

Constantine the Philosopher University in Nitra  
Faculty of Natural Sciences  
Department of Computer Science

and

University of Hradec Králové  
Faculty of Science  
Department of Informatics

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# Communication in Education: ICT Tools Assessment

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**Nataliia Morze, Rusudan Makhachashvili**

*Borys Grinchenko Kiyv University, 18/2 Vorovskogo Str, Ukraine  
{n.morze, r.makhachashvili}@kubg.edu.ua*

**Eugenia Smyrnova-Trybulska**

*The Faculty of Ethnology and Sciences of Education in Cieszyn, University of Silesia,  
Bankowa 12, 40-007 Katowice, Poland  
esmyrnova@us.edu.pl*

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## Abstract

*The article describes some preliminary results of implementation of WorkPackage 4 (WP4) "Selection and testing new IT tools" in frame international research network IRNet and researchers from partner institution from Ukraine, Poland, other countries. This results concerns analyzing and study some category ICT-tools for Communication in education and their assessment. The first part of article includes the theoretical aspects of communication: activity profile, some pedagogical aspects of teaching - learning together. The methods of cooperative learning, some psychosocial characteristics of communication over the Internet, analysing of challenges of communication, barriers of effective communication, model, communication quality requirement, form of communication and other items. Second part of paper described the research conducted in the frame of Module 005 WP4 and includes: Communication tools typology according to education activities, Mixed features of Communication Tools, Efficiency trend for top rated Communication ICT tools. Model 1, Sample expert card, Sample tool expert rating, Final expert ranking of Communication tools (all package period which has been divided on several main stages 1-5). Final part of manuscript contains expert model assessment and conclusions as to the top ranking IT communicative tools of the social media category. The comprehensive profile of social media communication tools in education and research is derived.*

## Keywords

*Communication. Education. ICT tools. Assessment. E-learning. Items of assessment.*

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## INTRODUCTION

Within modern educational paradigm, the 21<sup>st</sup> century skills concept (Abbott, 2013) is motivated by the belief that teaching students the most relevant, useful, in-demand, and universally applicable skills should be prioritized in today's schools, and by the related belief that many schools may not sufficiently prioritize such skills or effectively teach them to students.

The basic idea is that students, who will come of age in the 21<sup>st</sup> century, need to be taught different skills than those learned by students in the 20<sup>th</sup> century, and that the skills they learn should reflect the specific demands that will be placed upon them in a complex, competitive, knowledge-based, information-age, technology-driven economy and society (Suto, 2013).

While the specific skills deemed to be “21<sup>st</sup> century skills” may be defined, categorized, and determined differently, the term does reflect a general—if somewhat loose and shifting—consensus (Cápay et al., 2012). The following list (ibid) provides a brief illustrative overview of the knowledge, skills, work habits, and character traits commonly associated with 21<sup>st</sup> century skills:

- critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information;
- research skills and practices, interrogative questioning;
- creativity, artistry, curiosity, imagination, innovation, personal expression;
- perseverance, self-direction, planning, self-discipline, adaptability, initiative;
- oral and written communication, public speaking and presenting, listening;
- leadership, teamwork, collaboration, cooperation, facility in using virtual workspaces
- information and communication technology (ict) literacy, media and internet literacy, data interpretation and analysis, computer programming;
- civic, ethical, and social-justice literacy;
- economic and financial literacy, entrepreneurialism;
- global awareness, multicultural literacy, humanitarianism;
- scientific literacy and reasoning, the scientific method;
- environmental and conservation literacy, ecosystems understanding;
- health and wellness literacy, including nutrition, diet, exercise, and public health and safety.

In lieu of the fact that leadership, teamwork, collaboration, cooperation is considered an integral part of the 21st century marketable skills scope, **the objective** of this paper is to consider the placement of communicative activities and skills across a comprehensive expertise of required ICT tools in education.

