Report WP2-A4

The available tools and applications for online education and the selection of tools for the TET platform

Result:　　The available tools and applications for online education and the selection of tools for the TET platform

Related to:　　WP2-A4: A deliverable on the available tools and applications for online education and the selection of tools for the TET platform

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Note

For anyone interested in having more information about the project, please see the website at: http://www.teterasmus.eu

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1. Introduction

This report presents the results of scientific papers review performed by the project Partners to understand what technologies and solutions are currently proposed to be used in evolving textbooks development based on collaborative work.

2. Definitions and abbreviations

Term	Definition
video portal	A website that offers video content created by users.
Video conferencing	The reception and transmission of audio/video data by people who are in different locations for real-time communication.
Text messaging	The process of creating and sending electronic messages between several users. Messages consist of text, images, and pictorial symbols denoting the emotions of users.
Audio conferencing	The reception and transmission of audio data by people who are in different locations for real-time communication
Screen sharing	
e-mail communication	A method of sending and receiving asynchronous messages using electronic devices.
Files sharing	The practice of making digital assets available in such a way that users have simultaneous access and the ability to make changes.
Versioning systems	A class of information systems that manage changes to documents.
Wiki engine	A class of information systems that is used to collaboratively create and edit pages via a web browser.
Learning Management System	A software application for managing and delivering training courses
Discussion forum	Internet discussion site where users hold conversations in the form of text messages

Term	Definition
Anchored discussion	Collaborative discussion that is contextualized within a specific content [1].
Blog	A website published on the World Wide Web consisting of unrelated informal diary-style text entries
Mind maps	mind maps are a visual tool that can be used to identify students' initial information, thoughts, understandings, cognitive structures, and conceptual relationships [2]

3. Work methodology

3.1. General description

The methodology consists of the following steps:

Step 1 - Development of the searching queries and choosing a database to be searched

Step 2 – Searching of the papers

Step 3 – Reviewing the abstract of the papers and choosing the relevant papers

Step 4 – Reviewing the full texts of the papers

Step 5 – Filling the form with the following information:

- Partner
- Paper
- Type of paper (Review, Research)
- What is the paper about? (max 1000 characters)
- What are the technologies used in the paper? (up to 10 keywords)
- How we could use the solutions described in the paper for TET platform? (max 1000 characters)

Step 6 – Data analysis.

3.2. Abstract databases and search queries

Two bibliographic databases were selected for the literature review:

- Web of science,
- Scopus.

In both databases, the search was performed in the fields: title, abstract, keywords. The expressions used in the search criteria are shown in Table 1.

Table 1 Expressions used in the search criteria

No.	Expression
1	ict and tools and ("distance collaboration" or "remote collaboration" or "online collaboration")
2	tools and ("distance collaboration" or "remote collaboration" or "online collaboration")
3	ict and tools and survey and ("distance collaboration" or "remote collaboration" or "online collaboration")
4	"digital textbook" AND ict
5	"digital textbook" AND ("distance collaboration" or "remote collaboration" or "online collaboration")
6	"digital textbook" and survey and ("distance collaboration" or "remote collaboration" or "online collaboration")

3.3. Selection of articles for review

Duplicates were removed from the collection of papers and the results were sorted by publication date in descending order. Based on the content analysis of the abstracts, 80 articles were selected for detailed review. The analysis of the content of the abstracts was aimed at eliminating theoretical works and selecting such works, which resulted in:

- prototypes of IT systems used in remote cooperation,
- reviews of technologies used in remote cooperation,
- research on the properties of remote cooperation methods.

3.4. Reviewing full text of papers

The collection of papers was shared among consortium partners for thorough content analysis. As a result, a form was created with the data indicated in the step 5 of section 3.1. In addition, 2 articles that did not appear as a result of queries to bibliographic databases were analysed. These papers were included in the references of the items reviewed.

4. Results of the research

4.1. General description of results

A total of 82 articles were analysed. The papers qualified for detailed analysis were devoted to the following topics:

1. Review papers on ICT for remote collaboration and collaboration platforms features.
2. Characterization of remote cooperation platforms created as part of the implementation of R&D projects.
3. Descriptions of the methodologies used to create IT systems for remote cooperation.
4. Reports of solutions to specific tasks of remote cooperation with the use of ICT.
5. Assessment of the impact of using remote cooperation on processes in industry and education.

As a result, the following categories of information relevant to the TET project were distinguished:

1. Classification of remote collaboration tools and IC technologies.
2. Software used for development of collaboration platforms.
3. Tips on the features of the remote collaboration system.
4. Existing software tools ready for integration with the TET platform.
5. Reports of collaboration platforms development.
6. Methodologies applied in collaboration platform development process.

4.2. Classification of I&CT

Table 2 presents the ICTs classes identified from the literature review. For each class, the reference to the bibliographical position in which the mention occurs and the total number of occurrences in all analysed papers are given.

