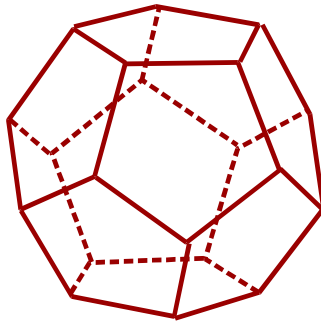# UNDERSTANDING THE FUNCTIONS

OF

INFORMATION AND COMMUNICATION

TECHONOLGY (ICT)

AS THE BASIC FOR SELF LEARNING AND CIVIL SOCIETY

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Introduction

This concised discussion aims to gain a better understanding about the potentialities and benefits of Information and Communication Technologies

Communications has social, economic and cultural implications

(ICT) or telematiques to their users, who are individuals, communities and government, and public as well as private organizations. It is understood that communications have social, economic and cultural implications, because they are the purposes or aims why people communicates.

During the last few decades, progress in ICTs have been fenomenal, specifically along with digital technologies[1], enabling it to transfer a bulk of information over long distances, by various means, - that is by voice/sounds, alphanumerics, images, data or their combinations,- reaching all places in the world, and all are accomplished instantly. This enormous capacity of bridging time and space represents an essential support to all men's activities, for learn and work and play.

We used to say that development are found along roads, but now development are pertinently found along electronic super highways, not only sporadic along transportation routes, but within the whole ICT service areas. Penetration of ICT facilities is now made an indication of the development of communities and nations

It used to be said that development are found along (transportation) roads, but now shifted to within ICT service areas.

concerned. ICTs are said to be the "engine" of development, the engine of growth, and their services to be educating and civilizing. Development is a psychological striving by everyone, every community and all nations. In Historical Majapahit (800 AD), the concept of community was "tata, tentrem, karta, raharja", meaning disciplined, peacefull, affluence or prosperity and happiness. This concept is nowadays translated to a "civil society", which is based on knowledge and (social, cultural, ethical and moral) values.

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[1] In fact, the first digital system invented was the (latin) alphabeth. Combinations of characters into words representing meanings, combination of words into sentences provides sense, and combination of sentences represent concepts. The number of elements totalled 46 (characters 26, figures 10, and marks 10). F.B. Morse in 1838 invented the Morse Alphabeth, consisting of only two elements: dots and dashes. Combination of dots and dashes may replace the alphabeth. The computer technologies refined the elements into "mark" and "space" (even no signal is an element), which in the computer world is identified as 0 and 1 (zeros and ones), which can also represent information.

In Indonesia, article 3 of Law no. 36 of 1999 on telecommunications stated that:

"Telecommunications serve to support the national unity, equitable affluence and wellfare, and to support economic activities and public services, as well as international relations"

Interconnectedness among all is the critical means to develop natural and human resources to their full potentialities, for a better future. The vision for telematics in Indonesia with the fertile land and abundant resources and a huge number of population is namely

Information and communications are to establish interconnectedness among individuals and communities nationwide, with international access, enabling their activities forning part and synergitycally integrated into the overall national develpopment.

Information and communications educate men, enhances men,s knowledge and capabilities, enhances consciousness and widening the horizon. But ICT is also a means for social contacts, establishing social cohesian, developing cooperaton in all efforts, assuming social, cultural ethical and moral values.

Universal access to information and communications bridges the social, economic and cultural gap among the communities within and among nations, toward the establishment of a civil society which is based on knowledge and values, heading to the information era and promising a better lifelyhood for all.

Jakarta, Desember 9, 2003

Information and communications.

Referring to the term adopted within MASTEL circles (Masyarakat Telematika Indonesia or Indonesian Infocom Society), *telematika* (telematiques) bears the meaning of the convergence of information and telecommunication technologies, including radio and television broadcasting[2]. The international term is information and communication, often abbrieviated to *infocom* when it refers to services or applications, or *Information and Communication Technologies*, when referring to the technical meaning often written as ICT for short.

> Definition of information and communications

A more elaborated account on the meaning of the term can be explained through the definition of telecommunications, which is: long distance communication through electromagnetic media[3]. Telecoomunications facilities were "traditionally" known as the telephone, facsimile (fax) and telegraphy, but including radio and television broadcasts. All above services or applications are now added by new ones, like data communications (among computers), the Internet, SMS (Short Messaging Servise), Automatic Teller Machine (ATM), various games and many others. Not everybody understands that ATM is data communication, applying remote (electronic) control, that is to verify bank accounts and ultimately to "authorise" the machine to pay upon request of the account holder[4].