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## COMMUNICATION: ACTIVITY PROFILE

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Collaboration is commonly defined as a conscious process of information transfer between two or more sentient beings with the help of a semiotic system; c In general, communication is a means of connecting people or places (OED, 2015), “To work jointly with others or together especially in an intellectual endeavor.” (WTID, 1993)

In education and business coaching collaboration is referred to as two or more people working together to accomplish some objective, to achieve shared goals (Boston KM, 2014)

It is a recursive (Martinez-Moyano, 2006) 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) by sharing knowledge, learning and building consensus. Structured methods of collaboration encourage introspection of behavior and communication (Spence, 2006). These methods *specifically* aim to increase the success of teams as they engage communicatively in *problem solving*.

It exists in two main temporal forms:

- *Synchronous*, comprising of Same Place <-> Same Time, and Different Place <-> Same Time models;
- *Asynchronous*, comprising of Same Place <-> Different Time, and Different Place <-> Different Time models (Boston KM, 2014).

Principle models and corresponding features of communication are:

1. Same Time, Same Place: Discussion, Brain storm, Communicative skills, Access to documents, Access to educator, Polling, Project/task management, Rosters of multiple types, Calendaring/scheduling
2. Same Time, Different Place: Lecture, Discussion, Workshop, Research, Tutoring, Conference, File sharing, Resources.
3. Different Time, Same Place: Resources, Control.
4. Different Time, Different Place: Message exchange, Review, Assessment, Resources.

Participants of reciprocal educational communication include universities, educators, students. In its turn, student's collaboration environment includes: 1) Students from University, 2) Teaching staff of University, 3) Administrative staff, 4) Experts, 5) Peers, 6) Tutors (MOOC), 7) Family, 6) Employers.

Among the indicators (or maxims) of effective communication are:

- **The maxim of quantity** : one tries to be as informative as one possibly can, and gives as much information as is needed, and no more
- **The maxim of quality**: one tries to be truthful, and does not give information that is false or that is not supported by evidence.
- **The maxim of relation**: one tries to be relevant, and says things that are pertinent to the discussion
- **The maxim of manner**: one tries to be as clear, as brief, and as orderly as one can in what one says, and where one avoids obscurity and ambiguity (Townsend, DeMarie and Hendrickson, 2015).

The given indicators are traced across educational paradigms.

The essentially communicative collaborative approach within the constructivist paradigm was derived by Lev Vygotsky, known for his theory of social constructivism, who believed that learning and development is a collaborative activity and that children are cognitively developed in the context of socialization and education (Greener, 2015). The perceptual, attention, and memory capacities of children are transformed by vital cognitive tools provided by culture, such as history, social context, traditions, language, and religion. For learning to occur, the student first makes contact with the social environment on an interpersonal level and then internalizes this experience.

In terms of this approach, Collaboration at the conceptual level, involves the following traits and features: awareness, motivation, self-synchronization, participation, mediation, reciprocity, reflection engagement.

## **Pedagogical aspects of teaching - learning together. The methods of cooperative learning**

One of the most contemporary and effective methods of teaching and learning is to teach in collaboration or co-operative learning has been described in manuscript (Morze, Varchenko, Smyrnova-Trybulska 2015). Authors stressed that there are many methods of collaboration learning. All of them are based on the creation of a situation in which students work in small groups to help each other learn the given material. Robert Slavin describes the methods. Some of them are presented in Table 2 (Morze et al. 2015), which contains the name of the method, a description of the method (May, Resler-May 2008), and aspects of the use of the method in a virtual team of learners in the LCMS MOODLE system (Smyrnova-Trybulska, 2009; Gutiérrez - Esteban P. et al., 2015). Name of collaborative learning methods:

1. The STAD method (Student Teams-Achievement Divisions).
2. TGT Method (Teams-Games-Tournament).
3. TAI Method (Team Assisted Individualization)
4. The "Jigsaw" Method, Developed by a team of Elliot Aronson
5. Group Investigation Method.

