

Secure collaborative systems and their nature of activities

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Abstract: *The paper wants to reveal the place of collaborative systems in the knowledge based society frameset. Means of achieving collaboration are presented and based on the tools that were used, activities are classified and analyzed in detail. Further visions into the development of collaborative systems are presented and an analysis upon the security aspects and the security evaluation criteria is made to empower the idea to which, security it must be taken into consideration when dealing with collaboration tools.*

Keywords: *communication, collaboration, cooperation, security, information.*

1. Collaborative tools of knowledge based society

Collaboration is an important aspect of today society. Collaboration is the essential mechanism through which efficiency is achieved in almost any non-individual tasks. The way how nature reacts, starting from multi-cellular level up to the complexity of society and of information systems, describes perfectly the importance of collaboration as main tool for getting a higher performance degree.

Collaborative tools are the main aspect of collaborative work. Without them collaboration couldn't have achieved this degree of complexity and efficiency. A collaborative tool is something that helps people collaborate [1]. The term is often used for collaborative software, but collaborative tools were being used before computers existed. A sheet of paper, for example, can be used as a collaborative tool.

Everything that helps to solve a predefined task together in a group more easily is an effective collaborative tool. Collaboration means in this context working together to fulfil a shared, collective, bounded goal. Conference phone calls may be replaced by asynchronous conferencing, video conferences, IRC or Instant Messaging now. Peer Reviews of documentation are easier to establish through wikis than by iterative versions on paper. Whiteboards are partly imitated by Online whiteboards that allow telework. Google Wave is a collaborative tool which opens new possibilities of communication, interacting, sharing, a new and exciting world of collaboration.

An important set of characteristics makes from collaborative tools a nice and efficient way to solve business issues. The characteristics that a collaborative tool should have are:

- see communication as a primary resource in fulfilling tasks;
- sharing objects between the participants of the tool;
- allowing instantly interactions between users;
- having a friendly interface for easiness completion of users' tasks.

One of the most important features of a collaborative tool is perhaps its ability to facilitate communication and interaction between users. The interface of such tools should be easy and intuitive to use, maybe emulating an existing tool or an aspect of the physical world. A user's ability to simply pick up, adapt to, and use a tool considerably diminishes extensive

training and supervision needs. For example, each successive generation of an IM tool builds on the previous one, making it easy for users to figure out how to use it. Incremental changes and version features allow for an evolution of the tools.

But collaboration could also have a negative effect. The reverse of the coin is also here available like in any other new technology and way of thinking. The main drawbacks of collaborations are:

- the difficulty of getting to a consensus, because of the existence of various types of personalities in individuals;
- unclear scope of the collaboration can lead into disagreements between workers;
- the lack of nominating who's in charge and who has what to do, could bring people into circumstances in which they can't decide who, what must do.

Nonetheless, the positive aspects of collaborative tools are highlighted as presented in [2] as a list of the top tools used in collaboration.

The figure 1 represents the main collaboration tools that are still used today, the figures meaning the percent of collaboration achieved from the total number of the events in a particular domain.

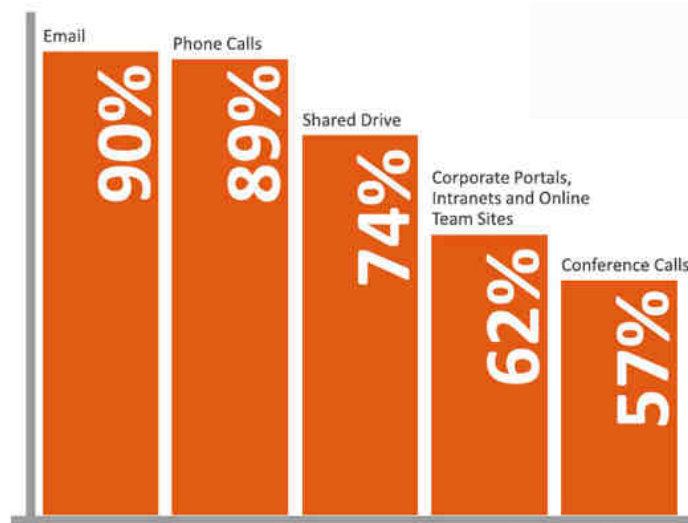


Fig. 1. Top collaboration tools [2]

To encourage input from participants, a collaboration tool should make it clear that input is expected and will elicit a response. For example, it should be clear whether and when it is acceptable to collaborate in this space. Is collaboration expected? Does the tool support taking turns or sharing of “airtime” in this space? An online presentation can be an ideal tool for collaboration, for example, but only if it is clear to the audience that they should be responding to the presentation and interacting with participants instead of passively watching a webcast.

