# Introducing CaCM: toward new students collaboration model

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**Abstract**. *With everyday challenges in students' lives, the need for better communication and collaboration between them is becoming more evident. A wide range of available interaction methods limits their usage by students to a certain narrow set of activities. In order to understand current student interaction activities, we conducted an investigation that gave us an insight into the importance of everyday communication and collaboration. In this paper we present these results in order to create a basic set of modules and characteristics that should be included in the Communication and Collaboration Model (CaCM) presented herein. Introducing CaCM is our first step while creating the multifunctional and flexible platform which will be built on this model and used as communication and collaboration tool by students.*

**Keywords.** Student, communication, collaboration, CaCM, model

## 1 Introduction

Communication and collaboration have been subjects to various research in order to, among the other reasons, analyse the effect of collaborative learning [4] and impact of communication on employee productivity [3]. These two important activities require significant interaction skills, and can be powerful motivators for the people around us.

By definition, connectivism [10] says that we learn by networking with people around us, and by sharing knowledge and experiences. In the same manner, students not only learn through regular classes, but also through interaction and discussions with each other. Online interaction takes an important part in that interaction, especially when talking about distance learning which take advantage of available e-learning methods.

Collaboration between students is an essential and integral part of interaction among students, and also an integral part of the general interaction among other people. We could say that the communication and collaboration actually exist as one activity. Benefits of collaboration have been discussed in various papers [7], but the model through which that kind of collaboration could be encouraged was never developed, even though a set of methods are usually used to stimulate students' participation in teamwork. Today, stepping in the digital age, it is becoming more important to understand how to use online technologies as a way of improving collaboration between students to everyone's benefit

Without introduction and conclusion, this paper is divided into four main parts. After introducing the problem, we will focus on communication and collaboration tools and services covered in the research by providing a brief description of each. It provides the reader with information about the core set of tools and services included in the research. Moreover, a concise presentation of covered tools and services, research analysis and discussion provide valuable information for development of the model. Next part introduces the Communication and Collaboration model (CaCM) and the basic architecture of its core variation, called xCaCM. Subsequently, the last part unveils and describes six important characteristics of the xCaCM platform.

## 2 Communication and collaboration tools and services

Following the introduction of the problem, we will present a set of tools and services that are now available for students to use and we will give a short description of these sites and applications while they are representatives of different categories. These tools and services are also closely related to the communication and collaboration.

### 1 Social network sites

Every site that connects people or organisations could be referred to as social network site [6]. What is important to note is that they promote creation, evaluation of information, which in turn requires communication and collaboration with other

participants in such sites. Our research covers several sites with such characteristics. The most popular are described in following paragraphs.

*Flickr* is basically a photo sharing site with social characteristics which are basically built around that idea. It allows users to upload photos, view photos created by others and comment on them. When it comes about social networking features [8], the site users can mark others as contacts and track their activities. Another photo sharing site is *Zoto*. This site allows the users unlimited upload of their favourite life moments captured in form of a photo. It has the ability to post photos to a user's blog, or send them to their Flickr account.

*Odeo* is a podcast oriented community web site. Its basic feature is that it allows users to record and share podcasts with the rest of internet population. *YouTube* and *Google Video* are in the same core business, sharing video. However, YouTube supports substantial characteristic of social network sites, while Google Video does not. This simple approach of uploading and sharing your videos has proved to be really powerful and changed many peoples lives or careers.

*Last.fm* is a music community site, attracting people who love listening to the music and discussing their favourite songs with a community which shares the same interests. It collects user preferences in music, and stores them in user profile, and that is what lies in the core of its social features.

*Linked In* social network site oriented toward the professional networking as well as *MySpace* and *Facebook* which are oriented to the personal networking. These sites have features of connecting people and groups sharing the same lifestyles or attitudes [2]. They also allow people to communicate, share information, search each other profiles and eventually collaborate in different fields of interest.

## 2  Instant Messaging and VoIP

*Instant messaging* (IM) can be defined as a method of communication built on top of information technology that allows transparent and almost real-time exchange of ideas and opinions between two or more people. It is not unusual that instant messaging is used as a collaboration medium as well, further deepening its effect on people who use it. *Voice Over IP* (VOIP) enables transmission of voice, giving participants a chance to take part in voice conversations over the internet. We include most popular IM and VOIP protocols and tools in our research to determine their level of usage. These protocols and tools are listed and described in this section.