## **Psychosocial characteristics of communication over the Internet**

Being in a virtual reality puts an Internet user in a different situation in which interaction and communication take place in a different way from everyday experience (Morze, Varchenko, Smyrnova-Trybulska 2015) A new quality of the experience is determined by specific characteristics of the virtual space such as (Aouil & Kajdasz-Aouil, 2007):

- 1) *Limited sensory experience*: a virtual environment implies the possibility of contacts based on experience, using the sense of sight, hearing, and the combination of both modalities. Still, the lack of physical contact is an important limitation;
- 2) *The identity flexibility and anonymity*: the lack of direct interactions between users of the Internet results in unusual ideas of self-presentation of conversation participants (study, work). They may, but need not reveal information about themselves;
- 3) *Equalization of status*: the virtual space gives equal opportunity to its users, regardless of their status, wealth and race. In this way the impact on the users of the network depends only on those communication skills, perseverance, and presented its achievements (academic, professional, in other), positions, etc.;
- 4) *Transcending spatial boundaries*: communication via Internet gives you the opportunity to communicate with similar interests and needs no matter where they live, and the distance between them. Bridging distances in a matter of minutes, seconds, building a new world regardless of geographical conditions;
- 5) *Time stretching and condensation*: cyber-space implies the possibility of synchronous communication on the one hand, when many people at the same time participate in the same conversation, the project is finished, etc.;
- 6) *Access to numerous relationships*: with pretty much ease contact you with a substantially large group of people. With advanced search options, filtering, dial becomes effective communication with user-specified individuals or groups;

- 7) *Permanent records*: Virtual communication and knowledge of the Internet can all be documented and stored (for example, for educational purposes);
- 8) *Dreams and altered states* - altered states of consciousness, sitting in front of computer monitor track and "controlling" the reality of the keyboard can experience the compact states on the similarity of dreams. It is probable that this possibility can be - is the cause of some forms of Internet Addiction.

The process of communicating via the Internet is not traditional means of communication. No physical contact between the participants on the one hand will limit the exchange of non-verbal elements of communication, on the other hand the process of releasing a number of restrictions and conditions, such as gender, age, status, time, space on the grid, the level of financial, performance, etc. (Morze, Varchenko, Smyrnova-Trybulska 2015)

Of all the educational paradigms, e-learning and u-learning (Crowe 2007: 129) relies almost exclusively on communicative collaboration as an educational template, skills formation and assessment tool and ultimate objective.

Forms of communicative collaboration comprise of 2 groups:

- 1) Relationship oriented: Affinity networks, Learning communities
- 2) Task oriented: Communities of Practice, Project Communities

According to the authors' estimations and expert assessment, *needs and challenges* of communicative collaboration include the following groups of issues:

1. Geographical:
  - Geographically dispersed teams
  - Sharing information and documents globally
  - Collaboration across time zones and physical locations
  - Sharing creation and access to work products
  - Identifying and accessing external experts and resources
2. Workplace:
  - Workplace with easy-to-use tools
  - Document repository
  - Management tools, including scheduling and task management
  - lists, tables, rosters, tasks, score cards
  - Communication tools, including e-mail, discussions, conferencing, voting
3. Personal:

Team members:

- Access the latest team resources, any time, any place
- Participation in asynchronous, threaded discussions

Team leaders:

- Confidence that all team members would be on the same page
- Ability to stay fully connected any time, any place

Barriers of effective collaboration include:

- No easy way to share best practices



- Insufficient facilities for video conferencing
- Inadequate technology – slow PC and network connections
- Technology overload
- Lack of accessible, effective, credible, local training and support
- Poor behaviors when working as a team (Boston KM 2014):

Needs and challenges of collaboration in an open e-learning environment comprise of the following issues:

- sharing information and documents
- collaboration across physical locations
- sharing creation and access to work products
- identifying and accessing external experts and resources
- classroom with easy-to-use tools
- document repository
- management tools, including scheduling and task management
- lists, tables, rosters, tasks, score cards
- communication tools, including e-mail, discussions, conferencing, voting.

