A 10-year Longitudinal Study of Social Media Use in Education

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Article Info	Abstract
	Students, as digital natives, are fascinated by social media as they use it in their everyday lives. However, not only opportunities but also challenges for education have arisen with the new bottom-up approach of using social media for educational purposes. In order to investigate different aspects of social media adoption and use in higher educational learning environments, a longitudinal study starting in 2010 was conducted. This paper summarizes and analyzes our findings based on several studies with quantitative and qualitative data collected and presented in 16 different articles throughout the last decade. Based on our results, we reached the conclusion that when there is proper infrastructure, appropriate strategies are applied, security and privacy are of high priority and teachers become accustomed to using modern technologies, social media can be used as an effective educational tool which improves the overall educational process and learning outcomes. Specifically, by using social media in a creative and student-centered manner in educational settings, students' engagement, motivation, interactivity, soft skills, communication and collaboration are promoted and improved. Finally, social media can be used as a means to help create virtual communities in which students will be able to exchange ideas, opinions and knowledge in both academic and extracurricular environments, mature and flourish. The aim of this ongoing longitudinal study is to enhance teachers' comprehension of social media and its use as an educational tool to create interactive learning environments for students of various disciplines in geographically and culturally distributed environments.

Introduction

The foundation of social media is communication, collaboration and sharing (Siakas et al., 2017a). Social networking sites are social media platforms based on Web 2.0 technologies and are considered to be communication enablers that promote horizontal knowledge sharing and a sense of community for their members. Social media facilitates and promotes people's communication and interaction for sharing knowledge, ideas, thoughts and information as well as participation in diverse social and interactive activities.

Current pedagogical trends are in line with the foundations of social media as they emphasize and focus on learning to learn approaches instead of focusing on the construction of domain specific knowledge. The use of

social media in education has the potential to create new pedagogical dynamic student-centered approaches of learning by using technological applications among digital native generations. Due to their bottom-up philosophy, social media facilitates the engagement of students in an online learning community for content creation, knowledge sharing, social interaction and collaboration.

Davis III et al. (2012) argued that it is imperative for teachers to understand how to competently deal with social media to develop and maintain academic social media networks in order to assist students in fulfilling their learning goals. Consequently, teachers need to focus on learning how to identify, initiate, maintain, support and utilize new learning environments and technological applications (Karademir Coskun & Kaya, 2020; Onat Kocabiyik, 2021; Siakas & Georgiadou, 2016). However, despite the many contemporary technologies, including social media, which support teamwork and collaboration among distributed students and offer them the opportunity to openly discuss class material and share opinions regarding academic issues (Salas & Alexander, 2008), there are still considerable difficulties when building online academic environments. By far the most important and the most difficult aspect of effective knowledge sharing and learning in online academic environments seems to be concerned with people, pedagogy, processes and culture (Siakas et al., 2013). So far, distance learning environments have mainly been used by students who are enrolled in distance learning courses or students who perform group tasks outside the university grounds as homework. However, the abrupt outbreak of the coronavirus (COVID-19) throughout the world, which was declared as a pandemic on the 11th of March 2020 (WHO, 2020), resulted in the sudden closure of schools, colleges and universities. The educational community was confronted with the overwhelming challenge to transition from traditional face-to-face or hybrid mode of education to fully virtual learning environments within an extremely short amount of time. This fact made online learning environments imperative.

Consequently, this paper presents our findings from a longitudinal study starting in 2010 regarding the use of social media in education as well as the results from different studies and data collected within the last decade. The relevant studies are presented in Table 1 in descending order of the publication year and the main results are drawn and described in the following paragraphs. More specifically, in the field of technical aspects [12-15], our data reveals the importance of security and privacy issues. In the publications focusing on usability [3-5, 10-11], the most notable effects found involve the influence of ICT-infrastructure and knowledge sharing on improving usability. In the field of teaching strategies [1-2, 6-9, 10], various frameworks, strategies and instructions were presented.

This paper starts with a brief literature review in Section 2 showing findings from related studies and continues with an overview of our longitudinal studies in Section 3. Some studies have several publications showing the results from different angles of the study or by using different data sets. In Table 1, the research population shows what set of data is used in the corresponding publication. For example, Makkonen et al. (2016b) compared usability viewpoints of Finnish students with viewpoints of Greek students, while Makkonen et al. (2016a) compared usability viewpoints of Finnish students with viewpoints of Finnish teachers. Section 4 summarizes the results of the studies. Additionally, Tables 2-6 present new data which was mainly based on early studies and which was not included in the original publications. It was considered important to include

these new presentations of the existing results in order to contribute to improving the understanding of the longitudinal study and its results.

Table 1. Publications of Social Media in Education Articles in our Longitudinal Study

No.	References	Research population	Publication's focus
16	Lampropoulos et al. (2020a)	GR students: 63	Teaching strategy
15	Makkonen et al. (2019a)	FI students: 43	Technical aspects
14	Makkonen et al. (2019b)	FI students: 66 GR students: 44	Technical aspects
13	Kanakaris et al. (2019)	GR students: 178	Technical aspects
12	Makkonen and Siakas (2019)	FI students: 66	Technical aspects
11	Makkonen and Siakas (2018a)	GR students: 40	Usability issues
10	Makkonen and Siakas (2018b)	GR students: 40	Usability issues
9	Siakas et al. (2017a)	GR students: 42 (Msc level) GR students: 239	Teaching strategy
8	Siakas et al. (2017b)	GR students: 239	Teaching strategy
7	Tsitsekidou and Siakas (2017)	GR students: 42 (Msc level)	Teaching strategy
6	Siakas and Georgiadou (2016)	FI students: 71	Teaching strategy
5	Makkonen et al. (2016a)	FI students: 71 GR students: 101	Usability issues
4	Makkonen et al. (2016b)	FI students: 71 FI teachers: 32	Usability issues
3	Makkonen et al. (2015)	FI students: 71	Usability issues
2	Siakas et al. (2014)	GR students: 172 GR teachers: 31 UK students: 15 UK teachers: 10	Teaching strategy
1	Siakas et al. (2013)	GR students: 172	Teaching strategy

Related Work

There is an increased academic interest regarding the potentials social media provide for higher education and the benefits it may have on students' learning experience. Moran et al. (2011) examined how higher education faculty members use social media and the impact social media has on their personal, professional and instructional use cases. Moreover, they investigated faculty members' social media level of awareness, their personal, professional and class social media use as well as their opinions and the various barriers when adopting social media in education. Barnes and Lescault (2011) carried out a study involving 456 four-year accredited institutions in the USA and they reported that all of them used some form of social media for educational purposes. Rodriguez (2011) examined important issues for teachers when using social media as an

educational tool by investigating how academic activities can be ramified to a public sphere. Additionally, they analyzed how laws that govern academic freedoms and behaviors can be applied in this newly created public environment. More specifically, they put emphasis on concerns regarding the adoption of social media and user-generated content into higher education, relevant privacy and copyright laws and intellectual property rights. They quoted that social media can be a means to enhance students' media literacy.

Davis III et al. (2012) conducted a survey involving 224 community colleges. Only 13% reported "substantial" use of social media by their institution, and only 5% reported that their institution devoted "substantial" resources to social media implementation. According to two-thirds of the respondents, the main barrier to expand and support social media was insufficient funds. Moreover, around 25% of the respondents reported resistance among faculty staff or administrators and lack of staff/faculty access to such technology as a barrier. College presidents and other leaders who responded saw most value in the use of social media in marketing and in one-way delivering of information from the college to students.

