

Challenges and Reflections on Knowledge Society & Sociotechnical Systems.

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Abstract: This paper considers some challenges and reflections concerned with Knowledge Society and Sociotechnical Systems. After a brief and innovative panorama on the knowledge society and sociotechnical system we present the core of this work: challenges and reflections related with our society and systems. For some of these challenges and reflections has been proposed answers such as: treatment of the organization as a living being → synergism & collaborative ecosystem research efforts; a unfair shared leadership, information partnership and a collaborative relationship in the age of knowledge and, a new way of development, which comprises the social, economical, cultural and environmental spheres leading us to a new model of perception and knowledge of the world & present financial crisis; the future... Those questioning are still open to create new insights and interests...

I - PANORAMA ON KNOWLEDGE SOCIETY AND SOCIOTECHNICAL SYSTEMS.

Information Technology (IT) is redefining the businesses basis. Customer attendance, operations, products strategies, marketing and distribution and even the society of knowledge depend very, or sometimes even totally on Information System (IS). The IT and its costs are starting to make integral part of enterprise day-by-day. However, many enterprises still believe that the simple act of computerizing them, spreading computers and printers throughout departmental units, connecting them in a network and installing applications systems, can organize the same. Technology by technology, without planning, management and effective action from knowledge workers and above all, without considering the sociotechnical systems, does not bring any contribution to the enterprise [01].

- **The Knowledge Society.**

Knowledge societies is one in which knowledge becomes a major creative force, a major component of any human activity. Economic, social, cultural, and all other human activities become dependent on a huge volume of knowledge and information.

Knowledge societies are not a new occurrence: a fishermen have long shared the knowledge of predicting the weather to their community and this knowledge gets added to the social capital of the community. **What is new in a knowledge society [02]?**

1.3 - With current technologies, knowledge societies need not be constrained by geographic proximity, figure 1.

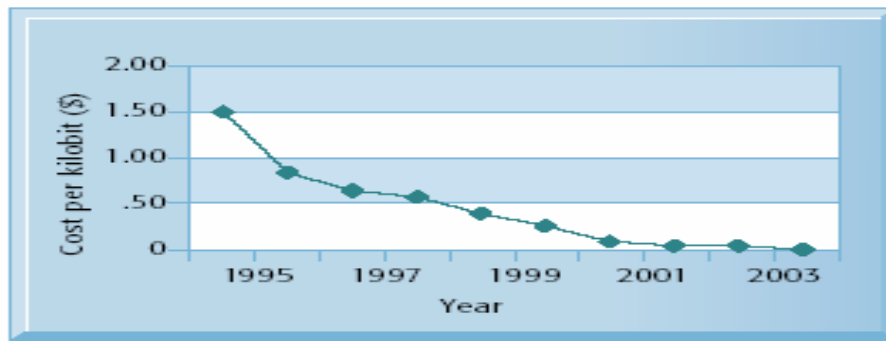


Figure 1. Internet costs per Kb: we have the power to be ubiquitous and this has changed the economics of information. [03,04].

2.3 - Current technology offers much more possibilities for sharing, archiving and retrieving knowledge, figure 2;

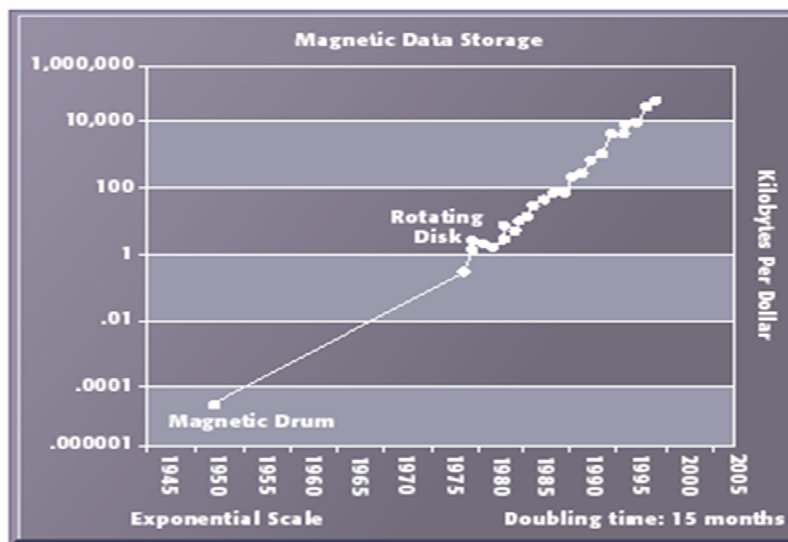


Figure 2. Everything about ourselves could be now stored in any personal computer [05,06].

3.3 - Knowledge has become the most important capital in the present age, and hence the success of any society lies in controlling and making use of it.

