Dear JTC 1/SC Chairmen,

Attached you find an SWG report on a possible new area of standardization activity: Web Collaboration. At its June 2013 meeting SWG-P adopted this report, recognizing that it might still be too early to start standardization work right away. Instead we would like to get some feedback from the SC Chairmen on this report. In section 11 of the report SWG on Planning has identified a number of possible standardization areas/opportunities. SWG on Planning kindly asks you to have a look at the report, especially section 11, and to give us feedback on the questions below.

1. Does web collaboration intersect with your current work programme? Where?
2. Which of your standards/activities are most relevant, if any?
3. What specific areas do these standards/activities cover?
4. Have you future plans for work on issues relating to web collaboration in your SC or in your group?
5. What opportunities for cooperation do you see for exploitation of web collaboration-related standardization in your area of work?
6. Does your SC/group wish to make any additional comment to SWG on Planning?

Thanks for your feedback by 2013-10-15 which will help us to determine how to proceed with the topic area.

Best regards

Cord Wischhöfer
Secretary JTC 1/SWG on Planning
DIN German Institute for Standardization
Tel.: +49 30 2601-2535
E-Mail: cord.wischhoefer@din.de

Date of document: 2013-08-14
Source: SWG on Planning
Expected action: COMM
Action due date: 2013-10-15
Email of secretary: cord.wischhoefer@din.de
Committee URL: http://isotc.iso.org/livelink/livelink/open/jtc1swg3
A standardization Initiative for Web Collaboration

Report on
Web Collaboration

On behalf of ISO/IEC JTC1 SWG on Planning

August 2013

Editor: Dr. Hongguang ZHANG
Shanghai Advanced Research Institute
Chinese Academy of Sciences
August 1st 2013
1 Background

The collaboration is a pure social science problem. Collaboration in the social science originally studies work practice and reveals how people engage in complex problem-solving. With the development of computers, Computer-Supported Cooperative Work (CSCW) appears. CSCW provides the enabling technologies of computer hardware, software, services and techniques for collaboration. With the improvement of web technology and closer internet adoption in society, the original CSCW, designed within groups or organizations to influence the people’s work, has been extended to Web Collaboration. It is not only the case that the way of collaboration has changed from Computer-based to Web-based, but also it leads many new features.

Web collaboration is related with both the field of social sciences and information technology. The section of social sciences provides theoretical guidance for web collaboration. In social science, web collaboration is the process of working together to achieve a goal. After the combination of information technology, it refers to a recursive process where more people or enterprises work together to realize shared goals with the help of Web technology, for example by sharing knowledge, learning and building consensus through web, such as video conferencing, blogs, Wikipedia and e-learning. Consequently, differences between web collaboration and normal collaboration is a newly emerging way of sharing and co-authoring computer files through the use of web, whereby documents are uploaded to a central "cloud" for storage.

Web collaboration and its related technical fields are shown in Fig1. Web collaboration has been affected by both the social sciences and the technical sciences. Web collaboration technologies can be classified into collaboration at same time and same place, collaboration at same time and different place, collaboration at different time and same place, collaboration at different time and different place, and multi-synchronous – has become an increasingly important and rapidly evolving subject.

Because of the facts that leadership is required by most web collaborations and the structure of such kind of leadership is a decentralized and egalitarian group, teams that work collaboratively through web can obtain greater recognition and reward when facing competition for finite resources, for example, IBM Rational is used for working cycle management between the different enterprises. Some examples of such kind of web collaboration tools including e-mail, videoconferencing, collaborative document sharing, project management tools and others. The continuing development of Web technologies, such as Wikipedia, blogs, multiplayer games, online communities, and Twitter, among others, has changed the manner in which people communicate and collaborate.

Currently, the web collaboration meets some challenges, such as: internet-based reliable transport, the theory and practice of ethnography for web collaboration, and collaborative information visualization.
2 Scope

This document intends to provide an overall review on the specified topics of the Web Collaboration in terms of exploring standardization opportunities. The SWG-Planning will make the report based on this review results.

This report deals with:
- reviewing definition, classification, ecosystem and key feature of the Web Collaboration;
- reviewing the related technologies for Web Collaboration;
- reviewing the development issues for Web Collaboration;
- reviewing the business perspectives of Web Collaboration;
- analyzing standardization activities of Web Collaboration in relevant SDOs;
- proposing prospective standardization areas and topics toward ISO/IEC JTC 1;
- suggesting the recommendations to ISO/IEC JTC 1.

