

THE NETWORK CENTRIC AND CLOUD - A NEW PARADIGM FOR THE OPTIMIZATION OF THE TECHNICAL AND HUMAN INFORMATION SYSTEMS

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Abstract

The paper presents an analyze of the complex factors that influence the development of both the communications and information systems and the knowledge based society, in order to optimize this complicate process.

After the analyze of specific “loop” links between the two technical and human information systems, from an step by step quality optimization algorithm, a new paradigm for approaching the process optimization has been identified.

The base of this new proposed paradigm consist of the “Network Centric and Cloud” generalized concepts, extracted from the recent evolutions of the communications and information systems, but with a crucial importance in the future of both analyzed systems.

Keywords: network centric, cloud computing, knowledge based society, communications and information systems, green technology, biotechnology, synchronized processes.

JEL classification: D81, D82, D83, D85

1. Why technical and human?

The development of Information Society towards Knowledge Based Society (KBS) is a complex and complicate process, because of the large diversity of factors that are driving this development and in the same time are linking the technical and the human parts of the process.

Most of these factors could be seen as parts of the inherent closed loop-links between the human creation (as part of the “human information system”) and the Communications and Information Systems (CIS) – as “technical” infrastructures, products and services.

As a consequence, if we want to optimize any of the two “systems” (technical/human) it is necessary for the analysis to include the other too, but the most important is that we have first to identify the mentioned links and then to determine their specific influence.

Probably the analysis would not be so complicated if these factors were independent, but unfortunately that is not the case.

As a first approximation, we assume the factors to be independent because the “loop” could compensate the possible errors, as this is the positive role of the loop.

The next step is then to determine and evaluate the “weight” or the level of influence of the main (relevant) factors, but we have again to face a difficult problem: how to measure the levels?

This way we just arrived to the core of the analysis and we have to decide (as the human kind did many times), if we reached an end or we have to find a new beginning.

Many times, when it appeared to be no solution, the solution was inside us, but we could not see it because of our old way to see things.

So, this could be again the case and *this philosophy will probably be more and more useful, as the humanity will have to face a growing wave of new, complicate and difficult crucial problems.*

The solution is thus to change the way of thinking, in our case to try not to measure (what it seems to be more and more “unmeasurable”), but to find a new vision that could bring us not the exact but the best estimate of the result we aim (the optimization), by *improving the whole without measuring the parts.*

This kind of vision could be a new paradigm about the (part) of the factors of the process. In order to get the answer, first we must have a short overview of the most important factors that influence the development of the KBS and CIS.

2. What moves ahead the KBS and CIS?

Of course it is very difficult to get an exhaustive answer and we hardly can approach a part of this complicate picture, taking into account that the humankind is asking nearly every day “where is ahead?” [3].

So (again) lets rethink our goal: which are, in the “picture”, the most prominent moves (waves), their causes and (if it is possible) their sequential (long term) effects.

Without even knowing, with precision, for some cases, which are causes and which are effects (because of the “loop”), we see the next waves in the present picture of CIS and KBS.

The market of course is, in the appearance, the main driving factor of CIS, but the diversity and dynamic of products and services rise some questions around the components of the core that lies behind the market:

- human needs;
- financial interests;
- political goals;
- social evolutions etc.

It is obvious that the list could be longer, but in the same time we have the evidence that these (inside) factors are not (each other) independent (as we have mentioned above) and more, they could be listed besides the market, as main factors.

It could be a surprise that an exit from this situation could be to add, above these factors, one that influences them all (without being independent of them!): the education or the “knowledge”.

Anyway, the knowledge, as a very dynamic factor (changing everyday), is driving all the evolutions, either in the CIS or the KBS.

As a matter of fact, the knowledge covers all technical fields (including CIS) and all other non-technical human activities, but the point of this paper is that we must consider that the information and eventually the associated knowledge has, through CIS, the most important impact on KBS, due to the diversity and the penetration force of the CIS products and services (the Internet and the WEB being the best examples).

