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Stimulating Creativity

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ABSTRACT

An awareness of creative thinking styles and the process of creative thinking is essential to understand the essence of creativity stimulating approaches. Organizations focusing on innovation need to stimulate creativity of employees by training and providing them an environment to unleash their creative potential.

INTRODUCTION

For understanding the nature of creativity and the creative styles of thinking it is important to be familiar with the process of creative thinking and approaches to creative problem solving. This paper endeavors to answer the question, how far individual, group and organizational creativity can be stimulated?

De Bono (1992) described creativity as moving "sideways" in order to try different concepts and perceptions. Couger (1995) defined innovation as the process by which new ideas are put in to practice. To gain or retain the competitive advantage in today's environment, the businesses must innovate continually. Puccio (1999) defined creative problem solving as every activity during which an individual, team or organization attempts to produce novel solutions to ill-defined problems.

Creativity is apparently associated with the ability to create something new such as innovative ideas, concepts,

products, services or simply new ways of solving problems that are unusual, unorthodox or untraditional.

Research and study of creativity has focused on the product, person, environment and process (Murdock and Puccio, 1993).

Product Focus: To understand and asses the product of creative efforts

Person Focus: To identify and develop cognitive and personality test to differentiate between more or less creative people.

Environment Focus: The study of environment stimulating creativity.

Process Focus: This approach models creativity as a process.

An environment that was earlier called "turbulent" (Waldo, 1971) was later described as "chaotic" or even "crazy" (Peters, 1992). It is also argued that rapid developments in the field of information and communications may be limited by the speed of light and the length of lifecycle (Gilder, 1997).

Evidently the business environment is changing fast. The managers are increasingly facing challenges of changes in political, social, economic and technological environments. This changing scenario requires corresponding changes and ways the products and services are conceived, designed, produced and marketed. To remain competitive in the turbulent environment, the decision makers around the world need to come up with ever new or innovative ideas and solution to their problems.

The business world is creativity driven in all its manifestations. The need for understanding the process of creative thinking and various approaches to stimulate creativity at individual as well as at group and organizational levels has become paramount concern of decision-making and problem solving. More so, when the customer tastes, demand patterns and preference structure of customers influence price, quality and technological advancements.

The organizations, to remain competitive, must encourage their employees to produce numerous creative ideas to develop unique products, services and practical processes. There is also a growing need for managers to achieve high level of creativity and innovation in making decisions and problem solving.

THE STYLES OF CREATIVITY:

In practice, different styles of creativity are used. Some categories of creative thinking are described as follows: -

Pragmatic Creativity: There is a greater demand for professionals with new ideas than those with pure knowledge. Applying creativity and thinking unconventionally in otherwise complex technological areas, many companies have grown globally. Integration of the features of computing, telephony, broadcasting, games and photography in a cell phone is the best example of pragmatic problem solving in the field of engineering.

Intellectual Creativity: Rethinking the whole idea of doing things requires the ability to shift and to apply logic without being restricted by rigidity. This requires deductive thinking to begin with the whole and inductive thinking to proceed step-by-step and eventually pull in thoughts that relate to the whole. The example of this type of thinking is

mathematics represented by symbols or the user interaction with the computers verbally.

Artistic Creativity: The ability to free oneself from the straight jacket of purely deductive thinking to see how the parts relate to the whole. New ideas are needed by fashion designers, packaging companies and product designers learned from the shapes, sounds and feel of the world around them. Example of the compact cell phones and compact power supply gives the feeling of concentrated power.

Wordless Imagery: The ability of absorbing positive knowledge and drawing from "fantasy" world "suppose" ideas and experiments is wordless imagery. An example is having a shower design of rainbow colors. According to Jack Foster (1997) Albert Einstein rarely thought in words. Notions came to him in images that only later he tried to express in words or formulas. Many creative people think in images instead of words.

The creative abilities may overlap and some people can think multi-dimensionally. Albert Speer, Hittler's ammunitions minister, although an architect, could think three-dimensionally, developing a manufacturing concept step-by-step like a building (Speer, 1969).

A study of cognitive styles (Isaksen et al, 1993) identified the way people organized and processed information, influenced their use of creative problem solving style. Bassadur et al (1990) suggested that there are personal preferences of different stages of problem solving process. The "Generator" category prefers problem finding and fact-finding; "Conceptualizer" prefers problem definition and idea finding; the "Optimizer" prefers evaluation and selection; and the "Implementor" prefers gaining acceptance and action planning stages.

Stiener's (1965) findings indicate that creative persons show high dissatisfaction with the existing situation and seek change as an attractive possibility. Highly creative people have high conceptual fluency, conceptual flexibility, originality and preference for complexity. A creative individual continuously experiences conflict in being attracted towards rationality and disorder. Additionally a creative person scores high in depression, psychopathic deviation and ego strength. Further findings about creative people emphasize the extent to which they have self-awareness of their character to turn weaknesses in to strengths (Aldner, 1976). Highly creative individuals possess rich bizarre fantasy and prefer experimentation.

They separate source and content of information for evaluation to solve problems, suspend judgment and spend more time in exploration and analysis, score less on conformity and are less authoritative.

An organization interested in responding to business challenges creatively would require to identify the types of creative abilities of its employees and their preference for various stages of creative problem solving process to appropriately assign the tasks needing creative approaches.

CREATIVE PROBLEM SOLVING PROCESS:

Bassadur (1995) developed a simplex method of creative problem solving process having problem finding, solution finding and implementation stages with eight steps. Each step of the creative process involves divergence and convergence. "Divergence" requires generating of ideas using the creativity stimulating approaches and techniques mentioned in this paper. This process is though simple but needs practice for consistency and good results. Before moving on to the next step, just one of the ideas is selected from the list. The process of selection is called

"Convergence" (Wilson ,1997). The simplex eight steps are described here: -

1) Problem Finding: In case of ill-defined problems of fuzzy situations, the participants list the problems (convergence). A prompter or facilitator provides questions relating to personal, current and future organizational aspects for stimulating answers creatively.
2) Fact Finding: A facilitator provides questions relating to known facts about the fuzzy situations, relevant to the problem and previous actions taken. From the wide range of facts, most important item is selected which forms the basis of a problem statement,
3) Problem Definition: A series of simple statements is written incorporating the important facts in to those statements. The group then agrees to select one problem statement for detailed consideration. Subsequently a problem definition map is produced asking questions: why the problem? (To broaden the problem) and what is stopping the solution? (To narrow the problem). Form the initial problem statement, a series of related problem statements are developed using the questions and the process repeated to broaden the map. At the end of the mapping process, the participants agree to select a problem statement.

Basadur (1995) illustrated need for correct problem finding while working for Proctor & Gamble. The R&D department was trying to solve the wrong problem i.e. How to make a green striped bar of soap that consumers would prefer to Colgate's Irish spring?. The real problem was found to be, after discussion, that: How might one better connote refreshment in appearance, shape and color in a

soap bar? This led to the new swirled blue and white bar called "Coast".

The step of problem definition is most significant as trying to solve the wrong problem would certainly not solve the real problem. Albert Einstein famously was quoted as having said that he would spend 55 minutes to identify the problem and only 5 minutes to find the solution, if asked to save the world within an hour.

4) Idea finding: The group develops a list of ideas for solutions (diverging) by thinking of wild or related ideas through blitzing, transforming, reversing, twisting and other methods of developing an existing list. From the list the team selects a short list of about half a dozen ideas for solution.

5) Evaluate And Select The Ideas: Develop a short list of criteria for evaluation of solutions and select the idea to be the solution for implementation.

6) Plan: The participants list the stages in sequence, including the information needed (What? How? When? Where?), and select the appropriate stages by convergence and divergence.

7) Gain Acceptance: Participants list and select the problems the solution will solve, the benefits, evidence of the solution and the ways to overcome the objections.

8) Action: It consists of preparing the list of actions and selecting the relevant ones to carry out stages selected earlier.

The education system and environment may stifle people's capacity of creativity and imagination (Divergence and Convergence) initially. (Parnes and Noelter, 1976)

Bonco and Bassadur, 1983) showed in their studies that training and practice in creative problem solving significantly enhances creative thinking attributes and the number of original ideas increased. Bassadur, Green and Wakabeyachi (1990) found that knowing one's style of creativity helped understand one's own creativity as well as that of others.

Richardson and Puccio (1992) observed that when working on real problems within creative process "Adapters" felt they were most effective during convergence phase of selection, evaluation and reframing options. Whereas, the innovators believed their best contribution came during divergent phase of generating different original options.

Using the process, the participants from various disciplines may bring about well-considered and more acceptable solutions.

The above findings underscore the significance of problem definition in the creative thinking process. Through training and practice of employees their creative thinking ability can be improved. The knowledge and understanding of ones creative style can provide a basis for the organization and the group to use adaptors and innovators more effectively in the creative process.

APPROACHES FOR STIMULATING CREATIVITY:

There are various approaches to stimulate creative thinking. Some approaches require less imagination and produce less innovative ideas or results than others. The decision makers would be required to use an appropriate technique depending on the situation.

Up Side Down Thinking: to take advantage of ideas, which have not occurred to many people before, the method requires looking at things up side down or backward or as in a mirror. One can train people to think up side down. First, playfully reverse a problem in your mind i.e. instead of bending down to milk cows, how about letting the cows walk up a platform so you can milk them while you are standing? This kind of thinking has many applications and can improve productivity. However, to be creative successfully one must also learn to over come resistance to change, form usual to unusual ways and perspectives.

Lateral Thinking: Normally one concentrates systematically on solving a problem and comes up with a logical solution through analytical or vertical thinking. In lateral thinking one thinks away, above, below or around a problem. One doesn't concentrate on the logical systematic approach in case of unstructured decisions. Ideas are generated by indirect thinking of full range of human concerns. When a likely solution is found, it is subjected by vertical thinking to all logic. Adward De Bono (1992) described the elements of lateral thinking and vertical thinking. Vertical thinking is analytical, systematic, and logical from one step to another, chooses from ideas and uses information for meaning. Lateral thinking is discontinuous, inductive jump to solution, uses information to trigger new ideas and changes perspective to bring new ideas. Osborne (1963) categorized creativity techniques in analytical and association techniques. The analytical techniques are more suitable for relatively structured decisions like extension of existing product range. For example attribute listing is simple and useful fur developing basic ideas to spin off existing product or range. The steps include picking up a major attribute from a list, altering the attribute in many ways .By alteration and combination of various altered attributes a potentially

different product idea is created. Jack Foster (1996) observed that in a small company the incidence of late coming was prevalent. The owner first approached the employees individually and then collectively to urge them to be on time, with little improvement through vertical thinking. However, as the owner took Polaroid pictures of the office employees and those present at various intervals for a number of days and displayed them on the notice board, the punctuality rate jumped to hundred per cent. This indicates how lateral thinking solved the problem.

Learning To Ask Fundamental Questions:

Even unusual basic questions can lead to creative answers. A toy designer asked a fundamental question. What are the toys? The answer included video games and computers. Armed with this idea, he turned around a failing toy business.

Not describing superficially, but digging deeper and critically exploring things with questions, which may appear to be simple, ridiculous or even outright absurd on first sight. They may often help show dimensions previously overlooked. Jack Foster (1996), emphasized evidence of unnecessarily assumed boundaries. Although creative thinking challenges assumptions and boundaries to come up with innovative solutions initially, the creative ideas and solutions are tested of their feasibility in terms of budget and time and other constraints at evaluation stage later.

According to Basadur et al (2000), the four skills required to stimulate creativity during the eight steps of simplex process of creative problem solving, can be described as follows.

Active divergence is the ability to creatively generate a variety of options or ideas. Active convergence is the ability to evaluate and chose from many options. Deferral of judgment is the ability to separate active divergence from active convergence. Vertical deferral of judgment is the ability to avoid unconsciously leapfrogging past steps or stages of the process.

There are paradigm preserving techniques to stimulate creative ideas generation by a small group of people, like the brain storming technique (Osborne, 1963). This is based on rules such as deferral of judgment during divergence, encouraging active divergence to produce many ideas and encouraging piggy backing to combine and improve ideas.

Similarly, the brain writing technique encourages participants to write down ideas. Another technique is the force field analysis, which provides ideas about forces against a decision and those for the decision. In the Gordon technique only the group leader knows the problem, who explains broad area of problem and the participants generate ideas facilitated by the group leader. Another technique is progressive abstraction, which provides ideas about possible effects by drawing increasingly on direct and indirect effects.

The techniques mentioned above use free association rules or analogies that do not force the participants to develop many new or paradigm breaking ideas and participants also piggyback (build on the ideas of others). The participants tend to follow rather structured approach (Mc Fedzean, 1998). Some important techniques, which challenge the existing paradigm, are called "Paradigm Stretching" or "Paradigm breaking". The techniques establish relationship between normally unrelated objects, ideas or natural, functional, technical analogies and associations. For new applications in existing products or

services one object is fixed, the other is chosen from a list. Participants are asked to find as many ways as possible to relate to the fixed object with the one chosen at random.

The object stimulation involves developing a list of objects unrelated to the problem and describing each object by the group members and use the description to stimulate ideas pertaining to the problem. In Excursion Technique, the participants look at colorful photographs or graphic words and try to link these images to the problem (Jhonson, 1991).

In guided fantasy, the participants are asked to describe a scenario including their feelings, sound, colors and smells. New ideas are generated from scenarios and linked to the problem. The Breakthrough Thinking extends the creative process to future and finds out the right purposes, goals and original options (Nedler and Hobino, 1994).

NagaSundra and Bostrom (1993) suggested that paradigm stretching or paradigm breaking techniques use unrelated and forced association of multiple stimuli. The techniques use collective or group memory and disallow evaluation and idea filtering. Also unusual mode of expression e.g. singing, drawing etc. is used.

Lindsay and Norman(1977) described the conditions for stimulating creativity as: -

- Setting time limit for reducing over elaboration and over evaluation.
- Using a secluded location to avoid distraction.
- Providing facilities for writing down and displaying ideas/ options.
- Stopping when group members are tired and resort to tension breaking activities.

Research and experience indicates that simplex skills for innovative thinking can be learned and improved in the organizations by experiential and practice oriented training (Basadur, 1994,1995).

The simplex process facilitates an individual, group or whole organization to discover, think through, clarify and define complex ambiguous issues. Training must go beyond understanding to achieve acceptance and practice of divergence and convergence (Bassadur et al, 1982).It is also inferred that training, understanding and acceptance application and practice of the four skills stimulates the creative performance in problem solving

STIMULATING CREATIVITY IN ORGANIZATIONS:

According to Stiener (1965), an organization would stimulate creativity in a number of ways: -

- Recruiting heterogeneous, unusual idea persons and establishing idea units.
- Providing open channels of communications within and outside sources like suggestions systems.
- Merit based selection and promotion of creative employees
- Investing in research and ideas flexibly
- Giving employees freedom to discuss ideas and chose the problem to be pursued
- Decentralizing time and resources to absorb risk of error and taking chances
- Providing autonomy to peruse original or different objectives
- Allowing secure environment and providing occasions for generating and evaluating ideas and options.

Steiner (1965) viewed further that organizational creativity would largely depend on the creative abilities of

the employees and how these are developed and exploited. The more an organization values and rewards the creative behavior of its employees, the more the employees would demonstrate this behavior.

The open and flexible organizational structures and management systems of rewarding ideas and risk taking are more likely to make employee behave creatively. However, for recruiting creative people, the problem of assessing creativity is to be resolved by assessing their past track record.

It can be assumed that most organizational members have the potential for contributing in a more creative way provided they are encouraged, trained and allowed to do so by the creative strategies of management. These strategies ensure free flow of information, encourage and reward using such information, accept positive change and risk taking, reward creativity and associated attitude, and develop supportive personal management style.

Mc Gregor (1960) expressed the view that the manager should adopt a style, which is based on more accurate picture of humans.

The capacity to exercise a relatively high degree of imagination, ingenuity and creativity in the solution of organizational problems is widely distributed but rarely utilized in the population at large. The creative behavior is only likely to occur when employees are given opportunity to meet their higher needs of self-actualization within the organization.

For managers, the ability to innovate and discover new applications, products and processes is important. It is likely that some people are more creative than others (Ribeaux,1978) but current thinking and research has

emphasized that creative thinking can be stimulated in most people (Davis and Scott, 1971).

As discussed, the opportunity and practice contributes to improving creativity. However, certain situations can be detrimental to creative performance. For example, the organizations having developed strong systems and procedures for delegated decision making focus on efficiency and leave no room for practicing new options for achieving better performance. Similarly, senior managers are assigned the task of initiating the new ideas while the rest of the employees do not get the opportunity for practice of stimulating creativity. In addition, some departments like R&D and marketing are supposed to be innovative, whereas, others are required to do operational jobs exclusively. They are given little opportunity to contribute creatively. The employees in these departments develop attitudes of indifference by socialization into non-creative activities.