The *XMPP protocol*, previously known as Jabber, is an open-standard based approach to instant messaging. It is based on XML and uses distributed client-server architecture. This architecture enables it to avoid the scaling complexities of centralised solutions [9]. Its open-source nature allows everyone to contribute to its development either by contributing code directly to the core, or by writing extensions and passing it through the XMPP Extension Protocols (XEPs) standard process. For example, Google Talk (GTalk*)* sits on top of XMPP protocol, and Jingle, a family of XMPP extensions that provides the ability to initiate and maintain peer-to-peer sessions. Some of the Jingle extensions provide support for audio-streaming, video-streaming and file-sharing sessions.

*ICQ* is an instant messaging application which uses AOL's proprietary Oscar protocol. The architecture of ICQ is centralised, what makes the user dependant on the services of only one provider. Another weakness is that ICQ has often suffered from security problems, where users would receive spam messages from either other users or ICQ spam-bots. It also fails to provide encryption of the transmitted data, and instead only scrambles it. Although Oscar is a proprietary protocol, by the arts of reverse engineering and some protocol documentation fragments found on the internet, a handful of ICQ-compatible clients have been written, violating the ICQ Terms of Service.

Another proprietary application developed by Microsoft is *MSN*. It requires .Net Messenger Service account for usage. Underneath its interface lives a MSNP (Microsoft Notification Protocol). Even though Microsoft disclosed version 2 of the protocol in an Internet draft, subsequent protocol specifications were never uncovered.

*Skype* is a peer-to-peer VOIP application with the main feature of providing the phone calls over the internet [1]. In addition, it supports instant messaging, file transfer, and video conferencing. It is almost completely central-server free, relying on it only for authentication purposes.

*Meebo* is a web service allowing users to access their IM accounts on-the-go. It currently supports 6 IM networks (AIM, Yahoo!, MSN, GTalk, ICQ, and Jabber). It also offers encrypted access through its https interface. Although security is important, encryption might slow down the exchange of the messages.

## 3  Collaborative editors

Collaborative editors allow participants to transparently and easily take part in creation and modification of various documents. Every editor mentioned here uses operational transformation, a technique for consistency maintenance and group undo, sometimes limited to undoing only up to the earliest local change [12]. The following four tools we included in our research.

*Gobby* is a free software collaborative real-time editor. It supports client-server architecture with fully encrypted connections, and is available on Windows and Unix-like platforms. Aside from editing features,

it also implements MUC (Multi-user chat) as mean of communication for session participants.

*SubEthaEdit* is a collaborative real-time editor designed for Mac platform. Aside from regular collaborative editing over the Internet, it takes advantage of Bonjour and BEEP protocols to provide zero-config collaborative sessions consisting of LAN participants.

*CoWord* is a Microsoft Word extension, transforming it into a real-time multi-user collaborative word processor. In its goal to provide a pleasant experience to the users, it implements collaboration features by following guidelines set by Word, which in turn results in optimal experience. It is powered by GCE (Generic Collaboration Engine).

*AbiWord* is a free software word processor and it is available for all major platforms. The developers' goal is for AbiWord to become a fully cross-platform word processor. It is built with simplicity in mind, and as such it doesn't support all the features found in modern word processors. Other then its cross-platform nature, this tool is also specific because Collaboration plug-in with four separate backends: XMPP, TCP, Telepathy and backend for collaboration through abicollab.net website.

## 4    Web-based office systems

Web office systems are relatively new on the web scene. But it is an undisputed fact that web is changing the way we think about computing, and office tools are following the trend.

For example, *Zoho* offers a wide range of productivity and collaboration applications, including word processor, spreadsheet editor and presentation tool. Another web office system is *Google Docs*. It is provided by Google, as set of office tools which contains a word processor, spreadsheet editor and a basic presentation creator.

It is important to emphasise, that both services mentioned here provide various tools, but all in their Web 2.0 form.

## 5    Virtual worlds

Virtual worlds are a digital reconstruction of elements and rules inspired by the real and various fictional worlds. The basic idea is to create a nice environment for its inhabitants who also can communicate and collaborate. Reconstruction of certain elements and rules inspired by the world around us lead to a creation of virtual worlds. Even though, they are often used for entertainment, they can also be used for the needs of research by analysing various behaviour patterns.

*Guild Wars* and *World of Warcraft* are only two of the popular multi-player online role-playing games, with World of Warcraft being especially popular [5]. Both worlds are set in fictional environments as well

as *Second Life* which is a life simulation in a virtual world. Its residents can engage in some of the activities that can be seen in the real world, like trading, social interaction, exploration, and others. Although there are a number of differences in the way Second Life approaches virtual worlds when others, the most significant difference is that it main inspiration was the real world, with no fictional elements in it.