Thus we have just identified the main link, among those we mentioned above, that are linking the technical and the human parts of the process.

The next step is to analyze the concrete technical and human trends that could leverage, on medium and long term, the information and knowledge impact in order to optimize the two systems (CIS and KBS).

A short list of the main technologies and trends should include:

- a. Network Centric;
- b. Cloud Computing (infrastructure, hardware and software as a service);
- c. Green technology;
- d. Biotechnology;

- e. Smartphones;
- f. Virtualization;
- g. Superconductors;
- h. Cognitive and context aware systems;
- i. Man-machine direct communications;

- j. Home working;
- k. eHealth;
- l. eLearning;
- m. eGovernment;
- n. Social networking etc.

If one should dare to speak “a little” about each issue from the list, it will take hours or tens of pages, because they contain in fact most of the human creation, with the common feature, given by CIS, to be very “small” or to concentrate “a lot”.

But the point is to observe that they are not independent (or complete different) and on the other hand all have in common (still to a different extent) the power to disseminate knowledge and finally to improve human efficiency (life), with *the condition to be developed in harmony!*

What could mean **harmony**?

Perhaps *harmonised development* is what the humankind needs most, now after we have already conquered the Earth and the Moon.

Why do we need harmony?

First because *harmony* in this context means optimization, that is *exactly what our paper is pointing*, but generally is what the actual state of science ask for any process. And what a process is KBS!

Before going further with optimization, it is very important to mention (as an essential starting point for optimization) that we have “conquered” the Earth and the Moon in a similar way the conquistadors have conquered new territories, without deeply understanding their habitants and their history, but on the other hand *without knowing how much remained to be conquered!* Just *imagine how much could be beyond the Moon!* What about the Earth? We have to imagine that it is still a long way till we will understand all the “history” of millions of years created on Earth, so *we need to optimize* our “remained” way to the *complete knowledge*.

On the other hand, there is also another important reason for harmony, as we have to agree that what we have reached (conquered) is not little thing.

The humankind achieved very much (with an increasing speed every century and decade!) and it is essential to keep it, that is to develop surely and long lasting – but we hardly observe the dangers that our prior “development” brought to the Earth!

More than this, our future development must “repair”, at least partial, the damage we have done to the Earth. That is why “green technology” is in top 3!

All these pertinent observations reveal the necessity and the complexity of the process optimization we are discussing of.

So we can now analyze the above list, from a holistic point of view, without entering in details of each issue. That is way we have chosen to group them in 3 classes.

Mainly the last class (j-n) are the consequences (human) part, while the first 2 are the causes (technological) part (again, we had to consider the lack of independence, by “mainly”).

The first class is differing from the next by the *systemic* power, versus the specific (for each technology) power.

In other words, in the second class we can easily add other prominent or new technology, while in the first the issues are *stronger* (and rarer!).

As a systemic approach, the first class is the most important for development, while the others could be further discussed.

After we have mentioned (even very shortly) the importance of “green technology”, about “biotechnology” must be noticed that the expectations from it are linked with crucial problems of the mankind as health, food and Earth ecosystem. But it is also important that “biotechnology” and all this expectations are depending on other state-of-the-art CIS technologies (and they provide, in turn, results that are learned from nature, useful for new CIS expectations, as bio-computing).

Step by step we have just arrived to the “main ingredients”: the “Network Centric” approach and the “Cloud” concept.

It is important to mention, from the beginning, that both issue are generally considered (as main features), not only as specific technologies with a recent and huge impact on CIS.

What could be the new paradigm that links these two concepts of the CIS and the KBS (seen as a human information system)?

3. How come “Network Centric” and “Cloud” paradigm

Our step by step analyze (as an optimization algorithm) led us to these 2 factors of development, but their importance (top 1-2) and especially their impact on KBS and CIS as a new paradigm, must be explained.

First and shortly, the “Network Centric” (NC) concept evolved in CIS from the physical communications network to the integrated communications and information technology (CIT) network (CITN), where Internet became the best example (but not the only one, as its support could be any IP network, either fixed as ATM or mobile as IMT 2000) [1].