- **Sociotechnical Systems.**

As we know, the implementation of a new technology has been associated with problems often linked to resistance by the work force and failure to achieve the expected benefits [07]. Figure 3,

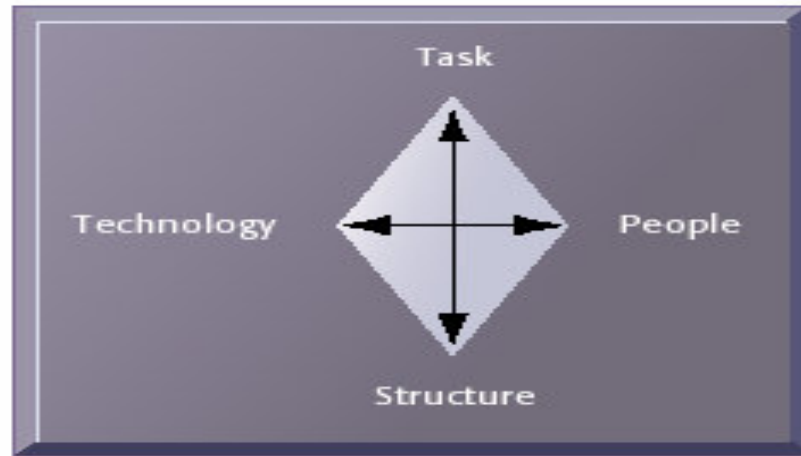


Figure 3. Information System (IS) influence access to key resources such as Intellectual Property, Central Competency and Financial Resources: “removes” peoples from their comfort zone and performance management. These key resources could be now in a IS instead in the hands of workers and, this IMPLIES organizational and political resistance. To implement changes, all four components must be changed simultaneously [06,08].

Researchers, notably at the Tavistock Institute in London, suggested that it would be needed a fit between the technical system and the social system which together made up an organization [07,08,09], figura 4.

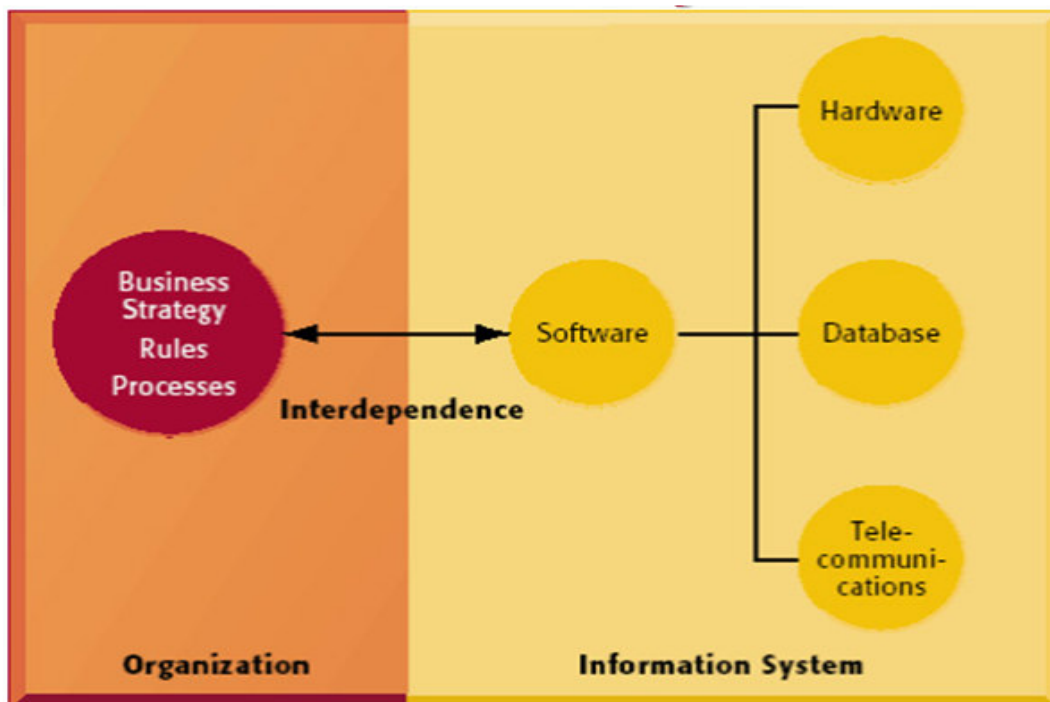


Figura 4. There is an interdependence between organizations and IS [03,10].

- The social system - Organization, figure 4 - comprises the employees (at all levels) and the knowledge, skills, attitudes, values and needs they bring to the work environment as well as the reward system and authority structures that exist in the organization.
- The technical system - Information System, figure 4 - comprises the devices, tools and techniques needed to transform inputs into outputs in a way which enhances the economic performance of the organization.
- The basis of the sociotechnical approach is: the fit is achieved by a design process aiming mutual optimization of all systems. Any organizational systems will maximize performance only if the interdependency of these systems is explicitly recognized, figure 4.

The fit between the technical system and the social system, together, build an organization, figure 5:

