Cloud technologies for enhancing communication of IT-professionals

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Abstract. The paper deals with the urgent problem of enabling better communication of IT-specialists in their business and interpersonal interaction using information and communication technologies, including cloud technologies. It is emphasized, that effective communication is an integral part of the successful professional work of IT-professionals, but in recent years it has undergone significant transformations, which have been expressed in new forms and means of communication, its content changes, its complications and volume increases, the need to improve its accuracy, and the level of understanding for a wide range of people. Certain peculiarities of communication in the IT-environment have been discussed. It is noted that typical forms of communication in the IT-environment are synchronous and asynchronous ones. The authors insist that during their professional career IT-specialists communicate in the professional community from a variety of positions and common types of task formulation can be expressed through verbal or symbolic communication means. Due to the specifics of their professional activities, IT-professionals often need to communicate using synchronous communication (chats, video chats, audio chats, instant messaging) and asynchronous communication (email, forums, comments) tools, hence there is a demand to teach corresponding communication skills at universities. Certain practical examples of teaching communication skills using modern technologies are given. Advantages of cloud technologies for better communication within a company or an educational institution are presented. Microsoft Office 365 services, which can be successfully used to enable better communication and collaboration within a company or an educational institution are analyzed.

Keywords: Communication, Synchronous Communication, Asynchronous Communication, Collaboration, IT-professionals, Cloud Technologies.

1 Introduction

Effective communication is an integral part of the successful professional work of IT-professionals [6; 18]. Recently, it has undergone significant transformations, which have been expressed in new forms and means of communication, its content changes, its complications and volume increases, certain needs to improve its accuracy, and the level of understanding for a wide range of people. Moreover, such transformations have long been objectified in the leading countries of the world and reflected in numerous guidelines, for example, in the European Qualifications Framework (EQF), the National Qualifications Framework of individual European countries (Austria, Bulgaria, Holland, Denmark, Spain, etc.), the National Qualifications Framework of Ukraine (NQFU), the Common European Framework of Reference for Languages (CEFR) and Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering, Information Technology and Computer Science. Communication competence in these documents is defined as the dominant characteristic of a specialist, this concept determines the possibility of high-quality multicultural communication without loss of meaningful content of messages and more comfortable and constructive interaction between the subjects of communication. The NQFU includes descriptors of communicative competence which are not presented in the EQF as independent ones. Level 6 descriptors define the communicative competence as the ability to reporting information, ideas, problems, decisions and own experience in a field of professional activity to specialists and non-specialists, the ability to form a communicative strategy effectively. Level 7 descriptors suppose comprehensive and univocal reporting own conclusions, knowledge and definitions which substantiate them to specialists and non-specialists, particularly to learning people, application of foreign languages in their professional activity. Level 8 descriptors presume communication in the dialogue mode with broad scientific community and public in a definite field of scientific and/or professional activity [15]. The analysis of the NQFU and EQF allows us to trace the increase in communication requirements from one level to another in the descriptors of communicative competence. Some NQFU communicative competence descriptors do not reflect the international context, including communication in European languages.

The analysis of the documents mentioned above and a number of other guidelines makes it possible to confirm that the communicative role of IT-professionals becomes extremely important in the time of unification of large multicultural and multiethnic societies, because these specialists can create conditions for more comfortable entry of millions of ordinary people into the world of information and communication technologies. For these obvious reasons, the scientific and pedagogical problem which has a very promising character emerges: enabling better communication of IT-specialists in their business and interpersonal interaction using information and communication technologies, including cloud technologies.

The objectives of the paper are to outline peculiarities of communication in the IT-environment, overview the process of teaching communication skills for future IT-

professionals in the learning process, and analyze the application of cloud technologies for enhancing communication of IT-professionals.

2 Peculiarities of communication in the IT-environment

Communication is an integral part of the successful work of IT-professionals, as they have to communicate with clients, project managers, colleagues and team members verbally and in writing, face-to-face and remotely, with or without information and communication technologies. Different types of interaction between IT-professionals have been discussed in our papers [5; 19; 20; 22]. A typical professional activity of an IT-specialist is working in an international team, which can be formed for a specific project. The main conditions for candidate selection for such a project are not the location of all participants, but the correspondence of qualifications and knowledge of a particular specialist to the project objectives and their level of communication competence.