Through their explorative interview study, Hrastinski and Aghaee (2012) examined how higher education students use social media to support their studies and analyzed their viewpoints on the potential benefits and limitations the adoption of social media brings about in comparison with other means. Based on their results, even though the majority of the respondents use social media frequently, only a few of them believed that they use social media to support their studies. Additionally, they quoted that the respondents mainly use e-mails and instant messaging to communicate and collaborate and they mostly use Wikipedia and YouTube to retrieve information and Facebook to initiate contact with course peers. The respondents regarded social media as a key means of the educational experience and prefer to use it to coordinate group work and for brief discussions. Finally, it was highlighted that the teaching strategy plays a key role in successfully implementing social media in educational settings.

Tess (2013) conducted a literature review regarding the role of social media in physical and virtual higher educational classes. Social media was regarded as a technology that mediates and enhances teachers' instructions and promotes active learning. In addition, this study summarized various scholarly writings and reviewed the findings of empirical investigations. Finally, it presented some of the limitations that are brought about when introducing social media in educational settings.

Wohn et al. (2013) investigated how different types of social capital associated with parents, close friends and Facebook friends in line with social media affected the first-generation high school students' higher education aspirations. Based on their results, social media was associated with higher levels of efficacy regarding college application procedures while the ability to seek information on social media increased their application efficiency. Moreover, according to their findings, parents as well as close friends and Facebook friends play different roles in college aspirations while knowing someone who attended college increased their expectations of college success.

Graham (2014) examined how social media could be utilized to increase and facilitate students' participation

and engagement. The results showed positive indicators concerning social media potentials in learning contexts. Additionally, the findings indicated that to achieve full potential, students need to be inculcated, nurtured and encouraged to engage themselves in this form of learning.

Greenhow and Lewin (2016) proposed a model theorizing social media as a learning environment that supports both formal and informal learning. They carried out two contrasting case studies in which they applied their model along with social constructivism and connectivism as theoretical lenses. In both case studies, it was shown that social media provided opportunities for students to harness the power of the network and seek relevant expertise and students showcased some elements of self-determination and self-direction in terms of the learning process.

Gok (2016) examined the impact of social networking sites on students' studying and habits. Specifically, 220 students of a vocational higher education school participated. The data was collected through the use of a questionnaire. In contrast to other studies, the results showed that social media negatively affected students' performance, studying and habits as they spent more time on social media instead of studying.

Sobaih et al. (2016) utilized a pre-tested questionnaire to examine the use of social media by students for academic-related purposes. According to their results, even though the use of social media was at a minimal level, social media was regarded as a teaching and learning tool that has great value for academic related purposes. Through their interviews, they identified several perils, barriers and concerns about the minimal use of social media. Finally, it was quoted that if these barriers were overcome, social media could be established as an effective educational tool.

In their study, Chugh and Ruhi (2018) analyzed the role of Facebook as an educational instrument for learning and teaching in higher education through their literature review. They identified numerous benefits of implementing Facebook in education such as increased interaction, improved performance and higher engagement. Additionally, they went over the potential problems and limitations of using Facebook in educational settings and recommended guidelines to encourage the adoption of social media in education.

Olowo et al. (2020) conducted a survey in order to understand and analyze the use of social media as an online modern tool to enhance secondary school students' academic performance. Particularly, their study involved 7.776 secondary teachers out of whom 385 were randomly chosen. Based on their results, the use of social media platforms such as Facebook, Twitter, WhatsApp and YouTube positively affected students' academic performances. Finally, both students and teachers regarded social media platforms as a significant interactive forum for learning and teaching activities.

In their study, Olagbaju and Popoola (2020) examined the effect of audio-visual social media instruction on learning outcomes in reading comprehension. Their study followed a quasi-experimental research design. The involved students were randomly selected from four senior secondary schools in Gambia. They were divided into two instructional groups, an experimental group and a control group. The findings showed that the use of

social media positively affected students as they showed improved interest, performed better and showcased higher retention rates in reading comprehension. Finally, according to the overall results, it can be concluded that social media tools with audio-visual properties can enhance the teaching process and improve learning outcomes.

Yuzbasioglu et al. (2020) looked into the impact of using a WhatsApp group as a means for bachelor students to communicate, interact and cooperate in the context of an astronomy course. In total, 87 students were involved and the messages that they exchanged were used as research documents and were analyzed through descriptive and content analysis methods. Based on the results, the specific tool was used as an interactive medium to communicate in both educational and extracurricular environments by daily sharing ideas and discussing information. Therefore, social media platforms such as WhatsApp can be regarded as an effective educational tool that enhances learning activities by improving students' interaction, concentration and motivation.

It is really significant to study and rely on history in order to better comprehend our current state and enhance our insight into the future. In that view, An (2021) scrutinized the history of instructional design and technology field in four major time periods while also putting emphasis on modern technologies and approaches such as social media, online learning, immersive technologies, digital game-based learning and gamification. Previous studies also showed the merits that cross reality technologies, such as augmented reality and virtual reality offer (Lampropoulos et al., 2020b) and the benefits of applying digital game-based learning and gamification in education (Anastasiadis et al., 2018). In addition, this study went over the evolution of instructional-design theories and models, which have received relatively less attention, particularly due to specific limitations and barriers. Based on the findings of this study, it can be inferred that teachers should see the potentials, benefits and additional value that 21st century technologies offer, become accustomed to and confident when using them and apply them in their classrooms.

Overview of our Studies

Benefits and Challenges of Social Media in Learning: Learners' Viewpoints

Siakas et al. (2013) investigated the extent and the best practices of using social media in education as well as the potential benefits and challenges when applying social media in learning, based on higher educational students' viewpoints. More specifically, in the context of this study, a paper-based survey was carried out in the academic year 2010-2011 involving 172 respondents from 23 departments and 5 faculties at Alexander Technological Educational Institute (ATEI) of Thessaloniki, Greece. The gender distribution of the respondents comprised 42.4% male and 57.6% female and their age distribution encompassed 25.6% under 20 years old, 68.6% between 20 and 25 years old, and 5.8% older than 25 years old. The main findings of this study are categorized and presented below:

1. The extent of utilizing social media in HEIs is illustrated in the following results:
   a) Readiness of using social media in education and learning:
      - Pedagogy paradigm shift: Embracing participative and collaborative approaches;
      - Open and free Web 2.0 applications: Promoting flexible bottom-up interaction, user involvement,

knowledge sharing and content creation;

- Social trends: Contemporary fashion of dynamic collective content creation, underlying gathering and organization;

- Net Generation students: Digitally literate and multitasking.

b) How important and urgent the respondents consider the use of social media in education: Table 2 shows that 90.7% of the respondents consider that the use of social media in education is important and the majority of the respondents (52.3%) consider the use of social media to be both urgent and important.

c) Respondents' current use of social media for learning matters: Table 3 showcases that social media is used by a majority of students (51.7%) to a very high degree or even exclusively in their learning issues. This use is exclusively a student initiative since no official use of social media is applied.