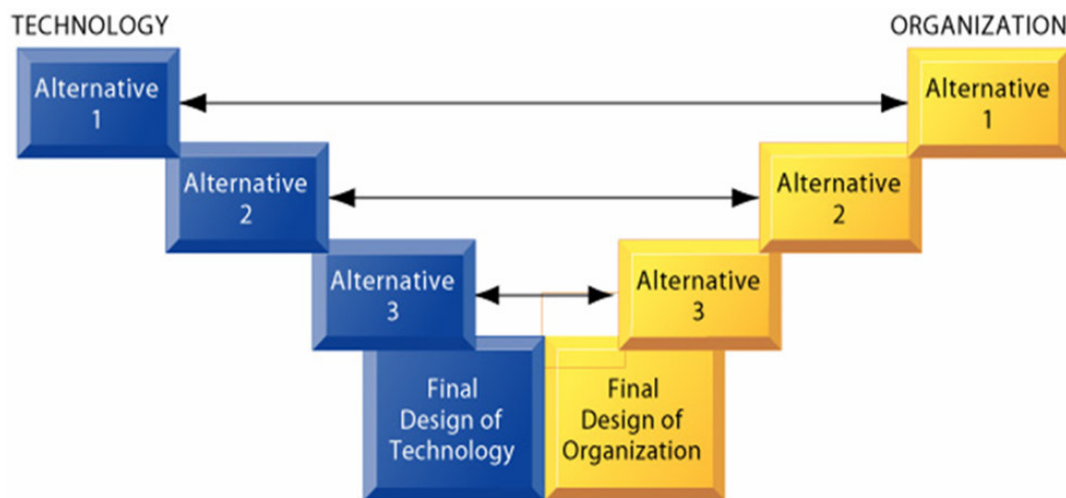


Figure 5. A sociotechnical perspective on Information System (IS): the performance of a IS is optimized when both the technology and the organization mutually adjust to one another until a satisfactory fit is obtained. [11].

II. CHALLENGES AND REFLECTIONS.

If we go back a little in history we shall remember that competitive advantage was marked by the ownership of capital and assets such as natural resources, estates, etc., but today we are experiencing a fourth great revolution, that of knowledge. The first revolution, the industrial age (initiated in 1750 until the mid 1960s) was marked by the evolution of the processes. A second moment took place in the 70s, marked by the expansion of the Japanese industry. The world was overtaken by a revolution in processes. Concepts such as Just in time, Lean, Kam-bam, Six Sigma arose, defining quality as being "the differential". Today quality is just a basic requirement! In the 80s and 90s the third moment, marked by a technological revolution in the West, led by the Americans, commenced: the digital

revolution via machines, software and methodologies capable of controlling in detail the management of an organization, increasing their gains in productivity. Then from the mid 90s on, the investment for access to new technologies evolved into a non impeditive factor in face of the vertiginous decrease on their prices, figure 06, enabling organizations to compete in same levels. In the present age, a great movement towards appreciation of the intellectual asset can be observed inside the organizations, focusing "people" as a great competitive differential. Here is the "Age of Knowledge". [12].

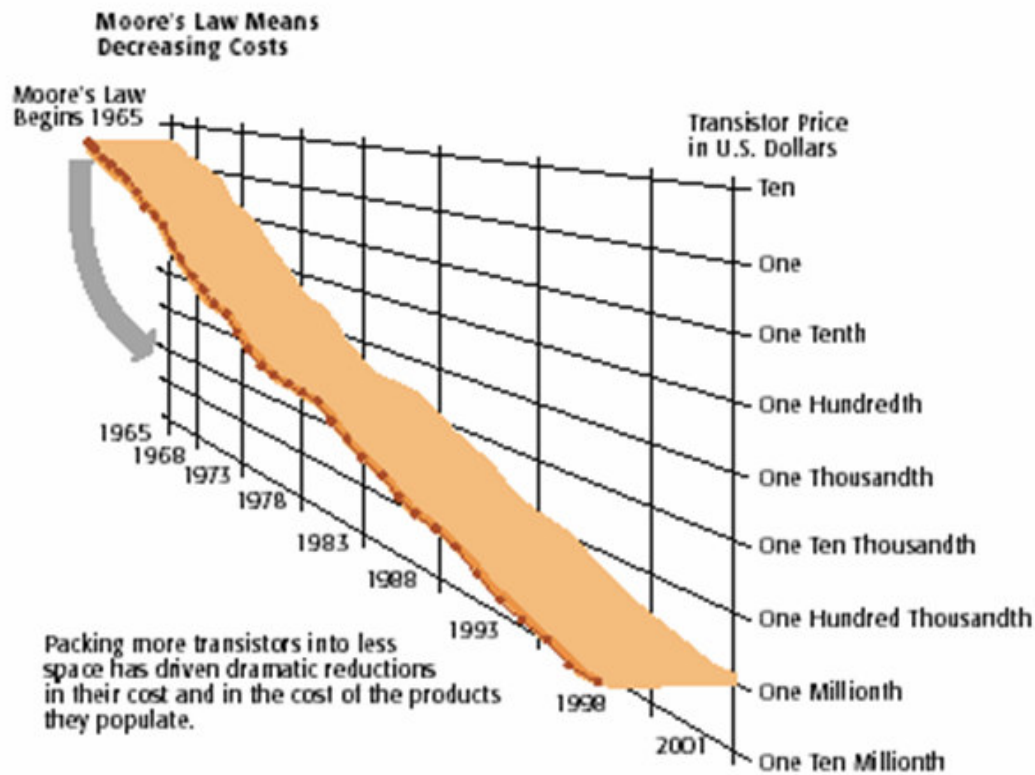


Figure 6: From the mid 90s on, the investment for access to new technologies evolved into a non impeditive factor in face of the vertiginous decrease on their prices enabling organizations to compete in same levels. It follows the fourth revolution. [03,13].

