



Article

# Social Networks Research for Sustainable Smart Education

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**Abstract:** Social networks research has grown exponentially over the past decade. Subsequent empirical and conceptual advances have been transposed in the field of education. As the debate on delivering better education for all gains momentum, the big question is how to integrate advances in social networks research, corresponding advances in information and communication technology (ICT) and effectively employ them in the domain of education. To address this question, this paper proposes a conceptual framework (maturity model) that integrates social network research, the debate on technology-enhanced learning (TEL) and the emerging concept of smart education.

**Keywords:** smart education; social networks; social media; conceptual maturity model; technology-enhanced learning process

## 1. Introduction

Social networks research has grown exponentially over the past decade. Subsequent empirical and conceptual advances have been transposed in the field of education. As the debate on delivering better education for all gains momentum, the big question is how to integrate advances in social networks research, corresponding advances in information and communication technology (ICT) and effectively employ them in the domain of education. To address this question, this paper proposes a conceptual framework (maturity model) that integrates social network research, the debate on technology-enhanced learning (TEL) and the emerging concept of smart education [1,2]. Social networks research is a rapidly emerging field of study, which in the context of education yields particular promise. Given the advances in ICT education providers worldwide, hence not only education institutions, have sought to employ social networks to boost the efficiency of teaching and learning. Several challenges and opportunities have been identified in that context, including:

Advanced learner profiling methods, developing active, self-directed, responsible learning context with technology [1,2], and integrating mobile applications and analysis tools are all examples of the studies concerning Smart Education Research [3,4]. Another important impact of social networks is setting very important milestones for Higher Education to advance social learning methodologies and practices [5] by the development of new strategies for student centric, and community centric learning. However, student centric and community centric learning is challenged by directions of Social Networking Research in Open and Distributed Learning [5].

Aspects of this reality are manifested in *Learning Analytics Research*, a branch that sets opportunities to reveal hidden pattern in large volume of data related to learners, academic institution, etc. Also, movement toward [6–10] more open learning using *MOOCs* (*Massive Open Online Courses*) is another area which offers full potential for researching student-centered learning analytics such as motivation effects and what to report on students learning. Another focus is *learning software provision*, which poses new significant challenges for policy makers, learning administrators, and faculty. Finally, the *fast movement* from centralized, controlled environments *towards collaborative distributed, integrated social learning systems* is an added direction to the list of focuses challenging the Social Network Research in Open and Distributed Learning.

In face of these challenges, it is important for universities and colleges worldwide to recognize whether they are ready to adopt flexible, decentralized and intelligent systems for learning and social networking or continue to perceive social networking as a standalone practice out of the typical, well set learning procedures. Within this context, the integration of *Social Networks Research* in *Smart Education Research* has to face, in our opinion, six critical challenges:

- The integration of advanced profiling techniques, learning objectives, and social networks;
- Effective use of learning analytics to boost the teaching and learning process;
- Advanced data mining techniques to support the teaching and learning process, on the one hand, and advanced management of teaching and learning, on the other hand;
- The use of data mining and data analytics to exploit synergies that the interaction of teachers and learners in the network environment create and develop strategies for collaborative active learning
- The use of data analytics and data mining to provide personalized learning assistance in context of global learning platforms.
- The use of data analytics and profiling methods examine and exploit the potential inherent in virtual and augmented reality as applied in teaching and learning;

These challenges directly pose a critical question: *Is it possible to realize the integration of all these changes in a sustainable plan for the evolution of Higher Education?* Do academic institutions have the innovators, the early adopters, or the policy makers capable of envisioning and preparing for such future?

The research is done in context of global challenges which rises several questions which authors of the research would like to make in front of future research directions. This paper addresses the following questions

- (i) Do social media and social networking websites have a significant role in in educational institutions?
- (ii) Is there a methodological framework capable of promoting the integration of the previous six challenges in current social networking capabilities of Technology Enhanced Learning and smart education platforms?
- (iii) What are the policy making requirements for such strategic shift?

The reminder of this paper is structured as follows: Section 2 offers a thorough literature review of social networks research and links it to the debates on TEL and smart education. In the following section the research methodology employed in this study is outlined. Conclusions follow.