3 References

This document refers to the following standards, specifications, articles and papers:
[1] Social networking service,
   http://en.wikipedia.org/wiki/Social_networking_service


[19] "The NIST Definition of Cloud Computing". National Institute of Standards and
4 Terms and definitions

4.1 Terms defined elsewhere

Computer Supported Cooperative Work (CSCW) - CSCW [10] is a design-oriented academic field that is interdisciplinary in nature and brings together economists, organizational theorists, educators, social psychologists, sociologists, anthropologists and computer scientists, among others. The expertise of researchers in various and combined disciplines helps researchers identify venues for possible development. Despite the variety of disciplines, CSCW is an identifiable research field focusing on understanding characteristics of interdependent group work with the objective of designing adequate computer-based technology to support such cooperative work.

Cloud Computing - It is a metaphor used by Technology or IT Services companies for the delivery of computing requirements as a service to a homogeneous community of end-recipients.

Cloud computing [19] is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models.

Service-Oriented Architecture (SOA) [21] – It is a set of principles and methodologies for designing and developing software in the form of interoperable services. These services are well-defined business functionalities that are built as software components (discrete pieces of code and/or data structures) that can be reused for different purposes. SOA design principles are used during the phases of systems development and integration.

4.2 Terms defined in this report

Web Collaboration - Web collaboration is collaboration between cooperated people through web technology. The web collaboration is interdisciplinary field combining social science and information science. The section of social sciences provides theoretical guidance for web collaboration. The aim of web collaboration is working together to achieve a goal. It is a recursive process where two or more people or organizations work together to realize shared goals. This is more than the intersection of common goals seen in co-operative ventures, but a deep, collective, determination to
reach an identical objective. For example, an intriguing endeavor that is creative in nature—by sharing knowledge, learning and building consensus.

Collaboration Awareness—Collaboration awareness is awareness between cooperated colleagues. In an organization an important prerequisite of smoothly operating cooperation is an awareness of what one's colleagues are doing. This can help in knowing for example when it is appropriate to disturb someone and ask for help, whether a colleague's current tasks are something on which you happen to have expertise and can offer help and gaining an overall sense of the state of progress of a large number of activities including the strategic changes in the nature of the organization. All of these awareness features work best in close physical proximity and may involve considerable 'face work' including substantial social interaction in order to achieve the desired quality of interaction.

5 Abbreviations, acronyms and conventions

CSCW - Computer Supported Cooperative Work
SOA - A service-oriented architecture
REST - Representational State Transfer
CSCL - Computer Supported Cooperative Learning
VR - Virtual Reality
W3C - Word Wide Web Consortium
ITU - International Telecommunication Union
IETF - Internet Engineering Task Force
EIA - Electronic Industries Association
OSLC - Open Services for Lifecycle Collaboration

6 Introduction to web collaboration

6.1 Definition of web collaboration

The term web collaboration is a generic term, which combines the understanding of the way human and machine work in groups with the enabling technologies of computer networking, and associated hardware, software, services and techniques. The improvement in web technology has provided the world with high speed Internet, wireless connection, and web-based collaboration tools like blogs, and Wikipedia, and has as such created a "mass collaboration." People from all over the world are efficiently able to communicate and share ideas through the Internet, or even conferences, without any geographical barriers.

The web collaboration is a new manner of collaboration, in which the organization of work becomes decentralized, centered on individual interests and dynamic. Instead of organization-centered scenarios, “tree organizations” and non-flattening organizations, people involved in a work as an organization are able to customize presence and operation to suit individual needs, represents themselves as unique individuals and select and control the medium and manner in which they access and
participate in the working environment. The ‘new organization’ must be tackled as a series of virtual communities interacting for achieving a set of well-defined shared objectives and goals. Some examples of the web collaboration illustrating the definition above are easily seen in the real world. For instance, Google Wave is a web-based computing platform and communication protocol designed to merge key features of communications media such as email, instant messaging, Wikipedia, and social networking. Wave, described by Google as “equal parts conversation and document”, are hosted XML documents that seamless and low latency concurrent modifications. Any participant of a wave can reply anywhere within the message, edit any part of the wave, and participants at any point in the process. The ability to modify a wave at any location lets users create collaborative documents, edited in a manner akin to Wikipedia.

From a technical point, web collaboration is composed of data bus, work flow and rule engine. Web collaboration is a software architecture model used for designing and implementing the interaction and communication between mutually interacting software applications. Each software tool is composed by work flow. Rules engine determine the direction of the workflow. Bus is used for distributed computing and combines a variety of tools into web collaboration. Web collaboration and its related technology are shown in Fig2.