At the present process of acceleration at the transition of Ages, we rapidly moved from the Age of Information to the Age of Knowledge and observed the emergence of an increasingly globalized and virtual culture, urged on by the development of computers and of communication in a very particular manner, which, consequently, is devastating for the social web and nature. **One asks How about the social-technical question involving IT and people?**

A possible answer to such question could be provided by what is known as Action Network Theory: the emerging issue is linked to the complexity of the real which shall not be able to be reduced since the great relations network (peer to peer) became evident through the technological development of ICT(s) [14]. There is also the vision where the world is seem as an intricate fabric made up of connections, of several types, alternate, combined and juxtaposed, determinant of the structure of the whole [15]. And it is such world, replete of connections and relations, that needs to be perceived in

a holistic manner so as the properties of the whole are not lost in the practice of analytical reductionism, proper to the mechanism which treats the world as a machine, explaining it via the explanation of its parts. Other possible answer to the questioning could be provided by “knowing the organizations”. The organizations are composed of complex organisms (**people**) who need to be understood through the knowledge of nature of their relations and within a determined context. It is the treatment of the organization as a living being, through a systemic view (think globally but acting locally), that will enable the emergence of phenomena which shall enable the whole to be more than the sum of the parts of such being/organism!.

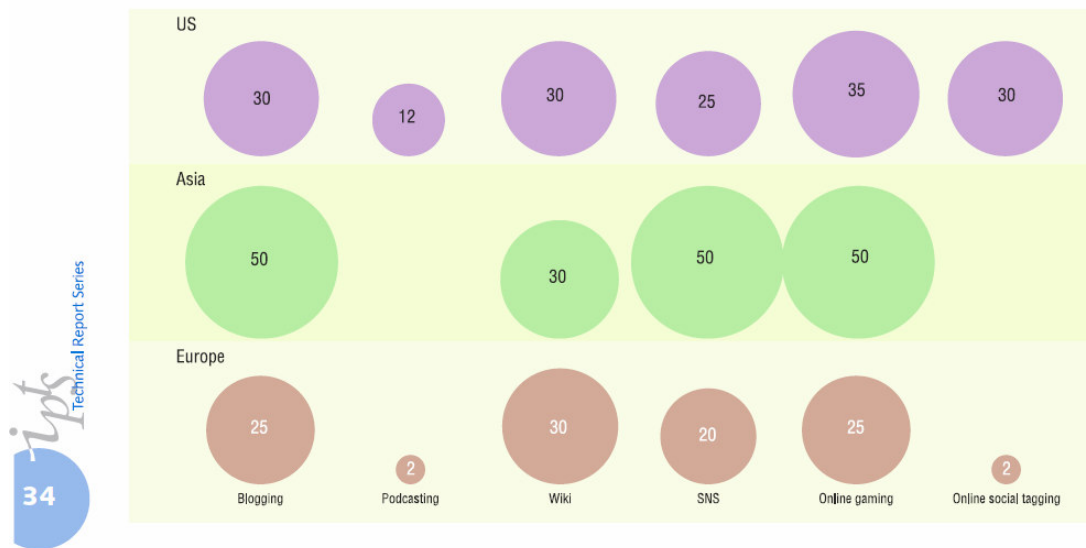
Treatment of the organization as a living being → synergism!

On the other hand, the organizations known as relation networks, not everything can be reduced and “systematized”. Thus, the focus on **people** is not enough, it is necessary to connect and contextualize them in the organization’s cause. So, connecting and contextualizing the people in the organization’s cause we hope to get the differential, id est., the full knowledge of the dynamics of the system as whole! **How to theorize such context?** An answer, perhaps, is in the Theory of Constraints (TOC), which possesses as one of its pillars the concept of Inherent Simplicity: “a deep understanding that there is always a simple explanation to any seemingly intractable problem. This leads one to use the intuition to find the core of the problem and develop a solution which both solves the immediate problem and doesn’t create additional problems along the way”. [16] The utilization of the Theory of Constraints (TOC), which considers the application of the exact science principles to human organizations, possesses as one of its pillars the concept of Inherent Simplicity and, the difficulty, initially, is to believe in such statement. Therefore it is necessary to study the cause-and-effect relations from the system in question in order to discover such Inherent Simplicity. On the present causality map the technological, psychological, environmental and political elements must be present, demonstrating all inevitable logical links between causes and effects (visible or not). Such logical maps, called “trees” in the TOC (from present reality, from future reality, etc.), aid us in obtaining an essential systemic view. The creator of the TOC, physicist Eliyahu Goldratt, applied the exact science principles to human organizations and demonstrated, amongst other things, that technology is necessary, but not sufficient. The personal factors, especially those linked to individual performance mensuration, generally exert a very strong influence in any context, which frequently frustrate any initiative for change. [17]. But in the end, a simple answer to the previous question (**How about the social-technical question involving IT and people?**) could be the following: The social-technical question involves the people (obvious) and everything surrounding them, including the IT. It is a question of utility, of functionability, of usability for the consumer (if we are to discuss market), for the user (if we are to discuss society). **How to demonstrate this?**

One of the aspects which are becoming important at everyone’s everyday life has to do with the values changes in our society. As well as manual labor was the basis for the Agricultural Age, and capital and energy were basic at the Industrial Age, the computer networks and human beings are essential in the Age of Knowledge. **Therefore, how to deal with the social-technical questions in such Age?** A possible answer relates to the Orkut phenomenon, with its 60 million profiles and good illustration for the social-technical questions from the new age. Its growth 'provoked' other social networks with specific purposes, but every network’s dream is to become an Orkut. Today, organizations participate in such network, not only using 'fakes', but showing their face, in order to get closer to their consumers, to provide service, offer products, and receive suggestions. Sales

teams are being managed with the aid of Moodle, keeping the team informed of processes and procedures uniformly, distance training, study groups and collaborative works in real time. Chiefs of major organizations communicate with their personnel via blog (Wordpress, Blogger, and alike). A small detail to be observed, not of little importance, is that "teens of up to 18 years of age deal with e-mail the same way the rest of the post-teen humanity faces ID and Individual Taxpayers Registry ID: as ills necessary so as to take the compulsory bureaucratic measures. (...) when reaching the labor market, such generation will turn the present schemes head over heels..." **Are such statements facts, how can we prove this?. Can we?**

One possible answer is Yes: by 2008, blogging, photo- and video-sharing, social networking and on-line gaming had been embraced by half the Internet users worldwide. Some regional patterns seem to emerge: Asian countries are leading the adoption of these, followed by the US and Europe, figure 07. [18].



