tried very hard not to influence the respondents, but the very act of questioning caused them to think in my terms. For many who were interviewed, they were talking about this for the first time. My background helped me ask more and more detailed questions, so I could draw out of them their views and feelings on the subject. The respondents enthusiastically participated in the interview process. Many realized a heightened awareness of the problems during and after the interview process.

The questions were influenced by my experiences and goals on this project. The questions were open-ended so as not to sway the respondents one way or the other. I controlled my views by allowing the respondents to take the subject in any direction they felt comfortable in pursuing. I let their information guide the questioning and interview process. My questions were used to prompt them for more information or to guide them into another area of the research project. The respondents were conscious of my involvement in the project, but were comfortable with the direction the interviews took. I consciously refrained from offering any statements about my personal value system during the interviews. While my questioning may appear to influence the respondents, in fact what it does show is how the possibility of change is not as remote as it might seem. This reinforces the hopes of change indicated in the last section. With communication and discussion we can alter our future course.

Because of these steps I feel my participation did not negatively influence the results of this project. I also feel I learned and grew through this process as well. Initially I thought this was a simple situation of children not learning what was required because they used too much technology. What I learned from the literature and the people I interviewed is this is a multi-faceted and complex issue, involving technology but many other aspects of society as well. I feel this project has increased my awareness of the issues at hand. It has also helped me to grow and learn, continuing my personal development. This awareness I think is the first step to resolving some of the issues we face today, to make a better future for our children. It will help me to better guide my children as they prepare for the future.

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Appendices

Appendix A: Chart of Interview Participants

IT = Information Technologies Business
Educ = Education Field

Business Interviews: All Information Technology Related Areas

Candidate:	Area:	Sub-Area	FT/ PT/ Contract	Position:	Years of Experience:	Highest Education	Age Category:	Sex:
IT-1	IT	IT Consulting	Full time	Team Leader	21	High School	28-40	Female
IT-2	IT	Headhunter	Full time	Recruiter	27	Nursing Diploma	40+	Female
IT-3	IT	IT Consulting	Full time	Manager	32	High School	40+	Male
IT-4	IT	IT Consultant	Contract	Systems Analyst	12	Univ. Degree	28-40	Male
IT-5	IT	IT Consulting	Full time	Account Manager	15	Univ. Degree	28-40	Male
IT-6	IT	IT Consulting	Full time	Software Developer	5	Univ. Degree	18-27	Male
IT-7	IT	IT Consultant	Contract	IT Generalist	24	Univ. Degree	40+	Female
IT-8	IT	Business Company	Full Time	Technical Lead	22	Univ. Degree	40+	Male
IT-9	IT	Headhunter	Full time	Marketing Manager	37	Tech. Diploma & Univ. Degree	40+	Male
IT-10	IT	Consultant	Contract	Senior Systems Consultant	42	Univ. Degree	40+	Male

Education Interviews: All Educational Areas

Candidate:	Area:	Sub-Area	FT/ PT/ Contract	Position:	Years of Experience:	Highest Education	Age Category:	Sex:
Ed-1	Educ	University	Retired	Emeritus Professor	38, +10 yrs consulting Work	Ph.D.	40+	Male
Ed-2	Educ	Tech. University	Full time	Executive Higher Education	40+	Masters Degree	40+	Male
Ed-3	Educ	Government, Educ.	Full Time	Secretary-Treasurer	30+	College	40+	Male
Ed-4	Educ	Grade School	Part Time	Teacher (ECS)	18	Univ. Degree (B.Ed.)	40+	Female
Ed-5	Educ	Grade School	Full Time	Vice Principle	13	Univ. Degree	28-40	Male
Ed-6	Educ	Grade School	Part Time	Teacher (ECS-6)	16	Masters Degree (M.Ed)	40+	Female

Appendix B: Listing of Skills, Areas of Knowledge and Learning

The lists below are intended to help support the distinctions made between specific skills and areas of knowledge and learning identified by the people interviewed. This is not an exhaustive list, but enough to help support the distinction the respondents make.

Areas of Knowledge and Learning:

These are broad based general use skills and techniques that can be used at work and in our personal lives. It pertains to basic knowledge, approaches, theories, methodologies, processes and life skills learned and used anywhere, such as:

- Problem solving
- Project management and organizational
- Systems analysis
- Critical thinking
- Communications (reading, writing, articulation)
- Interpersonal & team work
- Basic life skills (cooking, banking, finances, family planning, etc.)
- Theoretical computer knowledge (databases, development, design, architecture, servers, OS, desktops, communication, telecommunications)
- Background information on the "why" and "how" for using specific skills or tools (development and design methodologies)
- Moral and ethical and citizenship and history (local and global), responsibility, accountability, care and attention for your community and others
- Graphical design and development

Specific Skills:

These are specific skills learned to complete a task. It pertain to how to "do" a specific task with a specific tool or skill, such as:

- Programming with a specific tool (e.g.: Visual Basic, Powerbuilder, Visual C++, Java)
- Desktop Processing Tools (Word, Excel, Powerpoint)
- Database (e.g.: Oracle, Sybase or SQL Server).
- Key boarding
- E-mail and other electronic communications
- Desk top publishing
- Specific applications – SAP, Accounting systems, Gas Management Systems, Data processing systems.

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