DEVELOPMENT AND POWER THROUGH INFORMATION ENGINEERING

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A B S T R A C T

The goal of development, the desire to grow and advance, is a goal cherished by all people and nations throughout the world. This paper describes and discusses some concepts and practices as foundations for development, and in an inseparable way, the power derived from development. The word power is used in the sense of a more than the common ability to do something, the ability to control others, or the ability to exercise extraordinary influence on the outcome of certain activities. The paper also highlights some key factors which may hinder development.

In the introduction, the keywords in the title of the paper are explained from a synthetic point of view. In order to give practical meaning to ideas in the paper, a scenario is presented in terms of an encounter between an information entrepreneur and an information marginalizer.

The other sections of the paper cover the topics of information engineering, duality of information, knowledge engineering, information networks, the need for human excellence, and empowerment through information.

Engineering deals with information as a resource and how this resource may be extracted, refined, processed, packaged, and transported for pre-defined or yet to be discovered uses. Information resource may be likened to a natural resource such as water, animals, vegetation, minerals, oil, or gas. However, information resource exists by virtue of human activity related to these natural resources, and information resource is enhanced rather than exhausted through its use. Information resource is closest to the human intellectual resource, and in that sense it is the most potent worldly power for human development. Information engineering, the concept of duality of information, and knowledge engineering are all intimately tied to adding value to raw information.

An information network gives mobility to information, and through this process it opens the possibilities for potent information architectures and designs limited only by human vision, will, commitment, and the desire to excel. Information and the tools for processing information enable the mankind to make the best use of their capacities and thereby enhance their power, in particular, through more natural and greater use of their intellectual capacity.

1.0 INTRODUCTION

The goal of development, the desire to grow and advance, is a goal cherished by all people and nations throughout the world. It is not always easy to understand as to why some have succeeded magnificently, others only moderately, and yet others only marginally. But this understanding is crucial in order to develop and to sustain the process of development. Many regions have gone through stages in their development from being very advanced relative to others to being despairingly backward relative to others. The purpose of this paper is not to investigate and understand the international past conflicts or other man made causes resulting in development or underdevelopment of a region. Our goal is to look at the present and determine a course of action for the future. The past cannot be ignored but its study can be goal driven and focused within the context of developing a better understanding of the present phenomena.

In addition to the word development, the other keywords in the title of the paper are power, information, and engineering. These words and the concepts behind them require clarifications in order to fully appreciate the contents of this paper.

The word power is generally used in the sense of a more than the common ability to do something, the ability to control others, or the ability to exercise extraordinary influence on the outcome of certain activities.

Information is a description of something, in any form or on any medium, which may be meaningful in any current or prospective decision making. The form may be text, drawings, images, still or motion pictures, sound, touch and smell. The medium may be natural such as the human mind, other materials in nature, or some man made artificial material. The common artificial media are print and electronic. In this paper, we are primarily concerned with the electronically stored information because it is in this form that the potential use or abuse of information is being vastly enhanced through computer and communications technologies.

Engineering[1] represents activities of building products and processes for the best possible uses of information and for the benefit of mankind. It may also lead to worst possible uses to mankind's detriment.

Let us take one example in order to tie together the key concepts in this paper. Let there be two persons A and B. Person A is an information entrepreneur. He gathers information and uses it in fanciful ways. To him, information is an inexhaustible commodity. Each time he uses it, it does not diminish its future use, it may in fact enhance its value by showing new possibilities. The more he uses it the richer, in information, he becomes. Person B is an information marginalizer. He does not quite understand the potential of information, and as a consequence of it or otherwise, he does not try to become information entrepreneur, and even worse he does not even comprehend that others with information may exploit him.

Person A collects information on how much wealth person B owns, his likes and dislikes, his education and experiences, his strengths and weaknesses, his tastes and distastes, his preferences and biases, his relationships with others and the style of his dealings, and so on. Often the extent of information gathered, very little or a great deal, depends on the opportunities and challenges in the likely scenarios for its use.