Then, due to the huge proven advantages of such network, the idea was generalized, first (as often happened) in the defence field, as *network centric warfare* (NCW) [2].

With NCW, the NC got the content the new paradigm will also rely on: to use the features of CITN (logic, functionality, *synchronization* and finally the power) in order to leverage the potential of an organization (as group of individuals).

How about that? From where could this multiplication come?
Perhaps the best and shortest explanation starts from the well known axiom: “an informed man acts as two” and could be completed by the fact that *two well connected and synchronized men act as 4!*

So, both CIS and KBS will use the physical CITN, but *the point is to use, in the same time, all the features and advantages of CITN in the similar organization, management and development of those complex systems!*

Among the most important included features of CITN, an essential role in NC will have the synchronization, as CIS and then KBS will face the complicated problem of (maybe too) fast development and operation!

Without entering technological details, we must notice that the faster is the process, the more difficult is to synchronize its components and the more important the consequences of non-synchronism.

Another specific aspect is that for processes involving many people (and KBS is a “very” large set!), generally it is very difficult to “synchronize” (to harmonize) individuals.

So, the most important impact of NC in developing KBS is the unbeatable power to disseminate (refined) knowledge and *leverage the potential of humankind* to use it in a positive general evolution [4].

A second important feature of using NC principles in KBS is that the organization (the world leadership) will be able to better exploit the huge creativity resources of the billions of individuals, so the world will be more and more “network centric” and democratic. A good example is the “explosive” evolution of the social networking “phenomena” (Facebook, Twitter etc.).

What about “Cloud”?

As a technical approach, the “Cloud” concept and “technology” *appears to be only* a considerable trend to increase the efficiency of CIS services, for the user, as a natural evolution of CIS.

That is to concentrate the hard and soft resources in remote centres, as the users (including organizations and individuals) to “buy” exactly the amount of services (not exclusive computing!) they need (services on demand), with crucial advantages as reduce cost (with investment and maintenance – total cost of ownership/TCO), keep the pace with state-of-the-art technologies and generally complying with the “green” trend.

It must be noticed that although “Cloud Computing” seems to be an extensive use of the Internet, it would be a big mistake to consider so only because Internet is (usually, but not always!) the way to access services.

“Cloud” is more, not only by the generalization (in KBS), but even as a technical concept it consists of a huge amount of remote “things” (infrastructure, hardware and software as a service – and services could exceed CIS sphere) and *all the possible links between them and people* (as knowledge, ideas, money, laws, security etc.).

One of the sensible points of the Cloud trend is its increasing dependence of performance (speed and latency) and security on the Internet (“Achile’s heel”).

Here comes one of the essential features of the new paradigm: the link between NC and Cloud provides the necessary support Cloud needs for a secure and reliable development of CIS or KBS (notice that NC does not necessarily mean the Internet, but any physical or formal link between people and “services”).

The importance of Cloud for KBS is more than the technical approach, above mentioned, shows.

For the KBS, the “Cloud” concept will extrapolate the principle of using remote services, but the range of services and the benefits will extend from news to refined knowledge, including home working, e-health, e-learning, e-government, security and also social networking (sharing of experience, expertise or ideas).

As in the NC case, the new paradigm will transfer to CIS and especially to KBS, among other, the efficiency given by the fact that high level services (including all the Information Society services *and the refined knowledge resources*) will become available with low cost and fast delivery, for any type of user, in any location, any time [5].

An essential advantage of the new paradigm consists of the fact that the generalized NC and Cloud concepts have complementary mechanisms, as NC provide for organizations a higher use of the individuals potential and on the other hand Cloud provide a more efficient access of the individuals to the services/resources.

Conclusion

“Network Centric and Cloud” have the premises to become the new paradigm which will provide the main driving factor for the optimal development of the Communications and Information Systems and then of the Knowledge Based Society.

So it deserves to be further analyzed and watched!

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