The organizations which support idea generation, idea reward system, quality incentives and provide opportunities for training and practice of creative thinking can benefit from the large pool of creative potential of all levels of employees (Cooke and Slack, 1984). However it is mentioned that having highly creative individuals and organizational creativity is not the only goal of an organization. Though it is desirable to develop a more creative organization to meet the challenge of ever increasing competition globally.

CONCLUSION:

The conclusions drawn from the foregoing discussion are summarized as under: -

- Creativity or innovation is the most needed ability in the fast changing business environment for management decision-making and problem solving.

- Individuals and groups have the capacity to learn and to improve or stimulate creative thinking.

- Organizations can benefit from employee's creativity potential by identifying individual preference of the various steps of the creative process.

- Organizations can provide opportunities for training and practice to stimulate employee creativity.

- Rewarding the creative behavior, allowing risk taking and experimenting in addition to providing open communication and information access is most likely to stimulate creative problem solving behavior.

- Use of creative management styles and strategies for utilizing employee's creative potential can provide sustainable competitive advantage to an organization.

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EDUCATION/CAREER CONFLICTS OF THE GENERATIONS

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ABSTRACT

Generation gap in fact is the communication gap between the child and his parents. Communication is the basis on which relationships between individuals, organizations and countries develop. The most significant area of conflict between parents and young adults is choice of career. The present research is focused on the issue of career choice and the strategies to facilitate the process were presented through focused group methodology. The results indicate that career counselors play significantly important role in joining appropriate career paths.

INTRODUCTION

Conflicting Issue of Career Choice

Career decisions are long term decisions - determining decisively the future direction of life. Decisions about career are to be made after careful analysis - not simply of the most lucrative professions, but also with due regard to the interests and potential skills of the candidate. Unfortunately, in Pakistan career counseling is not taken seriously.

The abilities, skills and interests of a youngster are of least concern when career decisions for the professional

degree or life are being made. The primary and secondary schools are not used to developing a potential professionlaity profile of the student. The highlights of this decade spanning profile would conveniently reflect the proven abilities, skills and interests of the youngster and in turn facilitate guidance to the type of higher degree and profession meant for this particular individual.

Career choice (for most Pakistani youngsters) is not a matter related to inherent capability, but rather the first opportunity that comes their way or through the recommendations or directions provided by their parents.

Counseling mostly received by teenagers here is in the form of parent pressure. The parents try to figure out which is the best paying profession in their environment and then start coaxing their children into it. After all the parents want what is best for their kids (and what can be better than to have a greater income?)

So the society as well as the parents basically force the youth to select a higher paying job or a multi-national is considered better (no matter what they make you do).

Success is usually measured by the amount earned and not by the excellence, quality or commitment with which a job is done. The monetary criteria may seem very appropriate at face value, but then talk about being stuck with a job (or career) that does not match your capabilities or interests for a number of years. This may result in frustration and other adjustment problems and ultimately the conflict between the child and his parents occurs that sometimes later becomes a complete disaster.

Study Rationale

In eastern societies typically Pakistan the conflicting decisions that commonly prevail between parents and

young adults are related to choice of career that is the cause of dispute in many households.

Parents want their child to become a doctor or an engineer but fail to understand the lack of interest of the child towards that particular profession. They want their son/ daughter to marry the person they have selected for him/her just because that's how they think things should work. Parents usually made sole decisions either related directly or indirectly that influenced their children life such as decisions relating from their children marriage /career choice to buying a new car or shifting their home etc. They usually don't involve and care for taking or giving considerations to there child's opinion which ultimately conveys the message to the young ones that there opinions are not being acknowledged by their parents and thus become a reason for generation of communication gap. Such actions are the result of the set norms of the society which at times aggravate the parent-child crisis.

First we are children to our parents, then parents to our children, then parents to our parents, then children to our children." Milton Greenblatt.

Religious Aspects and Career Choice Issues

Muslims are encouraged to seek knowledge "from the cradle to the grave" to obtain knowledge. Over the years many Muslims have used these terms glibly, not fully understanding the responsibility attached to how one should come by this knowledge.

In the early days of Islam, there are records of illustrious students of religion who traveled far to learn the Quran and also seek "first hand" accounts and narrations of Hadith from those who had a direct chain of links to our beloved Prophet (P.B.U.H). Such was their zeal and love

for Allah that they left family and the comforts of home to travel through dangerous, rough and unknown desert terrain to seek knowledge which would be of benefit and fulfill there desire in this world and the hereafter.

So it clearly depicts that Islam always encourage both men and women to seek knowledge according to their interest and aptitude and should never care for the hurdles that will come along in order to get the desired education.

It is mentioned in a Hadith-e-Qudsi, Allah says, "I was a hidden treasure. I desired to be known so I created the creation."

One needs to look at the individual's upbringing. The home is every child's first school. The mother, it's the first teacher. The theme of her "Tarbiyah" (lessons) to her children should always connect them to God. In Islam it has been mentioned that the Parents should give priority to religion and Shariah before everything else so that the children develop within themselves the LOVE of God to such an extent that it becomes easy to follow and choose there paths according to the principles guided by religion.

Observant Muslim parents are obliged to ensure that their children are raised with an understanding of Islam and live their faith. However, some parents may not recognize the differences between cultural traditions from the home country and Islamic practices as taught in the mosque.

Case Study

RAHILA said: I have learnt to accept Islam because I believe in what it says about life. It's not confusing, incomplete or misleading. People make those mistakes or problems. I always wanted to model but I found I said to myself if you sincerely love, respect and believe in Islam

prove it. Practice it. The issue is a clear as Islam has clearly stated its guide lines but for arrogant and stubborn minds. It is a battling debate.

Parents have a responsibility to prioritize their duties to their children. A fundamental right a Muslim child has over its parents is religious education. Parents have a desire to protect their children from poison and it's disastrous effects, though Islam fully acknowledges the right of children to choose their career but also restrict them not to practice career that are against Islamic principles and codes.

The above mentioned case depicts one of the major potential conflict between parents and their children start when child starts showing interest in the careers that are in some way do not implicate Islamic teaching, it usually happens because that they are not initially given the knowledge about there religion in such depth.

The other reason of conflict originated when Muslim parents decide and choose their children's careers and spouses, believing these are Islamic injunctions although the Quran does not indicate that parents should choose children's marriage partners.

"Knowledge" for a Muslim is not divided into sacred and secular, and the implication of these sayings of the Prophet, in modern terms, is that every Muslim boy or girl, man or woman, should pursue his or her education as far as it is possible, bearing in mind the words of Allah in the Quran.

In Islam therefore, both men and women are equally credited with the capacity for learning and understanding and teaching, and one of the aims of acquiring knowledge is that of becoming more conscious of Allah. It is considered in Islam that the more a person, male or female,

studies the creation and observes its working, the more he or she becomes conscious of the Creator, the Power who made and sustains the creation.

There is a need or demand for young generation to select their own field of interest such as doctors, nurses, teachers, psychologists, physiotherapists, accountants, mathematicians etc. There are numerous other instances of learned Muslim men/ women who have been teachers, writers and poets, held in the highest respect by Muslim society. There is therefore every encouragement for a Muslim to pursue studies in any field for his intellectual benefit and to make use of his academic or professional training for the good of the community. Parents being Muslim need to understand that Islam encourages individuals to select and practice career of their own choice but according to the principles provided by Islam in order to excel and become prosperous and impart justice and dedication in their fields.

Social / Cultural Aspects and Career Issues

Pakistani culture remains strongly collective. As a result, children will often follow parental advice to seek their approval. It is well established that there are strong preferences within the older Asian community for particular vocational professions – for example, medicine, law, business studies, accountancy and engineering.

S.Z ARSHAD (A career counselor) said: 10 years back great number of parents pushed their children blindly into IT or 'Computers' just because it seemed to be the most lucrative field at that moment. Later on, whenever a slump in the job cycle of this field is observed (which by the way is quite normal in contemporary economic scenario) all those forced students were quite confused and depressed.

It was a time when the IT fever was 'on' - everyone young or old, from accounts or medical world wanted 'to do computers'. Numerous small computer centers popped up on every street and minted a lot of money while this IT mania lasted. Now that the IT bubble has busted, it has become relatively easy to talk about the harsh realities.

Trends are being followed by youth in case of selection of career. As it is typical culture that education is not acquired for the sake of getting knowledge but it is used to acquire professions that will provide monetary gains and higher status to the individual.

Case Study

'Most of the families, that's all they want: be a doctor, be a doctor'

'My dad wants me to be a teacher and my mom wants me to be a doctor and I want to be a pilot'

'All Asian parents want you to be a doctor '

(Pakistani and Bangladeshi girls aged 14-15)

Medicine and engineering, in particular, are the more popular profession among other fields in Pakistan. Both these occupations are recognized as having high status within society, with scope for high earnings and self-employment.

The reason behind is that no serious consideration about career counseling in Pakistan is given and dignity of labor is not being promoted and communicated. Society is still status conscious as it was in the past when small jobs with less money were being practiced by the people having lower status.

The conflicts arise because the new generations are more open and keen enough to explore new opportunities

regarding their own interests but the older generations are still reluctant to change their mindsets toward the new spectrum of global opportunities.

LITERATURE REVIEW

"It is a dilemma in our country that the choice of profession, directly or indirectly is shaped by our parents in majority of the cases. As an individual, a student since the very early stage of his / her educational career is not granted those discretionary rights by the elders, which he/she is specifically entitled so far as related to his/her personal likes/dislikes or tastes and inclinations. Career development is a long term process.

"Advice is non-directive information which is imparted by one person to another in such a way that he/she can only benefit from it after having forgotten the counselor and the need for advice itself."

"If we look deep down in the concept of counseling certain ideas are associated with it. Counseling is often used to describe Assistance aimed at "ordinary" people with quite "average" problems to solve and which is fundamentally different to psychotherapy. It is "characterized by a focus on 'normal' people, taking into account their personal development during a challenging situation, drawing on existing strengths and integrating the dynamic between the person and his/her surrounding environment" (Paul, 2002, p. 45).

"The very concept of counseling describes the assistance to solve fundamental problems. The situation is different with regard to "career counseling". Articles relating to "counseling" and forms of "advice" or "counseling consultations" can be found from as early as the 1970s and 1980s in specialize areas (Paul, 2002, p. 45)

"People determine their destinations according to their level of consistency and the situation in they are going through. Once you have decided, it is not the final option. Half a generation ago choices in Pakistan were limited and doctor, lawyer, accountant and architect were about it and if you were a female, teacher was the first and doctor was the last choice. The good and bad thing for the current generation is that there is now an array of career options. In the US it is said that at the undergraduate level over 70 % students change their major at least once in the first two years. Over twenty years ago in the book Future Shock, Alvin Toffler had written about the rate of change in America referring to how fast and changing everything was. Compared to then things are changing now at the speed of light. Additionally the current undergraduate population is part of the fast food generation and instant gratification is all they have come to know as the paradigm. So an internship with a doctor or architect and a measure of personal interest in a particular field may not be enough to clinch that career choice. (Mahjabeen Islam. 2004)

Certain things or factors affect students and people while determining their decision about their careers. There can be certain reasons due to which students are inclined towards some particular options. From the perspective of the student the choice ought to hinge primarily on interest. From the perspective of parents, especially if both parents are physicians and the child gets accustomed to a particular lifestyle, it is incumbent on the parents to guide, and not coerce. "Money can't buy me love…", goes an old song and though true, must be kept in perspective: radical lifestyle alteration can generate resentment and anger and these in turn can incinerate those idealistic notions of "I want to work in the depths of Africa and help suffering humanity". (Mahjabeen Islam. 2004).

Few articles (Hrabowski et al., 1998; (Hrabowski ,Greif & Maton, 2000) have examined other factors that influence their academic majors and career choices. Although some attention has been directed toward the process of choosing a college education (Freeman, 1997), there is still a dearth of research that has identified the most instrumental factors in influencing African American males' decisions to pursue engineering as an academic major and career choice. Because a dearth of research exists on this topic, the overarching purpose of this study was to provide African American males a forum to express their experiences in their own words. Drawing on a much larger study (Moore, 2000), this particular investigation sought to provide individuals who interact with African American males on an ongoing basis with valuable information to increase these students' interests in engineering. Toward this end, the findings of this study provided specific implications for teachers, school counselors, and parents.

The choice made by one person reflects one's thinking, association, education and family background, his stresses and relief. Certain factors affect one decision. Given below is the list of some obvious factors that play an important role in this regard:-

(1) That choice in general is developmental in nature;

(2) That "choice" actually consists in a series of choices, each of which delimits the field of alternatives remaining;

(3) That perceptions of reality play an increasingly important role in occupational choice as one matures;

(4) That occupational choice is influenced by personal factors such as values, motives, and ability, and also by persons or roles with which the individual identifies; and

(5) That societal structure influences choice through the educational system and the system of stratification by limiting the range of occupations which are open to the individual. (See Newton, 1962: 12; for a good summary of theories, see Osipow, 1968.). It is our opinion that the personal and structural factors specified under items (4) and (5) influence not only the occupational area within which a career is chosen, but also the age at which the career decision is made. This paper will report on research devoted to examining the latter problem-namely, the extent to which structural factors, particularly parental status, influence the time at which college students decide upon their careers. Within these limitations we hypothesize that students with lower-status parents make decisions regarding their careers earlier than do students with higher-status parents. (Osipow, Samuel H. 1968).

According to different researchers the Critical factors that influence the decision to attend college includes a college going expectation and encouragement from key persons in a student's life; access to accurate information about what getting into college and being in Teachers College Record entail; and school- and home-based resources. Particularly relevant are the respective roles that parents, school personnel, and peers play in reinforcing students' beliefs in their abilities not only to gain access to higher education but also to succeed in college (Attanasi, 1989; Choy, Horn, & Chen, 2000; Hossler, Schmidt, & Vesper, 1999; King, 1996; McDonough, 1998; Smith, Beaulieu, & Seraphine, 1995; Terenzini, 1994).

Selecting appropriate career is not only important for a student but also for her/his parents. It involves the reward of their overall efforts on their part. In addition to students, it is also important that parents are briefed on the different career options available to their children, kept updated on their children's academic progress, and reminded of the

importance of strong parental involvement. Healthy school-parent relationships have been found to be beneficial to students' school success Because parents have profound effects on students' career aspirations, individuals can help bridge "cultural barriers to effective academic, career, and personal-social interventions with young people and their families". Ford, D. Y. (1996), Ogbu, J. U. (2003).

Young Seok Seo Konkuk says that, with increased numbers of students and affiliated members, the discipline is confronted with the task of creating more career opportunities. Given the current constrained work settings and overlaps in theory and practice, counseling psychologists have to compete with other mental health professionals for limited positions. Under these circumstances, counseling psychologists may have to strategically collaborate with other mental health professional groups to develop and create career opportunities for all stakeholders by advocating for the establishment of positions in government and other public organizations.

Career counseling is affected by parents on different levels at different places. Mehan and Hubbard say Contrary to perceptions that minority parents are apathetic or resistant to their children's higher education aspirations. Immerwahr and Foleno (2000) found that African American and Hispanic parents often place a higher priority on education than do White parents. Time and financial constraints, however, are more likely to prevent them from participating in their children's education in traditional ways (Mehan, Hubbard, Villanueva, & Lintz, 1996). Another recurrent problem is that low-income and minority parents may express their ambitions for their children in ways that go unrecognized by the educational system.

A researcher writes Men, however, generally were reluctant to disclose any information about their families voluntarily or to elaborate on the much abbreviated descriptions that they offered when asked directly about their perspectives on the role that parental and other family relationships have played in shaping their lives thus far. With the exception of those who expressed open hostility toward their parents, men were also comparatively less inclined than women to identify any clear association between their parents' values, beliefs, and behaviors and their own life choices

According to Levinson, most parents are (or have) established autonomous and emotionally independent relationships with their maturing children. In terms of career development, (Levinson, 1986).

The ratio of parents selecting the career for their children is more in young adults. Either they fulfill their desire or they are impressed by their parents. For young adults the writer says ''Successful completion of this task is central to the young adults' identity development and lays the foundation for the completion of the second and third tasks: establishing intimate relationships and choosing a career path. Young adults who maintain very close emotional ties with parents are the most affected by the older generation's expectations and hopes when making relationship and career decisions'' (Penick & Jepsen, 1992).