Suppose now that person A learns that person B is looking at the problem of building a house for his family. Person A, with the wealth of information at his disposal and entrepreneurial means of processing this information, can become person B's problems solver with unmatchable appeal. It does not matter whether the solution that person A is presenting to person B is in fact in person B's best interests. This is up to A to decide on his own immediate and strategic considerations. What matters is that, with all that A has, he is able to synthesize an impeccable presentation for B, and in a manner and style matching mental, linguistic and cultural norms of B. He will sound absolutely convincing, almost godsend, to person B. B's prior notions about A's smartness give A an added acceptability. B will willingly buy person A's solution. A would never be questioned even if something goes wrong sometime after the solution has been implemented. One can always blame it on unforeseen factors, or blame oneself for it.

A and B in the above anecdote may not be persons; they may be organized entities such as institutions, businesses, or even countries. Every A will normally seek many possibilities of B for his success and power that comes with such success. Also, the anecdote does not describe an imaginary, totally conjectural scenario. It is real, and it is happening. We all know that knowledge is power, and information once processed and organized is, in fact, knowledge. The use of knowledge as power is not new. However, how powerful and potent this knowledge can become, in electronic form, is not commonly understood.

2.0 INFORMATION ENGINEERING

The real world consists of a wealth of information from the past and from contemporary activities. The information may consist of a set of observations: what we see, take notice, and record. The record may be in the form of descriptive text or any other form mentioned in the introduction. For ease of future references, we often categorize information by objects of interest within certain context, and often in tabular form. Consider the following collection of information related to operations in a computer services company:

TABLE 1: ABC COMPUTER SERVICES OPERATIONS

Person	Service	Education	Hourly Charge	Service Location
Jamal Ahmad	Hardware Repairs	Diploma	50	Company
Jawad Ali	Systems Programming	B.Sc.	70	Both
Ashraf Khan	Operations	B.A.	35	Site
Abdullah Hassan	Applications Programming	B.Sc.	65	Both
Mohammad Latif	System Configuration	M.Sc.	100	Site
Jamal Ahmad	System Configuration	Diploma	100	Site
Jamal Ahmad	Operations	Diploma	35	Site
Jawad Ali	System Diagnostics	B.Sc.	80	Company
Anwar Mir	Applications Programming	M.Sc.	65	Both

In this table, information has been recorded about both the ABC Staff and the services provided by ABC. We will discuss later whether this is a good way of organizing information on ABC operations. The important point right now is that, in ABC's perspective, this kind of information is essential in order to support its operations. When a client calls and asks for service in applications programming, ABC can access the data to check that this service is provided by it, the rates which are chargeable for this service, and the persons qualified to deliver this service. The value of the information is obvious to ABC. In order for ABC to serve a large number of clients effectively and efficiently, with a variety of services and many possible persons who may be assigned to a service, this kind of information has to be maintained and accessed electronically.

In response to a client's call, ABC can quickly determine serviceability of the client's request, and more importantly, generate an assignment by simply copying the relevant information from the table. This ensures consistency of information as it moves from transaction to transaction. Information consistency is essential to an organizations's integrity.

How do concepts and practices of information engineering[2-6] guide creation and maintenance of information? We will first discuss this question from a practical point of view by referring to information in Table 1. Generally, information engineering plays its role from the very start, before recording any information which may be of interest to an enterprise. It looks at the objects which are relevant to an enterprise operations, the information that the enterprise requires on these objects, and the overall organization in order to ensure effective access to information and its integrity. Given a situation such as the one shown in Table 1, we can perform reverse engineering [7] in order to arrive at the same solution.