Source: (Pascu, 2008a), estimation based on existing surveys

Figure 07: Prevailing trend of Internet users in Europe (25%), USA (30%) and Asia (50%). [18].

We are living a unique moment in History, discovering that, despite our way of thinking and living not being based on the holistic paradigms and us being in the middle of a dehumanized digital economy but, at the same time we are moving towards the development of a sense of unity and perception of the whole and, hopefully, towards a sustainable and solidary economy. **Is the present economic crisis the “last straw” in order for us to, finally, develop such sense of unity and perception of the whole?** In order for such to take place it is indispensable to learn new means of fomenting trust and the social and environmental responsibility, which means we need to organize our individual, social and political efforts in this new knowledge information society so as to develop a new conscience and a new ethics. The figure 08 shows an representative model for such concern, identifying the 5 moral dimensions of a society across individual, social, and political levels of action. [19].

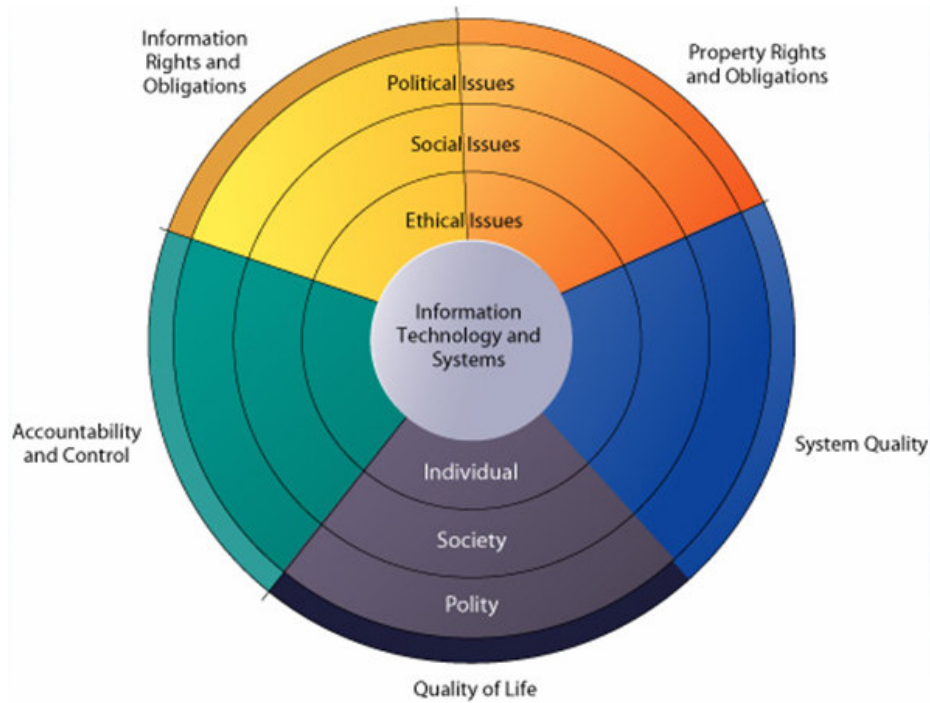
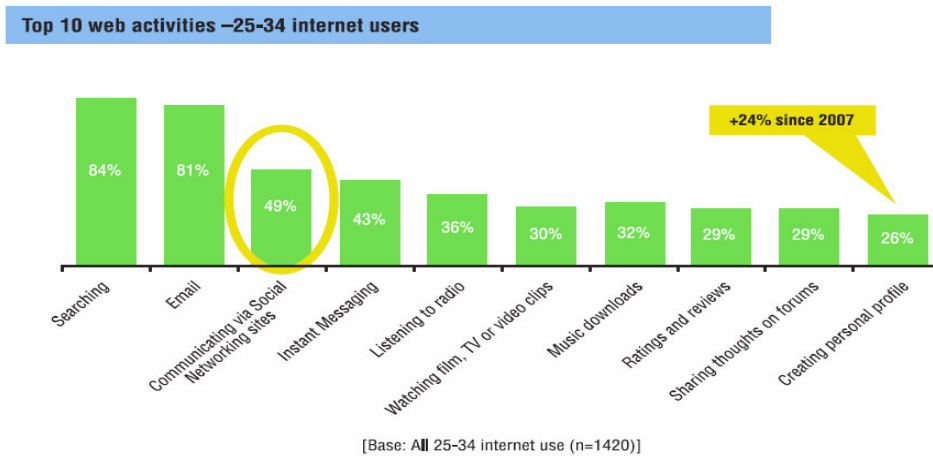


Figure 08: The Relationship between Ethical, Social, and Political issues in an Information Society. [19].