6.2 Classification of web collaboration

One useful way of classifying the various kinds of web collaboration systems is by determining the place and time of the collaborative interactions that are being supported. Collaboration may be between people in the same place or different places (Co-located or remote). Collaboration may also occur at the same time or separated in time (Synchronous or Asynchronous), as shown in Fig1.

6.2.1 Same time/same place

The model of “Same time/same place” is for “Face to Face interaction” task. It includes:
- Shared tables: Shared Tables was formed as a forum for people to exchange information and ideas in a relaxed, friendly environment.
- Wall displays: The display wall is used to place posters.
- Digital whiteboards
- Electronic meeting systems
- Single display groupware: Single Display Groupware is a model for supporting collaborative work between people that are physically close to each other.
- Roomware: Roomware [11] is a set of interactive and clustered applications running in a defined space. This defined space can be a room, a building, a public space, a city block or a combination of all. The interaction can take place via sensors, responsive devices, screens and projectors.

6.2.2 Same time/different place

The model of “Same time/different place” is for “Remote interaction” task. It includes:
- Electronic meeting systems
- Real-time groupware
- Messaging (instant messaging, email, chat: qq, msn)
- Video conferencing (for example: Video conferencing system of Cisco, Huawei, Sony) [13]
- Shared Drawing: Related to collaborative writing, shared drawing is collaborative design, where two or more people gather round a table or a drawing board, pencils in hand and participate in the design process. The bulk of work on web collaboration in this context has been to support synchronous remote shared drawing as part of design. It is important that the systems support the kind of fluid interactions that occur in this extremely creative activity and help people overcome the constraints of remoteness.

6.2.3 Different time/same place

The model of “Different time/same place” is for continuous task. It includes:
- Team rooms
- Large displays
- Warroom: A warroom is any place that is used to provide centralized command for some purpose.
- Post-it: A Post-it note is a piece of stationery with a re-adhered strip of adhesive on the back, designed for temporarily attaching notes to documents and other surfaces.
6.2.4 Different time/different place

The model of “Different time/different place” is for different communication and coordination task. It includes:

- Blogs
- E-mail
- Electronic meeting systems
- ELearning (for example: open course of MIT. Students are free to exchange ideas, and to co-design an experiment or a design)
- sharing of documents and knowledge

- Workflow: Workflow systems are computerized systems that support the way that many offices processes work by passing it through a number of people who deal with different aspects of it. An example would be how a bank processes a loan application.

- Version control:
  Version control also known as version control and source control (and an aspect of software configuration management), is the management of changes to documents, computer programs, large web sites, and other collections of information. Changes are usually identified by a number or letter code, termed the "revision number", "revision level", or simply "revision".

- Writing collaboration:
  Writing collaboration (for example: Wikipedia) [12]: There are inevitable biases of interest that arise from one's own work experience. Thus it should come as no surprise that a group of academics who frequently work together to co-author papers should investigate technologies to support collaborative writing. The co-authoring of documents is clearly a major activity amongst researchers, at least in the sciences, but there are many occurrences of this phenomenon in commerce as well.

6.2.5 Multi-synchronous

There is a collaborative mode called multi-synchronous that can combine all above situations (Same time/same place, Same time/different place, Different time/same place, Different time/different place).

For example:

- Google Wave is used for personal communication and collaboration.
- Lotus Live: Lotus Live Meetings, Instant Messaging of IBM-commerce: (for example: SMEs look for customers in Alibaba.)
- Collaboration of TV stations between transmission pipelines and business platform.
- Project management tools (for example: IBM Rational is used for working cycle management between the different enterprises.)
Web-based open collaborative design, manufacturing and service platform. AP StreamWork is an enterprise collaboration tool from SAP AG released in March 2010. StreamWork allows real-time collaboration like Google Wave, but focuses on business activities such as analyzing data, planning meetings, and making decisions.

Computer-aided design based on network collaboration: Product is designed by the person (user) and enterprise (marketing staff, designers) in a collaborative computer network platform, which convert the original serial design process into parallel design, improve the speed and relevance of the product design, reduce product development risks and costs, improve the market competitiveness of enterprise.

Flexible development platform for the information system: Flexible development platform is based on web collaboration. Flexible development platform combines software tools (for example: MATLAB) with the system. The data flow and control flow interact between software tools and systems through the web collaborative.