> Telecommunications are long distance communications through electromagnetic media

Besides services to the general public there are many other "specialized" services rendered by agencies, such as the aviation, shipping, marine, astronomy, space research, meteorology, government departments and agencies, to corporate networks. There are also restricted networks such as those operated by government agencies, police departments, and military uses. A few years ago we know of a "Citizen Band Radio" (CB) licensed to individuals.

> Specialized services and specialzed networks are rendered by government and public agencies.

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[2] Within the ITU, radio and television broadcast is also subjected to regulation besides telecommunicastions.
[3] Long distance communications not using electromagnetic media, such as postal services, semaphore, are not telecommunications.
[4] Electronic simulation produces traning applications and games, such as how to fy an aeroplane, and games, which by activating the handles, it produces sounds and images for example for boat or road races (without any risk of accidents).

The digital technology has given birth of many other new services, including the employment of possible combinations of voice, sound, image, data and control signals, including automatic meter reading (ARM).

A power company could install such ARM devices annex to the more than 30 million KWH meters throughout Indonesia, issues bills automatically by the central office and and managing the supply of power to the public. Remote control technologies are now also developed toward fleet and asset management for both air, surface and marine fleet, incorporating Global Positioning

> **ARM, positining and timing, and sensors, besides messaging are elements for fleet and business management.**

Service – GPS or GLONASS (positioning and timing), enabling the management to know the positions of every element of their fleet, be it ships, containers, trucks and other vehicles, while also capable of messaging. Nowadays, satellite navigation "in dashboard" devices for navigation by taxis are avalailable in the market. Other uses are for instance the operation of dams, and even a car's health measured by sensors, while the data cab be transmitted locally or long distance.

ICTs use the speed and reach of electromagnetik energy propagation, enabling a bulk of information to be transferred to all places in the world – even to outer space – and all acomplished instantly[5]. This enormous capability of bridging time and space allows one to be at any place instantly (through voice and/or picture and/or alphanimerics or data), without the

> **ICT bridges time and space, allowing instant communications with worldwide coverage.**

need for travelling; one can organize meetings without meeting (face to face), one can create a "virtual (or dustributed) togetherness" among people at different places (all over the world) but with intensive communication. One can also isolate himself (herself) – in his or her working place without being isolated to the world. One can keep his or her communications while mobile.

Technology owners are at present developing the third generation ICTs, - 3G for short – with new capabilities, that is broadband, worldwide coverage and mobile. Future services will

> **3G technologies promises to provide broadband, wordwide coverage services while mobile**

include access to various hosts of e-gov, e-learning, e-health, e-navigation for vehicles, and many more, including access to our computer (in the office and at home) from anywhere.

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[5] The propagation (transmission) speed is (almost) 300 000 km per second, reaching all distances instatly, allowing direct dialogs or direct interactive communication.

The process of information transfer over long distances instantly, can be explained in a simplistic model as follows. Information carriers such as voice, alphanumerics, images and data, are superposed onto the electromagnetic energy so that the latter carries the information signal parameters. This process is called modulation[6]. Electromagnetic energy propagates through metalic cables, optical ficers and radio (including satellite systems) or sequentially through interconnections of such available media, with the speed of lights (almost 300 000 km per second).

> **The process of converting information signals to electronic signals is called modulation and demodulation**

At their destinations, the electromagnetic energy containing the information are "detected" and converted to the original signals, with minimum distortion by respective receivers. This process is called demodulation[7].

By these processes – modulation and demodulation – information signals can be duplicated or reproduced at distant places instantly, thus information can be transferred at other places. By telephony our voices are not sent away to destinations, but "reproduced" at (a) distant place(s), and so it is with fax, our document is "read" by the machine to make a "photocopy" at the other end. In this sense we can say that the transmitter is controlling the respective receiver(s) to reproduce the information signals.

> **ICT proses is modulation and demodulation, with the results that information signals are reproduced at distant places, instantly**

The convergence of technologies gives rise to the convergence in the ICT signals and services through digitization, convergence of equipment in the form of one and the same equipment will serve a number of services, convergence of networks because the digital signals can go throudh all network elements, and convergence of regulation.

> **The convergence in technologies gives rise in the convergence of**
> - **Signals (digitized)**
> - **Equipments**
> - **networks**
> - **regulation**

Take an example of the convergence of services offered by cell phones that can store phone numbers, providing SMS services, besides the conventional basic telephony as well as some other applications such as simple games.

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[6] Modulation techniques in the digital era is very complex, it could be layered, and utlizing many methods

The near future planned services are including broadband services, enabling the caller to see the picture of the conversation partner by means of the installed camera, to do bank transfers, access the Internet, access their PC from anywhere, including while mobile and playing simple games with distant partners. GPS (Global Positioning System) equipment can also be integrated terminal equiopment to have (vehicle) navigation services, including its geographical location of their where abouts as well as the direction and speed of their movement.