First and foremost, communication is the transmission of messages. Any information is structured as messages, transmitted, received, processed, and restructured as knowledge. It is a system that works both at the level of direct "human-to-human" communication and in the situation of indirect "human-digital device-human" communication.

Typical forms of communication in the IT-environment are synchronous and asynchronous ones. Synchronous communication includes all audio and video chats, staff meetings within one team and one room. The asynchronous form includes forums, any task and time control systems, chats, mail messages, comments, correspondence, all messages that an IT-specialist has written and someone has commented instantly or in an hour, day or other period of time. The reply to the message can also be delayed in time.

An approximate estimate of communication in the IT-environment shows that almost 90% of communication is indirect, that is, the asynchronous symbolic communication system as opposed to the verbal one is dominant. During their professional career, IT-specialists communicate in the professional community from a variety of positions: contractor-supervisor, contractor-partner, contractor-customer. In addition, the typical types of task formulation that correspond to the types of communication with expression means are:

- verbal communication – staff meetings, communication in the process of flexible software development, which is characterized by short-term iteration tasks and cooperation between multifunctional teams capable of self-organization (agile software development), when the ability to make quick decisions is formed. It should be noted that the verbal setting of tasks is often indirect (calls, online conferences, etc.), since it is typical for IT-professionals to make a team at the time of the project according not to the regional criteria, but to the tasks that are being implemented now;
- symbolic communication – when tasks are received visually through a messenger, a task management system, in the course of correspondence. In the process of such

indirect communication it is very important to be able to clearly define their own tasks, existing problems, to understand the terms of execution, etc.

There are specific levers in the verbal communication system as IT-professionals can see each other. However, taking into account the technology development, Skype, Viber, Telegram may act as the system of verbal communication, however, all these and other chats can be used for non-verbal, that is, symbolic communication. Non-verbal communication may take more time to formulate a message, however, it may be more effective to achieve a specific goal.

As the work of IT-specialists requires precision in understanding the task and its execution, IT-mediated communication is better than verbal communication. In a critical situation, the occurrence of a problem or the detection of an error or a software bug, expression of emotions will be superfluous and hinder quick problem-solving. In the case of indirect communication, an IT-specialist receives a formalized message that is consistent with corporate policy and ethics. That is, a specialist who has found a mistake, cannot write about their own emotions, use slang or profanity. The reply should be based on phrase patterns that allow specialists to describe the tasks or bugs clearly, get similar formalized answers, evaluate, troubleshoot or follow the instructions in the message they receive.

3 Teaching communication skills for future IT-professionals in the learning process

Due to the specifics of their professional activities, IT-specialists often need to communicate using synchronous communication (chats, video chats, audio chats, instant messaging) and asynchronous communication (email, forums, newsgroups, comments) tools. These have their own characteristics that students need to learn.

Using synchronous communication tools, it is possible to conduct project and team activities aimed at completing a software development task or part of it. Students communicate using these means with each other in a project team, which can have a different structure according to the task: for example, a project manager, a programmer, a tester. Simulating processes of their future professional activities, the members of the same project team can be located not only in different rooms or different floors of the office, but also in different cities and countries, they communicate with each other via text messages, video or audio chats.

It is advisable to compare the peculiarities of communication using different synchronous means, to identify obstacles in understanding the essence of messages and to develop skills for their elimination. Thanks to the chat record archiving, specialists can be encouraged to analyze their dialogues after the conversation in order to find and correct grammar, stylistics, vocabulary, punctuation mistakes and more. It is advisable for teachers to take advantage of the following types of pedagogical chats presented by Dafne Gonzalez: a free topic chat with its main purpose in practicing speaking, listening and writing; a collaborative task-oriented chat, which is aimed at solving a specific educational task by its participants; an academic seminar or presentation chat, which is

used to present certain materials (software, research results, methodologies) for purposes other than informing but learning to identify ideas or research on a specific topic based on out-of-chat information; a practice chat aimed at practicing a skill or strategy with other participants and a chat moderator (teacher); an evaluation chat, the purpose of which is to control and evaluate the degree of material comprehension [4].