Table 2. Importance and Urgency of Using Social Media in Education

	Important	Not important	Total
Urgent	52.3%	4.1%	56.4%
Not urgent	38.4%	5.2%	43.6%
Total	90.7%	9.3%	100%

Table 3. Respondents' Use of Social Media for Learning

Not at all	Limited use	Medium use	High use	Exclusive use
3.5%	16.9%	27.9%	34.3%	17.4%

2. Practices applied regarding social media in higher education: The study showed that the social media practices and social media that students use most for educational reasons are Facebook, YouTube, Skype, wikis and blogs (in descending order). A large proportion of respondents considered themselves to be medium active users, meaning that they both actively create and post content. Moreover, they quote that they mainly use social media for educational purposes because they are fast (spread of latest information), free (cost efficient) and social.

3. Benefits gained from the use of social media in higher education: The respondents considered that social media is communication enablers promoting horizontal knowledge sharing and a sense of community for its members. They believe that social media promotes a feeling of team belonging, provides an opportunity to meet fellow students and improves self-organization and promote collaboration. Moreover, the respondents proposed social media learning approaches that include active participation of learners and unconscious sharing of knowledge approaches. The free text mode was chosen with the aim of obtaining unbiased opinions and fresh ideas directly from the learners. Examples mentioned were:

- Learner participation in social media content creation: wikis and YouTube videos about a certain subject for factual content information.

- Student conferences: On-line access to student presentations (videos from the presentations, PowerPoint slides and full papers) available through social media platforms where learners could

discuss the on-line provided material.

- Game-like on-line quizzes and on-line tests: a moderator reads questions to teams of learners, who endeavor to find the correct answer so as to win scoring points for the team.
- Discussion forums: for discussing concerns related to the subject of study and for sharing information related to methodological approaches.

4. Challenges of using social media in higher education: The respondents expressed the following worries and concerns regarding the use of social media in educational matters:

- Group competition: They feel pressure and competition in a group activity.
- Security and safety: The safety in social media (data protection).
- Compatibility of social media platforms: They consider that many new platforms are frequently developed which may not be compatible with the earlier ones. Moreover, the platforms may have different features which are not always better than those already being used.
- Trust, fake news, quality of content: Since the content is co-created, they do not feel sure about the quality and validity of content, especially if the group that has created the content is small.

Benefits and Challenges of Social Media in Learning: A Cross-cultural Study

Siakas et al. (2014) conducted a cross-cultural study in order to investigate the potential benefits and challenges that the application of social media in educational settings may yield. This study involved 172 students at different departments of ATEI of Thessaloniki in Greece and 31 teachers of the Information Technology (IT) department. Figure 1 shows the readiness for the adoption of social media practices in education based on the opinions of the students and teachers.
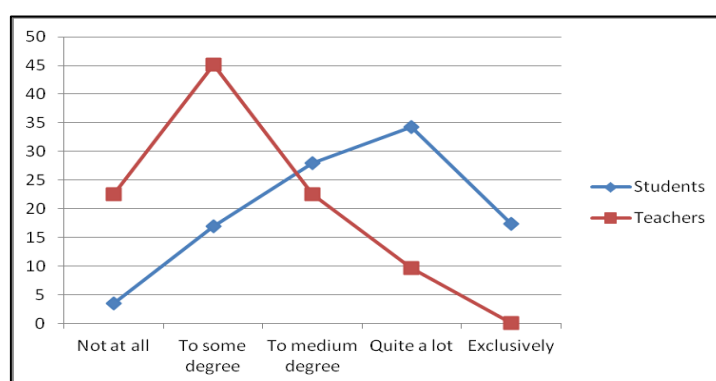

Figure 1. Readiness of using Social Media in Education (Siakas et al., 2014)

The blue line shows to what degree the responding 172 students are prepared to use social media in education while the red line shows the preparedness of the responding 31 IT teachers. A Likert scale from 'not at all' (on the left side) to 'exclusively' (on the right side) was used. Based on Figure 1, the conclusion was that the students are ready to use social media in education whilst the teachers are reluctant to do so. The fact that no teachers from non-IT departments accepted to take part in the survey is another important indicator. The reason they stated was that they were not familiar with social media and thus not able to express any viewpoint.

Siakas et al. (2014) also studied the degree to which social media is expected to improve learning. Additionally, 15 students and 10 teachers from the United Kingdom participated in this part of the study. 67% of the students believed that social media improves learning to a very high degree whilst the equivalent percentage from the teachers' point of view was 22%, which is a marked difference. The teachers' apprehension can be attributed to their earlier experiences both during their student days and during earlier pedagogic practices (Siakas et al., 2014). The positive attitude in Table 4 and Table 5 is calculated by summarizing the positive viewpoints a little, quite a lot, much and very much so. The tables are sorted in descending order according to the positive attitude. Table 4 shows the results in percentage of the 172 respondents in Greece regarding their opinion about the degree to which specific social media is expected to improve learning. According to Tables 4 and 5, both students and teachers regarded the YouTube, Google docs, forums, blogs and Facebook platforms as the most important for education. Furthermore, based on the results of this study, the majority of both students and teachers considered the use of social media to be both important and urgent. Particularly, 67% of the students believed that using social media is both urgent and important while the equivalent percentage for teachers was 55% (Siakas et al., 2014).

Table 4. GR-Degree to which Social Media Can be Expected to Improve Learning (Students' Perspective)

Results in %	Not at all	A little	Quite a lot	Much	Very much so	Positive attitude
YouTube	11.0	19.8	24.4	18.6	22.1	84.9
Google docs	13.4	5.2	16.9	23.8	27.3	73.2
Forum	12.2	7.6	18.6	16.3	29.1	71.6
Blogs	14.0	16.3	25.0	16.9	12.2	70.4
Facebook	26.7	29.7	18.0	10.5	11.6	69.8
Wikis	15.1	9.9	22.1	15.1	19.8	66.9
Skype	22.1	14.5	13.4	14.5	18.6	61.0
Twitter	26.2	20.3	17.4	7.6	4.1	49.4
LinkedIn	29.7	22.7	15.7	1.7	3.5	43.6
Second Life	29.1	15.7	11.0	4.7	9.3	40.7

Table 5. GR-Degree to which Social Media Can be Expected to Improve Learning (Teachers' Perspective)

Results in %	Not at all	A little	Quite a lot	Much	Very much so	Positive attitude
YouTube	3.2	16.1	323	19.4	16.1	83.9
Google docs	3.2	16.1	32.3	9.7	12.9	71.0
Forum	3.2	9.7	22.6	12.9	25.8	71.0
Blogs	0.0	6.5	19.4	29.0	16.1	71.0
Facebook	16.1	16.1	25.8	12.9	12.9	67.7
Wikis	0.0	3.2	3.2	25.8	35.5	67.7
Skype	25.8	22.6	19.4	0.0	6.5	42.0
Twitter	19.4	6.5	19.4	3.2	6.5	35.6
LinkedIn	22.6	6.5	19.4	9.7	0.0	35.6
Second Life	35.5	6.5	3.2	3.2	3.2	16.1

Finally, when comparing the results of the Greek teachers in Table 6 with the results of the Greek students in Table 2, it can be observed that 74.2% of the Greek teachers compared to 90.7% of Greek students consider the use of social media in education as important. Similarly, when it comes to characterizing the use of social media in education as both urgent and important, a significantly low number of teachers (22.6%) agreed in contrast to the number of the students (52.3%). Additionally, similar differences can be observed based on the results from the sample of UK teachers and students.