Table 2 General classification of remote collaboration tools and technologies

Class of a tool	Literature source	No. of occurrences
Video portals	UNILJ 2 KTH 2, 17 UNIPI 2 PRz 1	5
Video conferencing	UNILJ 1, 2, 5, 12, 20 KTH 9	10

Class of a tool	Literature source	No. of occurrences
	UNIPI 9 PRz 1, 4, 15	
Text messaging	UNILJ 1, 2, 10,12 KTH 9 UNIPI 9 PRz 1, 5, 15, 17	10
Audio conferencing	UNILJ 1, 5, 12 UNIPI 9 PRz 1, 15, 17	7
Screen sharing	UNILJ 1,5,12,20 PRz 15	5
e-mail communication	UNILJ 2, 5, 12 UNIPI 9 PRz 1, 15	6
Files sharing and simultaneous editing of documents	UNILJ 5 KTH 9, 14 UNIPI 9, 10, 14 PRz 4, 5, 6, 15, 17	10
Versioning systems	UNILJ 10, 17 PRz 19	3
Project management, resources management	KTH 8, 9 UNIPI 16 PRz 6, 15	5
Wiki engine	UNIJ 15 UNIPI 16, 19 PRz 19	4
Learning management system	KTH 1 UNIPI 11	2
Discussion forum	UNILJ 12 KTH 1 UNIPI 1, 10,13 PRz 1, 13, 15	8
Anchored discussion	KTH 13	2

Class of a tool	Literature source	No. of occurrences
	PRz 9	
Collaboration platform	KTH 7, 14 PRz 8, 15	4
Blog	KTH 15 UNIPI 1, 11	3
Mind maps	KTH 7 UNIPI 8	2
Callendar	UNILJ 2 UNIPI 10	2
Contact management	PRz 15	1
Tasks management	UNIPI 1 PRz 15	2

Figure 1 shows a chart created on the basis of Table 2 data. The most used technologies are file sharing and simultaneous editing, text messaging and video conferencing. Tools used to processes management, such as calendar, task and contact management are less common.

3.1. Software for collaboration platforms development

The authors of some papers mentioned software technologies that was used to build remote collaboration platforms. **Napaka! Vira sklicevanja ni bilo mogoče najti.** shows a summary of the information obtained. Modern frameworks and technologies based on the JavaScript programming language were used.

Table 3 Programming tools used for development of a collaboration platform

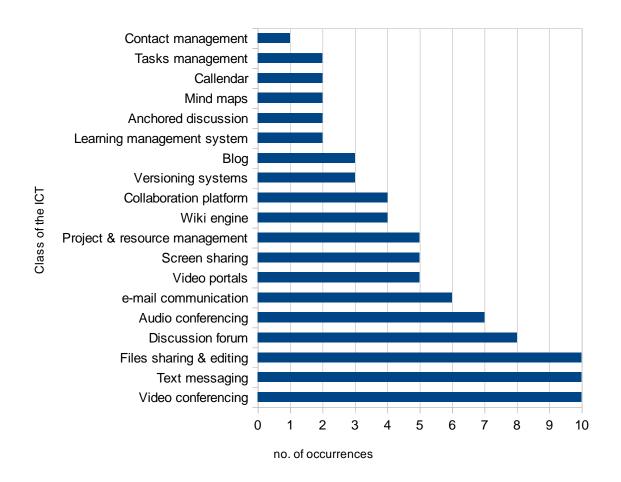| Programming tool	Literature
SimpleWebRTC framework	UNILJ 1
Javascript, HTML5	UNILJ 1, 8, 19 KTH 11
React, Vue	UNILJ 19
Node.js	UNILJ 19

Figure 1 No. of occurrences of category in the literature

3.2. Features of the remote collaboration systems

Currently, there are many systems on the market that are used to perform various tasks of remote cooperation. During the development of these systems, a certain amount of knowledge has been accumulated concerning in particular:

- features desired by users of these systems,
- threats that cause IT projects for the collaboration systems to fail.

The scientific literature provides guidance to avoid problems encountered by other teams and keep the development of the system running smoothly. Table 4 summarizes issues that are

important for the development of the TET system. A detailed description of the hint is included in the relevant scientific article.