Integration of chats and instant messaging into the learning process allows teachers to more effectively solve a number of didactic tasks in the classroom: to develop and improve reading, writing, speaking and listening skills; to develop and improve the skills of dialogue speaking; to boost vocabulary (active and passive) with modern words, phrases and terms; to acquaint students with the socio-cultural realities of a language (linguistic etiquette, features of linguistic behaviour, cultural peculiarities, traditions of the language being taught) [17]; to form a strong motivation for students in foreign language activities.

The use of asynchronous communication in the learning process, according to Oksana O. Rohulska allows: to provide subject-subject relations between the student and the teacher, as well as a general atmosphere of cooperation in the process of communication, to create the possibility of immediate correlation of the received information and activity, its emotional content; to identify deficits of skills, gaps in knowledge, as well as the inadequacy of the available motives of the installations formed in the process of activity; to replace inefficient learning models with newer and more effective ones [17].

IT-professionals need to learn how to handle e-mail correspondence, communicate in professional forums and newsgroups, and respond to customer comments about developed software properly. For this purpose, we have developed the methodological recommendations for forming the communicative competence of IT-professionals, we have developed tips for writing business correspondence in English and Ukrainian. These tips can be used when studying the English or Ukrainian language, certain special disciplines to learn how to complete a job request for an employer, a letter to a project manager or a software tester, or a whole letter to clarify a technical task for developing specific software.

Students should be acquainted with the process of commenting on user complaints. To do this, it is recommended to use comments on Google Play which can be analyzed from the point of view of using the correct vocabulary and grammatical forms, and to study response patterns to comments.

In their work, IT-professionals are periodically confronted with complex tasks and some problems that can be found in professional English forums. The materials of these forums can be used in the process of learning a foreign language, the formation of vocabulary and patterns of communication.

Due to the fact that the forum is intended to discuss the topic, this tool is suitable for discussion in the process of foreign language learning. It really develops the language skills of students, activates the use of vocabulary in their speciality. In the course of working with the forum, teachers can create communicative circumstances and bring the acquired clichés into speech, compile different writing formats, form the ability to separate and process information from the text passages and prepare students for conducting discussions.

The teacher chooses a topic for organizing self-study in the forum, for example, "New Inventions in ICT", "Global digitalization: good or bad", "Ethical aspects of artificial intelligence" and others. Then the teacher sets a deadline for students to participate in the discussion of a given topic. The task is to write a response to a discussion that would not be repeated by other students, and to build a competent statement. The criteria for evaluation are clarity, literacy and completeness of the answer, as well as its relevance to the given topic. The essence of self-study is that students have the ability to prepare a response using the Internet, to check the structure and spelling of their statements, and the teacher can correct them or point to materials that will help students write messages or correct mistakes. In the course of the forum, future IT-specialists have a clear ability to write in English, to understand writing, and to use language patterns. After all, students use more sophisticated and complicated designs, which are later transferred to real-life developments.

When communicating in the forum, the psychological barrier is removed, hence students cease to be afraid of a foreign language. Thus, the forum is an asynchronous communication tool that allows participants to conduct a meaningful conversation, breaking the timeframe of the session. When working in the forum, students increase motivation to learn a foreign language, intercultural and interpersonal communication is formed, there is an incentive to use their vocabulary and develop foreign language skills actively.

Social networks, virtual communities and virtual environments can also be used to enhance communication during learning and working processes. Undoubtedly, virtual communities have a huge potential in student learning, because they attract students with ease of use, the ability to choose the pace and the content of learning, the ability to participate in the formation of the learning content, the feedback presence from community members.

The most up-to-date definition of a virtual learning community is the definition of René Wegener and Jan Marco Leimeister, who argues that a virtual learning community is a virtual social space that exists in an information technology platform where people with a common purpose come together to interact with each other to get and/or share knowledge [21]. Danah M. Boyd and Nicole B. Ellison define social networks as web services that allow users to 1) create a public or semi-public profile within a connected system; 2) create a list of people they have contact with; 3) view their lists and other users' lists in the system [3].