Women's selecting career depends on their behaviour regarding their gender, and the gender-role attitudes that are allowed by the society. An important line of work has been to identify factors that predict which women will be strongly career oriented and which women will not. One major predictor of young women's career orientation is their gender-role attitudes; that is, their beliefs about

appropriate behavior for women and men. Consistently, research finds that young women who express nontraditional attitudes toward women's roles tend to be career oriented (Keith, 1988; Komarovsky, 1982; Morinaga, Frieze, & Ferligoj, 1993; Tinsley & Faunce, 1980).

Betz writes about women's contribution that, they represent an individual variable and an environmental social variable-two classes of variables important for understanding women's career-related choices (Betz, 1993).

Career counseling is also affected by the class distinction. Different people belonging to various classes are made up for different careers. The central and recurring theme of the above discussion is that a lower social stratum imposes certain limits on the number and variety of careers open to its occupants. In addition to economic pressures, one consequence of these limitations is simplification of the decision-making process. Since they are not faced with a variety of careers from which to choose, students of lower socio-economic status, we hypothesize; decide earlier in their lives on the careers they will pursue.

This greater knowledge, we speculate, is partly derived from the high schools which middle-class students more likely attend (which are more college-oriented and place greater stress on professional education), as well as from the value orientations of parents and family friends. Since middle-class students are more aware of professional opportunities and of the means for taking advantage of them, one might think that these students would find occupational decisions easier to make, and, consequently, that they would arrive at such decisions relatively early. The opposite may also be true, however; that is, precisely because of the middle-class student's increased awareness

of what commitment to a profession can mean, and because of his awareness of the variety of possible occupations, career selection becomes more difficult, and this difficulty leads to the postponement of career decision. In other words, increased knowledge increases the awareness of the consequences which a hasty decision may entail, and hence brings about a deferment of definite decision. (Stewart, 1959).

The lower-class student's presence on campus may be assumed to indicate his commitment to the success norm, and his concern for a career which may guarantee achievement of success

In addition, we should consider (as Riesman et al., 1950 have suggested) that parental knowledge (including knowledge of jobs and job markets) becomes fast outdated. In this respect at least it is probable that parents do not exert great influence on their children's career selection (this should hold true particularly in the Lower class).This fact may also explain why parental education has a greater effect on decision-making than do occupation and income. Parents with college educations, because of their experience, will tend to give greater latitude to their children's search and experimentation.

METHODOLOGY

Focus Group

To understand these issues a discussion forum through Focus Group on 10th August 2006 at **Mohammad Ali Jinnah University** was conducted. The topic of discussion was Generation Gap due to reasons of Career Selection.

In this focus group people from different mind sets were invited and 35 people participated actively on discussion of topic Generation Gap. Three panels were invited for discussion:

1. Islamic, Social, and Psychologists panel
2. Parents Panel
3. Youth or children panel

As experts of discussion following people were specially invited:

1. Dr. Aiesha Akbar: Sociologist (Muhammad Ali Jinnah University, IBD).
2. Mrs. Shehnaz Ahmed: Educationist (F-10 College, IBD).
3. Dr. Hafeez-ur-Rehman: Anthropologist (Quaid-e-Azam University, IBD).
4. Dr. Syed Naeem Bukhari: Islamic Studies (NUML, IBD).
5. Brig. Wasiq Ahmed: History &Islamic Studies(NUML , IBD).
6. Raja Zulqurnain Asghar: Psychologist (Rohzan NGO, IBD).

About 23 people from Youth/child side and 6 people from parent's side participated.

Here is some detail of discussion:

Discussion

The discussion was based on three issues:

1. Discussion on Marriage Decisions.
2. Discussion on Education and Career Decisions.
3. Discussion on Individual Acceptance.

Discussion on Education/Career Decisions

After the discussion of Marriage Issue of conflict, I asked a question regarding career decisions that who have right to select the career or education of children?

Children's Point of View

Children representative shared his point of view that, children have right to select his or her education or career because if a child has interest in some particular field, if he wants to select that field of career parents should support them. He said that parents have right to select education but just for basic education but when after completion of basic education, parents must set their kids free to select education or career.

Another children representative shared her point of view that, whenever parents put pressure on kids about choosing career. Parents usually want to see their children as doctor, engineer or going to some other profession. It is good but parents must also consider kid's interest because if kid's interest is different from parent's choice this will affect the level of achievement. He or she will become doctor or engineer but kids will not perform good as they can perform in field of their interest. Now a days we have some examples in which doctors are changing their fields because of the lack of interest in parent's selected field. Definitely, parents have right to guide their kids but parents should not force them.

Parent's Point of View

In reply Professor Aman Ullah said that kids have right to select the career but parents are much more experienced and their opinion was as important as kids opinion. But it is the responsibility of parents to stop their kids for selecting

such career which will affect their integrity and Islamic values. Career like modeling, acting or any other profession which is not acceptable in their society should not be selected by kids, because such career can give them money but not respect in our society. He said, "I will never support my kids if they want to select such career which will affect the integrity of my family values". He also agreed with the child's point of view that, yes parents must also consider the child interest. e.g. if kids have interest in mechanical side, parents should not force them to select Doctor's profession.

Social Point of View

Dr. Hafeez-ur-Rehman from QAU told that usually a child's opinion of selecting career is based on trends in our society e.g. few years back there was so much trend of Computer Sciences career, most of the children opt that profession but after having done these studies, most of them were found unemployed because of lack of job opportunities in the market, like wise currently most of the kids like to join telecom industry but I think the situation will be like computer sciences education. So he concluded that usually kid's choice of career is based on trend in the market. He suggested that, parents should act as career counselor for their kids but they should not force them.

Islamic Point of View

Islamic scholar said that, parents are supposed to give proper education of Islam and knowledge of word and they must guide their kids in selecting career by considering important point of Hlal & Haram. Parent must stop their kids to earn "haram".

Discussion

After detail of study and discussion it is concluded that there is a Gap between two generations due to many issues. But scope of this study circulates around the issue which is Education/Career Decisions. In result, following conflicting views among two generations were derived.

Conflicting views on Education/Career Decisions

Parent's View	Child's View
Parents want to decide about the education and career of their child. The parents try to figure out which is the best paying profession in their environment after all the parents want what is best for their kids (and what can be better than to have a greater income?) Parents exercise their decisions regarding child career because they want their child to be financially secured. Parents have a desire to protect their children from poison and it's disastrous effects of those career trends which negates Islamic teachings	After basic studies, child wants to select education and career by himself / herself according to his/her interests. It is child fundamental and Islamic right to select a career according to his/her own interest. Youth are far better aware of the emerging career opportunities as compared to their parents. By selection of diverse career according to their interest the youth can impart dignity of labor in the society. Through the selection of different professions it will eliminate status consciousness attached to limited professions.

CONCLUSION

The conclusion drawn from the focused group and literature review is that the issue of career choice can be dealt easily if the selection of career is based on the individual interest that should be supported by parents and explored with the help of career counselors who can properly excavate and find out the potential interest of the individual and can also modify it according to the teachings provided by Islam.

Neither parents nor young adult could clearly identify the right career path as both are in some way not experienced and aware toward new opportunities and trends. So there should be the role of career counselors to resolve the conflict properly

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GRID SECURITY POLICY, ARCHITECTURE, IMPLEMENTATION ISSUES AND SOLUTIONS

By
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ABSTRACT

This paper presents a critical review of the security architecture proposed for Grid services [2, 12] and proposes a secure architecture for trusted and non-trusted domains. The Grid architecture has laid the foundation for ambitious goals of creating virtual organizations (VO) by bringing dispersed domains together. The domains out source their computing power, storage space, database information, archives or solutions for scientific problems under a coherent, pervasive and secure mechanism.

KEYWORDS: Grid Computing, GSI, condor, cactus, Job Scheduling, JVM.

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I. INTRODUCTION

There are many security challenges being faced by the developers of Grid services. That is, virtualization of resource organization spanned over multiple domains having diverse and distributed individuals and organizations governed by local security policies and varying mechanisms [1]. The support for dynamic change of resources, participants and security policies dictate requirement for scalable, dynamic and distributed organization with the provision for secure integration and inter operability between heterogeneous systems. The Grid structure strives to enable management of an over all management policy for trusting domains wherein dynamic creation and termination of services is made.

Grid systems require the standard security functions i.e. Authentication, Access control, Integrity and Privacy [2]. Beside these the Grid systems have to coordinate diverse policies under various operating systems in heterogeneous environment, transparently and securely. The virtual organizations envisaged by the evolving Grid technology standards have to cater for establishing trust relationships between hundreds of processes and resources. To handle such problems the VO security policies has already been proposed by the Global Grid Forum.

The Grid applications demonstrated the use of data and resources amongst trusted domains [1]. They are centered around purely technical and research based problem solving through aggregation of computers into a virtual super computer. It is foreseen that the popularity of evolving grid concepts will open new dimensions of its usage. The Grids will soon involve various communities, social activities and E-commerce related applications. Hence the data security will be a serious issue when it is received on a remote machine over the grid and is liable to

be misused. This issue has not yet been addressed by security solutions proposed by the GGF.

The existing models do not provide any satisfactory explanation to the fundamental question of providing irrevocable security to the data assets transported to a remote machine where the local processes under the operating system of remote machine may misuse or save for later use or corrupt the data etc. The sand box model [13] for Java applications protects the operating system from a miss behaving process, but we have no provision for protection vice versa.

Hence it is proposed that the issue of data protection at remote computer be considered in detail as a research problem. One solution to the said problem is to provide a secure process environment within the address space of a remote machine. It will be a virtual machine which can request for both local and remote services but its own assets are guarded by strict secure protocols.

A related issue arises on how the code for such virtual machine will be transported to a remote machine. For this purpose we use the existing encryption techniques supported by digital signatures and message digest. To extend the concept we may visualize a scenario of many virtual machines for the Grid services being created under a protocol where the intruder can be further guarded by hiding the virtual machine generation procedure from the operating system of remote machine.

II. GENERAL SECURITY THREATS IN DISTRIBUTED SYSTEMS

In any distributed system the security policy must be examined against at-least following four threats. In grid systems we attempt to protect the services and data against

security threats, too. Four types of security threats are as follows:

A. Interception

An unauthorized party gains access to an asset. This is an attack on confidentiality. The unauthorized party could be a person, a program or a computer. Examples include wiretapping to capture data in a network and the illicit copying of files or programs.

B. Interruption

An asset of the system is destroyed or becomes unavailable or unusable. This is an attack on availability. Examples include destruction of a piece of hardware, such as a hard disk, the cutting of a communication line, or the disabling of the file management system.

C. Modification

An unauthorized party not only gains access to but tampers with art-asset. This is an attack on integrity. Examples include changing values in a data file, altering a program so that it performs differently and modifying the content of messages being transmitted in a network.

D. Fabrication

An unauthorized party inserts counterfeit objects into the system. This is an attack on authenticity. Examples include the insertion of spurious messages in a network or the addition of records to a file. The security policy and architecture proposed by Frank Siebenlist et al. [1] given below are examined against above four security threats.

III. GRID SECURITY POLICY AND SECURITY THREATS

In this section, we will briefly describe the security policy for grid as given by [2] and will examine its strength and weakness with reference to the sharing of resource amongst not fully trustful organizations. The grid security

policy consists of 8 security policy elements and on three elements we critique. GSI architecture is shown in Figure 1.

The user's access control is controlled by the local security administrator and user is authorized for the usage of specific resource. When user data is sent to remote machine some resources are authorized to that data but there is no mechanism through which we can say that the remote machine is authorized to use that data or not. The existing security policy does not provide any mechanism to handle this issue.

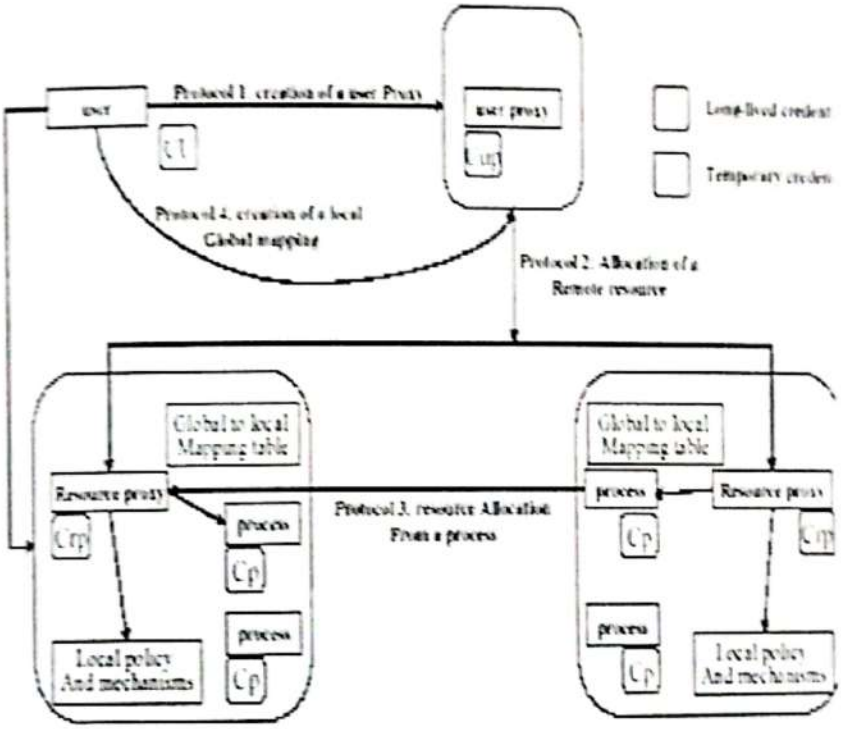

Fig. 1: Computation Grid Security Architecture

According to seventh element of security policy by Ian Foster, a user can delegate subset of his rights to process to act on his behalf. User specifies time-limit for this delegation. Here two issues may rise, that what if user wants to take back his delegated rights before the agreed upon time or he wants to extend the time-limit of the delegation? The existing security policy and architecture do not address these issues.

Data is not secured at the remote site because owner of the remote machine may misuse the data submitted along with the job. So, we have to propose a policy that contains such measures for data protection at the remote site.

We will handle these issues in our proposed security policy and hence will be implemented in the GT4.

IV. GRID SECURITY ARCHITECTURE (WORKING OF THE GRID SECURITY POLICY)

Grid security architecture consists of entities such as users, user proxies, resource proxies and processes. These entities are located in different domains and interact with each other. For their interaction, grid security architecture defines four different protocols as shown in Figure 2.

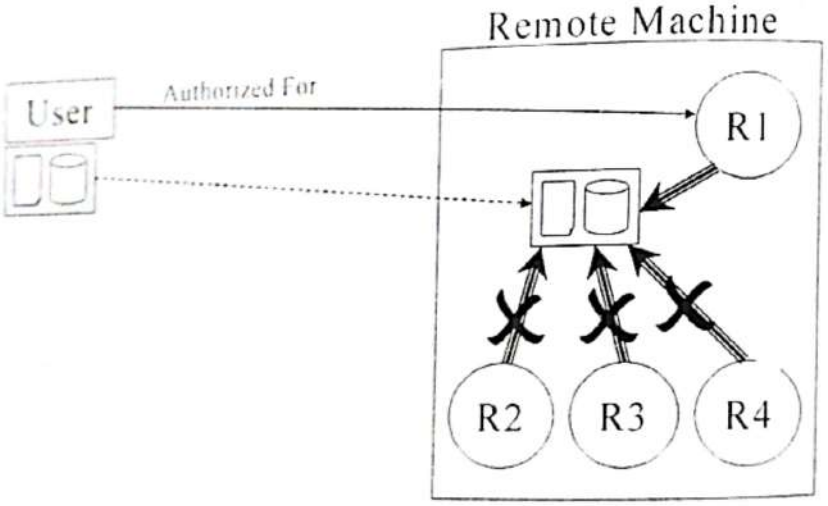

Figure 2: Two Way Authorization

The first protocol describes how a user can create a user proxy that will act on behalf of the user. The user gives the proxy an appropriate set of credentials.

The second protocol defines the way in which a user proxy can request the allocation of a resource in a remote domain. The protocol tells a resource proxy to create a process (resource allocation) on remote machine, after

mutual authentication between user proxy and resource proxy has been taken place. The user operates on resource according to the access control decisions at the domain where the resource is present.

The third protocol defines how a process created in a remote domain may request allocation for additional resources in other domains. This type of allocation is done via the user proxy, by allowing a process to have its associated user proxy, request the allocation of resources, essentially following the second protocol.

The fourth protocol is the way a user can make itself known in a remote domain. It prescribes how the mapping between the global credentials and the local ones can be registered by the user in a mapping table local to that domain.

The working of these four protocols is shown in the following sequence diagram Figure 3.