### 6.3 Ecosystem for web collaboration

In the web collaboration and its associated communities, there is an ecosystem with collaboration users, collaboration contents, collaboration Joiners, collaboration collectors, collaboration enterprises, and collaboration infrastructures that support the service provisioning.

- **Collaboration Users:** They are representative of the web collaboration services with software and a variety of services from different websites. The web collaboration users are the elements of the service links and domain for individual-centered web collaboration service as well as plays role of the members within the online community services.

- **Collaboration Contents:** In a broader sense, collaboration contents include web-based and software technologies used to turn communication into interactive dialogue. In web collaboration services, it is collection of the activities of the web collaboration users including share ideas, activities notifications, events, and interests within their individual networks.

- **Collaboration Joiners:** Members those who have established various web collaboration Platform.

- **Collaboration Collectors:** Joiners those who collect contents for web collaboration Platform.

- **Collaboration infrastructures**
  - Smart phones - Mobile phone built on a mobile computing platform to enable user access to the web collaboration services.
  - PCs – Computer with processing power and software applications to be operated by end users to support web collaboration systems.
  - Clouds - Delivery of computing and storage capacity as a service to a community of end-user to store web collaboration contents.
6.4 A key feature of web collaboration

Various web collaboration share a variety of technical features that allows individuals (end-users) to utilize services and platforms for solving problems, helping each other and information exchanges.

Typical features:

- **Awareness**: Provide applications to share interests and information. Individuals working together need to be able to gain some level of shared knowledge about each other's activities.

- **Articulation work**: Cooperating individuals must somehow be able to partition work into units, divide work among them, and, after the work is performed, reintegrate it.

- **Appropriation** (or tailorability): How an individual or group adapts a technology to their own particular situation; the technology may be appropriated in a manner completely unintended by the designers.

These concepts have largely been derived through the analysis of systems designed by researchers in the web collaboration community, or through studies of existing systems (for example, Wikipedia). Web collaboration researchers that design and build systems try to address core concepts in novel ways. However, the complexity of the domain makes it difficult to produce conclusive results; the success of web collaboration systems is often so contingent on the peculiarities of the social context that it is hard to generalize. Consequently, web collaboration systems that are based on the design of successful ones may fail to be appropriated in other seemingly similar contexts for a variety of reasons that are nearly impossible to identify a priori. Web collaboration researcher calls this "divide between what we know we must support socially and what we can support technically" the socio-technical gap and describes web collaboration's main research agenda to be "exploring, understanding, and hopefully ameliorating" this gap.

7 Related technologies for Web Collaboration

7.1 Web service

Web service is a concept that takes the network as a platform for information sharing, interoperability, user-centered design, and collaboration on the World Wide Web. A Web site allows users to interact and collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites where users (consumers) are limited to the passive viewing of content that was created for them. Examples of Web service include social networking sites, blogs, Wikipedia, video sharing sites, hosted services, web applications.

To tackle the demand for support to building web collaboration applications, one approach has been the provision of reusable components and infrastructures.
the need by web collaboration applications to use multiple kinds of information to adapt their services according to users' and groups' needs, web collaboration applications take advantage of the benefits provided by Web Services, allowing the interchange of multiple kinds of information between applications and infrastructures in heterogeneous environments. Web Service can store, retrieve and exchange multiple kinds of information via the Web for web collaboration applications.

7.2 Cloud computing

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a web. The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation.

Web collaboration combining with cloud computing can be called cloud collaboration. Cloud collaboration is a way of sharing and co-authoring computer files through the use of cloud computing, whereby documents are uploaded to a central "cloud" for storage, where they can then be accessed by others. New cloud collaboration technologies have allowed users to upload, comment and collaborate on documents and even amend the document itself, evolving the document within the cloud. Businesses in the last few years have increasingly been switching to use of cloud collaboration.

7.3 Service oriented architecture

Service-oriented architecture (SOA) is a set of principles and methodologies for designing and developing software in the form of interoperable services. These services are well-defined business functionalities that are built as software components (discrete pieces of code and/or data structures) that can be reused for different purposes. SOA design principles are used during the phases of systems development and integration.

As the web cooperative work becomes more and more large and complex, flexibility turns into a great challenge for design of web cooperative systems. SOA based applications are built by combining network-available services, which have the features of flexibility, reusability and scalability. Consequently, there has recently been an increase in the use of SOA to build web cooperative systems, which typically includes BizTalk, CoFrame and so on. In SOA based web cooperative systems, basic function blocks and platforms are packaged and published as services, which communicate with each other using a loosely coupled interaction mode.