Elektromagnetic energy (waves) propagate through metalic cabels (ground, overhead and submarine cabels), optical fiber and through space (radiowawes) including satellite systems, or consequencially through available above elements. Infrastruture network has covered all places worlwide, ICT siggnals have worldwide coverage accordingly.

> **Electromagnetic energy propagates through metalic media, or optical fiber or through space (radio), including satellite systems**

Communication can take place in three forms, namely "one way", that is from transmitter to receiver only, or "simplex", meaning alternating one way at a time (employing a single unidirectional channel), or "both way" (duplex), enabling direct dialogues due to the instant transmission of signals. Another way of transmission of signals can be through a "store and forward" mode, that is the message is stored and transmitted at appropriate time due to avialability of channel or other facilities. Signals can also be organized to reach a single

> **Mode of communication:**
> - **One way**
> - **Simplex**
> - **Two-way, duplex**
> - **Store and forward,**
> - **One to one**
> - **One to many**

destination (one to one), or to many destinations at any time (broadcast). The third generation of ICT development is aiming at : boradband, worldwide coverage even while mobile. This may be still a luxury to Indonesia because penetration of the basic telephones is still very low. (3.5% fixed telepnones, 4% cell phones).

Technological progress has given rise to the introduction of "new services), following the market demand, but at the same time there are services becoming outdated such as radio paging due to the availability of SMS or cell phones. In future traffic is anticipated that "data traffic" will be outpacing telephony, which will diminish to a smaal portion of information traffic. Internet e-mail has now already taken the capacity of megabits of traffic.

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[7] A pair of modulation and emodulation device is called "modem" for short. In the digital technology, such

Summary:

- ICTs or telematiques is long distance communictions means using electromagnetic media.

- Its capacity is to transfer a bulk of information, instantly and with worldwide coverage, employing various methods, e.g. by voice, alphanumerics, images, data and their combinations. ICT signals a can be utilized as remote control signals.

- The convergence of IT and Telecommunications technologies leads also to the convergence in the networks, equipment and their regulation to provide ICT services

- ICT infrastruktur consists of metallic cables, optical fiber (cables) and radio systems, including satellite systems.

- Digital technologies allow development and provision of various services, including voice, alphanumerics, images, data, and remote control. GPS (Global Positioning System – USA, GLONASS (Russia) and Galileo (under development) provides positioning and timing services.

- Besides ICT services developed for payed use by the public there are specialized services rendered by certain agencies or groups of susers.

- There are a number of communication modes, including one-way, simplex, duplex or trwo-way, while transmission of signals can be in a direct or real time mode or store and forward mode.

- Technological progress now is developing what is called the Third Generation infocom, 3 G for short, capable of broadband transmission, wordwide coverage, even while mobile. Numerous new applications are being developed.

- The enormous capacity of ICTs in bridging time and space represent an essential support to all men's activities, for learn, work and play.

- To communicate has purposes, either for themselves, for others or for all, it is therefore that communications have social, economy and cultural implications.

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processes are referred to coding and decoding, hence codec for short.

Readers notes:

2.   The functions of ICTs.

ICTs are communications tool, a means for long distant transferring information, one to one, or one to many destinations. But communicaions have their purposes, either for themselves, for others or for all. Communications is then also a tool for social contacts and community life.

> **Communications have their purposes, and representing a toll for social contacts and community life**

The first function of ICTs in transfering information made men gather more knowledge, and enhacement of their knowledge people are also developing their working skills, reasoning power as well as their consciousness or awareness. Self consciousness is the critical elements to create innovations and appreciation of their dignity. Awareness can be classified as social awareness to others, awareness to the natural environment, and ultimately the cosmic awareness unto God. This awareness enhancement has the educating function to men.

> **Communications is educating, enhancing knowledge and working skills, Selfconsciousness is critical for the creation of innovations**

The educating process has a multiplier effect, in that after one has gained knowledge for a certain purpose, the same knowledge proofed to be also aplicable to other purposes. These other purposes , in many cases require extra knowledge or more experiences, driving people to know more about things. This lead to development of knowledge and sciences in all areas. The day to day expression of implications id that communication is empowering, enabling people enhancing their working skills, better able to derive or arrive at critical decisions, because they not only know how to do, but also why to do something. With their sensing enhancement, people are better able to synthesize.

The second fuction of communication that it represent a means for social contacts in their communities' life. Social contacts develops social cohesion and social intelligence. Social cohesion develops the koncept of cooperation, while ICTs provide the necessary "interconnectedness" among the "distributed" participants at places around the world. It also creates the concept of distributed but coordinated activities. Cooperation lead to results more than the sum of individual accomplishment, it has the added value due to thier individual contributions in know-how and know-why. No big jobs or master pieces can be accomplished through individual efforts.