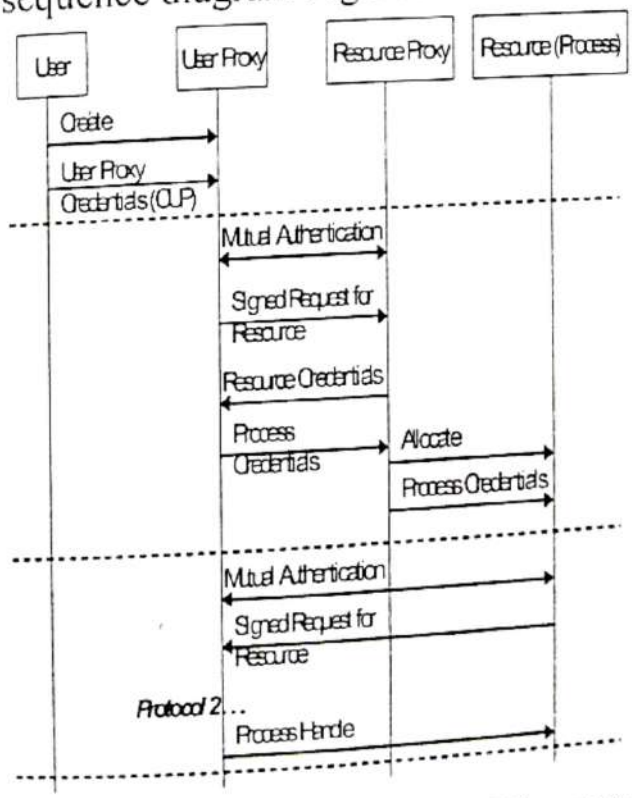

Fig. 3: Protocols – Sequence Diagram

This architecture does not address issues of two-way authorization and the protection of data on the remote machine.

V. NEW SECURITY POLICY PROPOSED

To cater the above mentioned issues we have proposed some new extensions to the existing security policy that will handle the four security threats.

- The grid environment does not consist of full trustful domains, and the domains trust each other only for some agreed operations, not for all the operations on domain.

  Comment: It is foreseen that the popularity of evolving grid concepts will open new dimensions of its usage. The Grids will soon involve various communities, social activities and E-commerce related applications. Hence the data security would be a serious issue when it is received on a remote machine over the grid, and is liable to be misused. So, there should be some solutions for domains that are not fully trustful.

- There must be two-way authorization for the resource as well as for the user data.

  Comment: When user makes request for the use of resource user will be authorized for the resource and resource will be checked for the authorization of the user data.

- User can delegate a subset of his rights to a process or program to act on his behalf for limited time period and the delegation can be terminated or extended by the user at any time.

VI. GRID SECURITY CHALLENGES

In this section we will explore security challenges that may be faced when developing a Grid. Then what functionality has been incorporated in security solutions will be discussed.

Group of different classical organization can be termed as virtual organization (VO). Rules and policies of classical organization govern its members (participants and resources). VO access to resources within classical organizations is the primary requirement for the Grid. Establishment of VO must be provided through binary trust relationships between (a) the local user and their organization and (b) the VO and the user. Grid Security Mechanism copes with these challenges by treating VO as a policy domain overlay as shown in Figure 4.

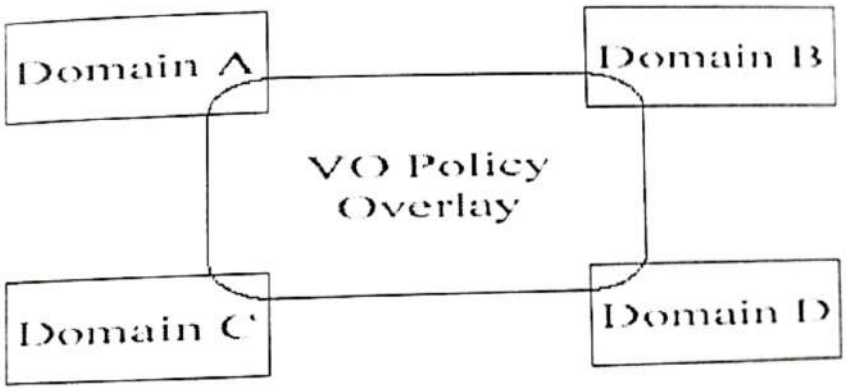

Fig. 4. Policy Overlay Pulls All Domain Together.

Different VOs publish their policies to a third party (VO), which oversees the published policies in an organized way to allow for coordinated resource sharing. Security policies are XML based and interoperable with each other.

The most challenging security issue is that new services may be deployed and instantiated dynamically

within a VO's lifetime because services have to be stateful.

Following three primary functions must be incorporated in the Grid Security Model to encounter such challenges.

1. As organizations have significant investment in existing security mechanism, therefore Grid Security Model must be interoperable with those mechanisms rather than replace that mechanism.
2. Users must be able to create new services dynamically without the involvement of security administrator.
3. As participants may leave or join the trust domain, therefore establishment of trust domains should be dynamic.

Traditional security administration does not meet the above criteria. Security model should be user-driven.

VII. IMPLEMENTATION OF GRID SECURITY

In this section implementation of grid security architecture will be discussed. Grid security mechanism has been incorporated in widely used software system known as Globus Toolkit. The GT2 [1] uses Grid Security Infrastructure (GSI) [2, 7] to provide the security.

GSI defines a common credential format based on X.509 certificates [8, 9]. Each GSI certificate is issued by a trusted party known as certificate authority (CA), which is usually run by a large organization. In order to trust the GSI certificate presented by a service, one has to trust the CA that issued the certificate. GSI certificate has four important fields of information.

Subject name: Identifies the person.

1. Public key of the subject.

2. Identity of the CA who issued the certificate.
3. Digital signature of the CA.

Transport Layer Security (TLS) based [10] protocol is used to provide authentication and message protection on the data stream. Gateways translate the common GSI structure to local site mechanism.

GSI certificate allows a user to create a new identity (Proxy certificate) dynamically, without involving a CA. In this way, another proxy certificate rather than a CA certificate identifies issuer of a proxy certificate.

Using proxy certificate and a security service known as Community Authorization Service (CAS) [11] satisfies dynamic establishment of trust domains. Hence proxy certificate satisfies both the dynamic establishment of trust as well as dynamic creation of services. But when there is a limited trust between multiple parties, proxy certificate alone is not sufficient. In such case we have to move towards CAS. By using this service VO can negotiate with the resource provider regarding his policy. This negotiation is illustrated in the Figure 5.

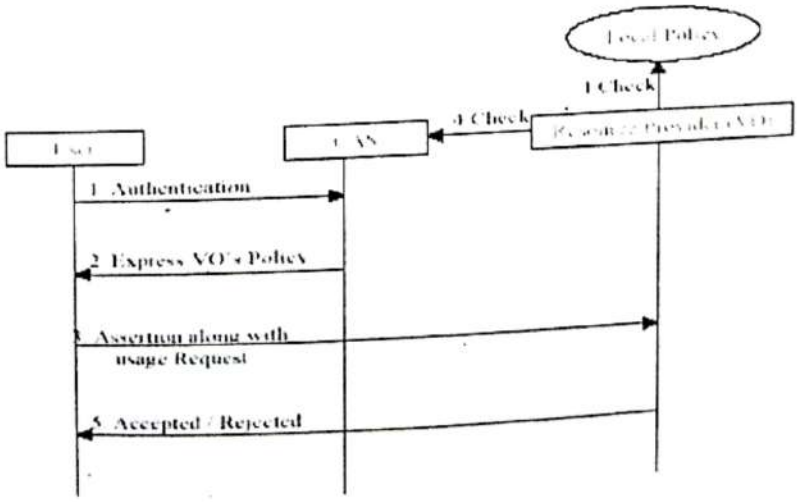

Figure 5: Negotiation between User And CAS.

Another version of Globus toolkit is GT4.

It has following main features:

- Security has been implemented as OGSA service that can be located and used as needed by application.
- Hosting environment has been used to handle the application security.
- To provide the ease for clients so that they can discover dynamically what credentials are needed to establish trust with the service, GT4 publishes service security policy.
- Specifies standards for the exchange security tokens.

VIII. ISSUES RAISED IN GT4 IMPLEMENTATION

In this section some issues that have not been in addressed in the implementation of GT4 will be presented along with their proposed solutions.

In case of multiple domains, user from one domain authenticates itself to CAS which authorizes him, resource from other domain. Then user sends usage request to resource. Issue is that user does not authenticate to resource. This is a serious security threat because hacker may use that resource in place of valid user [Sec 7 (CAS)].

Hence authentication of user to resource should be provided. Client data is not safe at the remote machine. Following solutions have been proposed for this issue:

A. SECURITY MECHANISM (GLOBUS ZONE APPROACH)

In this approach the machine owner will reserve some memory area for the globus jobs this area known, as globus zone will be protected from the machine owner by

making this area inaccessible. Only globus user will be capable of using this area. Related issue arises that how host machine will come to know that job has been submitted from the valid globus user. This has already been solved by using public key infrastructure (PKI). All services will be run in globus zone.

Modified globus toolkit will be installed in the globus zone. We can have two options to install the globus toolkit in this area.

1. Globus toolkit may be installed at the time when globus zone is created.

Or

2. Modification can be made in globus toolkit that permits the creation of virtual user that will install the globus toolkit in the globus zone and after installation completes, virtual user will be removed.

When globus toolkit has installed, now the time comes that globus user create or destroy services dynamically. For the creation of globus zone new operating system will be developed. Operating system will reserve the memory for globus jobs.

B. SECURITY MECHANISM (VIRTUAL MACHINE APPROACH)

In this approach, globus zone will not be protected from the host machine when globus user is not using it. Whenever globus job needs to be submitted, first a code will be sent to the host machine that will create á virtual machine in the globus zone.

Procedure for the generation of the virtual machine will be hidden from the host machine. After that an

envelope will be placed around the virtual machine for further protection from host machine.

Once the virtual machine is created then this virtual machine will send acknowledgment to the client and subsequently client will send actual job to the host machine. Generation of virtual machine will be in such a way that if host machine makes copy of it even then it could not be interpreted by the host machine. When job is finished, this virtual machine will release the globus zone as shown in Figure 6.

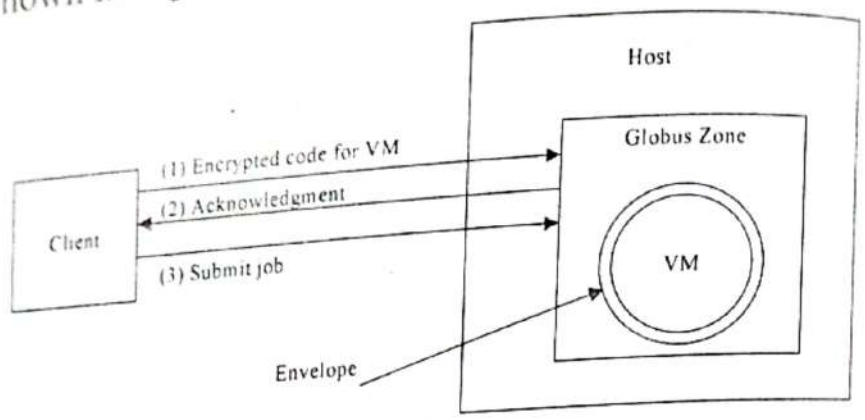

Fig. 6: Virtual Machine Approach

ACKNOWLEDGMENT

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JOB ATTRIBUTES: PREFERENCES OF PAKISTANI MBAs

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KEYWORDS: Job attributes, MBAs

ABSTRACT

The paper aims to assess job related needs of future leaders and managers of Pakistan and help employers know the same, so that they are able to offer jobs to business graduates while keeping in view the solicited benefits for both. A survey of 183 MBA students of five universities of Pakistan was conducted to test the relationship between "accepting job offer" and three categories of job attributes viz. "Job Itself", "Compensation/Security" and "Company/Work Environment". The study reveals importance being given to all job attributes (25 items) most of which are significantly correlated. Male and female students ranked MNCs and government organizations on top respectively.

INTRODUCTION

Humans are not only the most valuable natural resources (Prokopenko, 1987) but also have ability to expand the other resources (Eberstadt, 2000). Human resources of industrialized countries were found generating about 80% of the country's net income. Reason behind

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achievement of such milestones was availability of educated and trained population (Prokopenko, 1987).

Significance of higher education in general was already appreciated but in the discipline of business studies it has been notable too. In fact, MBAs have become a rapidly expanding and unregulated global market (Beckett & Towner, 2002). They were considered as very useful human resources for business organizations especially for Small and Medium Sized Enterprises (SMEs). Therefore employers used to bother about how to encourage business graduates to work for them (Moy & Lee, 2002). However, availability of educated and trained human resources was not only sufficient but their readiness and willingness to do was required also. The researcher therefore focused on studying preferences of Pakistani MBAs (job attributes), which could influence their decision regarding accepting job offer.

Objective of this research was to help employers by providing them a set of identified needs of future leaders and managers. This paper aimed at answering the question: Which job attributes play significant role in making decision regarding accepting job offer by business graduates of Pakistan?

LITERATURE REVIEW

An MBA seeks management science degree to satisfy his/her financial and economic motives (Bennett, 2004). Thus, an MBA degree is considered as a source of earning lots of money and improving cost of living (Feuerherd, 2002). Survey of heads of fortune 500 companies revealed that as far as knowledge was concerned, 78% of them demanded MBAs having functional and administrative background whereas 22% desired to have MBAs with general and broad background. To meet demand of

requisite skills 32% and 68% companies focused on technical and administrative skills respectively. Requirement of positive attitude regarding immediate job demands and long-range executive potential was noted in case of 29% and 71% companies respectively. Concern with abilities showed 44% companies demanded MBAs with no or less work experience, whereas 56% preferred MBAs having considerable work experience. Likewise, MBAs are also demanding because a competent business graduate gives an image of a true professional who possesses requisite mix of knowledge, skills, positive attitude and ability to handle multiple multifaceted business problems in a systematic way (Von Der Embse, Delozier, & Castellano, 1973).

Job Attributes

Business organizations, Multinational Companies (MNCs) in general and Small and Medium Sized Enterprises (SMEs) in particular, need to identify job attributes, which are given priority by the business graduates, so that organizations are able to attract young and educated minds to work for them.

Moy and Lee (2002) used a job attributes model to address the inability of SMEs to attract business graduates. They reviewed that Zedeck (1977) identified "advancement opportunities" and "flexibility" as important job attributes preferred by business graduates for accepting job offer.

In 1991, Powell further explored job attributes preferred by graduating students and recruiting practices of employers with an objective to assess their effects on business graduates' reactions to the initial employment interviews. He studied fifteen job attributes grouped under three categories and examined their importance to graduating students. Job attributes falling under category of

"job itself" were the opportunity to learn, the opportunity to use one's abilities, the opportunity for rapid advancements, responsibility, the variety of activities, challenging and interesting work, the opportunity to present one's achievements to one's supervisor/s. Job attributes classified as "compensation/security" were salary, fringe benefits and job security. Job attributes grouped under "company/work environment" were competent and sociable co-workers, type of work or service performed, the location of work or company, the reputation of the company and the company's training programs. All categories of job attributes were found important for graduating students at pre-interview stage with slight difference among their mean scores. Moreover, three categories were found significantly correlated at $p < 0.05$ (Powell, 1991).

In 1993, Turban, Eyring and Campion studied eleven job attributes with focus on holding a comparison between preferences and reasons for accepting and rejecting job offer by graduating students. Job attributes selected for the study were type of work, advancement, co-workers, company, security, location, supervisor, pay, working conditions, benefits and hours. Study concluded that 62% respondents ranked "type of work" on top (Turban et al., 1993).

In 1994, Teo and Poon carried out a study to investigate the job preferences of business undergraduates. They studied ten job attributes with an objective to rank preferences to work for MNCs, SMEs, running own business and government job. Job attributes were pay, fringe benefits, working conditions, long-term career prospects, marketability, job security, managerial relationships, responsibility given, authority and involvement in decision-making. Undergraduates preferring MNCs gave maximum importance to involvement in decision-making whereas undergraduates

willing to work for SMEs gave top priority to long-term career prospects (Teo & Poon, 1994).

Phillips, Phillips and Cappel, (1994) studied twenty-three job attributes viz. opportunity for advancement, job security, good retirement plan, good health insurance, good pay, good training program, positive organizational climate, challenging/interesting work, good life insurance, good dental insurance, paid sick leave, job autonomy, company reputation, location, region or city where job is located, ability of employee's spouse to find a job in or near the city where he/she will be working, paid personal leave days, company pays for future education, flexible work schedules, stock option/ownership program, health/work-out facilities, no travel and day care provided. They concluded that according to business undergraduates the most important factors were opportunity for advancement, job security, good retirement plan, good health insurance, good pay and good training program (Phillips et al., 1994).