Table 1 has information about the services that ABC provides as well as the persons employed by ABC to perform these services. While it is handy to have all the information in one table, there are obvious problems in terms of information integrity. Consider the following simple examples:

1. Jamal Ahmad may leave ABC. We may delete his record. However, if a client calls after this record is deleted, it will fail to show that Hardware Repairs is one of the services provided by ABC. This would generally not be true. Presumably, ABC remains committed to providing Hardware Repairs although there may be times that they do not have a person assigned to this service.

2. Suppose that Jawad Ali has upgraded his qualifications to M.Sc. In order to update Table 1 accordingly, we would have to go through all the records and repeatedly modify Jawad's qualifications. This type of recording something in several places is known as unnecessary redundancy. It is harmful to system integrity. When the same information is scattered in several places, it may not only take us time to update in all places but it also leaves the possibility open that it will be inconsistent because it did not get updated in one or more places.

In order to solve the kinds of problems described above, the approach taken is to record information only on a single object type in any table while ensuring that relatedness is kept intact[8-9].

In Table 1, there are two objects of interest to ABC. They are person and service. Furthermore, it is also important to maintain relational information i.e. all the services a person performs and all the persons who perform a service.

The resulting three tables are shown on the following pages.

TABLE 2: ABC PERSON

Name	Education
Jamal Ahmad	Diploma
Jawad Ali	B.Sc.
Ashraf Khan	B.A.
Abdullah Hassan	B.Sc.
Mohammad Latif	M.Sc.
Anwar Mir	M.Sc.

TABLE 3: ABC SERVICE

Service	Hourly Charge	Location
Hardware Repairs	50	Company
Systems Programming	70	Both
Operations	35	Site
Applications Programming	65	Both
System Configuration	100	Site
System Diagnostics	80	Company

TABLE 4: ABC SERVICE-PERSON

Service	Person Name
Hardware Repairs	Jamal Ahmad
Systems Programming	Jawad Ali
Operations	Jamal Ahmad
Operations	Ashraf Khan
Applications Programming	Abdullah Hassan
Applications Programming	Anwar Mir
System Configuration	Mohammad Latif
System Configuration	Jamal Ahmad
System Diagnostic	Jawad Ali

The above tables represent the basic objects Person and Service, and a relational object Service-Person. If information engineering had preceded the recording of information in Table 1, we would have derived the objects Person, Service, and Service-Person automatically before collecting data for them as shown in tables 2, 3 and 4. This is called forward engineering. Whether we do forward engineering or reverse engineering, we would discover an underlying structure of the enterprise objects and relationships for a given context of the enterprise goals.

In Table 2, we describe the object Person in terms of its two attributes name and education. This model of Person may be represented as follows:

Person:<name, education> (1)

Representation (1) says ABC describes a person in terms of its attributes name and education, and that each given value of name uniquely identifies a person in ABC. Generally, using someone's name as a unique identifier can be troublesome. Names of persons are decided by people outside ABC domain of influence, and in hiring them, ABC may hire several persons who have the same name. In order to resolve this problem, ABC will create a unique identifier for each person it hires. This practice is common in every enterprise. Accordingly, Representation (1) changes to:

Person: <person-id, name, education> (2)

With this change, Table 2 and 4 would be modified

TABLE 5: ABC PERSON (MODIFIED)

Person-id	Name	Education
p1	Jamal Ahmad	Diploma
p2	Jawad Ali	B.Sc.
p3	Ashraf Khan	B.A.
p4	Abdullah Hassan	B.Sc.
p5	Mohammad Latif	M.Sc.
p6	Anwar Mir	M.Sc.