Table 6. Importance and Urgency of Using Social Media in Education

	Important	Not important	Total
Urgent	22.6%	9.7%	32.3%
Not urgent	51.6%	16.1%	67.7%
Total	74.2%	25.8%	100%

What Promotes the Adoption of Social Media in the Teaching of IS/ICT and What Constrains it? - Students' Perspective

According to Seaman and Tinti-Kane (2013), 59% of faculty members consider that social media is likely to improve learning. However, at the same time, 56% agree that these technologies can be distracting in education. Because of this disharmony concerning the role of social media in education, it was necessary to examine social media tools as technology tools and social media applications as business or office software. By doing so, it is likely that social media adoption in education will follow a similar curb with Roger's innovative technology (infrastructure, as well as applications) diffusion and adoption (Rogers, 2010). His curb of adopters is shown in Figure 2.

In that view, Makkonen et al. (2015) investigated bottlenecks and success factors in the adoption of social media in IS/ICT classes. The study was based on the unified technology adoption approach. Particularly, the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh and Davis, 2000; Venkatesh et al., 2003), which covers issues related to the adoption and the various drivers affecting it, was used. The UTAUT theory deals with the social aspect which is an inevitable factor in the emergence of social media use in education. Figure 3 shows the major components of the UTAUH theory.
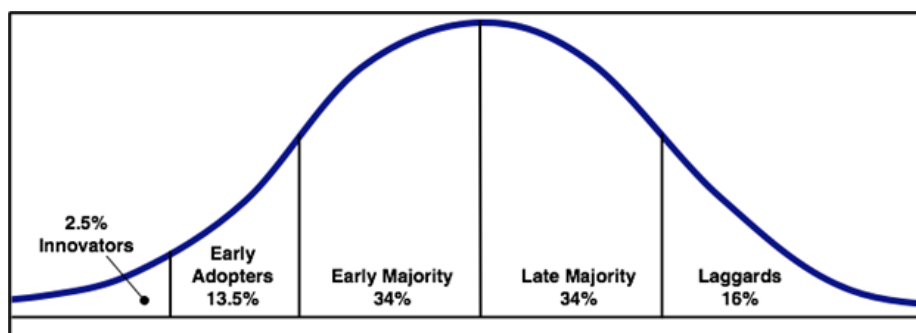

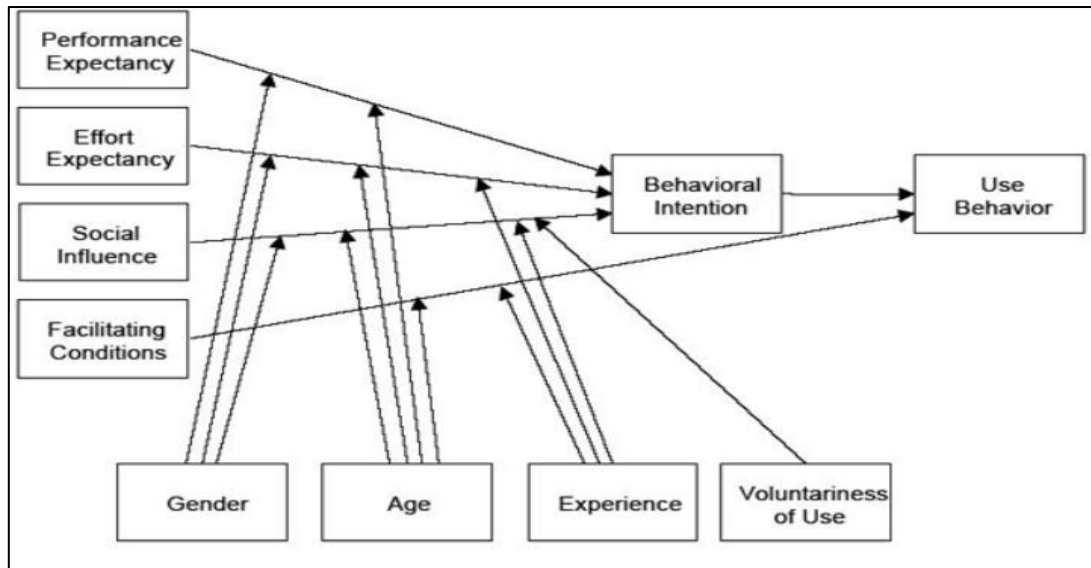Figure 2. Categories of Innovation Adopters (Rogers, 2010)

Figure 3. Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)

Moreover, for the purposes of the study, a survey which included the components displayed in Figure 3 and which concerned the acceptance and use of social media at the University of Jyväskylä in Finland was used. In total, 71 Information Systems (IS) students, 20 females and 51 males, with mean age 25 years (range 19-57 years), completed the questionnaire. The results revealed the relevancy of infrastructure as the major issue in the planning of learning activities based on social media. The second and the third factors considered important by the students are the ease of use and the help social media provides towards working or studying. Finally, based on the results, it can be concluded that when implementing social media solutions in education the priorities should be as follows:

1. Special attention to ICT infrastructure. Since students' home conditions are not known, the first step should be directed to analyzing students' learning conditions so as to outline new learning activities based on social media.
2. Identification and selection of the best platforms regarding usability.
3. Identification and selection of best teaching methods. Educational institutions and involved teachers should discuss how teaching and learning with the use of social media should be organized so that they could support students' learning and educational development

Adoption of Social Media in Teaching IS/ICT: Comparing Students with Faculty Members

The study of Makkonen et al. (2016a) analyzed the results regarding the acceptance and use of social media by teachers at the University of Jyväskylä, Finland and compared them with those presented in the study of Makkonen et al. (2015). In total, 32 IT faculty members with teaching responsibilities completed the questionnaire. The gender distribution was 9 females and 23 males, with mean age of 41 years (27-64 years old). The findings confirmed the importance of the infrastructure as the most significant component when introducing social media in an educational context according to teachers' viewpoints. In addition, the results revealed that students consider the social influence as highly important. Students often put new contemporary social media tools quickly into practice, as early adopters, whilst older faculty members seem to follow what

happens in the field of social media. Taking these results into consideration, teachers could experiment with setting up social media activities in which students can experience contemporary learning with modern social media tools that may motivate them in the further steps of their studies.

Adoption and Use of Social Media in Learning and Teaching: A Cross Cultural Case Study

Makkonen et al. (2016b) carried out a cross cultural case study in order to examine the adoption and use of social media in learning and teaching activities. Particularly, the study concentrated on comparing the 71 results from Jyväskylä University in Finland regarding social-media-based learning with 101 responses to the same questionnaire collected from the Department of Informatics at ATEI of Thessaloniki in Greece. The gender distribution in the Greek sample was 22 females and 79 males, with mean age of 23 years (range 18-52 years).

The results from the Greek sample confirmed that the importance of the infrastructure is the most significant component. The infrastructure component was more important for Greek students than Finnish students. It can be said that this depends on the fact that infrastructure in Finland is advanced (both at universities and at students' homes), whilst in Greece there is a lack of high-tech infrastructure at schools and universities, as well as at students' homes. This has been particularly evident since the financial crisis which started in 2010.

Another difference in the results is that the Finnish students appreciated the role of social influence to a higher degree than the Greek students. In order to understand this result, Hofstede's cultural values were used (Hofstede, 2001). In collectivistic cultures (Greece scores 35), people appreciate group harmony and consensus, while in individualistic cultures (Finland scores 63) people value freedom, self-reliance and independence. In collectivistic societies, like in Greece, there are in-groups (family and friends) and out-groups (not close friends). In social media, the in-group can be compared to 'friends in Facebook' that have a stronger social influence on individuals than out-group people. In individualistic societies, such as Finland, the social influence comes from personal achievement which is appreciated. Therefore, it is evident that in social media-based learning it is important to identify and commend role models with high performances that can act as motivators for students to improve their learning.