In 1996, Wilkinson examines the factors affecting the career choice of male and female civil engineering students. She selected fifteen job attributes including location, travel, decision making, salary, perquisites, pension plans, child care, opportunity to do interesting work, opportunity to do varied work, organization's training program, opportunity for quick advancement to management, ethical considerations, size of organization, prestige of organization, and percentage of women in organization. Male and female students ranked opportunity to do interesting work, opportunity to do varied work, organizations training programs for graduates, involvement in new developments, opportunity for quick advancement and salary as top five job attributes (Wilkinson, 1996).

Chow and Luk (1996) held a comparison between preferences of women managers of China and Hong Kong while studying their managerial behaviors. They chose job motivation, skill requirement, job promotion and management practices as important characteristics of managerial behavior. To analyze the role of job motivation, they studied fourteen indicators, which can attract an employee or potential employee. Indicators were recognition for good work, having a good relationship with superior and colleagues, freedom to demonstrate initiative in job performance, challenging and interesting work, good pay, a say in important decisions, a job that enables employee to develop skills and abilities, chances to accomplish something worthwhile, provided with adequate resources to get job done, a good chance for promotion and advancement, the amount of fringe benefits on promotion, fair treatment from company and by supervisors, and a prestigious and respected department/unit/company. Overall (in China and Hong Kong both), recognition for good work, challenging and interesting work, having a good relationship with superior and colleagues, a job that enables employee to develop skills and abilities, a good chance for promotion and advancement, were found as top ranked choices (Chow & Luk, 1996).

In 2002, Moy and Lee studied preferences of business graduates to work for MNCs or SMEs on the basis of nine job attributes viz. long-term career prospects, pay, job security, managerial responsibility, fringe benefits, working conditions, involvement in decision making, responsibility given and marketability. They concluded that overall (for graduates willing to work for MNCs and SMEs both) long-term career prospects was the most important attribute, followed by pay, job security and managerial relationships. Whereas the less emphasized attributes were involvement in decision making, responsibility given and marketability (Moy & Lee, 2002).

In 2006, Szamosi attempted to know what job attributes would be on priority list of tomorrow's employees (graduates), when they would accept a job offer. He studied eighteen job attributes grouped under three categories viz. job potential, working conditions and company values and examined their importance to MBAs. Results revealed that "respect from co-workers" and "types of organizations benefits" were rated as the most important elements but it was notable that twelve out of the seventeen variables were rated as the least important to respondents (Szamosi, 2006).

METHOD

Universities are an important source to produce and supply the knowledgeable, skillful and able human resources to business organizations. Business students receive extensive management training at universities (Moy & Lee, 2002) therefore students of MBA were selected as source of information and feedback for this study.

Conceptual framework

Accepting Job Offer (AJO) was set as variable that depended on Twenty-five job attributes set as independent variables. Job attributes model used in this study was based on relevant literature (e.g. Zedeck, 1977; Powell, 1991; Turban et al., 1993; Teo & Poon, 1994; Phillips et al., 1994; Wilkinson, 1996; Chow & Luk, 1996; Moy & Lee, 2002; Szamosi, 2006). While taking up basic idea of Powell (1991), job attributes were divided into three categories; Job Itself (JI), compensation/security (CS) and company/work environment (CE).

Category of "Job Itself (JI)" comprised nine job attributes viz. "Learning Opportunities (LOs)" (Powell, 1991; Szamosi, 2006), "Opportunity to Use Potential

(OUP)" (Powell, 1991; Chow & Luk, 1996), "Career Growth (CG)" (Zedeck, 1977; Turban et al., 1993; Phillips et al., 1994; Teo & Poon, 1994; Chow & Luk, 1996; Moy & Lee, 2002; Szamosi, 2006), "Responsibility (R)" (Powell, 1991; Teo & Poon, 1994; Moy & Lee, 2002; Szamosi, 2006), "Versatility (V)" (Powell, 1991), "Stimulating Work (SW)" (Powell, 1991; Chow & Luk, 1996), "Opportunity to Highlight Performance before Boss (OHPB)" (Powell, 1991; Chow & Luk, 1996; Szamosi, 2006), "Authority (A)" (Teo & Poon, 1994) and "Decision Making (DM)" (Teo & Poon, 1994; Wilkinson, 1996; Moy & Lee, 2002; Szamosi, 2006).

Category of "Compensation/Security (CS)" comprised five job attributes viz. "Base Pay (BP)" (Powell, 1991; Turban et al., 1993; Teo & Poon, 1994; Phillips et al., 1994; Chow & Luk, 1996; Moy & Lee, 2002; Szamosi, 2006), "Fringe Benefits (FB)" (Powell, 1991; Turban et al., 1993; Phillips et al., 1994; Teo & Poon, 1994; Moy & Lee, 2002), "Job Security (JS)" (Powell, 1991; Turban et al., 1993; Phillips et al., 1994; Teo & Poon, 1994; Moy & Lee, 2002; Szamosi, 2006), "Retirement Plan (RP)" (Phillips et al., 1994) and "Health Insurance (HI)" (Phillips et al., 1994; Szamosi, 2006).

Category of "Company/work Environment (CE)" comprised eleven job attributes viz. "Competent & Sociable Co-workers (CSC)" (Powell, 1991; Turban et al., 1993; Szamosi, 2006), "Type of Work (TW)" (Powell, 1991; Turban et al., 1993), "Job Location (JL)" (Powell, 1991; Turban et al., 1993), "Organization's Repute (OR)" (Powell, 1991; Turban et al., 1993; Chow & Luk, 1996; Szamosi, 2006), "Organization's Learning Programs (OLPs)" (Powell, 1991; Phillips et al., 1994; Szamosi, 2006), "Flexible Working Hours (FWH)" (Zedeck, 1977; Turban et al., 1993; Szamosi, 2006), "Working Relationships with Boss (WRB)" (Turban et al., 1993; Teo

& Poon, 1994; Chow & Luk, 1996; Moy & Lee, 2002; Szamosi, 2006), "Working Conditions (WC)" (Turban et al., 1993; Teo & Poon, 1994; Moy & Lee, 2002; Szamosi, 2006), "Marketability (M)" (Teo & Poon, 1994; Moy & Lee, 2002), "Ethical Considerations (EC)" (Wilkinson, 1996; Szamosi, 2006) and "Equipping with Information and Communication Technologies (EICTs)" (Szamosi, 2006).

Hypotheses Development

Following hypotheses were developed:

H_{o1}: Business students disagree to accepting job offer depends on job itself.

H_{o2}: Business students disagree to accepting job offer depends on compensation/security.

H_{o3}: Business students disagree to accepting job offer depends on company/work environment.

Participants

MBA students enrolled in public and private universities (recognized by Higher Education Commission, Pakistan) were considered as elements of population for the study. Aggregate profile of the sample revealed that average age of respondents was 24.44 years whereas minimum age was 21 years and maximum was 39 years. 83.6% respondents were male and 16.4% were female. As regards semester of MBA students, 36.6%, 41% and 22.4% were from 2nd, 3rd and 4th semesters respectively. Practical experience of participants revealed, 37.2% were on job whereas 62.8% were job seekers. As far as status of employment was concerned 7.1%, 9.3%, 16.9% and 6% were working with SMEs, MNCs, government organizations and running own business.

Sampling Design

Thomas (2004) guided to draw a sample of cases as few as they must and as many as they can. However particularly for survey data sample of around 200 cases usually gives sufficient scope for analysis. According to Gupta (1993), mere determining size of the sample is not sufficient to make it true representative of the population but the method of selection of sample is important too. Therefore, the researcher practiced utmost care while determining the sample size and adopting the method of selection.

The researcher considered 87 universities and degree awarding institutes of Pakistan offering business administration programs ("A Global Guide to Management Education 2006," 2006) as population to draw a sample of 200 business students from five universities and degree awarding institutes of Pakistan i.e. 5% of the population. The researcher planned to let 40 MBA students participate from each sample university/degree awarding institute, which was neither too small nor too large.

Measurement

The researcher maximized accuracy in the test scores by applying measurement scaling carefully. The research design of the study used five-point Likert scale for survey questions (Fink, 1995a). Nominal scales were also used for few questions.

Survey Instrument

The researcher designed a survey questionnaire for MBA students, which comprised three questions only. As suggested by Fink (1995b), only purposeful questions based upon research objective and hypotheses developed

were included. In first question, respondents were asked to show their level of agreement to giving importance to 25 job attributes for accepting job offer. In second question, they were asked to rank their order of priority for type of organization. Last question was aimed at collecting personal information. Medium of communication was English with focus on use of conventional language. Wording of survey questions was kept simple and unbiased (McClelland, 1993) and questions of trivial nature were avoided (McClelland, 1994). All questions were close-ended aimed at eliciting standardized response. Instructions/legends were also given at the start of every question having same format (Cooper & Emory, 1995). For expeditious response, survey questionnaires were got filled in classrooms in presence of respective professors.

Analysis and Presentation of Data

Overall response of survey questionnaires was 91.5% (183 out of 200 participants). The researcher gave due importance to the issue of blank responses and straightaway excluded the questionnaires having less than 75% responses as suggested by Sekaran (2003). Before application of statistical treatments on data, it was analyzed that average response of survey questions was 97%. Minimum response to survey questions in a questionnaire was 80% whereas maximum response was 100%.

Internal consistency procedure based on Cronbach's alpha coefficient was used to determine inter item reliability among responses of 29 items (exclusive of personal information questions). Cronbach's alpha for the overall survey questionnaire was 0.833. Thus, the internal consistency reliability of the measures used in this study was considered as good for further statistical analyses (Sekaran, 2003).

Initially spreadsheets of MS Excel were used for data entry but later data were transmitted into Statistical Package for Social Sciences (SPSS) for analyses. Moreover, the researcher focused mainly on inferential statistics with the purpose to test the hypotheses, but for description of facts found in data, tools of descriptive statistics were also used. Some initial treatment like transformation of data in case of three variables viz. job itself (JI), compensation/security (CS) and company/work environment (CE) was applied to prepare them for application of statistical treatments for further descriptive and confirmatory analyses. Three hypotheses were developed and tested to find as to whether they had answered the research question. One sample *t* test was performed to analyze difference between mean value of data set and response of every case for respective set of variables.

RESULTS AND DISCUSSION

Inter-item reliability coefficients (Cronbach's alphas) for all job attributes (25 items), job attributes categorized under job itself (9 items), compensation/security (5 items) and company/work environment (11 items) were 0.874, 0.725, 0.840 and 0.763 respectively. These reliability coefficients were within the acceptable range for further statistical analyses (Sekaran, 2003).

Table 1 :Importance of Job Attributes – Means and Standard Deviations

S.	Job Attributes	Agreement Level[a] (%)					M[b]	SD[b]
		SA	A	N	D	SD		
1.	Learning Opportunities	55.2	38.8	2.7	1.7	1.6	4.44	0.77
2.	Opportunity to Use Potential	25.7	42.6	23.5	6.6	1.6	3.84	0.94
3.	Career Growth	27.7	44.1	20.3	7.9	0	3.92	0.89
4.	Responsibility	24.2	44.0	20.8	8.8	2.2	3.79	0.98
5.	Versatility	26.8	41.0	18.6	8.7	4.9	3.76	1.09
6.	Stimulating Work	45.2	33.5	13.7	4.9	2.7	4.13	1.01
7.	Opportunity to Highlight Performance before Boss	28.1	41.0	18.0	10.1	2.8	3.81	1.04
8.	Authority	35.6	33.3	24.0	3.3	3.8	3.93	1.04
9.	Decision Making	36.1	43.3	15.6	3.9	1.1	4.09	0.88
10.	Base Pay	49.8	31.7	13.1	4.9	0.5	4.25	0.90
11.	Fringe Benefits	33.9	37.9	20.7	6.9	0.6	3.98	0.94
12.	Job Security	51.9	25.7	10.4	8.2	3.8	4.14	1.13
13.	Retirement Plan	27.6	37.0	18.8	11.6	5.0	3.71	1.14
14.	Health Insurance	34.8	35.9	16.6	8.8	3.9	3.89	1.10
15.	Competent & Sociable Co-workers	15.6	51.1	23.9	9.4	0	3.73	0.84
16.	Type of Work	17.2	46.0	28.2	5.7	2.9	3.69	0.92
17.	Job Location	25.1	41.9	24.0	5.6	3.4	3.80	0.99
18.	Organization's Repute	47.5	35.4	11.0	3.9	2.2	4.22	0.95
19.	Organization's Learning Programs	54.2	33.1	11.0	1.1	0.6	4.39	0.77
20.	Flexible Working Hours	29.9	39.2	21.5	6.1	3.3	3.86	1.02
21.	Working Relationships with Boss	45.0	45.6	7.2	2.2	0	4.33	0.71
22.	Working Conditions	44.2	36.5	16.0	3.3	0	4.22	0.83
23.	Marketability	25.9	39.0	21.4	7.7	6.0	3.71	1.12
24.	Ethical Considerations	38.5	33.3	21.6	4.4	2.2	4.01	0.99
25.	Equipping with Information and Communication Technologies	38.3	37.7	20.2	2.2	1.6	4.09	0.90

[a]SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree and SD = Strongly Disagree

[b]higher the Mean score with smaller Standard Deviation, the greater the importance given to the job attribute for accepting job offer

Table 1 Indicates strong and general agreement regarding importance being given to 10 job attributes (at serial number 1, 6, 8, 10, 12, 18, 19, 22, 24 and 25) and 15 job attributes (at serial number 2, 3, 4, 5, 7, 9, 11, 13, 14, 15, 16, 17, 20, 21 and 23) for accepting job offer respectively. However, "Learning Opportunities", "Organization's Learning Programs" and "Working Relationships with Boss" were perceived as the most important whereas "Retirement Plan", "Marketability" and "Type of Work" were given minimum priority among all job attributes.

Table 2 : Pearson's r Correlations among Categories of Job Attributes

	JI	CS	CE
JI	–	–	–
CS	0.526[a]	–	–
CE	0.497[a]	0.523[a]	–

[a] $p < 0.01$, JI = Job Itself, CS = Compensation/Security and CE = Company Work Environment

Table 2 shows significant correlations among categories of job attributes for accepting job offer. These results endorse Powell (1991).

Table 3 : Pearson's r Correlations among Job Attributes Categorized as Job Itself

	Los	OUP	CG	R	V	SW	OHPB	A	DM
LOs	–	–	–	–	–	–	–	–	–
OUP	0.210[b]	–	–	–	–	–	–	–	–
CG	0.248[b]	0.307[b]	–	–	–	–	–	–	–
R	0.194[b]	0.197[b]	0.096	–	–	–	–	–	–
V	0.230[b]	-0.043	0.148[a]	0.204[b]	–	–	–	–	–
SW	0.397[b]	0.127	0.268[b]	0.240[b]	0.323[b]	–	–	–	–
OHPB	0.228[b]	0.129	0.208[b]	0.188[a]	0.234[b]	0.263[b]	–	–	–
A	0.235[b]	0.114	0.163[a]	0.247[b]	0.083	0.319[b]	0.143	–	–
DM	0.315[b]	0.197[b]	0.334[b]	0.192[a]	0.238[b]	0.364[b]	0.072	0.597[b]	–

[a] $p < 0.05$, [b] $p < 0.01$, LOs = Learning Opportunities, OUP = Opportunity to Use Potential, CG = Career Growth, R = Responsibility, V = Versatility, SW = Stimulating Work, OHPB = Opportunity to Highlight Performance before Boss, A = Authority and DM = Decision Making

Table 3 shows correlations of thirty-six combinations among nine job attributes grouped as "Job Itself". Twenty-four and four correlations were significant at $p < 0.01$ and $p < 0.05$ respectively. In eight cases correlations were trivial.

Table 4 : Pearson's r Correlations among Job Attributes Categorized as Compensation/Security

	BP	FB	JS	RP	HI
BP					
FB	0.451[a]				
JS	0.460[a]	0.500[b]			
RP	0.453[a]	0.567[b]	0.591[b]		
HI	0.413[a]	0.416[a]	0.605[b]	0.582[b]	

[b] $p < 0.01$, BP = Base Pay, FB = Fringe Benefits, JS = Job Security, RP = Retirement Plan and HI = Health Insurance

Table 4 reveals correlations of ten combinations among five job attributes grouped as "Compensation/Security". All correlations were significant at $p < 0.01$.