TABLE 6: ABC SERVICE-PERSON (MODIFIED)

Service	Person-id
Hardware Repairs	p1
Systems Programming	p2
Operations	p1
Operations	p3
Applications Programming	p4
Applications Programming	p6
System Configuration	p5
System Configuration	p1
System Diagnostic	p2

How many attributes should an enterprise use to represent an object? It all depends on the scope of its operations. The greater is the number of modeled attributes, the greater power it gives the enterprise in handling its operations. Consider that ABC on the advice of someone, an insider information on its competitor, or on its own decides to add two new attributes experience and 2nd_language to its representation of Person as follows:

Person: <person-id, name, education, experience, 2ndlanguage> (3)

What are its implications? Presumably, the (years of) experience is indicative of maturity. This person may be assigned to more demanding jobs. The 2nd-language information may be matched to client work environment in order to facilitate communication. Normally, we will not add attributes and then think of all possible implications. We would first examine, the nature and scope of enterprise operations, review its information processing needs, and consequently decide on the most appropriate attributes for each object. Finding later that we have missed out on some attributes is not catastrophic. With proper information engineering tools, they can be easily added. However, the impact of this change must be carefully weighed from the object to which a change is made to the rest of the system that this object may have connections.

Sometime, the representation of an object may require a large number of attributes. Consider the following abstraction of the attributes for the object called employee in some enterprise:

employee:< id, fname, mi, lname, age, birthdate, birth-city, birth-state, birth-country, first-language, other-language, bachelor-degree-date, master-degree-date, doctoral-degree-date, first-job, last-job, home-street, home-city, home-postal-code, home-country, home-phone, home-fax, office-street, office-city, office-postal-code, office-phone, office-fax, email,base-salary, allowance, annual-increment>

(4)

There are some thirty one attributes. We assume that they are all necessary for the employee enterprise. However, the collection of attributes is too diffused. It lacks granularity. The entire collection should be grouped into meaningful chunks in order to present a clearer pic-

ture. Consider the following:

employee:< id, name, age, birth-date, birth-place, language, education, job, home, office, email, salary>

(5)

where

name:	<fname, mi, lname>
birth-place:	<birth-city, birth-state, birth country>
language:	<first-language, other-language>
education:	<bachelor-degree-date, master-degree-date, doctoral-degree-date>
job:	<first job, last job>
home:	<home-street, home-city, home-postal-code, home-country, home-phone, home-fax>
office:	<office-street, office-postal-code, office-phone, office-fax>
salary:	<base-salary, allowance, annual-increment>

We have grouped the thirty one attributes into twelve granules. Consideration of a smaller number of items at a time enhances the potential for discernment and tractability. Granularity is based on natural and access affinity. For example, when asking for employee name, the first name, middle initial, and last name often go together. The groupings are based on logical considerations. Physically they may be stored in the same file, or some of them in separate files, along with appropriate relational (connection) information.

The purpose of the discussion in the preceding paragraphs is not to give a tutorial on information engineering but to highlight the need for information engineering. Collecting information purposelessly is not going to lead to very meaningful results. Discovering the objects, attributes, and relationships is of strategic interest to any enterprise. This is what enables the enterprise to fulfil its mission and to do it effectively and with integrity. This is what gives an enterprise the power to compete and excel. Information engineering is not simply modelling the given information. It is first and foremost the task of discovering the requirements for information in order to fulfil some desired goals[2, 10-12].

3.0 INFORMATION DUALITY

Observations on objects of interest or business practices may often be recorded as assertions or data values. Consider, for example, Table 3 on ABC Service. We may induce ABC rules of business from its assertions about Service. A direct set of rules may be induced by simply looking at one record of observations (assertions) at a time. Therefore, we may write the following rules for determining service location corresponding to columns 1 and 3 in Table 3:

r1: if the service is Hardware Repairs then the location is Company.

r2: if service is Systems Programming then location is Both.

r3: if the service is Operations then the location is Site.

r4: if the service is Applications Programming then the location is Both.

r5: if the service is System Configuration then the location is Site.

r6: if the service is Systems Diagnostic. then the location is Company.

Usually, a large number of induced rules can be reduced to a small number of working rules through a process of deduction. We may look at two rules which result in the same conclusion or action, and combine them into a single rule through disjunction or conjunction on their premises. The preceding six rules may, therefore, be reduced to the following:

R1: if the service is Hardware Repairs or System Diagnostics then the location is Company.