In [3] are presented some of the important new features of today collaborative tools, characteristics that bring new opportunities in the communication between participants, like:

- immediacy – instant messaging is a accessible and universal way of supporting collaboration in multiple ways; usually such kind of applications supports beside changing text messages, audio and video chat support, file transfer and even desktop sharing and assistance;

- enhanced voice communications always is seen as a plus for the collaboration tools that supports it; is efficient to can change information between to users but is more efficient if multiple users can engage in a chat conversation or even a video and audio call conference; these advantages allow people around the world to break the barriers of distance and achieve their organizational or personal goals without almost any problems;
- ambient communications – constructing a virtual world that helps people find each other, get acquainted and react to others opinions is a new level of the collaboration tools; e.g. Twitter network;
- multimedia sharing – an important tool is the file sharing facility which gather millions of users together to share important moments and operate with them as with any other object, like Flickr does;
- document construction – this characteristic is one of the most important, in terms of achieving immediate and efficient results; when people are separated but they are in need of collaborating and completing tasks, working simultaneously on a single document, updating it by different users in the same time gives the opportunity to change ideas like in a real situation and then the efficiency of team collaboration is empowered by this mean, as Google Docs is helping users achieve this;
- social interaction – another way of achieving collaboration is by facilitating people to know each other, see what they have in common and what they don't, in this way giving possibilities for new interactions; LinkedIn and Facebook;
- geographic richness – geographical and mapping tools allow users to share place experiences and create a spatial connection between them; Google Earth is an application which allow users to share their world wide experience without difficulties.

A new set of features are presented in [3] that will set a new path for collaborative tools as they are solving the users' goals. These will further allow new types of interactions between users and create a particular framework for completing different tasks.

2. Types of activities for collaborative systems

Out in the Web 2.0 [4] many types of collaborative systems have been developed for all kinds of purposes. Despite de fact that are multiple purposes for which a collaborative system can be developed, there are multiple collaborative systems developed for one or multiple purposes, which makes all these world be a truly adventures, offering all kinds of possibilities. As presented in [5] the main types of activities identified for collaborative systems are:

- informative purpose – these types of collaborative systems aim to gather and store information under a common aegis, helping people share their knowledge, hence, these systems must offer among other characteristics, the intrinsic characteristics of information: (i)accuracy, (ii)relevancy and (iii)updated; e.g. Wikipedia;
- negotiating purposes – such collaborative systems play a vital role in the negotiation process and therefore (i)the fault tolerance and (ii)non time consuming characteristics must persist; e.g. BidRivals negotiation system;
- the collaboration aspect is presented here as a group that is working towards a single goal but at an individual level different tasks are assigned in order to accomplish the common goal; such an approach must rely on a complex (i)document and (ii)process management system; e.g. Office SharePoint server;

- the cooperation captures the aspects of a collaborative system used by a group of people who are trying to achieve the same goal, therefore having a common objective plus, using and sharing the same resources and working simultaneously and collectively like brainstorming activities; the characteristics which must emphasis in such systems are (i)atomicity and a (ii)boundless framework together with a (iii)low level of interference; e.g. Google Wave an open system which has a strong and well defined atomic structure in the presence of waves and a framework that allow users to add external components and expand the functionalities of the entire system without trails of interfering between these atomic structures, in other words a low level of redundancy.

Collaborative systems used for FIPO, for informative purpose only, are systems that allow participants to share information in an organized manner. A system is used for all users to post comments relating various topics.

The main characteristics for such systems are different if other purposes were aimed. Since the quality of information is at great deal in such systems, they must always preserve the information characteristics like (i) relevance, (ii) completeness, (iii) accuracy and beside those, the followings:

- completeness – these systems need to have huge databases filled with different types of data and they must cover as much as possible in relation to the specific subject domains for which these are employed;
- accessibility – is a general term used to describe the degree to which a collaborative system is accessible by as many people as possible, with as less of assistance or none, preferable;

Collaborative systems used for negotiation are as important as other kinds of collaborative systems. Negotiation is described as an interpersonal decision-making process by which two or more people agree how to allocate scarce resources. If the collaboration for this purpose isn't efficient, the end results may not comply with the expected ones that determined the need for collaboration.