Regarding social influence, the potential value of information that students encounter online is directly related to how others in their networks value that information and whether the information is relevant to their friends must be taken into consideration. There are numerous automated software tools, such as Usinet6, NodeXL etc. that are used for social network analysis, where relationships and knowledge flows between the relationships can be identified and visually mapped in networking graphs. Such tools can be useful for identifying key players, isolated individuals, tie strengths and cohesion of a certain social educational network.

Adoption of Social Media in Learning: A Student Perspective

In their study, Siakas and Georgiadou (2016) used the same sample of 101 Finnish students as Makkonen et al. (2015) did and investigated two research hypotheses, namely i) H1: IS/ICT Students are early adopters of social

networks and ii) H2: Male students are earlier adopters of social networks than female students. The results showed that IS/ICT students are early adopters of social networks. They are fascinated by social media and use it in their everyday lives, so they are also eager to use it as part of their learning. Students prefer to receive information from multimedia, want to learn by voice and pictures rather than by reading texts. They wish for useful and direct learning, simultaneous interaction, knowledge sharing and self-organization. Because of being sociable, they prefer group activities and active involvement.

To find out the effect of gender on the adoption of social media, T-test was run. In this specific use case, the ratings given by female to the ratings given by male respondents were compared. A significant difference only in the general experience in social media in which males were more experienced than females (mean value was 3.80 for males and 3.25 for females, the p value was 0.022) was found. Moreover, social media are considered a 'cool' new fashion and are likely to change the way teachers teach and the way students want to learn. They can enable students and teachers to create their own content and share it with a broad network of individuals. Finally, social media provides students and teachers with an unprecedented way to access information, socialize, communicate, speak, publish and co-create.

A Facebook Group among Postgraduate Students: Evaluation Results towards Learning

Tsitsekidou and Siakas (2017) conducted a study of two different Facebook groups for two different intakes in the MSc module in Web Intelligence at the Department of Informatics at ATEI of Thessaloniki in Greece, namely class of 2014 and class of 2015. The number of students involved in this study was 21 for each group. The group of 2014 consisted of students aged between 25-40 years, 15 males and 6 females, with most of the students being experienced Facebook users. The group of 2015 comprised of students aged between 20-45 years, 18 males and 3 females, most who of whom had medium Facebook experience. Furthermore, the questions were conducted in groups in order to support and evaluate students' engagement within the Facebook group, their motivation, their collaborative learning and their satisfaction from the overall experience. The four main parameters along with their three sub-parameters are:

- Students' engagement: The number of hours spent per week in the Facebook group, the rate of visiting frequency and the type of members' activity.
- Students' motivation: The degree of team spirit, communication flexibility and knowledge exchange.
- Students' collaborative learning: The degree of effective advising, timely responses and problem solving.
- Students' satisfaction: The degree of the group's contribution to the learning process and its emphasis on the students' studies as well as the type of the overall experience when participating in the group.

Every parameter was calculated based on three sub-parameters rated by the students. Each answer for these sub-parameters was given a value from 0 to 1 with step 0.25 or from 0.2 to 1 with step 0.2 in respect to its scale. For example, if the respondents answered a question with "not at all" the value 0 would be given and all the other answers would take a value from 0.25 to 1, having of course the most "agreeable" answer taking the value "1". However, there are some questions that do not use this scale as the optional answers were changed to better suit each given question. For example, where the question was "How often would you visit the Facebook group?"

there was not such a starting answer as "never" but "more than every other day" having the 0.2 value and the answer "more than five times a day" with value "1". The average scores of the calculated main parameters for the two groups are shown in Figure 4. Additionally, the correlations between these parameters were further investigated. The results showed that there is a significant correlation between students' engagement in the Facebook group and students' satisfaction of the overall experience with the Facebook group and subsequently, of the learning achieved via the Facebook group.
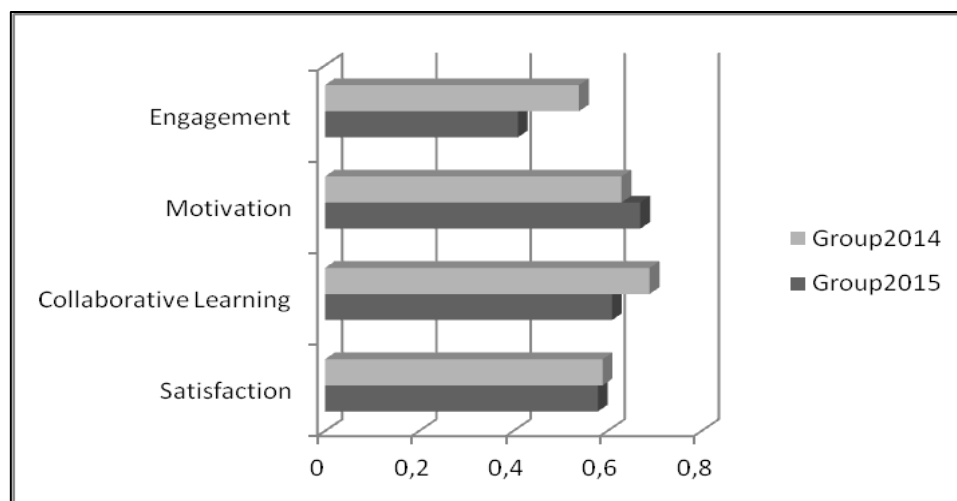

Figure 4. Students' Average Scores of Parameter Constructs (Tsitsekidou and Siakas, 2017)

Using Social Media in Higher Education: An Approach to Active Engagement of Student

Siakas et al. (2017b) used a survey involving 239 Greek students at the ATEI of Thessaloniki in Greece to validate the results from the earlier findings (Makkonen et al., 2015; Makkonen et al., 2016a; Makkonen et al., 2016b; Siakas and Georgiadou, 2016; Siakas et al., 2013; Siakas et al., 2014; Tsitsekidou and Siakas, 2017). According to the students, the 5 most popular social media platforms for general use were YouTube with 99%, Facebook with 93%, Skype with 75%, forums with 52% and blogs with 45%. Regarding social media tools preferred for improved learning, the following three social media tools are considered most important by the 239 undergraduate respondents:

1. YouTube comes first of Social media tools with 94% of the respondents rating it important for learning. More specifically, 18% of the correspondents stated that YouTube can have a little contribution to their learning process, 28% fair contribution, 29% big contribution, 19% very big contribution, whilst only 6% believe that YouTube is unsuitable for their educational needs.
2. Facebook comes second with 81% of the respondents regarding that it contributes to their learning. In particular, 40% of the students stated that the contribution of Facebook is little, 25% fair, 10% big, 6% very big, whilst 19%, do not consider Facebook a suitable learning tool.
3. Blogs are considered as an important social media tool in learning by 77% of the respondents. Specifically, 17% of the students stated that blogs help them only a little, 28% that blogs are fairly helpful, 10% very helpful, 5% immensely helpful, whereas 40% do not support the idea of applying blogs in their daily learning sources.