A learner focused quality concept has to be more comprehensive than just focusing on aspects of instructional or technological interface design. This is clearly shown in the results of the survey (Ehlers 2013). Accordingly, communicative collaboration quality requirement can be identified as:

- Social Cooperation:  
The cooperation sequences in the online course should especially focus on the integration of discursive course settings and controversial topics. Not the social aspect is emphasized here but the active knowledge creation in argumentative
- Discursive Cooperation:  
The cooperation sequences in the online course should especially focus on the integration of discursive course settings and controversial topics. Not the social aspect is emphasized here but the active knowledge creation in argumentative

Participants of communication in education are: Universities, Educators, Students. Thus, a student's collaboration environment includes:

- Students from University
- Teaching staff of University
- Administrative staff
- Experts
- Peers
- Tutors (MOOC)
- Family
- Employers

Principle models of communication in education comprise of the following activities:

1. **Same Time, Same Place:** Discussion, - Brain storm,- Communicative skills,- Access to documents,- Access to educator,- Polling,- Project/task management,- Rosters of multiple types,- Calendaring/scheduling
2. **Same Time, Different Place:** Lecture, Discussion, Workshop, Research task, Tutoring, Conference, File sharing, Resources
3. **Different Time, Same Place:** Resource,- Control
4. **Different Time, Different Place:** Message exchange, Review, Assessment, Resources.

## **COMMUNICATION ICT TOOLS EXPERT ASSESSMENT.**

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Communication tools requirements, according to the authours' group estimation, comprise:

1. Type of communication (verbal)
2. Simple interface
3. Scheduling feature
4. File sharing
5. Timing
6. Environment
7. Technical architecture

Among the requirements, the following features have been identified:

- Type of communication (verbal)
  - common
  - conference
  - private
- Simple and friendly interface
  - Intuitive
  - Voice oriented
  - Object oriented
- Scheduling feature
  - Long term project (Gantt chart)
  - workflow
  - Kahnban chart (crucial stages)
  - Brainstorm
- File sharing
  - Video
  - Audio
  - picture
  - Text
- Timing
  - Real time

- Off-line
- Environment
  - Centralized
  - Decentralized

The communication tools, identified for analysis (Hart 2015) have been subjected to typology according to the featured activity profile.

Thus, selected IT communication tools have been identified according to collaboration models:

**Same place, different time**

*Academia.edu, Google Search, Pinterest, Khan Academy, Google Scholar, SharePoint, Schoology, Blackboard Collaborate, PaperRater, Google Classroom, Schoology, Poll Everywhere, Udemy*

**Same place, same time**

*Skype, mural.ly, <http://www.draftboardapp.com/>, MindMeister <https://www.mindmeister.com/ru>, Socrative, Adobe Connect, Diigo, SharePoint, Evernote, Cloud, wiki, Google Classroom, Lectora Inspire, Wordle*

**Different place, same time**

*blogs (blogspot, twitter, tumblr), social networks, Trello, WordPress, Scribblar, LinkedIn, Kahoot, Yammer, Blackboard Collaborate, writing.com, Red Pen (Criticism) <https://Redpen.io/>, Google Doc, WordPress, Kahoot, Scoopit*

**Different place, different time**

*Cloud, wiki, Academia.edu, Google Search, Pinterest, Khan Academy, Google Scholar, SharePoint, Schoology, Blackboard Collaborate, PaperRater, Google Classroom, Schoology, Poll Everywhere, Udemy*

The second major Collaboration tool typology has been conducted according to identified prominent education activities (Table 1):

Table 1. Communication tools typology according to education activities (Source: authours' group study)