> **Communications develop social cohesion and social intelligence**

> **Cooperation results in more than the sum of individual accomplishments, it has the added values.**

Social interaction developes social intelligence. Initiating with good faith, and ultimately establishing social. Cultural, ethical and moral values. Also in establihing these values one can not do it individually, but together and shared with the community. Due to the social and cultural implications ICT is also said as civilizing. The use of ICTs has social, economic and cultural implications.

ICTs are educating as well as civilizing

The use of ICTs will bring about structural changes in the community, changes in ther ways of learning, working and palying, even changes in the way of thinking[8]. Technological progress, including ICTs, drive innovations in the way of learn and work and play, becoming part or peoples way of life, bringing about structural changes. An example of technological progress leading to structutal chenges is the invention of the "machine", two hundred years ago.

ICTs , like other new technologies, are bringing about structural changes

But to communicate is not always easy. Individual perception may lead to misunderstandings, for inxtance due to the language barrier. In case such misunderstandings were not readily remedied, "a dividing wall" is established creating antagonism. Community life has to care for others, to appreciate others. One may not be indifferent to others, or otherwise the community will be fragmented. Social cohesion will be maintained in case balnce in the community life can also be maintained, even under pressure of technological progress, globalization, scientific progress. Social cohesion is a dynamic process overcoming internal contradictions in community life.

To communicate is not always easy. Misunderstandings can develop, and it built up a dividing wall in case it is not ptoperly overcome.

In maintaining oneness or unity there is a Javanese saying that goes "winning without defeating" meaning that agreement or unity can be achieved without sacrifice of sertain parties, that is to arrive at a "win-win solution".

Policies and management of ICTs shall take into account these social and cultural implications. ICTs has enormous potentials, but the most critical element behind this "tool" is man himself.

ICTs has enormous potential, and as a tool, it helps men to develop their full potentials.

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[8] Alvin Toffler in his book "The third wave" elaborated the cultural changes that took place from agriculture (voice culture) , then after the invention of the alphabeth becomes the litteracy culture, within which technological progress (hardware) has taken place, and now by the development in digital technology we are haedaing to the info-culture, or post-industrial culture, where information represent the critical element in communities life.

Through ICTs man develops himself to his full potential. Reversely, a tool can be used to help doing wrong, unjust, unfair to terror, with nasty results.

In a community where everybody honestly contributing to help each other, hard working, then cooperation can be created, and resulting in more than individual accomplishment. Masterpieces cann not be accomplished individually.

It is to be noted that asymmetric access to information (ICTs) results in (social, economic and cultural) gap, within and among nations. This gap can be cunderstood to be initiated by the assymmetric access to the empowering and civlizing tool, creating disparities in individual capabilities, but spread to disparities in sector growth. This disparity in growth tend to distrurb respources allocaions, but favoring the high growth, resulting in a wider gap[9]. The rich become richer and there is no way to catch up for the poor.

> **Assymmetric access to information results in the social, economis and cultural gap between communities, and within and among nations.**

The divide create further stratification to community members, polarizing them to the different poles of the educated and uneducated, the rich and the poor, the formal and informal, government and private, the elite and the proletars. In such a divided and fragmented community, alienation by the higher strata tend to occur. This devide has been observed by advocates decades ago, in publications such as the Asian Drama (Gunar Myrdal) and North and South (Willy Brandt Comission). A new expression is recently created to overcome the digital divide, by creatyion of the digital opportunity.

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[9] This gap in the digital era is said to be a digital divide.

Summary of the fuctions of ICTs.

- Communications educate and civilze man, because it enhances knowledge. Working skills, as well as enwidening one's horizon and increasing awareness. ICTs are then identified as enabling and empowring tool, and within the economic sence, they are the engine of growth.

- As a tool for social interaction, ICTs are civilizing man, through the adoption of social, cultural, ethical and moral values.

- Technologies, including ICTs create structural changes to the community beause it chnges the way to learn, to work, to play, even to think. (Alvin Toffler identified these cultural changes as voice culture, to litteracy culture and now heading to the info culture).

- To communicate is not always easy, misunderstanding can developed, and if it is not readily overcome, the problem becomes more serious, antagonistic attitudes, to confronting cultures.

- Social cohesion is a dynamic process, balancing thoughts and attitudes, through implications of progressing science, technologies, innovations and globalization. This balancing is an art to keep the social fabrics working cooperatively and advantageously.

- Cooperation and collaboration yield more results than the sum of individual accomplishments , there are added values due to the contributions in skills, experiences and innovative thinking. No masterpieces can be created on an individual basis.

- Asymmetric access to information and ICTs will lead to the digital divide, within and among nations, and stratification and polarization of communities and nations , resulting in the alienation by the higher strata, leaving no way for the lower strata to catch up.