The characteristics that must exist in these kinds of collaboration tools of which main activity is the negotiation purpose are:

- fault tolerance – an important characteristic which allow participants to have an undisrupted negotiation process no matter of the events that are happening in the system, behind the scene; this characteristic is described also as the capacity of a system to face major problems and breakdowns with minimum losses;
- non time consuming – the way through which resources are handled with regards to the time factor; these applications must respond fast to participants' actions and the time is a crucial decision point for the end results of the negation process.

We could say that collaboration is the main purpose of collaborative systems, but other systems are making from collaboration just a mean to achieve their other goals. When we deal with systems to which, collaboration is their primary and uniquely activity, then other characteristics must be taken into account, such as:

- usability – describes the extent to which a collaborative system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context without any kind of impediments;
- document creation – the power of managing multiple users who are editing multiple documents in asynchronous or synchronous mode.

Cooperation as activity of a collaborative tool is puts accent on different things, as the final goal of cooperation we could say that is to make participants feel more involved in their activities, because of the multiple dependences found between their work and of others.

Cooperation is different from collaboration in terms of users engaging. If collaboration means achieving the same goal by users' work individual interaction, cooperation refers to the capacity of users to collaborate and work together on the same atomic objective.

Under these four generic categories of activities that a collaborative tool might vote for, a series of atomic activities, more specific, for different sorts of needs are presented in figure 2.

The evaluation and classification of different collaborative tools was made upon the following criteria:

- forums capabilities like: search engine, RSS feed, rating, if the threads can be organized based on different aspects or stickies;
- content management facilities like: sharing photos and videos, article posting capabilities, links and RSS, collaborative editing features or static pages;
- user interactions like: profiles, real names, user history, the role in the community, private messages, friends, chat or groups;
- user experience in options like: intuitive interface, visual appeal, visible dialogues, non-commercial, simple installation/setup, server hosting provider or open source.



Fig. 2. Evaluation of different collaborative tools [6]

For every feature that a collaborative tool has, a number of points were given and the first place was assigned to the collaborative tool called Ning.

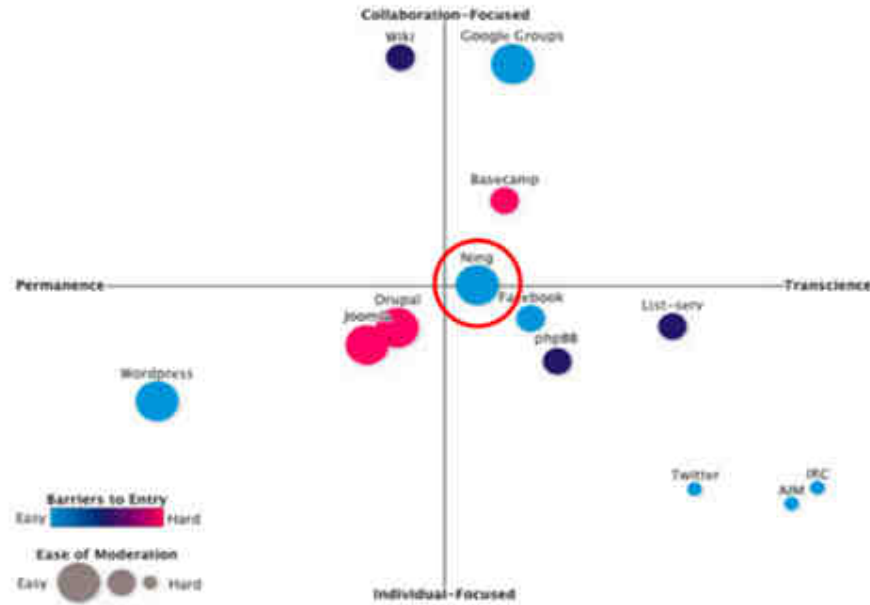


Fig. 3. Semantic differential map [6]

Based on the values obtained previously, a semantic differential map was created to emphasize better the characteristics of the collaborative tools analyzed from several perspectives for revealing which is the best combination of factors that can help a collaborative tool to perform better when it is design for workshop activity.