## 6    Other tools and services

Although we tried to include all important communication and collaboration oriented tools, services and protocols, there are many other left but also could fit in mentioned categories. As we want to point out some important features they have, a few of them will be shortly described in this section.

*Bubbl.us* is a collaborative web site which allows users to participate in brainstorming sessions and to create basis of their future work in form of mind maps. *Thinkature* is a web service/application giving users a virtual workspace on which they can collaborate by means of text, drawings and audio communication. And finally, *NoteMesh* is important in that it provides an integrated platform for students to come together, and create a set of notes for classes. Through collaboration on notes creation, students learn not only the subject they are working on, but also how to effectively collaborate and divide tasks.

## 7    Identity management

An important issue that we have to deal with is identity management. All mentioned tools, services and protocols include the modules which manage the users' identity information.

Out of many frameworks that provide identity management classes and methods, we would like to point out the *OpenID* framework. It is framework which consists of small, interoperable specifications defining a possible way for building user-centric identity infrastructure [9]. Its specifications, and numerous of implementations are build on principles of free software, allowing the community to participate in all aspects of OpenID development. Indeed, being open in this case is very important. Identity is a sensitive subject, and its management on the internet should be handled with extreme care.

# 3    Analysis of results

The importance of research we performed is best seen in acquired knowledge about usage of communication and collaboration technologies among students, their wiliness to share information and accept new interaction methods. In order to get the needed input

data for such research, a survey has been done among 308 students of information sciences at different years of study.

Analysis of collected data has shown that students are spending between 11 and 22 hours weekly on communication and resource exchange with their colleagues, where 65% of the students use specialised services for previously mentioned purposes more than three times a day. Moreover, results have shown that e-mail, instant messaging, blogs and wiki systems are among the most popular services for communication and collaboration. On the other hand, when it comes to collaboration editors, web-based office systems, social bookmarking or audio podcasting situation is much different with only a few students using them. Complete overview of all applications and services included in this research can be seen in Figure 1.
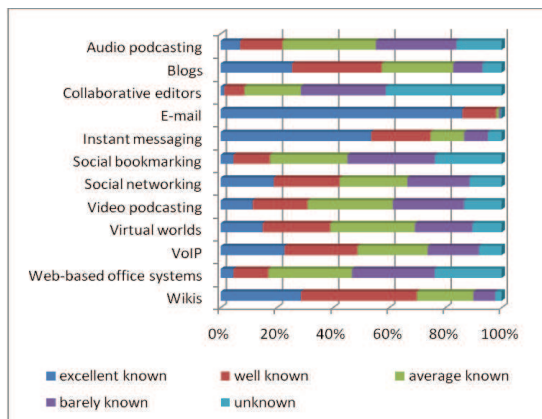


Figure 1. Popularity of communication and collaboration applications and services among students

If we look at the frequency of applications and services usage, it is necessary to notice that e-mail (99%), wiki systems (87%) and instant messaging (85%) are most used, while specialised collaboration tools represent the least used group (14%). Analysis has shown that in most cases, students use mentioned tools and services as passive users. Particularly, almost 70% of the student reads blogs at least once a week, while only 16% of them are writing it, with only 2% doing it on a daily basis. Wiki systems have a much better ratio of active and passive usage where we find 87% of students reading wikis on a regular basis, and 20% of the students are writing them, most commonly (70%) once or twice a week. Skype (96%) is most popular when it comes to tools for synchronous exchange of messages and resources among students, while students are much less familiar (52%) with Meebo, a representative of new-generation service.

When it comes to exchange of multimedia resources, research has shown that students mostly exchange video materials (51%), in most cases (70%)

by using video podcasting service YouTube. Exchange of audio materials is considered less attractive (33%), with 52% using specialised service Last.fm for this purpose. Social bookmarking, as a way of sharing web bookmarks, is used relatively rarely (32%), most often twice a week (80%). Participation in virtual worlds has proved to be the biggest surprise of this research, used at least once a week by 34% of the students. From the pool of Web Office services, a possible replacement for standard desktop office applications allowing simultaneous work on multiple documents, Google Docs (64%) is most popular among the students. Finally, out of the two most popular services for social networking included in this research, students prefer Facebook with 89% of the students participating in that network.