- Management of ICTs and their services must take care of their social, economis and cultural implications. The universal objectives are man's total development and progress.

Readers notes.

3. ICT applications.

To take examples of ICT applications, other than what we already know or use such as telephone conversation, written messaging, braodcasts, we see that tey are having considerations and objectives in common:

a) The enormous capacity of ICT in tansferring information is with worldwide coverage and accomplished instantly.

b) ICT applications supports all man's activities, learn, work and play

c) All applications is directed to help empower and civilize man to acquite social, economic, culture, ethical and moral values.

d) Always be aware that disparity in the access to information results in the "digital divide" wthin and among nations.

e) In a number of applications, the concepts of substitution of transportation by communication is developed.

Referring to the enormous capacity stated in a) above, that is bridging time and space, ICTs can be a tool in:

The creation of the "interconnectedness" among individuals and communities, enabling coordination of cooperation with distributed parties everywhere. ICTs function as a catalysator in the process of cooperation, among individuals, communities, geographical areas, integrating all efforts nationally, even internationally.

Supporting all man's activities, applications can be developed to meet communities' demands and efficient operational conditions in all sectors, social, economy and cultutal activities[10].

Several concepts of distributed but coordinated activities, which has been written in many publications, and discussed in seminars, and in itself represent a area of research are as follows:

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[10] The relation of the telephone and the national economy has been an area of investigation within the ITU (International Telecommunication Union) since 1970s. A strong correlation between the telephone penetration and in an area and its per capita income is demonstrated. This does not indicate that an affluent community can

1) Teleconferencing systems.

Teleconferencing can be planned at a modest system, such as employing only voice, for example a conference within and among villages, to an adnaved systems, employing broadband capacities at international forums. Participants are not meeting in one hall, but visits nearest locations equipment with the necessary equipment. Also, when a village conference is also broadcast by radio, passive participants (listeners) can follow the conference from home or anywhere, including from a coffee-shop [11].

Similar to this voice conferencing system, the Internet e-mail provides also writen conferencing capabilities. People are sharing views and eperiences. This e-mail service has now been wide-spread in a e-group or mailing list, both for individuals and companies or organizations. A company without Internet facilities is regarded as backward.

The Internet is now an essetial tool for big or international conferences. Days or even months before the event, conference material such as the committee's circulars and participant's contribtions are hosted in the website. Even during the conference, the laptop (PC) can brows information from anywhere, including all conference material and files in the participant's home office in theit home countries. The conference then can proceed directly to the discussion leading to resolutions and decisions, without too elaborate presentation of contributions.

2) Tele-education, distant learning

A teacher can have at the same time a number of "virtual" classes scattered at many locations. The electronic equipment is similar to that for teleconferencing, allowing interactive communications between teacher and students without the need of travel to meet face to face. Tutorial modules can also be accessed at host installed at many "campuses" worldwide. This means that students is free to choose modules he likes. The teacher should be carefull in presenting the tutorial material, because both teacher and students have the same opportunity to access various sources. Distant learning is growing, specifically among university and industrial circles. For practical physical work such as research and testing the may need to visi existing labs equipped with the necessary equipment.

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by telephones, but reversely, due to the support of (tele)communications, activities can be done more efficiently, and the communinty develop affluence.

A number of universities in advanced countries have introduced distant learning, including their certification processes.This distant learning system allows teaching and learning activities at comfortable locations and convenient times, such as at home, or while in the office, and even while mobile.

The distant learning system has the advantage that to access to more tutorial material than normally a a school or university can provide in the form of written material. It is reported that there are no detrimental effects due to the distant learning, compared to normal classes. Yet, through distant learning, students are normally "trained" in their pro-active attitude to find sources of material for their progress.

2) *Electronic commerce, often written as e-commerce for short.*

Except delivery of goods, all commercial transactions are done electronically, including advertising, website browsing, ordering, contract negotiations, and money transfers, delivery documents inclusive all agents such as duty offices and import and export offices. (Software can be delivered electronically). The international trade has many other procedures, such as verification of the "digital signature"and other estabisled legal procedures. All those transactiones can be done electronically from the office, and later maybe also while mobile.

There are two general categories in e-commerce, namely Business – to – Business, writeen as B2B and Business to Consumer, B2C for short. Commercial transaction may be local, inter cities to internasional.

In the primitive form e-commerce can take a model of on-line shopping, whereby oderes are done using the telephone and payments are done on delibvery. A more advance system is that the electronic orders are done through the internet e-mail. Through e-mail, orders can cover a number of commodities, and a list of goods and prices can be communicated. M\Payments are done through bank transfers.