COLLABORATION ACTIVITIES	COLLABORATION TOOLS
Composition	Cloud, wiki, Google Classroom, Evernote, Lectora Inspire, Wordle
Storytelling	Writing.com, Google Translate, Scoopit, Haiku Deck, Wordle
Presentation	Google Classroom, Google presentation, Go Visually, YouTube, Prezi, Pinterest, Adobe Connect, Udemy
Problem solving (project, applied task)	Scribblar <a href="http://www.scribblar.com/">http://www.scribblar.com/</a> , Conceptboard <a href="https://conceptboard.com/">https://conceptboard.com/</a> , Trello <a href="https://trello.com">https://trello.com</a> , Team Gantt <a href="http://teamgantt.com/">http://teamgantt.com/</a> , Dropbox, Padlet, Socrative, Adobe Connect, Edmodo, Nearpod, Blackboard Collaborate, IFTTT, Poll Everywhere
Assessment of object or process according to criteria	PaperRater, Google Classroom, Schoology, Poll Everywhere, Udemy
Peer review/evaluation	writing.com, Red Pen (Criticism) <a href="https://Redpen.io/">https://Redpen.io/</a> , Google Doc, WordPress, Kahoot, Scoopit
Brain storming, problem solving, argumentation	mural.ly, <a href="http://www.draftboardapp.com/">http://www.draftboardapp.com/</a> , MindMeister <a href="https://www.mindmeister.com/ru">https://www.mindmeister.com/ru</a> , Socrative, Adobe Connect, Diigo, SharePoint, Evernote
Composing a bibliography	Cloud, wiki, Academia.edu, Google Search, Pinterest, Khan Academy, Google Scholar, SharePoint, Schoology, Blackboard Collaborate
Communicative skills	social networks (Facebook, Academia) , blogs (BlogSpot, Twitter, Tumblr) Scribblar, WordPress, LinkedIn, Kahoot, WhatsApp, Yammer, Socrative, Adobe Connect, Scoopit
Role fulfillment	blogs (BlogSpot, twitter, Tumblr), social networks Trello, WordPress, Scribblar, LinkedIn, Kahoot, Yammer, Blackboard Collaborate

A total number of 242 of Communication and Remote collaboration tools have been analyzed by the authors' group, chosen out of the Top 100 Efficient Learning Tools ratings (Hart 2015).

Of them 47% prove to be of the mixed type, featuring indicators of Communication and Research activity tools (Cf. Figure 1):

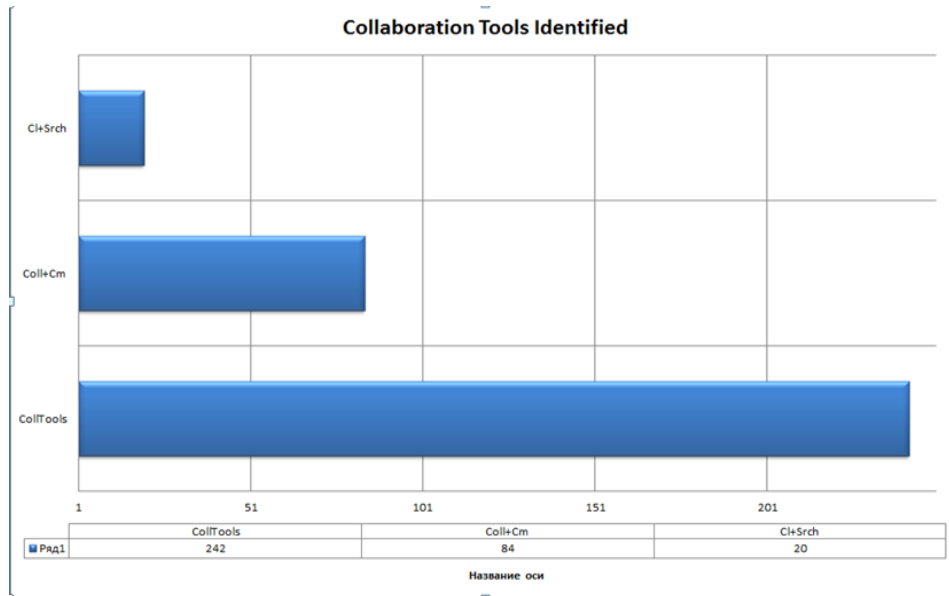


Figure 1 Mixed features of Communicative collaboration Tools (Source: authors' group study)

The efficiency trend for top 16 rated Communication ICT tools for the recent 3 years (2013-2015) acquires the following dynamics (Figure 2-3):