## 2. Literature Review on the Exploitation of Social Networking Technologies

Academics and researchers currently explore the capabilities of emergent technologies to support the learning process in an interactive learning environment. Table 1 summarizes recent relevant research on several dimensions of social networks and smart learning [11–28]:

The term “social networks” is broadly used in different contexts. Sometimes it is assumed that social networks are all online sites which can be accessed through the internet, sometimes it

is suggested that there should be clear definitions how social networks are different from Learning Platforms, Learning Management Systems, Virtual Learning environment etc. Authors of this paper will not focus on defining these differences, but rather on benefits of social learning which is supported by using different kind of social media and ICT to scaffold Knowledge Building [29–37].

The discussion of social networking for learning purposes is multidimensional. Various comparative bibliometric studies about the connection of social networks, neuron networks and learning promote the debate for the added value of this integration. In the current thread of literature researchers integrate social networks research with the emerging learning analytics and big data domain. In the same direction there is a solid research area that is dealing with the examination of perceptions on learners and teachers about technologies including social networking technologies for learning. At a broader context other studies discuss the trends on digital campus and best practices on the integration of ICTs. In the current literature there is also a well-defined discussion on the connections of social networks research to recommendation systems in technology enhanced learning e.g., Development of a social recommender system based on Hadoop to reduce the gap between students and useful information for them. A very interesting finding in the literature is also the fact that students mainly use social networks for socialization reasons, not fully exploiting the potential of social networks as learning tool. From an applied point of view, the research community of social networking for learning is interested also in the specifications and the implementation of social learning systems. These systems also include Smart Learning solutions in diverse domains like Healthcare or services industries. Emerging technologies, including cloud systems as well as augmented and virtual reality enabled social networking services gain more interest.

Advanced learner profiling methods, developing active, self-directed, responsible learning context with technology [29–31], and integrating mobile applications and analysis tools are all examples of the studies concerning smart education research [32,33]. Another important impact of social networks is setting very important milestones for higher education to advance social learning methodologies and practices [34] by the development of new strategies for student centric, and community centric learning.

Aspects of this reality are manifested in *Learning Analytics Research*, a branch that sets opportunities to reveal hidden pattern in large volume of data related to learners, academic institution, etc. Also, movement toward [35–39] more open learning using MOOCs (*Massive Open Online Courses*) is another area which offers full potential for researching student-centered learning analytics such as motivation effects and what to report on students learning. Another focus is *learning software provision*, which poses new significant challenges for policy makers, learning administrators, and faculty. Finally, the *fast movement* from centralized, controlled environments *towards collaborative distributed, integrated social learning systems* is an added direction to the list of focuses challenging the Social Network Research in Open and Distributed Learning.