E-commerce is an application for both local to international commerce, involving regulations, legal procedures, taxation, money transfers, legal procedures auch as the digital

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[11] Telephone systems also offer teleconferencing services, but limited to 3 or 4 people.

signature to be verified by clearing houses, , international agreements and collaborations, and more.

3) Electronic government (e-government)

 E-government is an application to enhance government administration. Its contents may be very complexed, but it is ment to enhance public services such as access to regulations in all sectors, economy, taxation, education to licensing and provision for identtity cards. The Internet is the base for e-gov applications, accessible from anywhere. Content may comprise citizenship regulations, districts' potentialities, natural resources, submittance of various applications forms, and many more. E-government is to enhance communications not only between government agencies and the public but also among government agencies themselves, with national coverage.

E-government will require not only its technical infrastructure, but its content as well., data or information originating from the central government to every viallge., such as population, local industries, income per capita and many other statistical data.

4) On-line shops.

At a small scale, e-commerce may take the form of on-line shopping. The shop is not centralised in one big building with a large parking lot, but both ofiice, store and service centres are spread near residence complexes. Orders are done electronically and payments through bank transfers. Deliveries are done by small trucks. Collecting goods for deliveries from different stores are also coordinated using the electronic means.

The central shop's office can access all information about commercial transactions by all branches spread throughout many cities, nationally. It can even access any point of sale computers, for the whole shop management, including timely supplies of commodities. On-line shopping is meant to make efficient delvery to customers and delivery fleet management.

5)   Tele-commuting, or distributed office..

Similar to on-line shopping, working can also spread in distirbuted offices. To avoid too shocking change from centrally organized head office to working at home, offices can be spread to smaller branches near residence complexes, including to villages. Any

employee can report their jobs to their bosses any time, and reversely supervisors can control their subordinates' activities throuh electronic means.

With distributed small brach offices, employees will save time for travelling to and from their jobs, thereby avoiding traffic jams and air polution . Only occasionally employees could be organized to meet together to know each other. (Note the Italian joke in using the telephone: Please come down, I need to talk to you!)

(Implications of the concept of the substitution of transportation by telecommunications is written in a separate chapter).

7). *Tele-medicine, tele-healthcare.*

A Medical doctor can have their patients distributed at small health care centers, and reversely those small centers can obtain specialists' services from different places. The patient are not required to visit the Central Hospital, saving time to travel, it suffices to call on a nearby health center equipped qith neceessary ICT equipment. Patient data , which has been recorded in a "sumart card", can be accessed by the distant physician, prescribtion can also be sent away, with a direct copy to the intended drugstore.

The system enabled a small health center to have services from distant specialists in the city or in other cities. Consequently collaboration among health centers are promoted, and services can be extended to more poeple in a wider geographical area.

6) *Tele-banking*

We know the ATM (Automatic Teller Machine), which was design to draw cash from bank accounts, but its functions now is growing to other services such as fund transfer,(to pay for electricyty, telephone, riticulated water bills. In a few years we will be able to transfer funds using our cell phones.

Later more banking services can be done electronically. A credit card now has limited accessibilty to banks, due the lack of coordination.

7) *Distributed manufacturing.*

The concept of distributed manufacturing has, in fact, been adopted in a limited model. The basics for this distributed but coordinated manufacturing activities is that no

manufacturing company is manufacturing all components of their products, because this is inefficient. They collaborate and rely on vendors,. No car manufacturing company is producing textile products, tires, glassware, electrical components and so on. Of coarse this division of labour does not only valid to car manufacturers, but all other comodities, even services.

The necessary components could be produced elsewhere, worldwide, assembled to the final product at many places, and marketed from many senters to the world. This organization seemed to be simple to describe, but it require professional management in all processes of manufacturing and marketing the product.

Management of districuted manufacturing activities are also employing other electronmic metods, such as e-commerce, tele-training, tele-advertizing, etc.

8) Tele-printing

Efiicient marketing can be done with this concept of tele-printing for dailies, periodicals and books as well as other printed matters. Dailies and periodicals can have smaller printing facilities in many cities. Its content is distributed by the head office, except maybe local news, and delivered to customers at the day, as it is printed locally.

Books can be printed in many cities worldwide, to speed up reaching customers. Electronic files can also delivered electronically.

9)   Tele-writing.

Books and other articles can be writen by a number of contributors, having specific knowledge and experience on the subject. Pictures can be sent away electronically. Before printing, the draft can be posted in a web, and the teleconferencing method caan also be employed to arrive at the final, agreed upon draft. Printing can also be done employing the tele-printing concept speeding up deliveries..

10) Distributed research and development.

R&D activities can be coordinated worldwide. In principal, science has always been the results of thinkers, researchers, and practitioners and other "stakeholders" of the subject material.. Take the exapmle of healthcare and medicine, they are the results of development around the world in decades, even ages.