The percentages regarding perceived importance of social media use in higher education are slightly lower than the actual use in private life reported by the respondents. The results showed that YouTube and Facebook are both popular in students' leisure time but are also considered as the social media tools that provide the highest potential learning outcome. When comparing the results of Siakas et al. (2017b) with the ones from Siakas et al. (2014) in Table 4, it is obvious that YouTube is still a top preference. Facebook has climbed up from the fifth place to second place and blogs from fourth place to third place.

Social Media Adoption in Higher Education: A Case Study Involving IT/IS Students

Siakas et al. (2017a) concluded all earlier findings and concentrated on the validation of the results deriving from a new survey which involved 239 Greek undergraduate students and 42 Greek master students. Table 7 depicts how social media tools were rated by the 239 undergraduate students in relation to specific learning aspects. Based on Table 7, the drawn conclusion is that YouTube, which was considered as the most important social media tool for learning (Siakas et al., 2017b), has the highest ranking in the visibility category. Facebook that was considered as the second most important tool for learning has the highest ranking in meeting peers and the second highest in knowledge sharing and team spirit. Blogs, which were considered as the third most important social media tool, have the third ranking in both knowledge sharing and organizational skills.

Table 7. The Three Most Important Social Media Tools according to Learning Aspect (Siakas et al., 2017b)

	Unconscious Learning	Knowledge Sharing	Organizational Skills	Team Spirit	Meeting Peers	Visibility
1	Second Life	Forums	Wikis/Google+	Skype	Facebook	YouTube
2	LinkedIn	Facebook	LinkedIn	Facebook	Skype	Instagram
3	Instagram	Blogs	Blogs	LinkedIn	Twitter	LinkedIn

In addition, this study put emphasis on the findings of Tsitsekidou and Siakas (2017) and calculated and compared the average scores for each parameter considered important for social media-based learning based on two separate groups that of the years 2014 and 2015. In particular, in the main four parameters the group of 2014 averaged 54% in engagement, 63% in motivation, 69% in collaborative learning and 59% in satisfaction. While the group of 2015 averaged 41% in engagement, 67% in motivation, 61% in collaborative learning and 58% in satisfaction (Siakas et al., 2017a). The results showed that the contribution of the Facebook group to the students' learning process by factors, such as students' engagement, motivation, collaborative learning and satisfaction, is quite high. Motivation and collaborative learning seem to be the learning factors that are appreciated to the highest degree by the students.

Social Media Usability and Functionality in Higher Education: IT/IS Students' Perspective

Makkonen and Siakas (2018a, b) discussed the adoption and use of social media in higher education. The aim of the study reported in these two papers was to identify the main factors and problem areas regarding the use of social media in higher education. The Honeycomb model (Kietzmann et al., 2011) and the theory of external

and internal motivation (Linnakylä, 1989) were identified to be suitable underlying theories for this study. Figure 5 demonstrates how the honeycomb can be used in analyzing social media use. More specifically, the left side of the figure shows how the honeycomb has been applied for the functionality of social media and the right side of the figure shows the implications of social media.
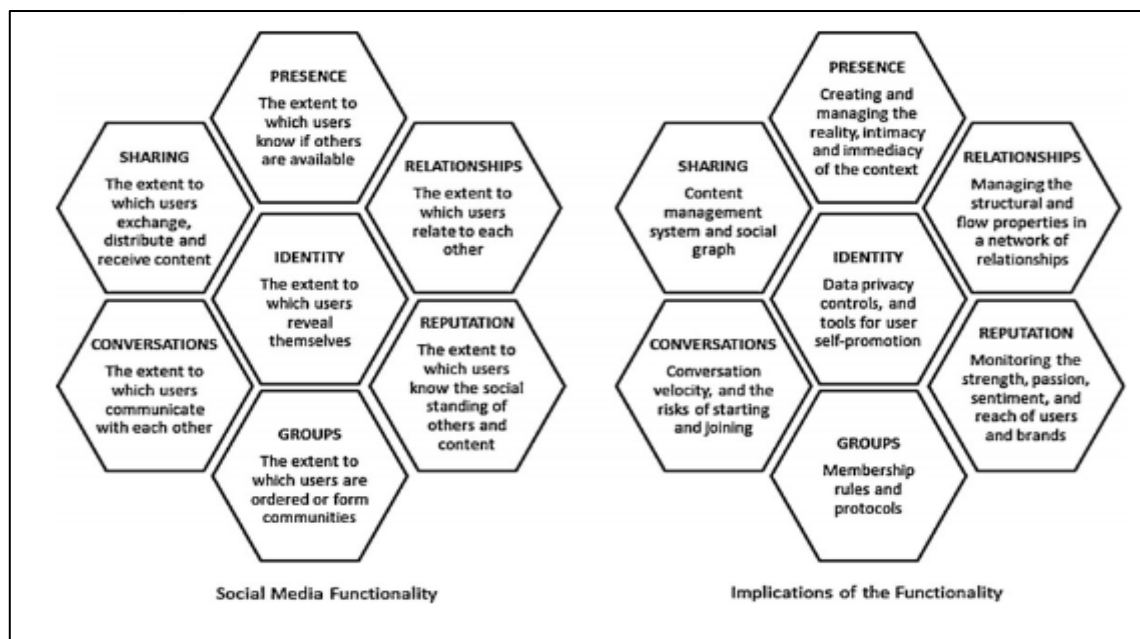

Figure 5. Honeycomb for Analyzing Social Media (Kietzmann et al., 2011)

For the purposes of this study, a survey was conducted to identify and examine students' perspective in regard to this matter. In total, 40 students from ATEI of Thessaloniki in Greece, 11 females and 29 males, whose mean age was 26 (range 18-46 years), participated in the online survey on the Webropol platform. The results showed that sharing content is the most important functionality factor for the Greek students. The students exchanged, distributed and received learning material and sources on social media, such as Google+, Dropbox and Facebook. Due to the persisting financial crises students are looking for ways of finding material for free, even the university libraries find it difficult to finance new resources, many students have to work simultaneously with their studies for financial reasons.

The power of social media is content sharing, and thus to understand content sharing is a very important issue in planning social media-based learning and teaching activities. Kietzmann et al. (2011) recommend in implications of the sharing functionality the use of content management systems and social graphs. Similarly, the use of visually mapped graphs was also recommended in order to understand the social influence (Makkonen et al., 2016a). Consequently, it can be inferred that social visualization can be a very important tool for understanding and motivating social media use in higher education.

The other significant factors found were internal and external motivation. Internal motivation is the sum of pre-interest and post-interest. External motivation is the sum of pre-benefit and post-benefit (Linnakylä, 1989). Thus, in planning social media-based learning and teaching activities it is similarly important to create strong

motivation factors for students to use social media in their learning activities and to show-cast the benefits. However, no significant difference was noticed between them. Figure 6 shows how internal and external motivation is created from a combination of interest and perceived benefit. It was also evident from the results that conversations are not considered significant for the Greek respondents who prefer conversation in more conventional ways such as talking face-to-face.
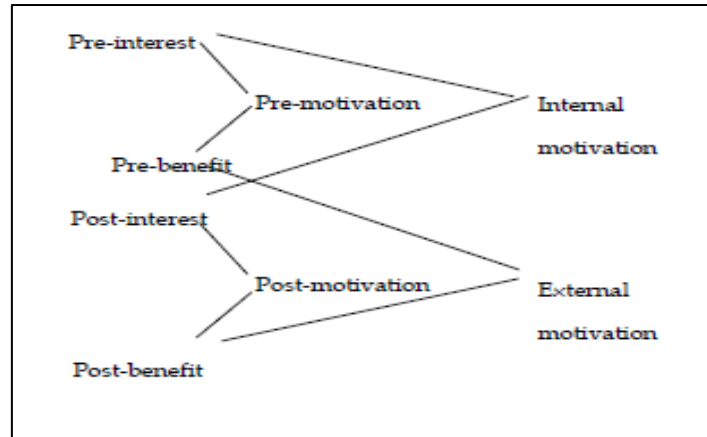