Does the solution for this knowledge information society go, necessarily, through the social-technical IT questions? One possible answer is: Yes! Again, according to what previously showed about the concept of Inherent Simplicity (TOC), an answer could be: a deep understanding that there is always a simple explanation to any seemingly intractable problem, id est. this leads one to use the intuition to find the core of the problem and develop a solution which both solves the immediate problem and doesn't create additional problems along the way. Following it is necessary to study the cause-and-effect relations from the system in question in order to discover such Inherent Simplicity..."

The access to the Internet and television by all citizens is becoming essential for the participation in a real time democratic life. See figure 09. [18]



Source: (European Interactive Advertising Association, 2008)

Figure 09: This survey shows an increase of web activities for 25-34 years old users. It seems that feeding the brain information becomes as natural as feeding the body so as to perform physiological functions. The massified information, in great volume, available almost always only to a technological elite, instead of favoring inclusion, reinforces exclusion – and the old humanity dilemma repeats itself: lack of food or information as well as their unbalanced or excessive consumption continue to cause the disarrangement and halting of systems to the same extent. [18].

Is it the onset of a negative impact from the IT's social-technical questions?

Maybe not! It could be the opposite: deals with the positive impact from the social-technical questions, now defined by the Ultimate Consumer. Not withdrawing the importance of TV and other means of mass communication, the consumer market on the Internet estimates the 'value' of products through clicks and, nowadays (**and in the future**), this is what matters. The supplier who relates with such public square is able to estimate the impact of its product analyzing the number of clicks. Real mensuration. See Figure 10. [18,20]

The Intelligence is in the Connections

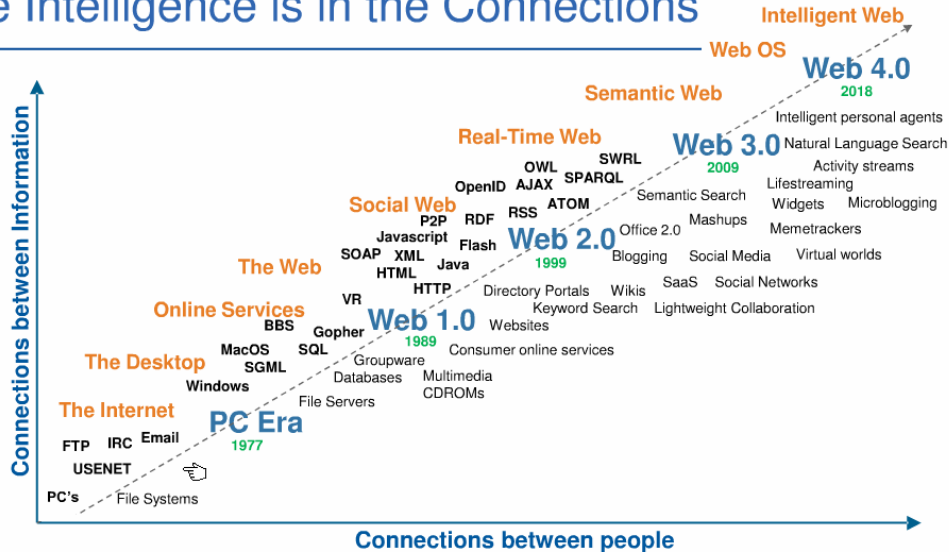


Figure 10: Web Developments Trends: Everything started with the Web 1.0, with its static sites, I mean, without an internet graphic interface. **Web 1.0** was the *not-for-profit information age*. **Web 2.0** can be seen as a result of technological refinements, such as broadband, improved browsers, and the rise of Flash application platforms. Has generally been regarded as the social Web (see figure 04). **Web 3.0** refers to a supposed third generation of Internet-based services, see figure 11. [18,20]. **AND IN THE FUTURE?** See figure 11.

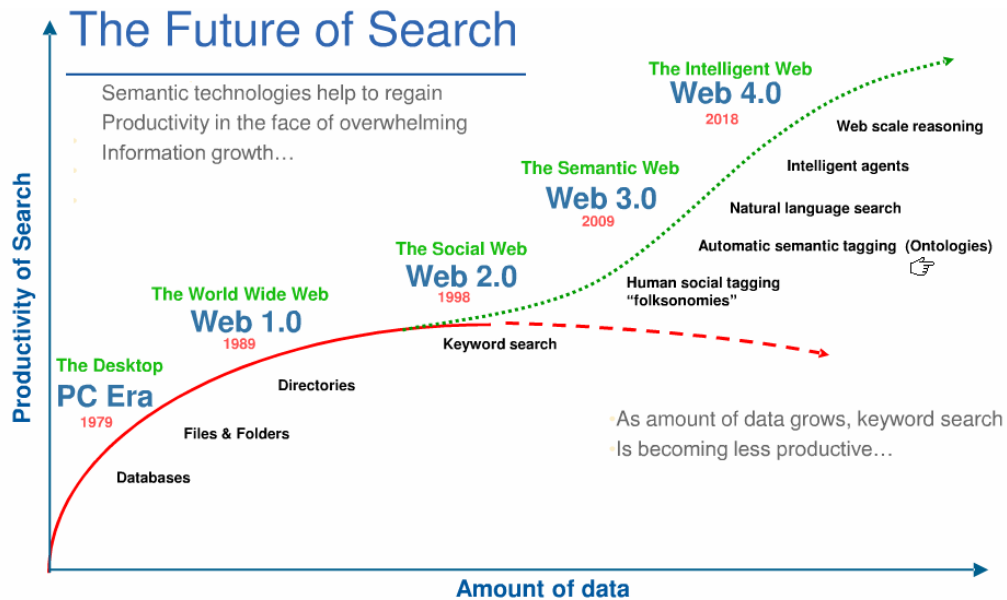


Figure 11: As mentioned in figure 10, Web 3.0 refers to a supposed third generation of Internet-based services. Web 4.0 must predict the management and the intelligent use of all available knowledge in the net with media convergence and a more intuitive search mechanisms. Based on previous demands from the Internet users as well in

about the study of their behavior in the web, the sites would start to deduce their next intentions... [18,20]. AND IN THE FUTURE?