The are of course specific fenomena related to geographycal conditions, but universal "wisdom" can drawn by comparisons to other areas. There are, however, practices, even regulation or laws thatt restrict universal access to specific science branches, such as technologies.

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 Above applications are only examples of the concepts of distributed but coordinated activities. There are a lot number of applications, depending only on the genius of the conceptors and developers, and the market of individual applications.

It has been described previously that communications using ICTs can take place in various ways, including remote electronic control. We can imagine that the immigration office at internasional airports can personal data of all passengers, both locals and foreigners, before landing of the aircraft. This system will avoid queing when they are leaving the airport, and helps detecting drug trafficers.

The capability of controlling commercial diliverables, including its clearance for taxes and regulatory clauses, is another advantage. Fleet and distribution management can be done with the help of such application. Other applications can be devices to manage fire and other emergencies. Automatic meter reading can also applied to remotely read electric power consumptions (KiloWhattmeters), temperatures and other climate data by the central office.

Other areas of apllication is crime prevention, including cyber-crime.

Readers notes.

4.   ICTC implications to the community.

The use of ICTs will introduce changes in the way people learn, work and play, even changes the philosophy of certain areas of activities. We will dicuss these implications to the community, however, with a general approach, because it is hardly impossible to predict what are the anticipated changes du to the use of ICTs, not an integrated approach analyzing also other agents of changes, the same change agent can have different implications in another communities' cultatal setting. One common thing is that the drive to do work more efficiently, creating new ways while research will be always progressing creating new technologies.

> **The use of ICTs has implications in the way people learn, work and play. (Alvin Tofflers description of cultures due to techologies, in his "The Third Wave")**

Implications and benefits due to the use of ICTs will not only be accrued to their users, but spreading to others and the communityu as a whole. Take the example of the ICTs support to commerce in enhancing transactions and deliveries, and to the farmers' productivity so as to make products available to all. Communication between farmers to goverment extension agents, the market, R&D institutions, etc, enhances their productivity.

> **The availability of ICTs will change the whole processes of doing work in all areas, agriculture, commerce, health care and so on.**

In general ICTs helps to enhance procuctivity, more efficient work and enhances product's quality, and the community reaps the economic benefits and raised quality of life. The costs savings are due to the less costs of electronics communications compared to transportation for face to face communication, and besides due to the increase in effective working hours. Three general kategoties of benefits are efficiencies (in terms of benefits to costs ratio), efficacies , in terms of better product and service qualities, and better distribution of products to reach communities.

> **General ICT benefits:**
> - **Better efficiencies**
> - **Costs savings**
> - **Product quality**
> - **Raised quality of life**

To demonstrate the quantitatieve value of savings, a simplified calculation of the benefits due to the use of ICTs is hereunder described, however no consideration has been paid of the savings due to other factors than ICT use.. The concept of on-line shopping will save transportation for shoppers. Take an example, if, after the few years initial operations, 50% of shoppers are changing to on-line rather than visits, and deliveries by 4 to 5 small trucks could take care of say 20 – 25 adressess per day, then for every 100 shoppers the traffic reduction will be {½ x (100 - 5) : 100 } x 100% or 47,5%.

> **The concept of subsitution of travel by celectronic communication results in big costs savings (and reduction of air pollution).**

Please compare the normal day to day traffic during school hollidays, where students transportation to schools are non existence. Savings are also booked by less fuels burned and no necessity of shops to built parking lots. Less polution. Reduction of traffi quoted above was only due to on-line shopping. Higher reductions can be achieved through implementation of other forms of substitution of transportation by communication such as distributed office (on-line working, or office anywhere, distant learning, tele-health, and many others as listed in the elctronic applications previously. Further, better efficiences can be gained from wasted time to travel to go to and from work. Thousands of suburban people of cities need 1 to 2 hours on the road to go to work and the same amount of time to go home, each worling day of 8 hours.

> **Efficiency of energy conversion from fuel to drive vehicles very low, but substitute for it which is commercially accepted has not been invented. Carbon fuel has high energy density.**

Fuel for transportation is also inefficient, in terms of energy conversion. Only around 15% of the energy contained in fuel is achieved to run the engine stationary, the rest is converted to heat which again require energy to cool down (and polusion). The only energy source for cars is fuel, which is converted into mechanical power, charging the battery, lighting, running the air conditioning, powering the radio for music, and other gadgets such as flip up and down of roff antennas, adjusting the mirror, etc, etc.