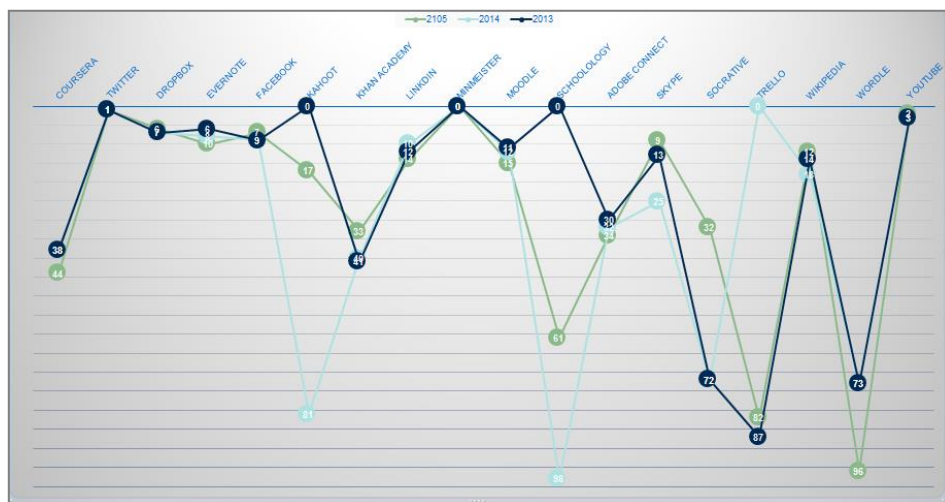


Figure 2 Efficiency trend for top rated Communication ICT tools. Model 1

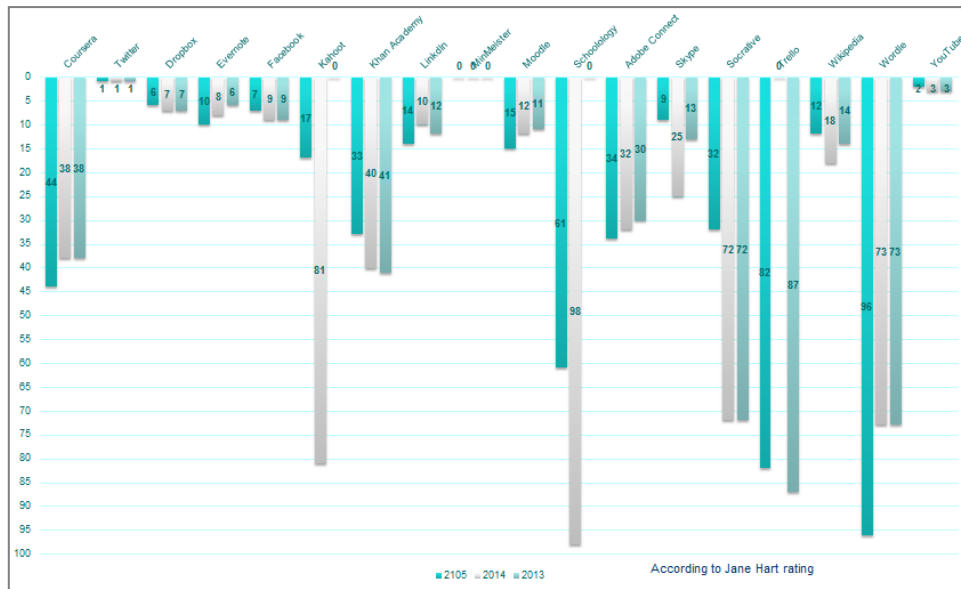


Figure 3 Efficiency trend for top rated Communication ICT tools. Model 2 (Source: authors' group study)

The diachronic dynamics indicates the drastic increase in social media and network technologies as a type of Communication and Remote Collaboration tool in learning (ranking points 1, 3, 6 and 7 accordingly across the sampled time-span).