R2: if the service is systems programming or Applications Programming then the location is both.

R3: if the service is Operations or System Configuration then the location is Site.

Whether some information should be represented as assertions or rules is determined largely by the nature of information and its intended use. As a simple example, we may calculate taxable income and then simply refer to a table provided by the taxation department in order to determine payable taxes, or use the rules for determining the payable tax. In reality, assertions for certain aspects and rules for others, each suited to the needs of information representation and processing, are both used.

4.0 KNOWLEDGE ENGINEERING

In a very general and non-technical sense, we may use the words knowledge and information interchangeably. However, in a more precise and technical sense these two words have different connotations[13-15]. We have already defined information in sections 1 and 2. How is knowledge different from it? We may define knowledge in terms of the following components:

Facts expressing valid propositions,

Beliefs expressing plausible propositions, and

Heuristics expressing methods of applying judgements for which valid algorithms generally do not exist.

Another, possibly more important distinction comes from the way these components are organized and processed in a knowledge-based system. In an information system, the statements for operations that process data are placed in a pre-determined sequence. The order of these statements is also indicative of the processing behaviour. In a knowledge- based system, the order of statements does not control the system behaviour quite the same way.

A program in an information system is executed by an interpreter or a monitor. We may call it an executive. The processing control that this executive exercises is quite limited. It begins execution of the program (a collection of statements) at a pre-specified location, and simply allows the remaining statements to be executed in the order specified by the program logic. The executive in a knowledge-based system, called an inference engine, plays a more active role, much like a real world executive, looking at relevant knowledge in a given situation and participating more actively in how this knowledge is processed. The inference engine specifies the logical process by which new facts and beliefs are derived from known facts and beliefs. It also contains the control strategy that orders the search for an inferential solution.

Adding new information in a program, called program modification is usually location specific. Adding new knowledge, called knowledge acquisition, has more freedom.

The above distinctions are not as sharp when we take the case of a program written in a non-procedural language.

There are some other notable goals generally supported by systems based on knowledge. These include the following:

1. Provide a rich set of techniques for supporting realistically complex evaluation tasks.
2. Allow flexibility, arbitrary order of decisions, and partial solutions.
3. Deal with errorful, incomplete, and uncertain data.
4. Give explanations and justifications.
5. Implement an interface with naturalistic input and output.
6. Interpret and make plausible inferences based on user intent i.e. do what I mean.

Knowledge engineering deals with defining and constructing systems based on intelligent human behaviour. Some characteristics of this knowledge are: marshalling of relevant facts, avoiding of common errors, Making critical distinctions between problem types, pruning useless paths of investigation, ordering search, eliminating redundancy, reducing ambiguities, eliminating noise in data, exploiting knowledge from complementary disciplines, and analyzing problems from different perspectives, or levels of abstraction.

A knowledge-based system may be engineered to perform a variety of tasks, such as the following:

1. Find the value of some expression. Ex: Should I take my car for service?
2. Derive a value from other values. Ex: Given that the car acceleration is errat ic, should the trans mission be replaced?
3. Validate the truth of some assertion. Ex:Car brakes are damaged.
4. Generate candidate solutions,
5. Synthesize components into an overall solution,
6. Analyze and divide an object into meaningful components, and construct a description of a

   part,

   system, or a

   plan.

There are now numerous examples of successful systems in business and industry based on knowledge engineering. Some of the obvious benefits of these systems may be listed as follows:

Order-of-magnitude increases in speed of complex-task accomplishment.

Increased quality.

Reduced errors.
Reduced cost.

Decreased personnel required.

Reduced training time.

Improved decisions.

Retention of volatile or portable knowledge.

Portability of knowledge

Improved customer service.

Knowledge engineering represents a new paradigm for information engineering. It has added new dimensions to expropriation of power through information.