The axis of the figure 3 describes how collaborative tools are spread around the following characteristics:

- permanence;
- transience;
- collaboration focused tools;
- individual focused tools.

It can be seen that the most popular collaboration tools which scored better are also situated somewhere in the middle, containing a balanced proportion of each characteristic analyzed.

3. Evolution trend of collaborative area

Interdisciplinary approaches are the future in what e-science will be and the future in which collaboration will plays its part. Scientific conjunctures tend to attract more opportunities for enriching the complex world of interdisciplinary research and collaboration will be a part of what this future might look like.

Swarm concept [7], being related to social networks, it encompasses social characteristics like the liberty of acting as we want to, without being restricted by some predefined rules as it is in social networks. Swarm concept is trying to unite people, like social network does, but, in the same time, is not trying to lead their behaviour to one direction or another, it gives the liberty that those directions to be chosen by people, letting them, *together*, define the behaviour that a swarm group will have.

As it was the case of an important organization called Migros, founded in Switzerland, in the beginning, they have tried to offer peoples the most basic things, because for the basic

stuff all the people are going. The third principle presented in [7] which says “*Concentrate on the swarm, not on making money*” may be partially right because we concentrate on the swarm exactly for the desire of making money, so in the end it’s all about money, thinking from a pecuniary perspective.

Lots of examples are found out on the market, which are taking advantage on behalf of this principle. There is even a saying “*Our client, our master*” which is very close to the concept of swarming and this is what the Migros did, and today, a large part of the Swiss population are members of the Migros cooperative – around 2 million of Switzerland’s total population of 7.2 million. They let people do what is in their interest, which is exactly the solution for making money and the principle of a good collaborative exercise.

The swarming concept will spread more, as human, as social beings, will be more aware of the fact that the power of a group of individuals is higher than the sum of powers of each one of them taken separately, the so called synergism. The collaborative aspects of each activity that we pursue will further increase.

In our research or professional activity more are the things that we don’t consider taking into account than the ones we do – like methods, existing theories or assumptions that could help improve our results – and fortunately or not they come along without noticing them by pure intuition, common sense or just luckily circumstances.

In a world where everything, almost, is debated, a place for something new and worthy to be created had became the Holy Grail of Science. In the research activity we found ourselves to be more and more involved in different theories that we came across and sometimes those theories could change totally the whole our research is going, leading us to a new perspective, which could be almost totally divergent than the first one with which we started.

The question that is triggered relates to the association between our daily activity research and the theory taxonomy: Are there any suggestions that our research should follow the recipe of a theory? If so, which are the ingredients and which is the appropriate type of theory that can be applied for, from the ones mentioned in [8].

For example, taking the notions such as action research (AR), design science (DS) and participatory design (PD) and analyzing them implications in collaborative area. Yet there are many publications in the field and different research aspects and results come to unite all what have been written since their beginnings, still is plenty room for more interactions and collaboration could bring lots of useful contributions in this perspective.

When it comes about DS, collaboration could alter the final designed artefact in terms of performance and efficiency, by the simple fact that, both, DS and collaboration, are working with technological artefacts, [9], that could improve interaction between humans, as users, and the systems used for the business process, eventually leading, through repeated steps, to an improvement of the work of the participants.

4. Security evaluation criteria

Security is the safeguard of collaborative systems in terms of how we can have trustful and reliable collaborative tools which can stimulate participants to be involved more and use them in as many situations as possible without worries about the security issues that may arise and can’t be handle it.

Security in Information Technology is equal with at least the existence of the triangle CIA. In contrast with these three cornerstones of security is another model, called the six atomic elements of information [10], which comes with another set of characteristics.

The CIA triangle stands for confidentiality, integrity and availability, important aspects that collaborative tools must provide in order to catch users' attention.

Confidentiality is the term used to prevent the disclosure of information to unauthorized individuals or systems. In information security, integrity means that data cannot be modified without authorization. For any information system to serve its purpose, the information must be also available when it is needed.

Criteria are the standards against which security evaluation is undertaken. They define several degrees of rigour for the testing and the levels of assurance that each confers. They also define the formal requirements needed for a product to meet each assurance level.

Security evaluation is a depth analysis of the security features of IT systems to provide a level of confidence in them, showing that they are working well and are reliable, without any vulnerability which can be exploited.