**Table 1.** Literature on social networks and smart learning.

Title	Authors	Main Research Issue	Main Contribution	Implications for a Holistic Model
Analysis of the scientific literature published on smart learning	Durán-Sánchez, A., Álvarez-García, J., Del Río-Rama, M.C., Sarango-Lalangui, P.O. (2018)	Analysis of state of the art of the field of Smart Learning	Comparative bibliometric study	Content Context Policy Making & Leadership/Innovation Integration/Sustainability
A bibliometric perspective of learning analytics research landscape	Waheed, H., Hassan, S.-U., Aljohani, N.R., and Wasif, M. (2018)	Analysis of learning analytics literature	Better understanding of current research on learning analytics and the importance of big data and data mining tools	Content Social Interaction Assessment Integration
Learning and teaching with social network sites: A decade of research in K-12 related education	Greenhow, C. and Askari, E. (2017)	Survey of educational research literature	Examination of perceptions on learners and teachers about technologies	Perceptions Integration/Sustainability
Smart learning in digital campus	Liu, D., Huang, R. and Wosinski, M. (2016)	Research on digital campus in China	Discussion of trends on digital campus and best practices	Content Context Collaboration & Social Interaction Development
Homogenizing social networking with smart education by means of machine learning and Hadoop: A case study	Jagtap, A., Bodkhe, B., Gaikwad, B., and Kalyana, S. (2016)	Educational activities, social networking environment and the interest of students for activities	Development of a social recommender system based on Hadoop to reduce the gap between students and useful information for them	Content Context Social Interaction Development Integration
Social media networks as a learning tool	Kolokytha, E., Loutrouki, S., Valsamidis, S. and Florou, G. (2015)	Examines if it is convenient for students the upload of e-learning content in social networks (like Facebook)	Students mainly use social networks for socialization reasons, not fully exploiting the potential of social networks as learning tool	Content Collaboration & Social Interaction & Leadership/Innovation
Analysis of collaborative learning in social network sites used in education	Al-Dhanhani, A., Mizouni, R., Otrok, H. and Al-Rubaie, A. (2015)	Comparative study between different social network sites and educational social networks sites	Development of an educational social network site based on the findings of the conducted study	Content Collaboration & Social Interaction Integration
Smart learning environments using social network, gamification and recommender system approaches in e-health contexts	Di Bitonto, P., Pesare, E., Rossano, V., and Roselli, T. (2015)	Creation of learning paths focused on the specific needs of individual, with the use of information technologies	Solutions of smart learning environment in the field of e-health	Gamification Context Smart Education
Social networks analysis and participation in learning environments to digital inclusion based on large-scale distance education	Da Silva, A.D.S., De Brito, S.R., Martins, D.L., (...), Costa, J.C.W.A. and Francês, C.R.L. (2014)	Evaluation and monitoring of programs designed for digital inclusion training	Identification challenges in these activities	Context Collaboration & Social Interaction Development & Assessment
The Social Network Learning Cloud: Architectural education for the 21st century	Schnabel, M. and Ham, J. (2014)	Social network learning cloud for architectural education and linking academic learning management systems and professional or private social networks	Ways of using social network cloud for other areas of the CV and future directions	Context Innovation Integration/Sustainability
Using smart mobile devices in social-network-based health education practice: A learning behavior analysis	Wu, T.-T. (2014)	Satisfaction of learning and learning behaviors	Empirical evidence show social networks can improve interactions between individuals in nursing education (students, educators)	Content Collaboration & Social Interaction Development & Assessment

Table 1. Cont.

Title	Authors	Main Research Issue	Main Contribution	Implications for a Holistic Model
The Use of Virtual Learning Environment (VLE) and Social Network Site (SNS) Hosted Forums in Higher Education: A Preliminary Examination	Hollyhead, A., Edwards, D.J. and Holt, G.D. (2012)	Use of asynchronous virtual learning environment forums and social network sites in higher education institutions	Lessons and also challenges for educators	Content Context Collaboration & Social Interaction Development & Assessment Innovation Integration/Sustainability
“How do social networks influence learning outcomes? A case study in an industrial setting”	Maglajlic, S. and Helic D. (2012)	Analysis of the impact of implicit social networks on the online learning outcome in an industrial context	Case study shows correlation between communication intensity and the outcome of the learning process	Development & Assessment Policy Making & Leadership/Innovation Integration/Sustainability
Reflective learning through social network sites in design education	Park, J.Y. and Kastanis, L. (2009)	Empirical study (survey) on reflective learning through social network sites in the context of two animation units	Findings show the importance of the learning circumstances of the students and the students’ learning circumstances and the design of peer-to-peer interactions	Development & Assessment Policy Making & Leadership/Innovation Integration/Sustainability

Having a clear vision of the full potential of smart classroom environment is crucial for transitioning from conventional classroom to the smart classroom and thus driving the innovation in learning and higher education institutions. It is essential to integrate social networking in the smart education research domain and exploit the benefits of the use of social networks as learning tools in the context of smart classroom environment for smart universities. Emergent technologies offer valuable opportunities for using new learning methods with the focus on students. Higher education institution must be aware that pedagogy, and teaching and learning practices needs to adapt to these new tools too.

In our proposed model we highlight the importance of implementing a holistic approach to overcome the challenges of e- learning but also assist academics, deans and stakeholders involved in the design and reform of national educational systems as well as stakeholders working on national/EU/international online learning initiatives. Higher education institutions need to have a clear vision and leadership capabilities to accomplish this strategic transformation.