5.0 INFORMATION NETWORK

An information network provides electronic pathways for moving information. It is a means of communicating information or knowledge about people, places, and organizations. It brings people face to face instantaneously without requiring the people to move physically. It enables people to collaborate as if sitting next to each other while in reality they may be half the world apart from each other. An information network connects people within an enterprise, and a network of networks (internet) connects them globally.

A telephone encounter allows people to hear each other. The exchange of information is what can be coded in voice, and subject to the usual volatility of this information. Physical meetings allow maximal communication. However, they dislocate people. Some of them are forced out of their natural surroundings, along with the discontinuities in thoughts and actions. There is a limitation on what these people can bring with them. An information network allows the people to remain in their natural surroundings, communicate and collaborate, physically see each other, talk to each other, work together on a common piece, move any object that exists as information to each other. There are no borders, no check points, no customs and no immigration considerations. The information that exists in millions of places throughout the world can be assembled and processed to monumental advantage.

As in the real world of people, connections are essential in making a headway, and the right kind of connections open the doors to real power.

From their start in the late seventies as local area networks (LANs) on the campus of universities, they have evolved to wide area networks (WANs), metropolitan area networks (MANs), and world wide network of networks (internet). Early versions of networks were of limited speed, generally allowing communication of textual information over voice-grade telephone lines. The speed of communication has seen almost a thousand fold increase in the last two decades. There are now nationwide and worldwide information infrastructures, also called information superhighways, accessible to all information entrepreneurs in order to achieve new heights in power of information.

6.0 THE NEED FOR HUMAN EXCELLENCE

What is human excellence? How to achieve excellence? How to remove hurdles in achieving excellence? Here, we will not discuss the philosophy of excellence. We will focus on the practices leading to excellence[16]. Without due attention to excellence, the goals of development remain elusive.

What is human excellence? It is the ability to discover one's capacities and to apply them in ways that gives others a lead to do the same, for individual and collective benefit. The most distinct capacity given to mankind is the development of mind, the ability to think and act accordingly. Most other human capacities take a cue from the mind. Actions that reflect the best that a human being can deliver constitute excellence. Excellence is not to do better than someone else or better than everyone else. It is not a race, and certainly not a blind (mindless) race to reach some goals. It is to reach where no one has reached before for one's own good and the good of the humanity. Excellence is to do the best given one's capacities. It is a deliberate, personally thought out, best possible course of action, given the human capacities and other available resources.

How to achieve excellence? The creation of mankind as described in Islam provides some of the clearest answers. The mankind was created with a free will, the ability to make choices using facts and reasoning. We have the freedom to think and the freedom to act. Even the best thought out actions may not be always right, but that is the right given to mankind. Going wrong unknowingly and not deliberately is a perfectly acceptable course of action in Islam. This is an essential characteristic of growing up, and achieving maturity in our thoughts and actions. This freedom is also the essential foundation in developing excellence.

How do we exercise this freedom in practical situations? In particular, consider the challenge of manpower education and training in order to fulfil the goals of development. The inherent capacities of the people in any country are the same whether in the developed or developing part of the world. Those who say otherwise, let them prove it with reason, and without enslavement to past practices. The past is not about inherent capacities but how we chose to develop those capacities.

What do we do with the available human capacity and other material resources to develop a world-class education and training system satisfying the emerging needs of a country or region? First, we must free ourselves from the willing slavery to past practices, and other numerous 'gods'. Let us freely consider what our goals should be and how to achieve these goals. Let us convince ourselves that this is what we want and that is how we want to do it. We may define choices for the goals and choices for how to achieve these goals. Some of our past practices or existing control mechanisms may stand in our way. We prepare ourselves to deal with them. It may be difficult and it may take time. But then achievement of excellence is neither fast nor easy. We may frequently use references to past practices and existing control mechanisms in order to limit our freedom of thought. It is an easy escape, we accept it as unavoidable form of slavery. The reality is often different, a real quest for freedom of actions, based on reason and conviction, opens the doors that we often think impossible to open. The ability to make the doors of possibilities wide open is the real manifestation of our freedom of thought.