A detailed overview of all groups of communication and collaboration services and tools, included in this research can be seen in figure 2.
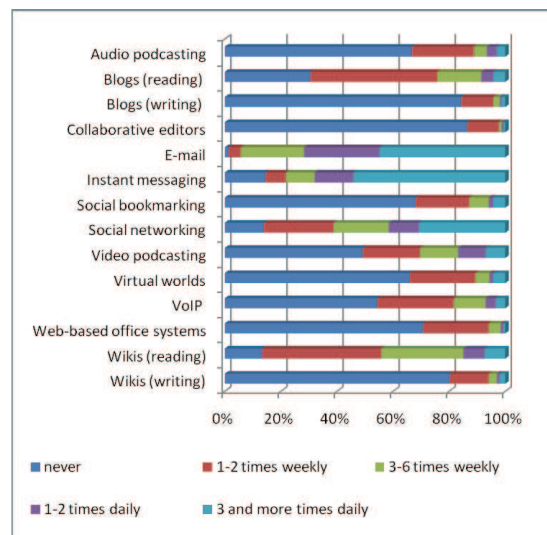


Figure 2. Frequencies of use of communication and collaboration services

Besides the information about popularity and usage frequency, goal of this research has been to determine students' wiliness of knowledge and resources exchange with their colleagues, and in what degree would they be willing to adapt to new models and technologies for that purpose. Over 54% of the students stated that they like to exchange their knowledge and experience with colleagues, while over 30% is willing to share their resources on the web.

Furthermore, 80% of the students think that communication and collaboration are crucial for successful studying, while 60% of them have shown interest for learning about new models and methods of interaction with their colleagues.

Based on collected, processed and analysed data, we were able to successfully determine current

interaction methods among students and their interest. Thanks to the model specifcs and its xCaCM platform architecture, shaped by students' preferences and our experience, it offers students a remarkable resource for quality interaction. Core ideas behind CaCM and architecture of its associated xCaCM platform are presented in the next part.

## 4  CaCM Model

Before presenting a CaCM model, it is important to stress that instead of putting focus on technology, we choose to put focus on people, while technology is used as a way to enhance interaction between them. Another important thing to note is that CaCM is not meant as a replacement for traditional interaction methods, but rather as their complement with the main role of deepening and improving them.

Although interaction between people can be seen as chaotic, where everyone is connected to everyone we can clearly define two ways of interaction: the face-to-face and the face-to-face-through-technology interactions.

This model focuses on improving the face-to-face-through-technology interaction, and indirectly through it even face-to-face interaction. In the core of the model are identity management and communication servers, which act as gateways for communication and collaboration.

For the purposes of xCaCM (platform core variation, built on CaCM ideas), identity management is handled by OpenID provider, while XMPP plays role of the communication server.

As shown in Figure 3, people interface either with desktop applications, in this case XMPP-enabled clients (clients who support authentication procedure through XMPP) or with Web services supporting OpenID (OpenID relying parties). Both the OpenID provider and XMPP server are used for authentication; however they have different use-cases. OpenID provider is used directly if a user wants to authenticate to a web site, while in the case of using a desktop client user authenticates to XMPP server using username and password, which is then passed to OpenID part for verification.
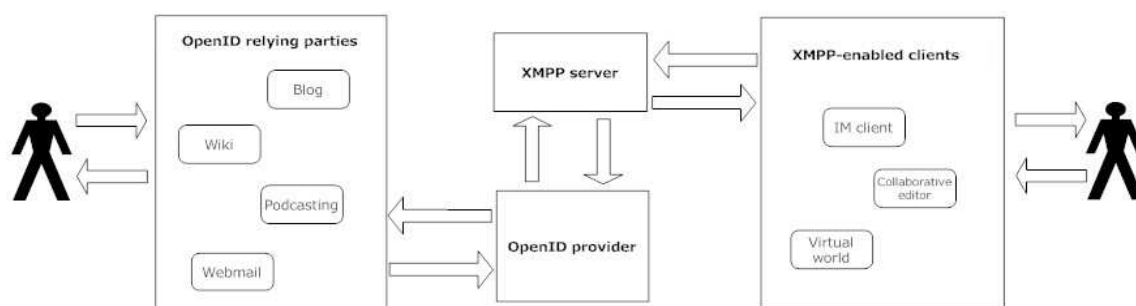


Figure 3. Simplified xCaCM architecture

The core idea behind this model is improving free communication, both formally and informally. It should not restrict students in exchanging thoughts, and should encourage them to express themselves creatively in their preferred way.