7.4 Data exchange

Data exchange [7] is the process of taking data structured under a source schema and actually transforming it into data structured under a target schema,
so that the target data is an accurate representation of the source data.

REST (Representational State Transfer), is an architectural data exchanging model oriented to web cooperative systems. Its services implementation uses XML and HTTP standards for data exchange. It doesn’t have SOAP extra abstractions what facilitates services implementation and deployment. This is contributing to a fast spread and adoption by many web sites. REST depends on microformats for service related information management. Microformats provide information structure for REST transfers. RSS and Atom are the most representative microformats, XML standards primary used for web subscription and publishing. Other microformats types are FOAF (for machine-readable modeling of homepage-like content and social networks), iCalendar (calendar data interchange) and vCard (personal data interchange).

7.5 Information security

Information security [8] means protecting information and information systems from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction. Internet-based reliable Information transport is the biggest challenge for Collaboration between different humans and enterprises.

The security of web cooperative system is a new application area of the security of information, while the most important goal of the research of information security in web cooperative system is to guide and constrain the design and implementation of information security in the web cooperative system via building the security web cooperative architecture. Based on the basic theory security architecture of information system and characteristics of web cooperative system, the security architecture model of web cooperative system consists of security function structure, security system structure, security technology structure and the relationship constraining them.

7.6 Collaboration awareness

In an organization an important prerequisite of smoothly operating cooperation is an awareness of what one's colleagues are doing. This can help in knowing for example when it is appropriate to disturb someone and ask for help, whether a colleague's current tasks are something on which you happen to have expertise and can offer help and gaining an overall sense of the state of progress of a large number of activities including the strategic changes in the nature of the organization. All of these awareness features work best in close physical proximity and may involve considerable 'face work' including substantial social interaction in order to achieve the desired quality of interaction.

Even being on a different floor in the same office can reduce the degree of awareness and consequently the effectiveness of collaborative working. Clearly remote teams, those split between offices in different locations will lack some of these traditional awareness options. Awareness work in web cooperative system attempts to address this problem by the use of advanced technologies including the use of sound,
video and active badges. It will come as no surprise to discover that as well as raising great potential for including peripheral members into a group, these awareness technologies raise many important issues of privacy, an issue explored in former section.

The difficulties of remote video for supporting informal communications are eye contact and people moving out of camera range. The psychological distance between remotely connected users was greater than between co-present ones. So collaboration awareness emphasizes the importance of human factors in systems design. Note that physical proximity is not just a factor in maintaining collaborations, but in initiating them. It can afford the kind of casual social interactions that can lead to the discovery of mutual interests and the beginning of formal collaborative working. Physical proximity can greatly help this, but other ways of intellectual matchmaking are possible.

7.7 Collaborative modeling

Throughout the history of software engineering, the problems of the ever increasing complexity of software systems, intensified utilization in safety-critical domains, and the need for shorter time-to-market significantly influenced the methods for the development of software systems. Raising the level of abstraction and providing environments that allow large teams to collaboratively work together proved to be successful approaches to address these issues. During the last years, the level of abstraction has been moving from source code to models that describe software systems on a higher level. As stated by Lin et al. [16], models are elevated to first class artifacts. This is reflected in many approaches currently used in industrial practice. The subjects of Model Driven Engineering are well-defined models. But similar to source code, models are subject to a continuing evolution and therefore need to be managed by software configuration management systems.

The management of evolving models is an ambitious challenge, because often large models are developed concurrently by modelers in large teams that may be geographically distributed. There is a huge demand for both effective and intensive communication in order to get growing software complexity, team sizes, and geographical distribution of the developers under control. Close collaboration plays a key role in today’s and tomorrow’s software development and has to be well supported by tools. Currently, there are several products as the Microsoft Team Foundation Server [17] or the IBM Jazz Platform [15] that provide collaboration platforms for software development to meet this emerging demand. These products are focused on code-centric development. They take more effort to support the collaborative development of models by an integrated collaborative platform.
7.8 Data Synchronization

Data synchronization is the process of establishing consistency among data from a source to a target data storage and vice versa and the continuous harmonization of the data over time. It is fundamental to web collaboration.

There are four types of data synchronization: file synchronization, version control, distributed file systems, and mirroring.