The challenge of manpower education and training is a situation of common interest to everyone. Education is also the foundation for progress and prosperity. This is even more true today with the information revolution all around us. However, the preceding discussion applies to the achievement of excellence in general and not simply achieving excellence in education. All of us face numerous challenges in our personal and work environments. The discussion here is fully applicable to all these situations.

Achieving excellence is rarely a solo effort. It depends on beneficial interactions with others. Again, Islam takes a clear stand on recognizing the diversity among individuals, the need for nurturing this diversity, and then bringing these diverse capabilities together for individual and collective excellence. Islam's stand dignifies the individual regardless of his/her status in society, and emphasises that each individual has a contribution to make. Let each one be given some responsibility and let each one be held accountable for actions emanating from this responsibility. No one should be denied from responsibility and the freedom of action that goes with the responsibility. Some will make mistakes. But the overall result would be far more productive than not giving responsibilities to people at all or giving them vacuous responsibilities where there is neither freedom of thought nor freedom of action.

Individual and collective excellence is achieved through delegation of responsibility with a clear understanding of human interactions and interdependence, as well as giving freedom of thought and the corresponding freedom of action.

Are there short cuts to human excellence? The answer is yes if by short cuts we mean avoiding pathways that others have traversed and retracted. We should learn from the mistakes of others and avoid making the same mistakes. We can also benefit from the pathways that others have traversed and succeeded. There is no need to re-invent the wheel. We can benefit from solutions which already exist, and adopt them to our own specific needs. This is common sense. However, taking a short cut may not be the same thing as leap frogging. The term leap frogging is often used mistakenly to convey the notion that we can reach frontiers of knowledge and innovation without paying attention to the foundations of these frontiers. Such mistaken notions may lead to grand illusions or precipitous falls.

Can foundations be built in a time span much shorter than what others have achieved? The simple answer is yes. However, if it takes smart people with good resources to build some foundation, it will take highly intense efforts of extra smart people with super resources to get an equally strong foundation in a significantly less time. The foundation has to be there in order to stand firmly at the frontiers and move smoothly with shifting frontiers.

Perceptions and reality may be poles apart. Just because a perception seems so convincing one cannot simply assume that it is the same as reality. (We may convinced but we may have nothing to give us a hold.)

How to remove hurdles in achieving excellence? The biggest hurdle in achieving excellence is to accept all forms of invisible slavery. "Don't even think about it, so and so won't let you do it." "The system won't allow it." "But this is how we do things here." We may make excuses or we may have vested interests. Nonetheless, we are engaged in the worst form of slavery when we do not, or we do not let others, engage in free thinking. A concern for the individual and collective excellence vanishes. The desire to continue past practices becomes paramount.

Reactive mode of actions is another big hurdle in achieving excellence. Rather than working on things that lead to events in the future in line with our own thoughtful vision, we simply keep on reacting to the current events in our midst. To be an event maker takes self propelling hard work. To react is simply a piece of cake. To be masters of events in our world, or even react effectively to events adversarial to our interests, we require a personal plan, and we have to engage in observing the under currents building up to future events. Pre-occupation with the present, and constant belittling of our ability to control the events in future, denies achievement of excellence.

The feeling that certain things may take a long time, and may never materialize should not detract us from what we truly want to achieve. Persistence and perseverance bear fruits, often a lot sooner, than our mind may allow us to envision.