The highest ranking Communication tools identified include:

1. Social networks
2. Blogs
3. Skype
4. Writing.com
5. Mind Meister(mind maps)
6. Scribblar
7. Google Classroom
8. Trello
9. Google presentation
10. You Tube
11. Adobe Connect
12. Red Pen
13. Evernote
14. PaperRater

The identified Communication tools have been subsequently subjected to independent expert evaluation according to the adhering to the Customer Satisfaction Evaluation model (Dos Reis 2015), featuring the efficiency per education activity as a main criterion (Cf. Figure 4)

COMMUNICATION ACTIVITIES	COMMUNICATION TOOLS															
	Skype	Adobe Connect	Google Classroom	Google Doc	Google presentation	Google search	YouTube	Evernote	Writing.com	Scribblar	Trello	Mind	Miestier Social networks	Blogs	Red Pen	PaperRater
Composition	3	4	5	5	5	1	4	3	5	5	5	5	5	5	3	2
Storytelling	3	3	4	3	4	1	3	3	4	4	3	4	5	5	2	1
Presentation	3	4	5	4	4	1	4	1	3	4	3	3	5	4	2	1
Problem solving (project, applied task)	4	4	3	3	2	1	2	3	4	4	3	3	5	4	3	1
Team building	5	4	4	3	2	1	2	3	4	4	4	3	5	4	3	2
Peer review/evaluation	4	2	4	5	2	1	3	3	5	4	3	3	5	5	4	4
Brain storming, problem solving, argumentation	5	4	3	5	3	1	3	4	4	4	4	4	4	5	2	1
Role fulfillment	5	4	4	1	3	1	4	2	4	4	3	3	5	5	4	4

Figure 4 Sample expert card (Source: authours' group study)

The total number of 7 anonymous independent experts have been featured in Communication tools assessment. Each tool has been rated according to each activity efficiency estimation (see Figure 5):

N o		Experts opinion							Su m 1- ..	coef ficie nt	Toal sum x coeff
		1	2	3	4	5	6	7			
	<b>Social networks</b>										
1	Composition	5	5	5	2	5	5	5	32	0,91	29,26
2	Storytelling	2	3	5	2	4	5	5	26	0,74	19,31
3	Presentation	4	4	5	1	5	3	3	25	0,71	17,86
4	Problem solving (project, applied task)	3	4	5	4	4	4	4	28	0,80	22,40
5	Assessments of object or process according to criteria	2	2	4	2	4	5	5	24	0,69	16,46
6	Peer review/evaluation	5	4	5	1	4	5	5	29	0,83	24,03
7	Brainstorming, problem solving, argumentation	4	4	5	4	4	5	5	31	0,89	27,46
8	Composing a bibliography	1	1	4	1	3	4	4	18	0,51	9,26
9	Communicative skills	5	5	5	5	5	5	5	35	1,00	35,00
10	Role fulfilment	4	4	5	5	5	5	5	33	0,94	31,11

<b>Total n° of points</b>	23,21
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Figure 5 Sample tool expert rating (Source: authours' group study)

The rating coefficient has been calculated as a  $\sum$  of points per activity divided by 35 = (7x5) => 7 experts, 5 points total per each activity.

The final expert ranking of Communication tools under consideration is as follows (Table 2):

Table 2. Final expert ranking of Communication tools (Source: authours' group study)

No	Tools	Points
1	Social networks	23,21
2	Blogs	21,05
3	Skype	17,61
4	Writing.com	17,41
5	Mindmeister (mind maps)	16,81
6	Scribblar	16,74
7	Google Classroom	16,49
8	Trello	15,75
9	Google presentation	14,55
10	Youtube	14,27
11	Adobe Connect	13,8
12	YouTube	11,86
13	Evernote	11,04
14	Red Pen	11,01
15	PaperRater	6,15

## CONCLUSION

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According to expert model assessment – the top ranking communicative tool falls into the *social media* category (23,21 points). The *social network* engines are designed to store, share, promote, reference and review academic output. The network type interface is designed to facilitate students' and researchers 'personal collaboration, navigation through the thematic span of academic output, uploaded into public domain.

The major purposes of this collaboration tool include:

- store
- share
- interact / network
- review
- disseminate
- upgrade
- rate
- learn
- charter a comprehensive, customized reference stock of one's research and/or education interests

A social network interface comprises of the following elements:

- a personal profile (photo, basic personal data, interests, CV)
- an upload service to store one's work by type (books, papers, drafts, pictures)
- a newsfeed featuring recent uploads filtered by stated interests complete with bookmark service

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