## 5  xCaCM Platform Characteristics

The CaCM model was built with special care to allow the xCaCM platform to feature six important characteristics, conveniently referred to as DOMSIC acronym which stands for *distributiveness, openness, modularity, security, interoperability and cross-platform support*. Each of mentioned

characteristics separately might not seem like something innovative or exciting, but combined in a single platform these characteristics form a tailored set of environmental properties forming a supportive atmosphere for interaction, which is new and innovative in many different ways. The idea of using these six characteristics raised from the fact that none of previously mentioned tools, protocols or applications provides functionality for all communication and collaboration features which students might need during their study.

a) Distributiveness

With people all around the world, and platform implementations specific to certain environments, the key to successful opening of global communication

channels lies in distributiveness. There are two aspects of distributiveness we should be looking at: individual xCaCM implementations across the world and a potential situation where xCaCM modules of one platform implementation are distributed over a wide range of institutions keeping those modules on their servers.

Regardless the way the individual xCaCM platforms are implemented, either as distributed modules acting as one environment or multiple xCaCM implementations across the world, they should act as one biosphere, and characteristic of distributiveness should allow them transparent interaction between all users.

### b) Openness

Openness of the entire model and the xCaCM platform must be preserved, allowing everyone access to their specifications and source code.

By opening it, there is a possibility that the wider community will recognise the importance of the ideas behind the CaCM model and its associated platform, and participate in its further extension and modification. Another important aspect of this characteristic is that everyone gets to work together on improving both the model and platform for common or individual needs, thus indirectly improving inter-cultural communication and collaboration.

### c) Modularity

Due to the divergent needs of various institutions and their students, flexibility through modularity is a very important characteristic of this platform. What this means is that the users of the platform can choose modules to include as part of their implementation, while still benefiting from all of the characteristics this platform has to offer.

For example, one user can include or create one set of modules while the other can include and use completely different set of modules. The communication and collaboration between these two users can be accomplished only if there are some access points between their modules. In addition, the modularity is also important to enable the users to create their own plug-ins and to communicate through them with others who might not have them yet.

### d) Security

Since this model is all about communication and collaboration, a lot of personal information will be transmitted over the network through the platform. In order to minimise the possibility of information theft, security has to be at adequate level while not interfering with regular activities. To achieve that kind of security, transparent encryption should be used for all data passing through the network. Additional

security measures are be subject of further discussion and research.

### e) Interoperability

People have tendency to prefer staying with their current habits over acquiring new ones, and this is especially true in the field of communication and collaboration we are discussing. One of the important reasons for such behaviour can be seen in the people we are interacting with will not change their current interaction tools and services just for us, even if we choose to use the xCaCM platform. There is always an option to use the previously used tools and services in parallel with xCaCM, but that leaves us with even more overhead then we started with. To alleviate the "switch shock", tools and services offered by the xCaCM platform, in cases where that is possible and desirable, should include "translation layers" which would allow interaction with people outside the xCaCM biosphere using tools and services not compatible with the technologies used as part of the platform.

### f) Cross-platform support

Every person, regardless of their preferred operating system (OS), should have access to the same set of functionalities offered by tools and services which are part of the xCaCM platform. General recommendation is to support the major three OS platforms: Linux, Windows and MacOS. Depending on the availability of development resources, additional platforms could be supported as well, and the only module that should be written is one that will assure the message translation between users who communicate or collaborate and use xCaCM based tools running on different platforms.

## 6 Conclusion

Communication and collaboration are important part of students' lives, and as such it is important to constantly work on improve those skills. Identifying problems which lead to limited interaction is a first step in defining an acceptable solution. Students agree that even though communication and collaboration are very important part of their studies, they are not using available interaction tools and services to their full potential due to various limitations and barriers they face. Lead by experience and research results showing students current interaction activities, we assembled a CaCM model with hope to overcome most of interaction problems by offering a simple-to-use xCaCM platform with virtually no limitations whatsoever. Acceptance of the CaCM model among students will mostly be connected to the difficulty of migration to the associated platform and acceptance of ideas behind the model. A lot of additional research,

implementations and testing has to be done in order to evaluate the usefulness of the model in realistic conditions. Since this model is first of a kind, there is plenty of material for additional research including detailed analysis of both the technical and sociological side of the model, evaluation of social and technical conditions in places where model could be implemented, determination and discussion on applicable use-cases and other related subjects.

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