7.0 EMPOWERMENT THROUGH INF ORMATION

The practices of empowerment through information have been known to mankind from the very beginning. In the light of recorded history, we find that the natural or inherent capacities of mankind, in terms of intellect, vision, hearing, touch, smell and other physical aspects, have remained the same. What has been changing is the ability to augment and enhance these natural capacities through artificial means. This is empowerment. The industrial revolution opened the potential for physical empowerment. We can fly instead of walking, we can use our hands to move a shipload instead of a box, and we can rearrange our surroundings in no time. Through this empowerment, it is possible to increase physical abilities a thousand fold, almost limitlessly. However, physical empowerment is inadequate without intellectual empowerment. Intellectual empowerment is the real key to human development, and it comes through enhancement of capacities for abstractions from observations, storing abstracted information in easily recallable form, and processing this information rapidly and effectively in producing solutions.

The use of information for intellectual empowerment is not a new phenomenon. Mankind has done it all along. People excelled or debased themselves through use or abuse of information available to them. However, the means available for intellectual empowerment have changed dramatically over the last few decades. If a person can now carry information equivalent to a hundred books in a pocket, browse through an entire book and find needed information in a matter of seconds, work with another person thousands of miles away while feeling as if the two were sitting next to each other, search through libraries of the world without moving an inch, then there should be no doubt about the potential for intellectual empowerment. It is happening today.

There are some pre-requisites for getting empowered through information. Some of these concern human and organizational matters and others pertain to information technology. Technology gives us the ability for storing vast amounts of information, and instantaneous recall and processing operations. It can help us conceptualize and visualize objects a thousand different ways and it gives us the means to engage in frontiers of creativity. However, technology in itself does not create things. It only empowers us towards creativity. There must be a desire to create, a goal to reach, and the will to learn and persevere with knowledge. This is up to us. This is where the human and organizational elements are crucial.

Formal education and a commitment to lifelong learning are basic elements in human development. The educational system must continuously evolve in order to meet the new challenges in the society and the world at large. Good quality education has to be easily accessible to the masses. This is the best investment that any country can make in its people. Educational institutions are the laboratories for human development. It is here that the human minds are shaped, energies are channelled into fruitful courses of action, and a vision for human development is formed. It is here that the ideas for lifelong learning are instilled.

In order to develop and maintain a good educational system, we require visionary leadership and commitment of financial resources. Returns from the educational system are not instantaneous. They take time and the results are not always easily measurable. This often works against political expediency and the educational system ends up getting a low priority in the scheme of things. However, there can be no doubt that the human progress brought through industrial revolution resulted primarily

through products of education. The instruments of industrial development gave us unlimited physical power. The instruments of current information revolution are opening the doors to unlimited intellectual power. Education of the people is more crucial now than ever before. Investments in it will produce far greater returns.

In addition to human development through education and lifelong learning, there is a need to create platforms for creativity and empowerment. While individual and undirected creativity is important, there is an equally important need to provide organizational structures for mobilizing creativity towards common collective goals.

Collection and dissemination of information, and developing powerful indigenous capabilities for processing of available information are fundamental to all elements of progress. Information may exist at many different sources. However, the sources have to be linked and enabled for global accessibility. This requires organizational initiatives in the form of national information infrastructures - also called information superhighways, reminding us of the vehicular highways of the past decades.

Today, we can have access to a wealth of electronic information worldwide by connecting to internet. Good connectivity to this network is important. However, we cannot be simply consumers of information. This is, at the very least, questionable empowerment. It is easy because the goods are readily available. To be truly empowered with information, we have to become producers of information. We have to create new information which no one else has created, we have to shape available information like no one else has shaped, we have to make it available in a form which surpasses in appeal and utility to what anyone else has done before. These are the means for empowerment.

One may advance the argument that all these initiatives in information technology are really not necessary, and that some of them may be unnecessarily wasteful in human and financial resources. This would be true if we could freeze all activities being taken by others. But that is not possible, and because of that we are subject to encroachment. We should not perch ourselves on a false high ground. Rationales for inaction are futile. If we do not take the initiative to develop ourselves and advance, we will lose control over our destiny.

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