Figure 6. The Theory of External and Internal Motivation (Linnakylä, 1989)

Three Quality Attributes – Availability, Performance and Security of Social Media Services used in Higher Education: An Analysis and a Cross-Cultural Study from IS/ICT Students' Perspective

In their study, Makkonen and Siakas (2019) designed a survey instrument for investigating the importance of three quality attributes, namely availability, performance, and security in social media. The target group of the survey was ICT and Information Systems (IS) students in Finland. In total, 66 students from the University of Jyväskylä in Finland, 32 females and 34 males, whose mean age was 26 (range 18-46 years), participated in the survey. The result analysis indicated that security was a major issue compared to availability and performance in the design and use of social media in higher education. Moreover, the results also showed that malicious software, apps and phishing attacks were the most notable security threats. In regard to the availability attribute, it was shown that errors in the logic of the software and disturbances in planned maintenance were the major concerns. Finally, the results of the performance attribute showed that the network performance was the most significant issue.

Furthermore, based on Makkonen et al. (2019a), the quality of social media services can be evaluated in many ways according to various attributes. This study focused on the evaluation of social media services regarding three quality attributes, namely availability, performance and security from a wider perspective. In particular, this paper compared, analyzed and presented data which was collected from ICT and IS students of two universities, one from Finland (with 66 participants) and one from Greece (with 44 participants). The same survey instrument was used so as to investigate the significance of these quality attributes in social media and to directly compare the results of the two countries. The analysis of the results indicated that in both countries security was a major issue compared to availability and performance in the design and use of social media in

higher education. However, some cultural differences were found in this survey. For example, the Finns respondents appreciated far more availability and performance attributes.

Students' Perspective about Data Security and Privacy on Social Media

Kanakaris et al. (2019) carried out a survey aiming to identify Greek higher education students' awareness of security and privacy issues in social networking when it comes to the acquisition of their sensitive personal data by malicious users through their publications. In total 178, Greek higher education students from the Department of Electrical Engineering of Eastern Macedonia and Thrace Institute of Technology in Greece and the Department of Informatics of ATEI of Thessaloniki participated in the survey. Based on the results of the survey, the respondents were aware of the privacy settings of the social media platforms they use. Additionally, they believed that they should be more careful about sharing personal data and who they add as an online friend. Finally, the students expressed their concern regarding malicious users being able to access their personal data through their online publications on social media platforms.

Security and Privacy Issues and Concerns about the Use of Social Networking Services

Makkonen et al. (2019) conducted a study with a view to supporting and assisting teachers who are eager to design social media-based teaching and learning activities and presenting higher education students' major concerns regarding security and privacy issues on social media. In total, 43 students from the University of Jyväskylä in Finland, 18 females and 25 males, whose mean age was 27 (age range 20-57), participated. According to the results, the respondents regarded the potential of their personal information, financial information and intimate secrets being breached as the most notable concern. Furthermore, it was evident that social media improvement regarding security and privacy issues is still considered as necessary. Finally, it was pointed out that teachers should further increase students' awareness of the way they should share content and protect their privacy online properly and more effectively by highlighting the significance of information security and privacy as well as the various online threats.

A Framework to introduce Social Media in Education - Students' Perspective about the use of Social Media as an Educational Tool

In their study, Lampropoulos et al. (2020a) presented an educational social media planning and design framework and analyzed the results of a survey which aimed at pinpointing students' viewpoints concerning the use of social media in teaching and learning activities. A total of 63 students, 11 females and 52 males, aged from 18 to 20 years from the Department of Information and Electronic Engineering of the International Hellenic University in Greece, participated in the paper-based survey. The majority of the respondents had been using social media for more than 5 years (frequency: 54 and percentage: 85.7%). Additionally, the majority of the respondents (frequency: 29 and percentage: 46%) used social media for at least an hour per day while a lot of them (frequency: 25 and percentage: 39.7%) spent more than three hours. Based on the results of this study, it was clear that the majority of the students regarded social media as a helpful and indispensable educational tool

that can improve learning when applied in a student-centered manner. The mean values of the responses to questions regarding the impact of using social media in education are sorted in descending order in Table 8. Based on the results, it is apparent that they considered social media as a means that can improve learning and that can boost communication, collaboration and knowledge sharing with their fellow students and teachers in an educational context. Finally, they deemed social media as a tool that can promote, enhance and facilitate group work and collaboration and which can positively affect their academic performance.

Table 8. Mean Values (scale 1-4) of the Responses regarding the Use and Impact of Social Media in Education, adapted from (Lampropoulos et al., 2020a)

Do you consider that . . .	Mean value
. . . social media can increase knowledge sharing among students?	3.22
. . . social media can improve collaboration among students?	3.10
. . . social media can improve communication among students?	3.10
. . . social media provides a useful platform for academic group work?	3.08
. . . the use of social media to share work with your peers for academic purposes has a positive impact on your studies?	3.02
. . . social media can be used as a means to improve learning in education?	3.00
. . . social media is indispensable for communicating with both their teachers and fellow students?	2.98
. . . the usage of social media can benefit your academic performance by any means?	2.98
. . . social media is an indispensable educational tool?	2.94

Discussion

Our findings showed that a general readiness for using social media in education and learning exists because of a pedagogy paradigm shift toward more student-centered collaborative approaches, lightweight open and free Web 2.0 applications which are easy to learn and use, digitally literate and multitasking students who increasingly use social media in their daily lives and finally contemporary fashion of dynamic collective content creation. Our results clearly showed that students are early adopters of social media and are both emotionally and technically ready to use social media in their learning purposes. Therefore, teachers should start experimenting with creating social media activities for learning purposes. One potential way could be to actively involve students in the planning and creation of tasks in order to acquaint them with the overall process.

In total, 90.7% of the Greek students (n: 172) from multiple disciplines who were involved in the study of the year 2010 considered that the use of social media in education is important and 52.3% of them that the use of social media in education is both urgent and important. Half of the students reported that they already use social media for educational purposes (mainly Facebook, YouTube, Skype, wikis and blogs) on their own initiative since no official use of social media is applied. The advantages of using social media in learning are that social media facilitates communication, promotes knowledge sharing and creates a sense of community and belonging

for its members. The challenges reported were group competition, security and safety, compatibility of social media platforms, trust, fake news and content quality.

When asked which social media tools are most likely to improve learning both Greek teachers and students considered YouTube, Google docs, forum, blogs and Facebook to be the 5 most important ones. Teachers lag behind and are also reluctant to use social media for educational purposes. In a similar study (Siakas et al., 2017b), Greek undergraduate students (n: 239) and master students (n: 42) considered YouTube, Facebook, Skype, forum and blogs as the most popular social media tools while they regarded YouTube (visibility), Facebook (meeting peers, knowledge sharing and team spirit) and blogs (knowledge sharing and organizational skills) as the most useful platforms for learning. YouTube remained the most popular social media platform for students both for their private life and for educational purposes while Facebook climbed up to second place in the past seven years.