Participation and collaboration in social networks expands learning opportunities such as sharing, transfer and internalization of new knowledge by learners, which is essential in the online learning process. Higher education institutions (HEIs) must exploit the benefits of a holistic integration of initiatives towards the use of social networks as learning tools for students. And consider challenges in its implementation as well. Learning analytics, visual learning, cloud computing and emergent wearable technologies are key drivers for the successful achievement of the benefits of the online learning process [21,22,28,38,39]. At the same time researches show that neither academia [40], nor students are fully prepared to accept the challenges and use new possibilities meaningfully to construct new knowledge. There are concepts developed on blended learning where learning is supported by virtual and real environments are combined together. There are concepts developed on Knowledge Building [39] but they are missing the collective cognitive responsibility [41,42] as the learning environment is transforming and more responsibility is transferred to learners. This underlines the necessity to put more efforts in searching for new paradigms in learning and analysis of possibilities and challenges brought by social networking sites.

In order to create value through social networking sites in smart education and benefit students, academics and other stakeholders, policy makers and academic staff must understand the following key components and explore their interactions and implications: the content offering, context, collaboration, social interaction, development, assessment, policy making, levels of integration and finally leadership and innovation.

Social networks and technology together will provide different levels of interactivity during learning process, enriching teaching methods and developing students' skills as well as increasing the participation of students resulting in more active learning.

Feedback in a smart education environment is very important. Academic staff must receive feedback about students' performance in smart classroom which in our context is understood as learning space enhanced with diverse digital technologies and an environment of online learning. This feedback can be in form of data or information about the status of assigned tasks or results of an assessment.

Furthermore, another complexity in the smart education context must be emphasized: smart education requires innovative pedagogy methods and tools in order to maximize opportunities of active learning and exploit and enhance the creativity of students. At the moment there are some promising initiatives on pedagogical aspects for smart environment but this is still not enough [43,44].

Figure 1, summarizes the main components of value in social networking sites, helping policy makers at regional, national, and international level to understand the importance of components individually and as a whole. These components must be personalized for the specific context of smart learning environment enhancing the learning process in smart classrooms.



**Figure 1.** The value components of Social Networks in Education and Learning.

Here we present our innovative conceptual model based on our previous research experience and publications on smart education and technology enhanced learning for more than a decade as well as our daily teaching activities and utilization of new technologies and pedagogical tools to transform traditional classrooms into smart classrooms.

The research team is actively working on the final stages of design of a survey to test the conceptual model proposed here. The survey will be conducted in several countries in Europe and Gulf Region which will help us not only to test our theory and propositions but to gain deeper understanding of social networks and smart education's interrelations and also proving a comparative view across countries and regions.

Both the proposed theory and model as well as the geography regions we aim to cover in our survey will contribute to fill the gap in literature providing a holistic model to analyses and understand social networks in smart education environments.

### 3. Research Methodology

This research is part of an integrated research related to the International Technology Transfer and Best Practices in Higher Education. It serves as a follow-up, meta-research paper of a special issue recently published in IRRODL, International Review of Research in Open and Distributed Learning, on the theme of Social Networking for learning.

In Figure 2, we provide the overall research methodology adopted in this study. At stage 1, a combined and focused literature review focused on:

- The study of a rich literature on the use of emerging ICTs and their contribution to technology enhanced learning and smart education
- The understanding on how Social networking technologies are exploited in education
- The thorough analysis of policy making requirements and strategic propositions for Smart education and technology enhanced learning

At Stage 2, we drafted our key research problem which is how emerging technologies challenge the adoption of Social networks in Education? This approach integrates several of the new technologies like Learning Analytics, Virtual and Augmented Reality, Visual Learning and Cloud Learning Services. For this study the theoretical construct of Social Learning value components presented in the previous section was exploited further.

At Stage 3, a combination of qualitative and quantitative research was design. The main purpose was to run a quantitative questionnaire for the perception of uses of Technology enhanced learning services about the value of Social networks and emerging technologies as well as to adopt a desktop research on other studies. Soon we plan numerous qualitative interviews with experts of social networking services in education.

At Stage 4, our key theoretical contribution is presented a maturity model for value integration of Social networks in learning and education based on the contribution of emerging ICTs.

The main research questions that this article addresses include:

- What are the main aspects of adopting social networks in education?
- What is the strategic impact of social networks for teaching and learning at diverse levels and in diverse domains of education systems?
- Is there a maturity model that summarizes the value added of social networks in teaching and learning?
- What are the key challenges for the advancement of research geared toward integrating social networks in teaching and learning in higher education?