Table 4 General tips for TET development

System feature hint	Literature
Key features of a digital textbook	UNILJ 8 PRz 13
Technologies identified for e-textbook IT related challenges	KTH 11
Designing multimedia interactive digital teaching resources	UNIPI 7
Key considerations for designing a collaborative e-learning platform	UNIPI 12
User requirements for online collaboration tools	UNIPI 14 PRz 11, 12
Features of the TET platform based on the project *XML digital textbook e-book*	UNIPI 17
Challenges associated with e-textbooks	UNIPI 19
Electronic textbooks design principles	PRz 3
Analysis of risks in remote cooperation systems	PRz 6
Privacy and security in collaborative systems	PRz 20

3.3. Software tools for integration with the TET platform

In many cases, an IT system is used to support specific tasks leading to a specific goal. In the case of the TET platform, these tasks will be independent (loosely coupled). Integration of these tasks will occur at the level of human interactions. An example may be a teleconference between selected people, carried out on a scheduled date. In order to support this type of tasks, it is advisable to use ready-made software. It is pointless to write IT system components from scratch. The task of organizing and conducting an exemplary teleconference can be performed using existing contact management programs, calendar, voting over the selection of the

meeting date, group video calls. Table 5 contains a short report of software identified during the literature review.

Table 5 Existing SW tools ready for integration with TET processes

Software tool	Class	Literature
MS Office 365	Collaboration suite	UNILJ 1 PRz 8
GitHub, Git, Dat project, OSF	Versioning system	PRz 19 UNIJ 17
Google workspace	Collaboration suite	UNILJ 13 KTH 14
Skype, Whats App	A/V conferencing, text messaging	UNILJ 13 PRz 8
MediaWiki, Wiki	Resource management, Wiki	UNIJ 15 UNIPI 16
Slack, Zoom	A/V conferencing, text messaging	UNILJ 14 PRz 8
Moodle	Learning management system	KTH 1 UNIPI 5
phpBB	Discussion forum (phpBB selected on the basis of Wikipedia *Comparison of Internet forum software*. It is free and has the Single sign-on feature)	
Concept Board, Limnu	Collaboration platform for drawing	KTH 7
FreeMind, MindMaster	Mind Map	UNIPI 8
Google Blogger	Blog	
Google Drive, OneDrive	File sharing	UNIPI 15 KTH 9, 14

Software tool	Class	Literature
		PRz 8

3.4. Reports of collaboration platforms development

Some remote collaboration systems have been developed as part of scientific projects. The result of these works are publications discussing the features of the created systems. These works make it possible to estimate which technologies listed in section 4.2 are used in practice in large remote cooperation platforms. They also provide an overview of how ICT support tools can be integrated to implement complex processes. Table 6 presents descriptions of remote collaboration systems found in the papers.

Table 6 A paper of collaboration platforms development

Collaboration platform	Literature
VP platform Casus	UNIJ 1
Active Textbook System	UNIJ 7
Advanced interactive design environment (AIDE)	UNIJ 12
Media Watch on Climate Change	UNIJ 16
SketSha	UNIJ 20
Adaptive book	KTH 19
Automatically generate an E-textbook for a user-specified topic hierarchy	UNIPI 18
Optus inCITE Enterprise Collaboration Platform	PRz 14

3.5. Methodologies for software development

The literature describing ICT for remote collaboration also contains information on the methods of production of IT systems supporting remote collaboration. Table 7 summarizes the methods found in the analysed papers. The characteristics of the common features of the presented methods are as follows:

1. The iterative and incremental life cycle of the IT system was used.
2. Requirements are assumed to be unstable.
3. The emphasis is on the user of the system, not on the processes performed by the system.

Table 7 Methodologies of collaboration platform development

Methodology	Literature
Digital textbook development methodology	UNIJ 4
Human-Centered Design	UNIJ 18
A Model for Scripting and Designing a Digital Textbook	KTH 2
A general description of a web-based collaboration software development process	PRz 4
An application of Adaptive Software Development Model for the design of an online collaboration platform	PRz 5

Summary

This report presents the results of a literature review aimed at identifying ICTs for remote collaboration that can be used in a TET project. A list of available communication technologies along with their popularity has been presented. Programming technologies used in the work on modern IT systems have been identified. It is possible to propose a methodology for creating the TET system and a set of tools that implement remote communication ready for integration with TET.

The conclusions of the review are as follows:

1. Teleconferencing is a commonly used communication technology.
2. The software used to create remote cooperation platforms is based on cloud solutions and JavaScript and HTML5 languages.
3. As a result of the implementation of projects similar to TET, guidelines have been developed that allow you to avoid errors and obtain a high-quality IT system.
4. There is ready-made software that can be used to build a remote cooperation system.

5. The production method of the TET platform should be an adaptation of human-centred design.

References

For the details of the literature reference (e.g. UNILJ 2) see the document *Available tools and materials - Review of publications*.

[1] van der Pol, J., Admiraal, W. & Simons, P.R.J. The affordance of anchored discussion for the collaborative processing of academic texts. *Computer Supported Learning* **1**, 339–357 (2006). https://doi.org/10.1007/s11412-006-9657-6

[2] Aliye Erdem , "Mind Maps as a Lifelong Learning Tool," Universal Journal of Educational Research, Vol. 5, No. 12A, pp. 1 - 7, 2017. DOI: 10.13189/ujer.2017.051301.

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