In the study conducted by Lampropoulos et al. (2020a), a decade after the first study, Greek students (n: 63) seemed to be certain about the positive impact that social media may have on education. All mean values based on students' responses (1 = strongly disagree ... 4 = strongly agree) regarding the impact of social media concerning certain factors of education were very high, namely knowledge sharing (3.22), collaboration (3.10), communication (3.10) and academic group work (3.02). Additionally, the participants considered social media as an indispensable educational tool (2.94) that can be used as a means to improve (3.00) and benefit academic performance (2.98).

After having understood students' and teachers' viewpoints regarding the use and potential impact of social media for educational purposes, issues, concerns, potential bottlenecks and success factors in the adoption of social media in educational settings were investigated. The study was based on the unified technology adoption (Venkatesh and Davis, 2000; Venkatesh et al., 2003) and the honeycomb (Kietzmann et al., 2011) approaches. The main findings of this study revealed worries about infrastructure, security and privacy, network and social media performance as well as availability of broadband and social media services when considered necessary. Moreover, based on the findings of the longitudinal study, we embarked on improving and extending the educational social media planning and designing framework presented in (Lampropoulos et al., 2020a). The improved framework is depicted in Figure 7 and it can be used in any educational institution that has a vision to use social media in their teaching and learning activities.

Finally, it is worth noting that there are a lot of factors that should be thought over in order to successfully apply social media-based learning. All the involved members should take part and collaborate to design appropriate student-centered and technology enhanced learning methods. Therefore, strategies, detailed objectives, action plans and measurement indications should be planned, created and managed as a joint task. Taking this into consideration, the main steps of the framework include the creation of strategies regarding:

- Infrastructure
- Social media platform
- Additional tools

- Teaching methods
- Level of social media use
- Training needs
- Quality and reliability of information and sources
- Risks, availability and performance
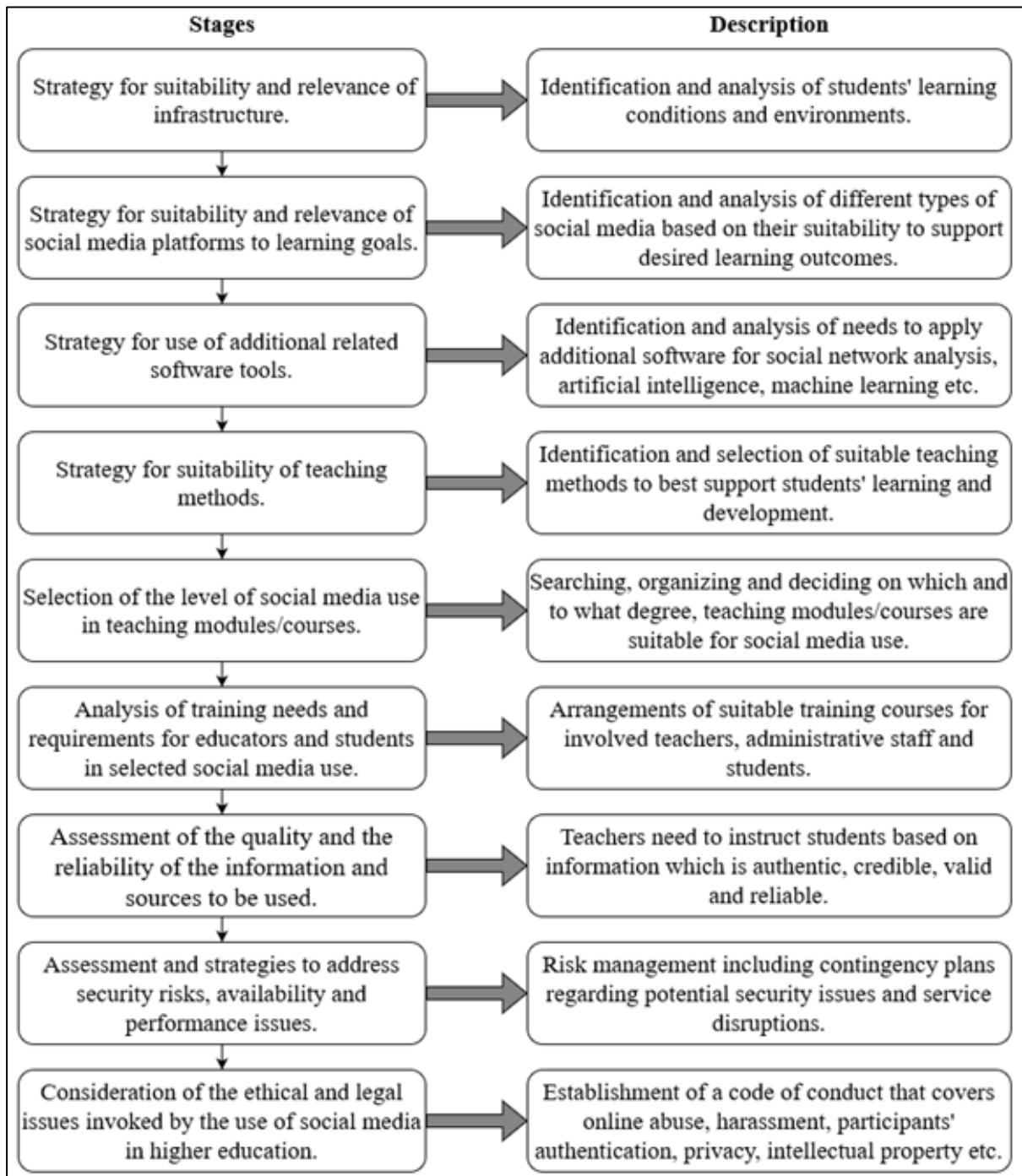- Ethical and legal issues

Figure 7. The Educational Social Media Planning and Designing Framework

Conclusion and Future Work

This study aimed at enhancing teachers' comprehension of social media and its use as an educational tool to create interactive learning environments for students of various disciplines in geographically and culturally distributed environments. Therefore, it summarized and analyzed last decade's results and findings of our ongoing longitudinal study which started in 2010. Based on our results from the longitudinal study, we proposed an improved educational social media planning and design framework. Nonetheless, it must be said that the given framework has not been finalized yet, as it has not been thoroughly evaluated in practice by students, teachers and parents.

By summing up the main findings of our studies over the last decade as well as those of other related studies, we came to the conclusion that when there is proper infrastructure, appropriate strategies are applied, security and privacy are of high priority and teachers are well informed and become accustomed to using modern technologies, social media can be used as an effective educational tool which improves the overall educational process and learning outcomes. Specifically, by using social media in a creative and student-centered manner in educational settings, students' engagement, motivation, interactivity, soft skills, communication and collaboration are promoted and improved. Finally, social media can be used as a means to help create virtual communities in which students will be able to exchange ideas, opinions and knowledge in both academic and extracurricular environments, mature and flourish.

Future work will focus on continuing and expanding our longitudinal study and examining the effectiveness of our proposed framework in cross cultural case studies. In addition, due to the impact of the COVID-19 pandemic, the overall work practices around the world have been transferred toward more flexible ways. This is in line with the concept of connectivism in e-learning paradigm which supports that learning occurs regardless of time, place and device restrictions (Siemens, 2005). Therefore, we also aim at looking into the current shift in work and teaching/studying practices toward online learning and which factors will enable the full transition to virtual learning environments. Finally, we aim at investigating the use of social media in conjunction with cross reality technologies and gamification approach.

Acknowledgements

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