- File synchronization is commonly used for home backups on external hard drives or updating for transport on USB flash drives. The automatic process prevents copying already identical files, thus can save considerable time relative to a manual copy, also being faster and less error prone.
- Version control tools are intended to deal with situations where more than one user attempts to simultaneously modify the same file, while file synchronizers are optimized for situations where only one copy of the file will be edited at a time. For this reason, although version control tools can be used for file synchronization, dedicated programs require less overhead.
- Distributed file systems may also be seen as ensuring multiple versions of a file are synchronized. This normally requires that the devices storing the files are always connected, but some distributed file systems like Coda allow disconnected operation followed by reconciliation. The merging facilities of a distributed file system are typically more limited than those of a version control system because most file systems do not keep a version graph.
- Mirroring: A mirror is an exact copy of a data set. On the Internet, a mirror site is an exact copy of another Internet site. Mirror sites are most commonly used to provide multiple sources of the same information, and are of particular value as a way of providing reliable access to large downloads.

7.9 Concurrent Computing

Concurrent computing is a form of computing in which programs are designed as collections of interacting computational processes that may be executed in parallel. It is a useful tool for web collaboration. There are several models of concurrent computing, which can be used to understand and analyze concurrent systems. These models including:

- Actor model
  - Object-capability model for security
- Petri nets
- Process calculi such as
  - Ambient calculus
  - Calculus of Communicating Systems (CCS)
  - Communicating Sequential Processes (CSP)
  - $\pi$-calculus
7.10 Work flow

A workflow consists of a sequence of concatenated (connected) steps. Emphasis is on the flow paradigm, where each step follows the precedent without delay or gap and ends just before the subsequent step may begin. This concept is related to non-overlapping tasks of single resources.

It is a depiction of a sequence of operations, declared as work of a person, a group of persons, an organization of staff, or one or more simple or complex mechanisms. Workflow may be seen as any abstraction of real work. For control purposes, workflow may be a view on real work under a chosen aspect, thus serving as a virtual representation of actual work. The flow being described may refer to a document or product that is being transferred from one step to another.

7.11 Rule Engine

A rule engine is a software system that executes one or more rules in a runtime production environment. The rules might come from regulation. A rule system enables operational decisions to be defined, tested, executed and maintained separately from application code. Rule engine is commonly provided as a component of a rule management system which, among other functions, provides the ability to: register, define, classify, and manage all the rules, verify consistency of rules definitions, define the relationships between different rules, and relate some of these rules to IT applications that are affected or need to enforce one or more of the rules.

8 Development issues for web collaboration

8.1 Ethnography

In a similar way that an aspect of psychology, cognitive psychology, has played a major role within Web Collaboration research, an aspect of sociology, (also drawing from anthropology) ethnography [20] has been especially prominent. The theory and practice of ethnography is complex and subtle and beyond the competence of researchers of web collaboration. Ethnographic techniques have also been coupled with insights and methods from cognitive psychology. To grossly simplify ethnography, it involves the study of how people do their work in the actual setting in which it occurs, attempting to understand that work in its own context and to describe what people actually do, rather than what they 'ought' or are 'meant' to do. The description attempts to explain the activities from the perspective of the participants - how they describe and understand their work rather than how it might be perceived by someone with a different perspective (such as a systems developer).

Some scientists advocate the ethnographic approach to studying web collaboration
and revealing how people collaborate in complex problem-solving. If these complexities are not taken into account in web collaboration systems design, then one has effectively designed a web collaboration system that supports an idealized version of the web collaboration practice and consequently one that fails to mesh with how people actually work.

The ethnography work in web collaboration can help in capturing requirements. This involves determining in detail what people actually do in an organization and consequently how systems can be designed to help that process. Such studies can be contrasted with idealizations of how people work that might be obtained from work practice manuals or by interviewing managers who either have only an overview of how their subordinates achieve their work, or even if they once undertook the tasks themselves are somewhat out of date as the technologies available and the nature of the work constantly change. Even asking a person who does the work may not be sufficient. People are inclined to give overview in terms of an idealization of what they are meant to do rather than what they actually do. For reasons of simplicity they may describe an ideal case in which there are no exceptions. However when observing actual work practice, one is able to see these exceptions and how they are resolved. Indeed it may be that every activity includes at least one exception and the idealization is but a useful fiction to describe activity in general. It should be clear why designing system to support such fictions is a bad idea.