III. THE FUTURE.

Therefore, for countries in development, such as Brazil, to transform their condition, it is necessary, **NOW**, to advance their **R&D** and local **Collaborative Ecosystem** research efforts.

This R&D and local collaborative ecosystem (*ecosystem refers to a combined components of an environment*) research efforts must consider the principle of the Systemic View (*thinking globally but acting locally*), and it may be accomplished by the integration among one of these interdependent subjects: ecology, biology, communication, organizations, economy, education, communities, technology, culture and the human being (*human, social, psychological, intellectual and mental ecology: social-technical systems*). **How to elaborate/build a new way of development, which comprises the social, economical, cultural and environmental spheres, and that leads us to a new model of perception and knowledge of the world – a perfect social-technical system?** Maybe an answer to such questioning “perfect social-technical system” is the following: many ways are elaborated each moment. Maybe there is no definitive way, as definitive only the Eternal. Here we are able to return to the TOC, from physicist Eliyahu Goldratt, who applied the exact sciences principles to human organizations and demonstrated, amongst other things, that technology is necessary, but not sufficient. The personal factors, especially those linked to individual performance mensuration, generally exert a very strong influence in any context, which frequently frustrate any initiative for change. **BUT, stressing: IF such new system had already been developed, AND ACCEPTED, would the present financial crisis have occurred?** This demonstrates that the run for money cannot be sustained for a long period and this was already common knowledge, as shown by the famous "chain schemes", where with the simple ‘investment’ of US\$ 1,0 a citizen would receive several times more what had been invested without having to do anything. Note that although the basis of the capitalist principle (*if I invest US\$ 1,0 million, be it in stocks, be it in a new enterprise, I expect, without having in fact to actively work, have the higher compensation of such amount*), this is a crime. The present crisis, which has been announcing itself for a few years, is a symptom of a new Social-technical System (**or symptom of a gigantic Information System?**), which is not, yet, well defined for a great parcel of the population, connected to the paradigms of the 19th century economy. Today’s crisis is the result of a catastrophic failure, primarily in the financial system but also of our economic and political systems; is the result of the reductionist, atomistic thinking that had long dominated humanity’s approach to problem-solving [21]. The challenge now is the systemic thinking - to design a society (regulator) that actually measures and focuses on systemic risks, rather than on the individual parts of the system id est., systems thinking focuses on the performance of a system as a whole [22]. This is in contrast to an approach that breaks systems into parts and focuses on the performance of the individual parts, on the assumption that if each individual part is improved then the sum of the parts will also be better. This assumption often proves wrong in practice: the only profession that he believed had truly embraced systems thinking is architecture, where the design process starts by asking what sort of building is desired, and then works backwards to focus on what individual parts are required. An architect never starts by saying, **“Here are the parts, what can I build from them?”**

Yet, the present economic model cohabits with the principle of shortage, of centralized production, of hierarchical relations, of private property. The model of the future has its

sustentation in the non scarce goods, in collaborative production, in network relationships, in common or collective property and in ascent of the intangible goods. The final question concerned with the goal of this letter **Is Globalization at Risk with the 2008 Financial Crisis?, an answer is yes, id est., the need of a gigantic Information System as state before! Why?** The crisis has increased calls for a new “Bretton” to better regulate the global economy. World leaders, however, will be challenged to renovate the IMF (**International Monetary Fund**, special UN agency that was founded in 1944 to stabilize exchange rates and to facilitate international commerce) and devise a globally transparent and effective set of rules that apply to differing capitalisms and levels of financial institutional development. Failure to construct a new all-embracing architecture could lead countries to seek security through competitive monetary policies and new investment barriers, increasing the potential for market segmentation. Again, the sociotechnical concern of IT. [23,24].