Driving need to overcome "slack" between tires and the road surface, more energy are lost when after achieving certain speed of the vehicle, then one has to brake for some reason. In bad traffic jams, the engine is running without moving, that can last tens of minutes commulitively. This end up in an efficiency of less than 10%. But sadly, no substitute of this energy source has been invented which satisfy the market in terms practicability. Fuel has high energy density, relatively easy to transport it for distribution. The world is very much committed to fuel.

How much saving in terms of travelling costs can roughly be demonstrated as follows. Standard company costing calculations for vehicles are normally done with selling the car after 5 years use and calculating all annual credits and debets , for maintenenace, supplies, to arrive at an average per km cost of travel, whic is between Rp 1250 – Rp 1500. (Converted to per mile costs multiply the number by 1.6).

Jakarta and its suburbs has at least 3 million cars and trucks driving at least 20 km per day for all purposes such as working, learning, shopping, deliveries, entertaining. How much is the savings worth

> **Savings amounts to Rp 1.6 trillion in Jakarta alone, (aequivalent to 2 billion US $) annually, that can by electronic systems and built toll roads.**

if 50% of traffic can be saved, is 0.5 x 3 million vehicles x 20 km/day x Rp 1500.- per km = Rp 4.5 billion per day, Rp 135 billions per moth and Rp 1.620 trillion annually. Other cities can book saving even if the amounts is less. This amount of money can buy the electronic systems to achive the savings and built toll roads.

From the above rough analysis, the direxct and indirect implications can be listed below:

- Savings in road traffic, fuel and polution
- Gain in more productive working hours
- Develop the concept of distributed but coordinated activities,
- spread of populaion and easing urbanization
- modernization of villages

The rough analysis above shows big savings but the social and cultutal implication shall also be assessed. The inter-connectivity among individuals and communities made possible by ICTs can support strategic concepts such as:

1) ICTs as tools for empowerment and civlization, while asymmetric access to information (ICTs) results in the digital divide, a strategic plan of Universal Access Obligation (or commonly said as Universal Service Obligation, USO) to ICTs shall be implemented. Advancede countries has been implementing the policy of Compulsory Education for more than 120 years, resulting in the superiority of their human resources, as base for their advanced countries). At present, there are about 42 000 villages out of some 70 000 villages in Indonesia not being served by telecommunications)[12]

2) The potential of providing the interconnectedness among individuals and communities of ICTs, its benefits are extended to all segments of the communities rather than only the users, in the form of education opportunities, trading, small industries, in the area served. Teachers, traders and government extension agents will benefit from the

> **ICT infrastue in villages drives other infrastructures to be built, and the creation of job opportunities with the existence such infrastructure.**

collaborative work among areas, indivuals and communities to the rest of the world. ICT infrastructure will also drive other infrastructure to be complementarily built, such as roads, schools, reticulated water, helath centers and so on, resulting in the equitable distribution of development efforts and modernization of all areas.

3) The spread of development efforts will create job opportunities accross all areas in the country, resulting in the reversal of urbanization. Urbanization is a fenomena of lacking job opportunities in villahes, driving people to find jobs in the cities (even to foreign countries), but lacking knowledge and skills, the land and slumbs in the suburbs, which become the burden of the city in providing public services, such as residential quarters, health care, transportation, environmental conditions and even fighting crime.

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[12] In a seminar of 10 September 2002 on 3G (Third Genretaion Telecommunications) the government stated that Universal Service Obligation is number one priotity of the government program.

4) The modernization of villages will allow village communities to better contribute to development. Human and natural resources in the rural is abundant.

5) The long term implication of rural development is decentralization of activities and authorities, but primarily the provision of digital opportunities, to overcome the digital divide.

6) Interconnectivity among individuals and communities allow development of cooperation and collaboration "among equals", based on win-win solutions rather than principals and licensees, preventing the implicaions of the divide, including marginalization and stratification of communities.

Readers notes.

5.   Conclusions.

   Understanding the functions of ICTs we can draw a summary of solid conclusions as follows:

- ICT's main function as an empowering and civilizing tool is the potencial of providing interconnectivity or interconnectedness among individuals and commuties, allowing the development of the concepts of cooperation and collaborative activities within and among nations. Cooperationan and collaboration allow distributed but coordinated activities among participants of all places world wide.

- Various applications can be derived from ICTs to device applications in support of all man's activities, for learn, work and play.

- Management of ICT services has to take account on the social, economic and cultural implications of the use of ICTs. The concept of the civil society id to built a society based on knowledge and (social, economic, cultural, ethical and moral) values.

- The interaction among individuals and communities, however, runs with risks of mis-understandings and asymmetric access to ICTs that will result in the divide among them, with nasty results of the digital divide, polarization and marginalization of communities.

- A simple and plain saying goes with us in Indonesia, that if there are still many people lacking education and job opportunities, than there are a lot of work to do. ICTs can help the empowerment and civilizing efforts to this end.