Table 5 : Pearson's r Correlations among Job Attributes Categorized As Company/Work Environment

	CSC	TW	JL	OR	OLPs	FWH	WRB	WC	M	EC
CSC										
TW	0.195[a]									
JL	0.073	0.330[b]								
OR	0.174[a]	0.350[b]	0.280[b]							
OLPs	0.259[b]	0.126	0.086	0.279[b]						
FWH	0.304[b]	0.141	-0.040	0.166[a]	0.229[b]					
WRB	0.339[b]	0.129	0.109	0.178[a]	0.436[b]	0.346[b]				
WC	0.188[a]	0.190[a]	0.085	0.210[b]	0.049	0.361[b]	0.238[b]			
M	0.242[b]	0.305[b]	0.212[b]	0.141	0.086	0.143	0.174[a]	0.298[b]		
EC	0.369[b]	0.301[b]	0.225[b]	0.174[a]	0.105	0.228[b]	0.335[b]	0.273[b]	0.413[b]	
EICTs	0.124	0.219[b]	0.169[a]	0.258[b]	0.180[a]	0.433[b]	0.218[b]	0.364[b]	0.172[a]	0.314[b]

[a] $p<0.05$, [b] $p<0.01$, CSC = Competent & Sociable Co-workers, TW = Type of Work, JL = Job Location, OR = Organization's Repute, OLPs = Organization's Learning Programs, FWH = Flexible Working Hours, WRB = Working Relationships with Boss, WC = Working Conditions, M = Marketability, EC = Ethical Considerations and EICTs = Equipping with Information and Communication Technologies

Table 5 shows correlations of fifty-five combinations among eleven job attributes grouped as "Company/work Environment". Thirty and eleven correlations were significant at $p < 0.01$ and $p < 0.05$ respectively.

Table 6 : One Sample t Table – Perceptions of MBA Students Regarding Significance of Three Sets of Job Attributes for Accepting Job Offer

Sets of Job Attributes	N	M	SD	t	df	Sig (1-tailed)
Job Itself	169	3.96	0.54	47.33	168	0.000*
Compensation/Security	170	3.99	0.83	31.28	169	0.000*
Company/Work Environment	160	4.01	0.50	50.38	159	0.000*

*$p < 0.025$

Table 6 indicates rejection of all null hypotheses. Results reveal that business students of Pakistan believed that their decision regarding accepting job offer depended on job attributes grouped under job itself, compensation/security and company/work environment.

Table 7 : Preference of Business Students: Gender versus Type of Organizations (Cross-Tabulation)

		Gender (%)		Total (Type of Organization)
	Choice	Male	Female	%
Entrepreneurship	1st	39.0	5.7	44.7
	2nd	11.3	2.8	14.2
	3rd	7.8	4.3	12.1
	4th	26.2	2.8	29.1
SME	1st	12.8	3.4	16.2
	2nd	14.9	2.7	17.6
	3rd	20.3	2.7	23.0
	4th	37.8	5.4	43.2
MNC	1st	46.4	5.2	51.6
	2nd	16.3	5.2	21.6
	3rd	11.1	3.9	15.0
	4th	10.5	1.3	11.8
Government	1st	24.8	8.5	33.3
	2nd	24.2	2.0	26.1
	3rd	15.7	2.0	17.6
	4th	18.3	4.6	22.9
Total (Gender)		83.6	16.4	100

Table 7 indicates that business students gave top priority to work for MNCs followed by running own business, joining government organization and SMEs. Male students ranked MNCs on top priority whereas female students ranked government organizations as first choice.

CONCLUSIONS

Conclusions substantiated the research objective while answering the research question that all job attributes (25 items) influence business graduates' decision regarding accepting job offer. Job attributes, further divided into three categories viz. job itself, compensation/security and company/work environment, were tested and found as identified needs of business graduates. It is interesting to know that all job attributes were found important for accepting job offer but all are not significantly correlated with each other. In some cases, correlations were found negative and trivial. Therefore, employers may study the relationships among certain job attributes while making decision of offering jobs to business graduates. Male and female students ranked MNCs and government organizations on top respectively.

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LIVE OS IN A NETWORK

By

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ABSTRACT

History of Operating Systems starts from the existence of computers, and still OSs are evolving. In this paper we have reviewed the topic of Live OS that has not yet been explored properly. From the perspective of computer networks, Live OS can be used for establishing Firewalls, Clusters and as Security assessment tool of networks etc. Our proposed concept is that a Live OS can be used to fulfill an organizations specific network requirements with respect to their servers. It could take a lot of precious time in a network environment to rectify the problem of server failure due to hardware or software, so for that situation a preconfigured server in the form of Live OS on CD/DVD/USB can be used as an immediate solution.

Live OS resides on CD/DVD/USB and is portable. Live OS in a network environment is a quick alternate of the services that are not available due to hardware or software problems of the server. Live OS can be a cost effective solution for low budget networks. The life of Live OS starts when we boot it from CD/DVD/USB and remains in action for that session. As soon as the machine is rebooted, any work done for that session is gone, (in case we do not store any information on any storage media). Live OS is normally used on computer systems where we do not have installed Operating System.

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A Live OS can also be used on systems where we already have an installed OS. On the basis of functionality, Live OS can be used for many purposes and has some typical advantages that are not available on non-live operating systems. Vendors are releasing different distributions of Live OS and are becoming their sole identity in a particular domain like Networks, Security, Education or Entertainment etc. There can be many aspects of Live OS, but Linux based Live OS and their use in the field of networks is the main focus of this paper.

I. INTRODUCTION

Smooth and consistent services provided by Operating Systems are very necessary for all types of networks. Computer networks are dependent on the services provided by the Operating System, for that reason OS becomes the most significant software whose failure leads to disaster in network environment. As the devices used for establishing, handling and managing networks are OS dependent so, every type of network relies upon the correct functioning of the OS. Failure of an OS, which provides services as a server in a network environment, is certainly the failure of the network. Failure of an OS can lead to the failure of a network but the reverse may not be true. So, whenever a Network OS responsible for providing services fails, the network service provided by it are affected and becomes unavailable to the user, and ultimately clients become the real sufferers. Environments where delays or stoppage of services can not be tolerated and in some other critical Real-Time environments, different types of solutions are available, such as RAID supportable systems, multiple processors environment, and other types of redundant hardware modules, including machines and NOS.

Redundant hardware in the form of machines, RAID supportable systems and multiple processor environments are expensive solutions, but are widely acceptable, and have their own importance and significance in providing uninterruptible services in case of hardware failures for design of graceful degraded environment for an OS to perform the fail soft functionality. A software-based issue

is of Operating System, being out of service, due to any reason. A solution is to prepare a machine again, but it could take a lot of time to reinstall the OS and configure the system to run again on the network for provision of services. A proposed and relatively better and effective solution can be adopted in such a situation is in the form of Live OS. Live OS is a complete Operating System that can be on a CD/DVD/USB and one can use it without installing it on Hard Disk. Live OS provides more flexibility at times, and some specific solutions in times of trouble.

II. LIVE OS ON CD/DVD/USB

Survival without network is almost impossible just as accessing network and its resources without NOS is impractical. Operating Systems and particularly Network OSs will remain the most essential software for network connectivity. From time to time new ideas have been implemented in Operating Systems in order to improve their efficiency and to make them diverse. Operating Systems now days are comparatively intelligent as compared to the Operating Systems that we have experienced in the past. Operating Systems used now days, either by a home user or by an administrator in a complex network environment for delivery of services have at least one thing in common, that is the network. Operating Systems were initially single user systems and have gone from multi user to network environment. The scheme of using an OS is that it is normally installed on hard drives. Time required for installation of an OS and the space it needs, depends that how many packages or components are selected for installation. More time would be required and more space would be needed, if more packages or softwares are selected for installation. Operating Systems that are in common use now a day, i.e. MS-Windows, Macintosh, Unix and Linux etc are installed on the hard drives. After installation, these OSs have their booting files available on the hard drives along with other relevant data. Whenever a user tries to load the OS, the boot files are loaded from hard drive to memory and OS starts providing the services. Other techniques for booting OS are also possible, and include network booting and booting from a bootable Floppy or CD etc.

Live OS is an Operating System on CD/DVD/USB, containing Operating System files, and desired or required softwares, including Network relevant software like different networking servers i.e. Telnet, Proxy and SSH etc, network security tools like Nessus or ACID, Language Compilers, Office applications and other softwares, all stored on a bootable CD/DVD/USB etc that can be directly executed, without installation of the OS or other softwares, on hard drive [11].

Most of the available Live OS are based on the GNU operating system and the Linux kernel. Although Live OS based other operating systems exist, such as Mac OS, MSDOS or Microsoft Windows etc, but their legal status is not yet confirmed and predictable.

III. Usage of Live OS in Various Environments

The list of Live OS available from the Internet shows the primary functions of different distributions [1]. On the basis of usage and functionality they can be used as:

- **Educational OS:**
  Contains educational softwares that are used in education fields.

- **Cluster OS:**
  Used for establishing a Clustered-computing environment [2, 3].

- **Desktop OS:**
  A GUI based desktop environment containing programs like web browsers and other necessary softwares.

- **Rescue OS:**
  Includes softwares that are used for the recovery of data when conventional OS cannot access files using its own file system.

- **Security OS:**
  As an OS that contains network security and assessment tools like Nmap, Nessus and ACID etc.

- **Home Entertainment OS:**
  More focus is towards home entertainment softwares like audio and video applications.

- **Diagnostics OS:**
  Most of the utilities are related to the diagnosing and testing the hardware.

- **Firewall OS:**
  These types of distributions are used in order to achieve the working of a firewall for the creation of Militarized (MZ) and Demilitarized Zones (DMZ) in the LAN/WAN Environment.

- **Forensics OS:**
  Contains softwares that are used for forensic computer analysis [4, 5].

- **Server OS:**
  Can be used to work as different types of servers i.e. SSH, Telnet and FTP etc.

- **Educationally customized OS:**
  Can be customized in an educational domain to supply complete working and studying environment for the students who do not have special skills, as they are unfamiliar with the new technology [6].

- **Grid OS:**
  As installation, configuration and maintenance of Grid services is a difficult task, so a natural extension to the traditional Bootable Cluster CD (BCCD) image is one that focuses on aspects of Grid in the form of (BGCD), i.e. Bootable Grid CD [3].

On the basis of usage scenarios, we see that Live OS actually are Special purpose Live OS [7], ranging from large desktop oriented OS that use compressed file systems to add more and more applications to tiny little CDs that are used to set up small routers or firewalls in embedded environments.

IV. Working Specifications

Life of Live OS starts when it is booted from its CD/DVD/USB. The reason of naming Live OS is because it is "brought to life" upon boot without having to be physically installed on a hard drive [8]. During the boot process the Live OS on CD places its files onto a ram disk in comparison to the other Operating Systems that would normally be installed on a hard drive [11]. Although the technique of using ram disk reduces the RAM available to applications and reduces performance to some extent but even though the benefits achieved by Live OS are fairly large [8]. Despite of the drawback that the memory required for application reduces because of using the RAM as ram disk, there are much more benefits that Live OS offers.

Based on the concept of Live OS on CD/DVD and the benefits gained, Live OS on USB is available too, and gaining popularity.

In order to boot a Linux based Live OS, a utility with the name of "syslinux" is used mostly and conforms to the "El Torito" specification which treats a special file on a disk as a floppy diskette image [8]. Other technical details of booting, hardware detection and file systems support in some linux based Live OS are available in [9].

V. Future of Live OS

On the basis of features Live OS has proved its uniqueness and has given new dimensions to the use of Operating Systems in general. Being equally capable of using in many specialized areas like networks, multimedia, security and education etc, still there are unexplored areas that can gain benefit from the scope offered by Live OS.

The idea of Live OS was started in early 1990s by Mac OS 7 [8] and a survey revealed that there are more than 300 Live OSs available in the market and the trend is on the rise. Many Linux OS based Live OS are available on the basis of their functionality. Another important point to

consider regarding Live OS is their size. Some special Live OS distributions are as small in size as 5 MB.

Table1 shows some Linux based Live OS distributions on the basis of their primary functions and small size starting from 5 MB [10].

TABLE I
SMALL SIZE LINUX BASED LIVE OS DISTRIBUTIONS

#	Name of Live OS	ISO Size (MB)	Primary Funcation
1	GeeXboX	5	Home Entertainment
2	CHAOS	8	Clustering
3	Thinstation	9	Thin Client
4	Rxlinux	10	Server
5	Repairlix	11	Rescue
6	Trinux	19	Security

Live OSs that are relatively bigger in size and cannot be stored on smaller USB devices or CDs, are stored on DVD. There are large sized general purpose Live OS available to be used from CD or DVD [10] and some of them are shown in Table II.

TABLE II
LARGE SIZE LINUX BASED LIVE OS DISTRIBUTIONS

#	Name of Live OS	ISO Size (MB)	Primary Funcation
1	PaiPix	1720	Science
2	Suse Live-Eval	1446	Desktop
3	Knoppix	700	OS Replacement
4	Burnix	690	Clustering
5	Plan-B	658	Forensics & Rescue
6	BackTrack	625	Security

VI. PROPOSED WORK FOR LIVE OS IN A NETWORK

On the basis of features offered by Live OS, a customized Live Network OS can be established for satisfying the needs of a network environment. A complex network environment could have different types of servers with different types of configurations. Reconfiguring a server due to a problem in that environment, or reinstalling it, due to OS failure, would be a time consuming task that perhaps would not always be affordable specially from available times perspective. Our proposed idea is to establish a Live Network OS in such a way that in case of a failure, i.e. Hardware, OS or Server failure, instead of wasting time in installing OS from scratch or start configuring, reconfiguring or installing the servers again, we should use Live Network OS.

As many Live OS distributions, specially Linux based, are becoming popular due to their primary function, so the idea of a customized or special server software, designed for a particular organization, can also be configured on a Live OS. The benefit would be that the time for installing the server again, and then configuring it would be saved as it would already be installed and configured on a Live OS for a particular network environment according to its precise needs, and it would yet be another Live OS distribution, used specifically in the scenarios for which it was built.

Proposed work is suitable for establishing servers like Anonymous FTP server containing material for download, or Secure SHell (SSH) or Telnet server for using language compilers available in operating system. Proposed system will not work for some specialized servers like mail servers. The reason is that mails need to be stored and spooled, while the proposed system cannot store information in case of CD or DVD etc.

We have tested our proposed idea in a network consisting of around twenty to thirty nodes. One of the machines in that network was an Anonymous FTP and Telnet server. We stopped FTP and Telnet servers and another machine with Live OS was started and configured

as Anonymous FTP and Telnet server. Name server entries that were previously providing old machine name was changed to provide naming information of Live OS. It took less than 5 minutes to complete the whole process that could never have been possible otherwise.

VII. CONCLUSION

Conclusion made is that Live OS can be used in a specific network environment and would always add in the form of improved reliability in services provided by that network.

Live OS is found to be a cost effective solution for a network environment that has limited budget allocations and do not have immediate replacement of the failed hardware and devices.

Customized client/server environment can be established and used in Live OS, and another important benefit for this scheme would be its mobility. As it would be installed and configured on CD/DVD etc, it would be portable in any network environment that uses the same hardware for which Live Network OS was primarily designed.

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A PERFORMANCE COMPARISON OF SUPER SCALAR MULTIPROCESSING, PIPELINED PROCESSOR WITH MASSIVELY PARALLEL PROCESSOR

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Lecturers

ABSTRACT

The super scalar processing is a technique which is used to execute multiple Instructions or more than one Instruction in parallel in a single clock cycle. This technique is used in the field of modern processor design.

This approach is also known as pipelining and parallel processing. This paper discusses about the internal architecture of super scalar processor including processing phases, process of executing multiple Instructions in parallel. Then in the last the concept of MPP processors (massively parallel processing) technique for real time processing, is introduced and compare with super scalar processing to show, which technique is more efficient and reliable in the field of processor design.

INTRODUCTION:

Let's start with the introduction of super scalar processor. What is super scalar processor, and what is its relation with Instruction level parallelism .A **superscalar** CPU architecture implements a form of parallelism called Instruction-level parallelism with in a single processor. As compared to Super scalar processor what is MPP? The

super scalar processing is a technique by which we increase the processing speed of multiple Instructions by using single microprocessor and MPP (massively parallel processing) is purely Hardware based processing design approach in which we execute multiple instructions by using more than one microprocessors running concurrently on the same task.

Massively parallel processor MPP from its definition tells that the processor is parallel and massive. The massive means multiple processors (CPUs) within a machine. The goal of 'parallel' is to have more than one of these processors working, simultaneously, on a single problem. A multiprocessing architecture may use from a few thousands of processors. Some might contend that a computer system with 64 or more CPUs is a massively parallel processor. To take advantage of more CPUs in an MPP system means that the specific problem has to be broken down further into more parallel groups. However, adding CPUs in an SMP system increases performance in a more general manner.

SMP stands for symmetric multiprocessing systems used as servers to increase the performance capability of microprocessors.