Active communication of members in the community, their regular participation in community events, high motivation and shared interests make virtual communities an indispensable tool for learning. For example, Kirsti Ala-Mutka [1] highlights the significant advantages of introducing virtual communities into learning: access to certain knowledge and development of new knowledge, personal growth and development through socialization, and teamwork. According to the author, the typical types of educational activities and their respective educational perspectives in virtual communities are: the access to resources that are created individually and in collaboration (obtaining certain knowledge, understanding them through common materials, discussing by members of a community a certain topic); the use of knowledge and development of new common knowledge (training to obtain and provide advice,

familiarization with different perspectives, development of offerings skills, defense and acceptance of thoughts); observing and following members of the community (learning different ways of being, functioning, reflecting on one's life, personality, knowledge and skills compared to other members of the community); communication and socialization (finding relationships with people, building and maintaining relationships with them) sharing personal contributions (development of creativity on knowledge and expression); participation in collaborative production (learning to work together, review and review through commenting, developing new solutions and problems in a dynamic environment).

Virtual learning communities can operate within global educational projects, within educational institutions, and can be created to bring together people of different age groups from different countries for the purpose of communication, learning, sharing experiences and more.

It can be argued that in the learning of foreign languages, communication, motivation and joint activity are the leading factors for successful mastery of the language. So it is not surprising that there is currently a large number of virtual language learning communities, which are different in style, content and capabilities.

Virtual foreign language learning communities provide communication with native speakers, promote speaking, writing, reading and listening skills, attract participants with modern content and multimedia, and allow participants to work at the pace and in the mode they need. All these features of virtual communities support the process of learning a foreign language, whether within the educational process or when learning a foreign language outside the formal educational process.

Thus, virtual learning communities are effective means of building the communicative competence of IT-professionals, including those who study foreign languages, as they bring together people of different life experience, ages and social backgrounds located in different parts of the world, but united by common motives and interests (mastering a foreign language or improving their professional level). Students, as members of virtual communities, have access to a wide range of resources and distribute self-created materials. Interaction and communication within virtual communities help students develop all the necessary communication skills (reading, speaking, listening, writing) and professional skills, because community members use knowledge and participate in the formation of new knowledge and new products. Successful functioning of virtual communities requires constant increase of interest and motivation of participants, modern content and active interaction of participants.

4 Cloud technologies for enhancing communication of IT-professionals

Basically, all tools of verbal and symbolic communication are moving to cloud technologies. Cloud computing, as it is stated, is the delivery of applications, platforms, data storage, operating systems, and other computing resources over the Internet instead of over on-premise infrastructure [8]. Experts believe cloud computing can improve communication within an organization, a company or an educational institution. Allied

Telecom company specialists [2] give the following benefits of adopting the cloud for a company:

1. improvement of remote working which leads to effective collaboration with everyone in the company;
2. possibility of working from any device (tablets, smartphones or desktops) which "encourages higher quality work, more effective document sharing and better business communications";
3. less outsourcing and more decentralizing (using videoconference platforms);
4. more effective collaboration due to shifts, changes and improvements of the cloud;
5. business globalization.

Lisa Remo outlines the following ways of enabling better communication using cloud technologies: the rise of video conferencing which "can help foster the development of better relationships and more effective meetings and collaboration sessions"; document sharing and collaboration; connecting by way of messaging platforms [16].

The examples of cloud technologies for enhancing better communication in the IT-environment are:

- synchronous communication tools – iMessage, Facebook Messenger, Firebase Cloud Messaging, Google Cloud Messaging, etc.;
- asynchronous communication tools – Office 365, G Suite, Zoho Workplace;
- collaboration tools – ezTalks Cloud Meeting, Yammer, Evernote, Prezi, Office 365.

Let us consider Microsoft Office 365, the line of subscription services, which can be successfully used to enable better communication and collaboration within a company or an educational institution. The main aspects that influence the choice of a particular tool are the specific communication needs, the size of the team, the specifics of the project, as well as the preferences of employees [7]. The line includes OneDrive for Business, SharePoint Online, Microsoft Teams, Yammer, Skype for Business, Outlook Online boards.

OneDrive for Business [10] is the Microsoft cloud service that allows users to store files, share them with others, and get the access to them from any devices. As it is an online repository for an organization or educational establishment, the organization manages user's OneDrive for Business library, and users can share and work on documents with other employees. Site administrators in the organization determine what users can do in the OneDrive library.