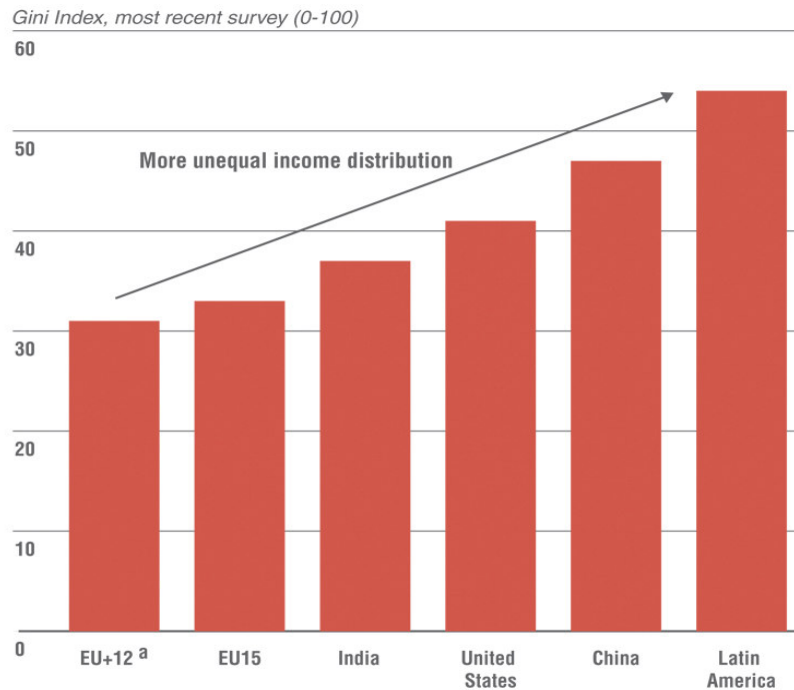
About Brazil [25], inserted in the world-wide context, the wide scale changes occurring in the environment business has compelled the enterprises to radically modify their organizational structures and productive processes: sociotechnical concerns. The main factors of these changes are: the products globalization, the wide scale of electronic processes use, the nature of the job (*shifting from industry to the services sector*) and the emergent markets as China, India and Brazil. Therefore, for the Brazilian enterprise, now and in the future, gets and keeps position in the world-wide market, it is vital to look forward the content proposed here. But, a question remain to be answered: **“will management in IT, and the emergency of global partnerships allow Brazilian enterprises to compete more effectively in the global marketplace, or will they be undermined by greater global competition in their “home territory”?** Indeed, is there such a thing as **“home territory”?**” Here it is important to remember what Winston Churchill said [26]: *“We shape our buildings; thereafter they shape us.” Therefore, the collaborative work space and sociotechnical environment of tomorrow are being shaped today!*

Who is willing to take responsibility for the space shaped?

How can we define many of the ethical and social dimensions that arise with connectivity and information privacy (sociotechnical concern), with an unfair shared leadership, information partnership and a collaborative relationship in this age of knowledge?

Could we change the 2025 global trend as shown by figure 12? [24].

Regional Income Inequality: European Inequality Lower Than Most



^aEuropean Union Nations that acceded in 2004 or later.
 Source: UNDP, Human Development Report 2007/2008: World Bank.

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Figure 12: Income distribution. A Transformed World. [24].

Finally, it is important to draw the attention to new ways of organizations arising in the past few years and which provoked a reorganization of the social sectors. An important class of such new organizations is the so called Learning Community, promoting Education and the Social Asset with the development of individual qualities at people networks dynamized by the electronic networks (figure 09), leading possibly to new ways of acquaintance and relationship, aiming essentially at the transformation of knowledge, of circumstances, of institutions, of concepts, of the Arts, of the Sciences and values from the human being. However, the great challenge of the 21st century shall be to change the system of values behind the global economy, so as to make it compatible to the demands of human dignity and to the ecological sustainability in a system where the IT of information changes parameters every 24 months and lowering the income inequality, figure 12 .

Therefore, we must consider all technological possibilities available, not inventing the wheel, but, yes, improving bearing.

IV - PERSPECTIVES.

Our world is fundamentally a sociotechnical world, id est. a world deeply characterized by human and technological interactions: human organizations are living systems and should be analysed accordingly. Their interactions drastically affect people relationships in space and time. [22]

Therefore, if we consider that the core knowledge is embodied in people's heads (tacit knowledge, [25]), and their abilities to utilize them generating new knowledge, we cannot speak about knowledge society without taking into account these interactions. Since the Internet brings together the computer, media, and the distributed intelligence of the family and the community, constituting a new basis for the effectiveness of socio-technical organizations then, in this way, beyond the economic, organizational, cultural, and technological dimensions, the specific sociotechnical context characterizes every knowledge society initiatives: synergism and ubiquitously driven by the Internet!

However, management opposition persists because sociotechnical system by nature enables collaborative decision-making and shared leadership. Management has been reluctant to give up the power and authority they have worked so hard to establish. Indeed, sociotechnical system challenges the traditional management taboos that of sharing information and knowledge with subordinates on a need to know basis only [25]. The central corner stone of a technocratic bureaucracy is that decision-making is top-down and implementation is bottom up. Amazingly, many postmodern organizational leaders still believe information is best kept in the minds of senior management who have been trained how to use it, make decisions, and implement policy. In this mechanistic model, managers pretend to know and employees pretend to cooperate.

This this new scope is changing all our mentality about and, this letter, in its section II "Challenges and Reflections", tried to awake such feelings towards this new era of knowledge but, news questions remain to be answered: **who or what will be driving innovations in this new era? Which is the impact of the sociotechnical system in such innovations process?**

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B) - Ethical and Social Issues in Information Systems

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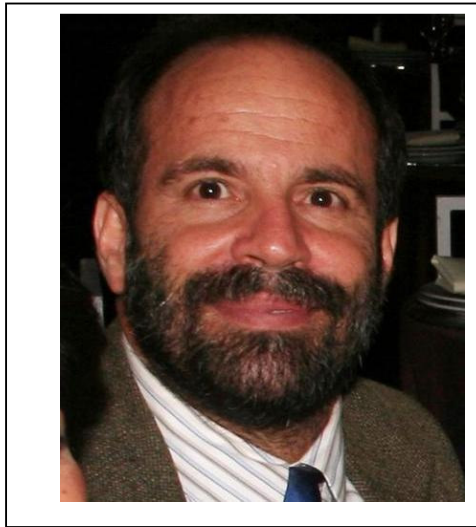
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