Historical Back ground:

The first **superscalar processor** was designed by Seymour Cray's CDC 6600 in 1965 often mentioned as the first superscalar design. Later in 1998,the Intel micro coperation designed a superscalar processor named as i960CA and the AMD 29000-series in year 1990.
These microprocessors were the first commercial single-chip superscalar microprocessors.

1. The Massively Parallel Processor (MPP)

The massively parallel processing supercomputer was built by Aerospace for the NASA Space Flight Center. It was designed to deliver enormous computational power at lower cost than other existing supercomputer architectures, by using thousands of simple processing elements, rather than one or a few highly complex CPUs. The Development of the MPP began in 1979; it was delivered in May 1983, and was in general use from 1985 until 1991.

"Massively parallel processor is an emerging technology. Many organizations are examining their future computations and computer purchasing strategies with MPP in mind. There is a great deal of expectation of this technology to arrive. Then what is MPP?
Why it is getting so much press? What are the issues associated with computing on MPP?

Will an MPP replace existing computer?

What is its architecture and how it work?

1.1 Idea of High performance processing:

In this research paper we are discussing two major Issues. First issue is related to data dependency Hazards in super scalar processing and how these can be efficiently reduced with the help of MPP (massively parallel processing) technique. Second issue is the most important that is related to the comparison of processing performance of both super scalar microprocessor and also of massively parallel processor.

1.1 (a) The Instruction processing Model in super scalar Architecture:

A **superscalar** architecture executes more than one instruction during a single pipeline stage by fetching

multiple instructions and simultaneously dispatching them to redundant functional units on the processor. Lets take a simple example of two stage pipe lined superscalar processor and its architecture.

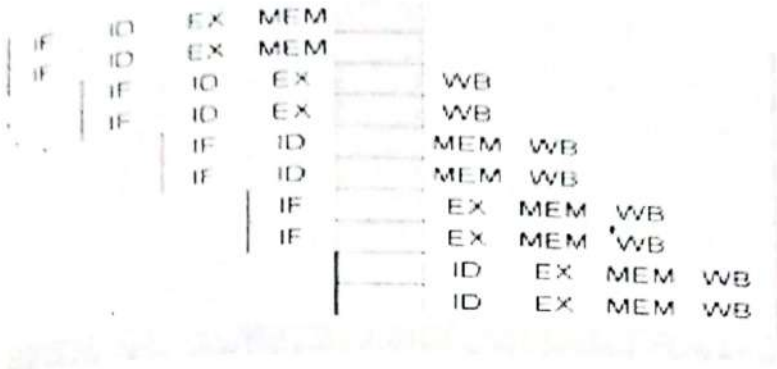


Fig1: Simple superscalar pipeline. By fetching and dispatching two instructions at a time, a maximum of two instructions per cycle can be completed.

(Fig: from www.wikipedia.org and www.prinhell.com/henssy).

This means that a superscalar processing technique, described in the fig simultaneously fetch two multiple instructions in parallel (fetch means to pick a specific program Instruction from memory), to decode it decides what the Instruction means whether we have to add, subtract multiply or divide the Instruction, to execute it means to compute the results of the Instructions and if it is a memory reference instruction for example load word or store word it is by pass to data memory otherwise the result is write back to register file or to the memory.

2.0 Design of data path to execute multiple Instructions in parallel:

Before going into data path design to execute multiple Instructions in parallel, it should be observed first that all the techniques involving, the execution of multiple Instructions in parallel is based on asynchronous clock mode, means when the clock signal is one the data passes

from one end of the circuit to another, rather it work like a switch to on or off the circuit.

All instructions to be used in super scalar design are of MIPS R2000 Architecture are 32 bits in length. Initially the MIPS instructions to be supplied to microprocessor data path of three types These three different instruction formats in this architecture are described as :

R-Type (Register type Instructions), I-Type (Immediate type Instructions), and J-Type (Jump type Instructions)

2.1 R-Type instructions or Register instructions are used for register based ALU operations.
Examples of Instructions are

Add: add $s1, $s2, $s3 ($s1=$s2+$s3)
SUB: sub $s1, $s2, $s3 ($s1=$s2-$s3)
MUL: mul $s1, $s2, $s3 ($s1=$s2*$s3)
DIV: div $s1,$s2, $s3 ($s1=$s2 / $s3)
AND: and $s1,$s2, $s3 ($s1=$s2 & $s3)
OR: or $s1, $s2, $s3 ($s1=$s2 || $s3)

The two operands and the destination of the result are specified by locations in the register file.

Lets take an Example of the first Addition Instruction the instruction adds the values of the source operands in the register $s2 and $s3 and the final result is saved in register $s1.The register $s1 is serving as a destination register. Similarly the remaining instructions are executed in the same manner.

2.2 I-Type instructions are memory reference instructions, can be either Load/Store operations, Branch (jump) operations, or Immediate ALU operations.

Load Word:

Lw $s1, 100($s2) ($s1=Memory[$s2+100])

In this statement data is transferred from memory to register.

Store Word:

Sw $s1, 100($s2) (Memory[$s2+100]= $s1)

In this statement data is transferred from register to memory

2.3 J-Type instructions, or Jump instructions, devote all of the non-opcode space to a 26-bit jump destination field.

Jmp:

J L (Go to L (target address))

This instruction means jump to a specific label in your assembly language program.

Jr $ra (Go to register $ra)

This Instruction means jump to a specific location of register $ra.

The Instruction format Table of each of these three Instructions is described as given below:

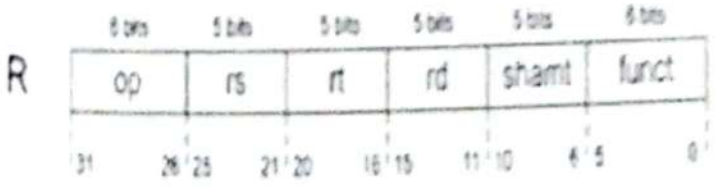


Fig2.1: R-type Instruction format contains specified field of Instructions.

(Fig. from www.wikipedia.org and www.prinhell.com/henssy).

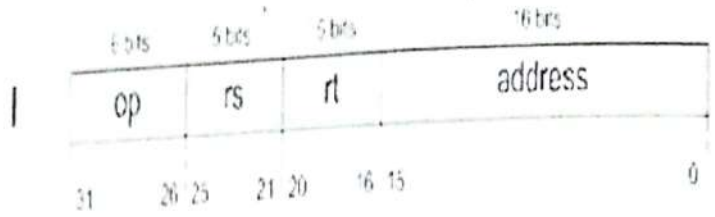


Fig2.2: I-type Instruction format contains specified field of Instructions.

(Fig: from www.wikipedia.org and www.prinhell.com/henssy).

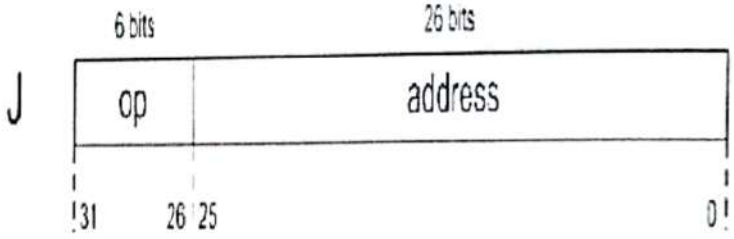


Fig2.3: J-type Instruction format contains specified field of Instructions.

(Fig: from www.wikipedia.org and www.prinhell.com/henssy).

In these three Instructions architecture,

op = opcode (Basic operation of Instruction)

rs = rt source operands

rd is destination operands (gets the result of the operation).

Shamt: Shift amount, shift left or right by a constant value.

Now we move on to the detail of parallel or simultaneously executing multiple Instructions in parallel.

The first major problem faced by us in executing multiple Instructions is that of data dependency hazards, due to which the result of next instruction is depending on the previous instruction.

There are basically two types of data dependencies true dependencies and artificial dependencies.

True dependencies involves read after write (RAW) hazards and artificial dependencies involves write after read hazards (WAR),and write after write hazards(WAW) hazards.

Hazards prevent next instruction from executing during its designated clock cycle.

3.0 Another Examples of Hazards includes:

Structural hazards: Hardware cannot support this combination of instructions - two instructions need the same resource.

Data hazards: Instruction depends on result of prior instruction still in the pipeline

Control hazards: Pipelining of branches & other instructions that change the PC.

3.1 Basic Techniques to resolve the hazards.

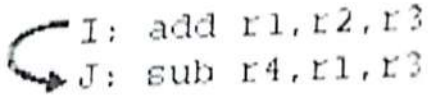
- Common solution is to stall the pipeline until the hazard is resolved, inserting one or more "bubbles" in the pipeline
- To do this, hardware or software must detect that a hazard has occurred.

There are three situations a data hazard can occur in:

3.1(a). Read after Write (RAW): An operand is modified and read soon after. Because the first instruction may not have finished writing to the operand, the second instruction may use incorrect data.

- **Read After Write (RAW)**

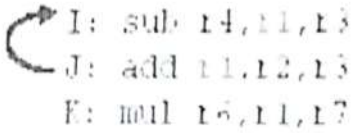
Instruction J tries to read operand before Instruction I writes it.



3.1 (b) Write after Read (WAR): Read an operand and write soon after to that same operand. Because the write may have finished before the read, the read instruction may incorrectly get the new written value.

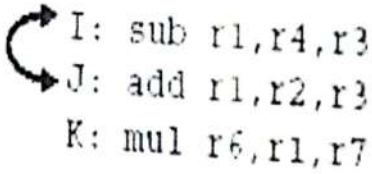
- Write After Read (WAR)

Inst J writes operand before Inst I reads it.



3.1 (c) Write after Write (WAW): Two instructions that write to the same operand are performed. The first one issued may finish second, and therefore leave the operand with an incorrect data value.

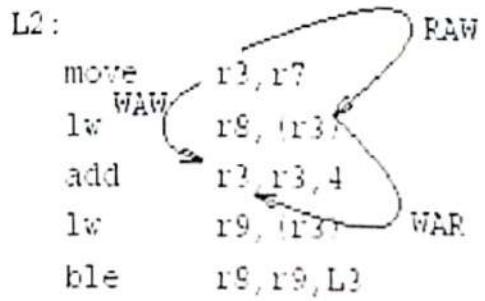
Instr J writes operand before Instr I writes it.



3.2. Structural Hazards

- Structural hazards occur when two or more instructions need the same resource.
- Common methods for eliminating structural hazards are:
  - Duplicate resources
  - Pipeline the resource
  - Reorder the instructions

Now Lets review a block code of an Assembly language program.



Now from the block of code we see that register r3 is being first write by moving a value form register r7.In second statement register r3 is passing a value to register r8.In this such type of case in a same clock cycle a value is being stored by register r7 in register r3,before this process completed in second statement the previous value of r3 is being loaded into register r8 causes a hazard in the program. Known as read after hazard.

In the second statement in lw and in third statement of add instruction the value of r3 in second statement is loaded in register r8.befor the step is completed in third statement the previous value of r3 is being updated by adding a value 4 in it causes a write after read hazard causes a program flow or sequence of execution to disturb.

In first (move instruction) and in third instruction of addition, the value of register r3 is being simeltenseuly updated causes a write after write hazard in our program.

To eliminate these hazards we have several software design approaches known a stalling the pipe line or forwarding.

3.2.1 Eliminating hazards:

There are several established techniques for either preventing hazards from occurring, or working around them if they do.

3.2.1(a) Bubbling the Pipeline

Bubbling the pipeline (a technique also known as a **pipeline break** or **pipeline stall**) is a method for preventing data, structural, and branch hazards from occurring. As instructions are fetched, control logic determines whether a hazard could/will occur. If this is true, then the control logic inserts NOPs into the pipeline. Thus, before the next instruction (which would cause the hazard) is executed, the previous one will have had sufficient time to complete and prevent the hazard.

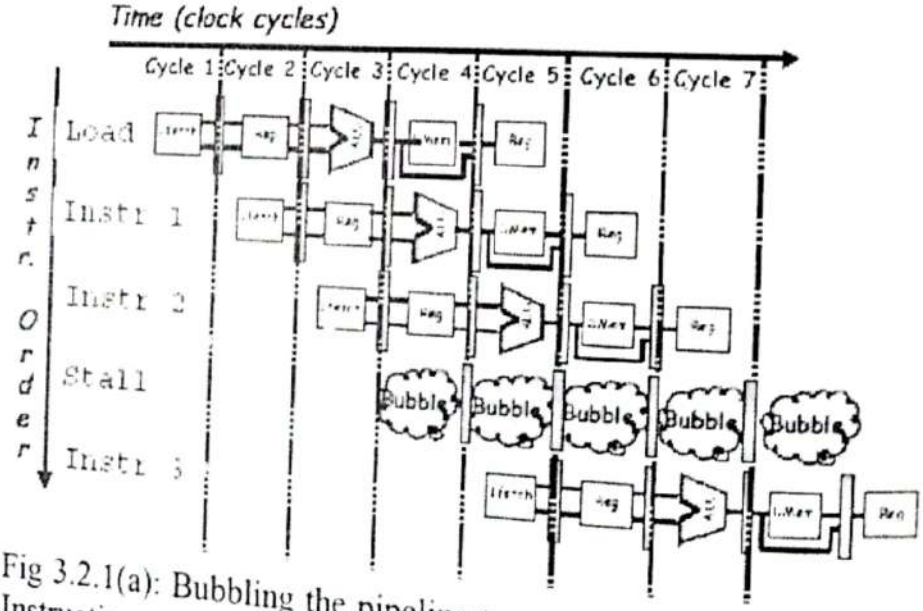


Fig 3.2.1(a): Bubbling the pipeline to avoid dependency hazards in the Instructions.

(Fig: from www.prinhell.com/henssy/lectures).

3.2.1 (b) Data Forwarding

With data forwarding (also called bypassing or short-circuiting), data is transferred back to earlier pipeline stages before it is written into the register file.

Instruction I : add r1, r2, r3 (result ready after EX stage)

Instruction J: sub r4, r1, r5 (result needed in EX stage)

This either eliminates or reduces the penalty of RAW hazards. To support data forwarding, additional hardware is required. Multiplexers to allow data to be transferred back.

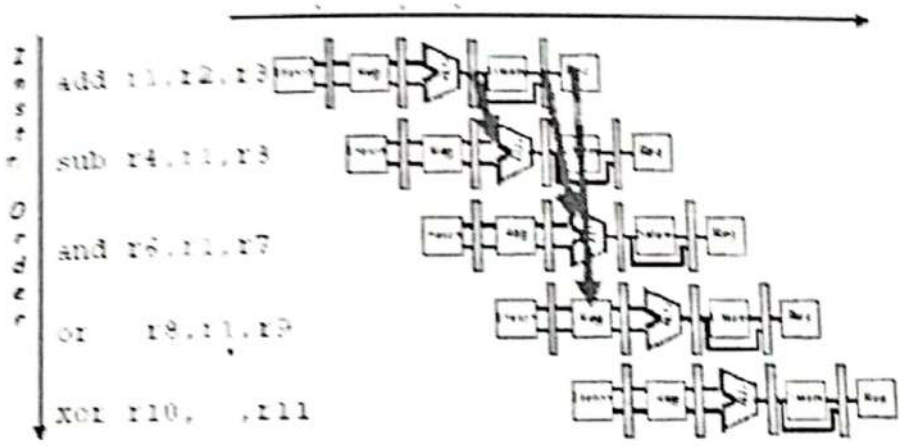


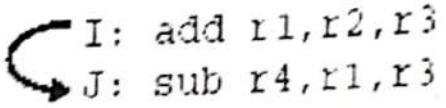
Fig 3.2.1(b): Forwarding to avoid data hazards. (Fig: from www.prinhell.com/henssy/lectures).

All these hazards detecting techniques will slow down the execution performance of microprocessors. As compared to super scalar processing technique massively parallel processing technique is also an efficient method for the processing or execution of multiple Instructions in parallel.

Now lets discuss in detail about massively parallel processing design technique. Our main idea of Research in this paper starts from here.

4.0 Massively parallel processing technique.

In the next section we are introducing the idea of massively processing technique. In this technique each sets of Instructions are processed separately and the problem of dependencies in Instructions are much more removed because the Instructions in form of blocks are processed separately because the MPP the processor is "parallel" and "massive." The "massive" means multiple processors (CPU) within a machine. For example we have a block of Instruction.



As we know that there is data dependency RAW hazard in it. Instead of executing this same Instruction on superscalar processor again we execute these two Instructions on Massively parallel processor. In this architecture as we know there are multiple processors with in the same machine.