8.2 Collaborative information visualization

Synchronous query formulation can also be realized by interacting in a virtual reality environment where both information and users can be visualized. A VR (Virtual Reality) system provides explicit support for cooperative information retrieval. This is research strongly rooted in the computer science traditions of Web Collaboration and Virtual Reality (VR). As noted in an earlier section, collaboration relies on awareness of the activities of others. When VR is used to support Web Collaboration, awareness can be supported by embodiment; providing appropriate virtual bodies. The constraints of memory, bandwidth and processing power lead to the use of 'blockies' - very simple representations that convey position and spatial orientation using only a few polygons and so are computationally inexpensive. Communication is provided synchronously over a live audio channel and asynchronously through annotations attached to documents.

This is not practical system in its current form, but an exploration of possibilities of radically different interfaces. As such it is a powerful example of the computer science research approach of building in order to learn, discover and refine the problem area. It is also an example of how a consideration of the issues and needs of applications can feed back into general computer science research issues, in this case the design of VR environments. In the study of VR it was noted that relevance decisions and the marking of objects as significant or boring by different users are highly likely to be subjective - not surprising to a librarian, but leading to a reassessment of the functionalities that may need to be provided in VR systems to support many different kinds of activity. The prior
implicit assumption was that a VR environment should provide an objective view of the world. The VR study revealed that there may sometimes be a need for subjectivity in VR applications.

9 Business perspectives of web collaboration

Business perspectives on the Web Collaboration are mainly on its Collaboration purposes by targeting specific group of users by analyzing their activities according to the interests. In form of Web Collaboration tools that are offered as applications or in form of workflows that map a process to an online environment. The objective of these services is to improve the process efficiency by making necessary information as agendas, to do lists and similar accessible from everywhere and through any device. These services offer functions for online collaboration (e.g. time schedule), management of online process flows (e.g. online brainstorming), or provide online applications (e.g. online text processing).

Furthermore, the current trend is selecting tools and services from a variety of vendors to meet their needs. Because of lack of standards, various network collaboration products are not compatible. Web Collaboration today is promoted as a tool for collaboration internally between different departments within a firm, but also externally as a means for sharing documents with end-clients as receiving feedback. This makes cloud computing a very versatile tool for firms with many different applications in a business environment.

Business perspectives of Web Collaboration are as follows:
- Use real-time commenting and messaging features to enhance speed of project delivery
- Leverage presence indicators to identify when others are active on documents owned by another person
- Allow users to set permissions and manage other users' activity profiles
- Allow users to set personal activity feeds and email alert profiles to keep abreast of latest activities per file or user
- Allow users to collaborate and share files with users outside the company firewall
- Comply with company security and compliance framework
- Ensure full auditability of files and documents shared within and outside the organization
- Reduce workarounds for sharing and collaboration on large files

10 Relevant standardization activities

10.1 W3C (Word Wide Web Consortium)

We present a framework for understanding the Web collaboration and the relevant standards (from both within and outside the W3C [3]) in this report.

The extremely rapid growth of the World Wide Web means that it provides an
infrastructure for supporting collaborative interactions at a relatively low cost. This enables researchers to move from technologies that necessarily can only initially be studied in the laboratory to those that as soon as they are developed are available for use worldwide. In order to exploit and study this potential, a number of research groups are developing toolkits and functionalities to exploit the protocols of the web for collaborative working. There are distinct advantages that the web provides including the standards and protocols which enable the use of the web to be free to join, work across different hardware platforms and indeed be extendible by the introduction of newer updated functionalities and standards. The overwhelming advantage which both causes and is caused by the other factors is that so many people already use it, ensuring that it is worthwhile to continue using and adapting it. Thus in developing a web-based collaborative system one knows that already there are a large pool of potential users who will be able to take advantage of your system with relatively little difficulty of installation, and that these groups span organizational boundaries. Just using the web may not be sufficient, however. There are problems with the basic client-server architecture of the web. In particular the protocol (HTTP) is stateless. That is, no information is stored between requests. The consequence is that while the web can support asynchronous collaboration, the synchronous forms are more problematic. There are a range of solutions including the use of cookies and Javascript as well as the development of web applications specifically to address this need.

10.2 ITU (International Telecommunication Union)

The International Telecommunication Union [4], previously the International Telegraph Union, is the specialized agency of the United Nations which is responsible for information and communication technologies. ITU coordinates the shared global use of the radio spectrum, promotes international cooperation in assigning satellite orbits, works to improve telecommunication infrastructure in the developing world and establishes worldwide standards. ITU also organizes worldwide and regional exhibitions and forums, such as ITU TELECOM WORLD, bringing together representatives of government and the telecommunications and ICT industry to exchange ideas, knowledge and technology. The ITU is active in areas including broadband Internet, latest-generation wireless technologies, aeronautical and maritime navigation, radio astronomy, satellite-based meteorology, convergence in fixed-mobile phone, Internet access, data, voice, TV broadcasting, and next-generation networks.