Together, security evaluation criteria, stands for the standards that are applied against an IT system, particularly a collaborative system, for getting the assurance that is it safe and reliable for a certain level of security, prior determined based on the types of activities known to take place and the risks to which is exposed.

In [10] some of the important references in the security field are mentioned, that might help protecting the collaborative tools as protected as it can be.

The most important standards for security evaluation criteria were and one of them still are the following:

- TCSEC – orange book, comes from Trusted Computer System Evaluation Criteria published and used by the US Department of Defence;
- CESG3 – a UK government used standard and proposal of the Department of Trade and Industry;
- DTIEC – green book, used for commercial IT security products;
- ZSIEC – the German Information Security Agency;
- SCSSI – the blue-white-red book, developed in France.

It is very important that these standards defined in the aforementioned documents cover all the important aspects, security related, for not finding ourselves confronting security issues that were not yet documented.

Two main aspects should be taken into account when evaluating security:

- functional aspects;
- assurance requirements.

As threats are increasing in number and complexity of such collaborative systems and not only is also increasing, Common Criteria were built by multinational boards to establish an effective way of determining the level of security of a Target of Evaluation or ToE.



Fig. 4. Security dimensions of Common Criteria [11]

In [11] are presented three main dimensions used by the Common Criteria for the evaluation of security aspects:

- capacity to provide opportunity for users to specify their security requirements;

- an implementation guidance for the developers;
- the evaluation strategy for the laboratories to justify if the requirements are fulfilled.

Figure 5 depicts a complete set of elements needed for achieving a level of security worthy to be mentioned for a collaborative tool.

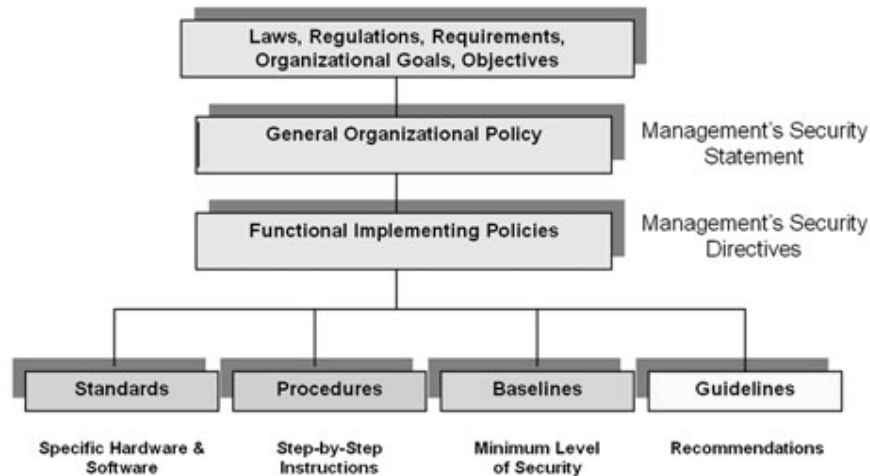


Fig. 5. Security policy diagram [10]

From the functionality perspective criteria, security features are viewed at three levels:

- security objectives – for which purpose is the functionality wanted;
- security enforcing functions – what functionality it is provided;
- security mechanism – which tools can provide the functionality mentioned.

The evaluation process also requires a method for trying to establish which is the level of confidence that a security feature has.

The assurance requirement is formed by two major components: the assurance of effectiveness and the assurance of correctness.

5. Conclusions

The collaborative systems are meant to improve our style of working as multimedia came and improved our way of relaxing and enjoying the free time. Also collaborative systems could interfere with our work extern related activities, as we spent more of our time in different virtual social network communities, trying to embed our personality like we are doing in the daily life.

As we can see, collaborative systems have invaded our personal and public space with no means of retrieving. So, the deficiencies with which they may come will also represent deficiency for us. In this context security is wanted to be a way of protecting ourselves as we protect our collaborative system with which we are working.

The bound between collaboration and human being was formed earlier when people become evolving, reaching the point where this link amplified itself, enclosing almost all the information systems that we work with.

Acknowledgements

This article is a result of the project „Doctoral Programme and PhD Students in the education research and innovation triangle”. This project is co funded by European Social Fund through The Sectorial Operational Program for Human Resources Development 2007-2013, coordinated by The Bucharest Academy of Economic Studies (project no. 7832, “Doctoral Programme and PhD Students in the education research and innovation triangle, DOCECI”).

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