SharePoint Online [11] serves as a platform for corporate intranets and portals. It enhances collaboration through dynamic team sites for each project team, department and division. Team members can share files, data, news and resources using personal computers or mobile devices. Pages, lists, and libraries give all users access to required resources stored in Office 365 and other services. Participants can manage files, collect and track data, and keep up to date with news, job announcements, and deadlines. Recommendations and tips to help team members to find the right contacts, sites, and files can also be found easily.

Using the services mentioned above at a university, students can carry out a joint project, manage this project, work on set tasks, discuss arising problems, thus improving their written communication skills.

Microsoft Teams [9] can be used for public or private communication, as well as voice and video conferences. The service is suitable for online meetings, including audio, video, and web conferencing with anyone in the organization or outside it. Participants can get help with meeting planning, it is possible to take notes, open access to the desktop to any team member, download files, and chat. The service is also suitable for meeting broadcasting. Webinars, general meetings, and presentations for up to 10,000 participants from the organization and beyond it can be held. Audio conferencing allows participants to join a meeting from their phones or connect directly with Microsoft Teams. This function is possible even in the absence of the Internet.

The most noticeable function of Microsoft Teams is instant messaging, which is the most common activity in communication within a team of IT-professionals. It allows participants to communicate in group or private chats, join video calls and demonstrate their screens to their partners. Team members can add some emotions to their messages with personalized GIFs, stickers, and likes.

Yammer [13] is a platform for internal social networks, the participants of which are employees of a certain company. The possibilities of Yammer are creation of channels with useful information, development of knowledge bases, message exchange, file sharing, quick search of people inside the company and access to them directly, news sharing, and conducting surveys. In contrast to SharePoint Online, which is a platform for intranets suitable for formal communication within a company, Yammer is aimed at uniting team members, enhancing their informal communication and developing professional environment.

Skype for Business [12] is an application which includes numerous features, including instant messaging, audio and video calls, informing about team member presence. It is possible to record meetings, display the screen contents, and create PowerPoint annotations in real time. Up to 250 people can participate in the meeting. The distinguishing features of Skype for Business are boards, polls, voting, and built-in messaging.

Outlook Online [14] allows team members to send, receive, and organize e-mail messages, schedule and organize meetings using the calendar, prioritize tasks with Microsoft To-Do.

As it can be seen from the descriptions of the services, their application can facilitate personal and public interaction, foster both formal and informal communication, and improve team work activities.

The main features of the services mentioned above which can be used for enhancing better communication within a company or an educational institution are presented in table 1.

All the subscription services mentioned above can be successfully used within a company to enable better collaboration between team members. Moreover, introduction of these services into the learning process at higher education institutions can enhance better communication and collaboration between students and teachers while studying general and professional disciplines, working on the project, developing a software

product etc. The possible disadvantages of cloud technologies for communication are the decrease of personal contact because of prevailed non-verbal interaction, the loss of meaning or simply misunderstanding between interlocutors, the slow choice of better decisions because of large number of different opinions on the topic which is being discussed etc.

Table 1. Features of Microsoft Office 365 services

	File storage	**File sharing**	**Joint work**	**Private communication**	**Public communication**	**Videoconferencing**	**Conducting surveys, polls, voting**
One Drive for Business	+	+	+				
SharePoint Online	+	+	+				
Microsoft Teams	+	+	+	+	+	+	+
Yammer	+	+		+	+		+
Skype for Business				+	+	+	+
Outlook		+		+	+	+	

5 Conclusions

Cloud technologies are definitely recent innovations which can significantly improve communication and collaboration within a company or a team. Numerous cloud developments can foster better relationships within a team, they change the way people communicate, making it possible to hold meetings and sessions, share documents and files, and connect using messaging platforms. Introduction of cloud technologies into the learning process at universities can enhance better communication and collaboration between students and teachers while studying general and professional disciplines, working on the project, and developing a software product. The prospects for future research can be the following ones: development of the methodology of cloud computing application for improving communication of IT-professionals at higher educational institutions and experimental examination of the methodology effectiveness.

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