10.3 IETF (Internet Engineering Task Force)

The Internet Engineering Task Force (IETF) develops and promotes Internet standards, cooperating closely with the W3C and ISO/IEC standards bodies and dealing in particular with standards of the TCP/IP and Internet protocol suite. It is an open standards organization, with no formal membership or membership requirements.
Part of communications protocol used in web collaboration is developed by the Internet Engineering Task Force (IETF). Communications protocol is a system of digital message formats and rules for exchanging those messages in or between computing systems and in telecommunications. A protocol may have a formal description. Protocols may include signaling, authentication and error detection and correction capabilities. A protocol definition defines the syntax, semantics, and synchronization of communication; the specified behavior is typically independent of how it is to be implemented. A protocol can therefore be implemented as hardware or software or both.

Internet standard used in web collaboration is developed by the Internet Engineering Task Force (IETF). A specification for which at least two independent and interoperable implementations and successful operational experience has been obtained may be elevated to the Internet Standard level. An Internet Standard is characterized by a high degree of technical maturity and by a generally held belief that the specified protocol or service provides significant benefit to the Internet community. Generally Internet Standards cover interoperability of systems on the Internet through defining protocols, messages formats, schemas, and languages. The most fundamental of the Internet Standards are the ones defining the Internet Protocol. All Internet Standards are given a number in the STD series - The first document in this series, STD 1, describes the remaining documents in the series, and has a list of Proposed Standards. Each RFC is static; if the document is changed, it is submitted again and assigned a new RFC number. If Request for Comments (RFC) becomes an Internet Standard (STD), it is assigned an STD number but retains its RFC number. When an Internet Standard is updated, its number stays the same and it simply refers to a different RFC or set of RFCs. A given Internet Standard, STD n, may be RFCs x and y at a given time, but later the same standard may be updated to be RFC z instead. For example, in 2007 RFC 3700 was an Internet Standard—STD 1—and in May 2008 it was replaced with RFC 5000, so RFC 3700 changed to Historic status, and now STD 1 is RFC 5000. When STD 1 is updated again, it will simply refer to a newer RFC, but it will still be STD 1. Note that not all RFCs are standards-track documents, but all Internet Standards and other standards-track documents are RFCs.

10.4 OSLC (Open Services for Lifecycle Collaboration)

Open Service for Lifecycle Collaboration (OSLC) is an open community, originally proposed in 2008, to define a set of specifications that enable integration of software development and more broadly Application Lifecycle Management (ALM) and Product lifecycle Management (PLM) products and services. The intention is to make life easier for software and product developers and tools vendors, by making it easier for tools to work together.

Lifecycle of web collaboration is developed by Open Service for Lifecycle Collaboration (OSLC). The Systems development life cycle, or Software development process in systems engineering, information systems and software engineering, is a process of creating or altering information systems, and the models and methodologies
that people use to develop these systems. In software engineering, the lifecycle concept underpins many kinds of software development methodologies. These methodologies form the framework for planning and controlling the creation of an information system.

11 JTC 1 perspective standardization areas and issues

Within the ISO/IEC JTC1, the following item is addressed in each SC.

For Web Services which is discussed in section 7.1: main issue of web services is developed in SC 38 (Distributed Application Platform & Services (DAPS): which comprises 3 working groups, WG 1: Web Services.)

For Service Oriented Architecture (SOA) which is discussed in section 7.3: main issue of SOA is developed in SC 38 (Distributed Application Platform & Services (DAPS): which comprises 3 working groups, WG 2: Service Oriented Architecture (SOA))

For Cloud Computing which is discussed in section 7.2: main issue of cloud computing is developed in SC 38 (Distributed Application Platform & Services (DAPS): which comprises 3 working groups, WG 3: Cloud Computing.)

For data exchange which is discussed in section 7.4: main issue of data exchange is federation in different service providers, it is developed in SC06 (Telecommunications and information exchange between systems) and in SC 32 (Data management and interchange).

For Information security which is discussed in section 7.5: main issue of Information security is developed in SC 27 (IT Security techniques).

The following issues are not addressed in ISO/IEC JTC1.

Data synchronization is discussed in section 7.8.
Work flow is discussed in section 7.10.
Rule engine is discussed in section 7.11.