Lets review the execution of these two Instructions with the help of figure,

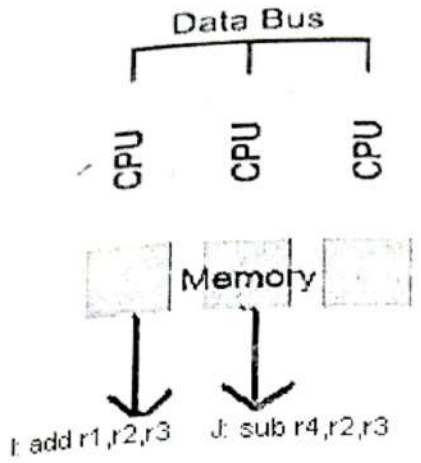


Fig 4: Representing the block diagram of massively parallel processors. Three processors are connected in series and they communicate with each other through Data bus a shown above.
(Fig Design with the help of Parallel architectures from www.lsbu.ac.uk).

As mentioned above that there are two given Instructions which we want to execute on MPP machine. The first Instruction is of addition it is assigned to cpu1 to execute and second Instruction of subtraction is assigned to cpu 2 and cpu3 is remained idle. As in the figure it is mentioned that these three cpus are communicating with other through a high-speed data bus.

As it is mentioned above that there are two Instructions I and J. Instruction I (first addition) is of addition and Instruction J (second Instruction) is of subtraction. The second Instruction J is depending on the result of the first instruction I.

In case of super scalar processing technique the single cpu is being assigned to execute the two above mentioned Instructions.

In the case of Instruction I in the first clock cycle the processor compute the result of the first Instruction in register 1, in the mean while the second instruction is waiting for the result of the first instruction as input source operands. In the second clock cycle the result of the second instruction J is computed and assigned it to register r4. This means that these two Instructions I and J execute in 2 clock cycles.

In the case of MPP processing design technique the first (addition) Instruction I is fetched by cpu1 and second (Subtraction) Instruction J of addition is fetched by cpu2. The cpu3 is left idle.

In the first clock cycle the cpu1 computes the result of first instruction and saves this result in the register r1. Instead of waiting for the second clock cycle in the same time span on in the same clock period the result in register r1in first Instruction is being supplied to register r1 in second instruction as source operand through high speed data bus. In the same clock cycle the Instruction J is being executed and the result of this second instruction is assigned to register r4 in the same clock cycle.

By comparing the execution time of same instructions on two multiple processor design technique we conclude that performance of MPP processor design technique is more efficient as compared to super scalar processing technique, because the (throughput) execution rate of MPP is more as compared to Superscalar because is can execute multiple instructions in less time frame as compared to superscalar and we are saving a lot of processing time delays in clock cycles. It means that n number of Instructions can execute in almost n /2 time span in case of MPP processing design technique and it is 2n times faster than super scalar processor.

4.1 Internal Architecture and working of massively parallel processor.

In this section we discuss about the Internal Architecture of MPP processor and also discuss in detail about its Instructions processing technique.

Before we discuss about the Internal Architecture and working of MPP our first step is to understand what is parallel processing in context of MPP.

4.2 Instruction processing and Elements of High performance processing:

The idea of massively parallel processing is originated from parallel processing design technique. What is parallel processing design technique? Let's discuss in detail about it.

4.2.1 Parallel computing or parallel processing is the simultaneous execution of the same task (split up and specially adapted) on multiple processors in order to obtain results faster. The idea is based on the fact that the process of solving a problem usually can be divided into smaller tasks, which may be carried out simultaneously with some coordination.

A parallel computing system is a computer with more than one processor for parallel processing. In the past, each processor of a multiprocessing system always came in its own processor packaging, but recently introduced multicore processors contain multiple logical processors in a single package.

There are many different kinds of parallel computers. They are distinguished by the kind of interconnection

between processors (known as "processing elements" or PEs) and memory.

4.2.2 Flynn's taxonomy, is one of the most well known theory that relates directly to working of multiple computer systems working in parallel, and the types of MPP architectures are based on this theory.

4.3 Types of MPP Architectures.

There are currently a number of different architecture types in the field of **MPP**. A classification of the types of architectures would help to make discussing the **MPPs** easier. This is a grouping of computers into four classes. The classes are identified by acronyms. They are:

SISD—Single **I**nstruction stream, Single **D**ata stream.

SIMD—Single **I**nstruction stream, **M**ultiple **D**ata stream.

MISD—**M**ultiple **I**nstruction stream, Single **D**ata stream.

MIMD—**M**ultiple **I**nstruction stream, **M**ultiple **D**ata stream.

The most interesting class of **MPP** machine is the **MIMD** class. In this class the machines have multiple streams of instructions and multiple streams of data. Thus we can have different processors doing different things simultaneously and working on independent data. In this class we find, in principle, the most generality. As a specific example of this class we can use the Intel iPSC/860 Hypercube.

4.4 Idea of High performance processing design Technique:

In keeping the view of idea of LAN (local area networks) where multiple workstation machines are working in parallel, we assume a block diagram of multiple massively parallel processors working in parallel as an example of High performance processing.

Let's review a Block Diagram of Multiple Massively processors working on a specific task.

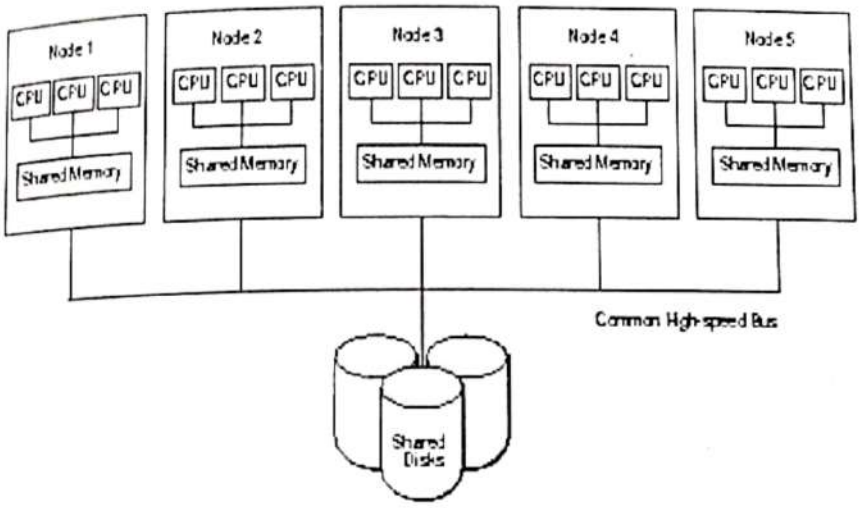


Fig 4.4 (a) : Represents multiple nodes connected in series to work in parallel (Figure from: www.lsbu.ac.uk)

The cluster illustrated in Figure is composed of multiple tightly coupled nodes.

Each node consists of one or more CPUs and associated memory.

Memory is not shared between nodes. Each node has its own recourse memory.

Communication occurs over a common high-speed bus.

4.5 Advantages and Disadvantages of parallel processing in case of MPP processors:

Common Advantages of parallel processing are as follows,

- Shared disk systems permit high availability. All data is accessible even if one node stops processing.
- These systems have the concept of one database, which is an advantage over shared systems.
- Shared disk systems provide for incremental growth for more database in future.

Some disadvantages that are related to shared disk systems are as follows,

- Inter-node synchronization is required. If the workload is not partitioned well, there may be high synchronization overhead.
- There is operating system or memory requirement overhead of running shared disk software.

In contrast to shared disk systems there is another class of shared memory system in which all the processing units have directly accessed to a single shared memory between each of the microprocessors and the feature of shared disk system is also included in it. These systems are used in various applications depending upon the requirement of the various applications.

4.5.1 Shared Memory systems:

Tightly coupled shared memory systems, illustrated in Figure 4.5.1 have the following characteristics:

- Multiple CPUs share memory.
- Each CPU has full access to all shared memory through a common bus.

- Communication between nodes occurs via shared memory.

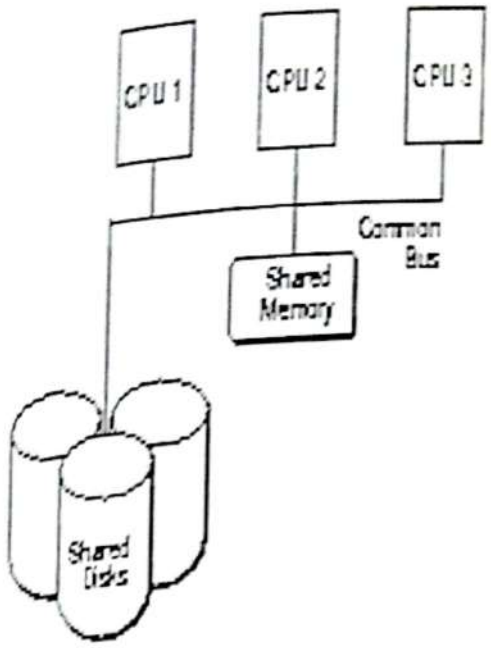


Fig 4.5.1: Shared Memory systems (figure from, www.lsbu.ac.uk).

4.6 The Micro architecture of massively parallel processor: The internal architecture and working of massively parallel processor is described below with the help of figure 4.6

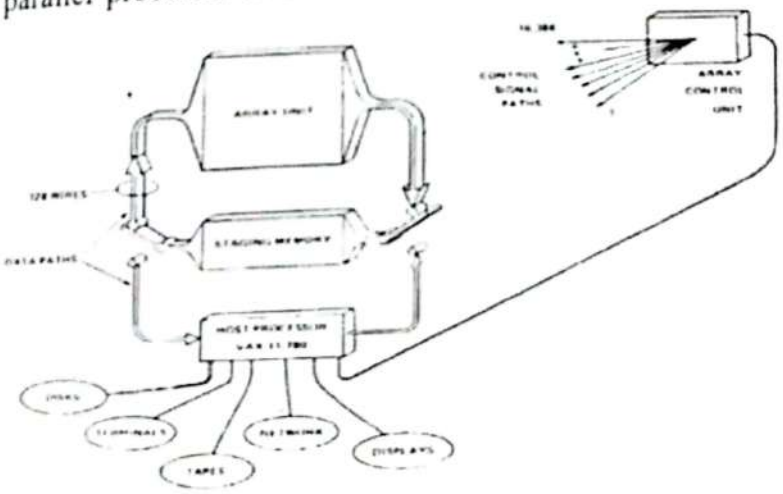


Fig 4.6: Internal Architecture and components of MPP Processor. (figure from www.en.wikipedia.org)

The architecture of Massively Parallel processor consists of following major parts,

1. Array Unit,
2. Array Control Unit
3. Staging Memory.
4. Host Processor.

Array Unit:

The array unit is the heart of Massively Parallel processor. It consists of 128 * 128 arrays of 16,384 processing elements. It means that there are 128 processing elements in rows and 128 processing elements in columns. Each Processing element is implemented on Large Scale Silicon Integrated chip. The PE are bit serial processors for efficiently processing operands of any length. Its basic clock rate or processing speed is 10Mhz.The combination of 16,384 processing elements combine together to produce a very high processing speed. Each processing element has arithmetic and logic units for arithmetic and logical operations. There are 35 shift registers included in each processing element.and 1024 bits of random access memory implemented with off-the-shelf memory chips. The processor elements, each containing approximately 250 gates and 1000 transistors, are contained within a single processor element chip.
The logical address of PE is of 7 bit number. The operating frequency of the array unit is 10 MHz.

Architecture of a single processing Element.

Each processing element in the 128 by 128 square communicates with its neighboring processing elements. As we know that each processing element supports bit serial processing, this means that input stream of bits may vary from 6 to 12 bits in length. After processing the length of result may vary from 6 to 30 bits in length.

Bit serial processing process operands bit by bit and handle these operations with out any wasted hardware.

The internal architecture of one processing element is described below with the help of figure,

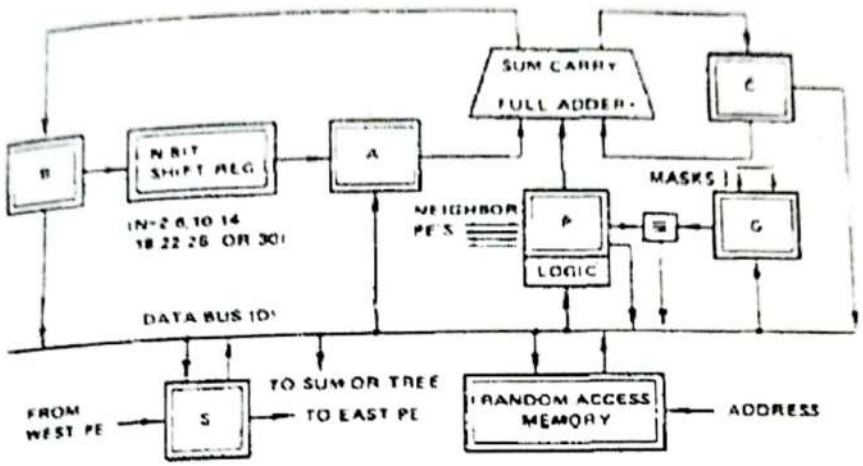


Fig 4.6.1: Architecture of single processing element. (Figure from IEEE Research paper Architecture of a Massively parallel processor by Dr. Kenneth. E. Batcher. Digital Technology Department. USA)

The processing element design consists of full adder, shift register combination which is used for arithmetic operations. Each of the 16,896 processing elements in this architecture consists of six one bit registers.

These six registers are named as register A, B, C, G,P and S. These specific registers in one processing element are used for several purposes. The Data bus is also used for routing the data in each processing element.

The random access memory is also used to store the results in temporarily in each processing element. The full adder combination logic is also introduced to add the no of bits in registers A and P.

Now lets introduce the separate functionality of each register in processing element.

The P –register is used for logical operations. The Boolean functions for two variables including AND, OR, NOT, NAND, NOR, XNOR.....etc are implemented with the help of this register.

The full adder shift register and the registers A, B and C are used for bit serial arithmetic operations including Add,Sub,Mul,Div and so on. Lets take an example ,Suppose we want to add two operands, the bits of one operand is put in register A and second operand bits in register P. The two operands bits are added in sequence by full adder.LSB bit is processed first in case of register A and P. The final result of adding two operands in registers is produced by full adder. The result of sum produced is stored in register B and carry is stored in register C. In the case of Multiplication the series of addition steps where the partial product is recirculated through the shift registers and registers A and B.

Floating point operations is also supported by this processing element.

The G-register is also used as mask bit to control the activity of each processing elements.

The S-register is used to control input and output data of Array Unit.

The random access memory stores 1024 bits per each processing element.

In this particular design of massively parallel processor, the two rows, four columns of processing elements are packed into single VLSI/CMOS silicon manufactured chip.

4.6.1(a) Array Control Unit:

The Array Control Unit broadcasts commands and memory addresses to all the processing elements in array Units.

4.6.1(b) Staging Memory:

The Staging Memory is a 32 megabyte block of memory for buffering Array Unit data. It was useful because the PEs themselves had only a total of 2 megabytes of memory (1024 bits per PE), and because it provided higher communication bit rate than the Host Processor connection (80 megabytes/second versus 5 megabytes/second).
Data was moved between the Staging Memory and the array via 128 parallel lines.

4.6.1(c) Host Processor:

The Host processor is a front processor that loads programs and data into massively parallel processor.

APPLICATIONS OF MPP:

The MPP was initially developed for high-speed analysis of satellite images. In early tests, it was able to extract and saperate different land-use areas on land sat imagery in 18 seconds.

Some examples of applications that were made of the MPP are described as follows,

- Signal processing in the field of Radar systems.
- Solving large systems of linear equations.
- Analysis of Satellite Images by using Image processing software.

5. CONCLUSION:

In the last step I finally conclude that the performance of massively parallel processor is more efficient as compared to super scalar processor design technique because to execute multiple Instructions in parallel in less time frame and there is no problem of data dependencies.

As compared to super scalar processor design technique the architecture of MPP is more complex but instruction-processing model is more reliable and fast as compared to super scalar processing design technique.
MPP is the latest emerging technology and the idea of MPP is practically implemented in new Intel Pentium IV HT and in dual core technology where multiple processors are working simultaneously on the same task.

Increasing multiple processors in a particular machine is directly proportional to the cost and complexity, it means as you increase the multiple hardware in your machine, the cost of the system and complexity of the architecture increases.

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[1] Computer Architecture, "A Quantative Approach" by Patterson Hennessy (Third Edition).1996-2003. (Lecture slides and reference material from Book).

[2] Computer Organization and Design, The Hardware/Software Interface by Patterson Hennessy (Third Edition).

[3] Computer Organization and Architecture By William Stallings (Fifth Edition).

Online Resources:

[1] ftp://ftp.cs.wisc.edu/**sohi**/papers/**1**995/i**eee**-proc.**superscalar**.pdf

[2] http://i**eee**xplore.i**eee**.org/i**el1**/5/**1**0194/00476078.pdf