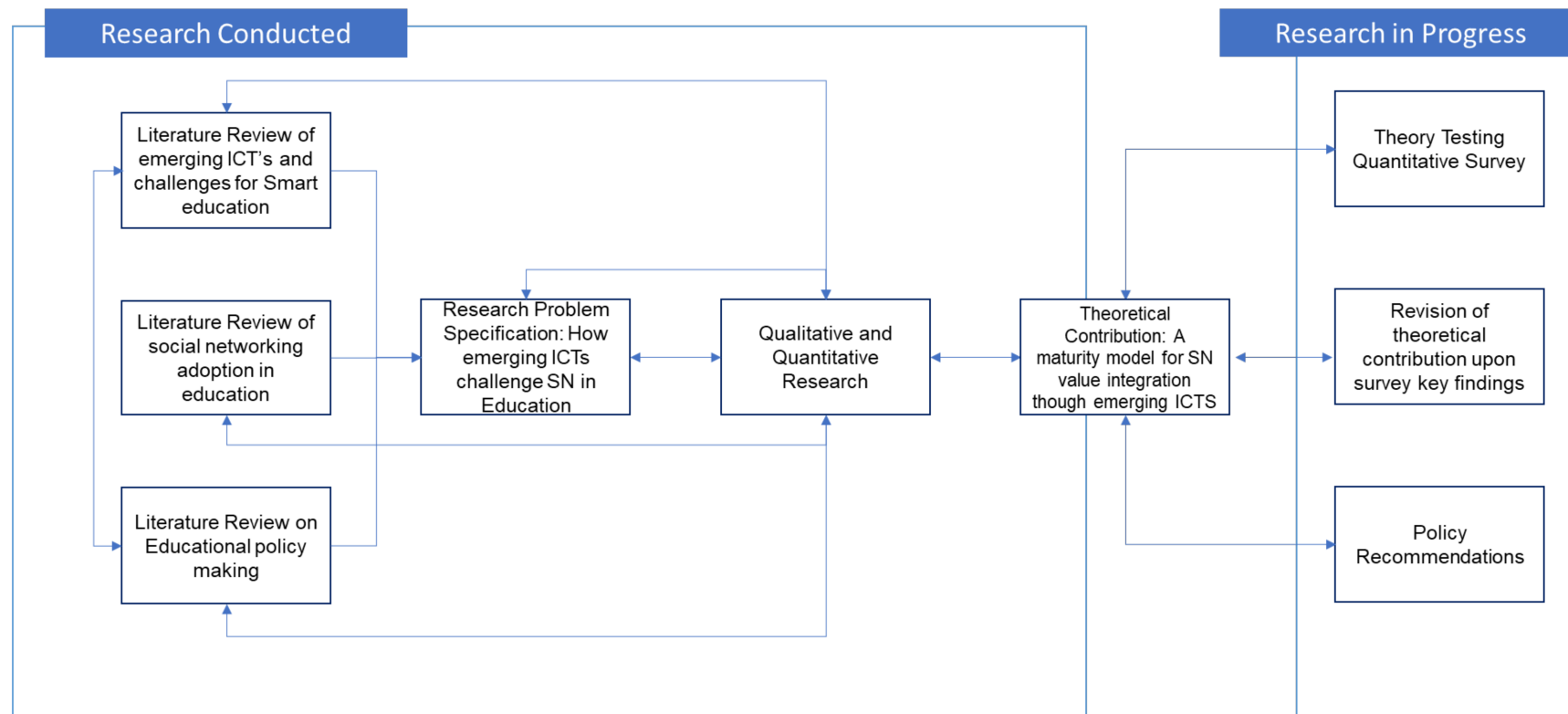


Figure 2. Our Research methodology for the integration of emerging technologies in Social Networks for Education.



#### 4. Analysis and Main Findings—Social Learning Networking Strategic Shift

The development in Smart Education Research domain is a continuous evolving process towards sustainability in Education. In the analysis of it is critical to understand that the adoption of any emerging technology—along with the relevant experimentations, the lessons learnt and the analysis of contributions—do not have a significant impact unless they maintain a continuous value adding perspective for the future. In our analysis of the domain and in the rhetoric communicated in the special issue, Social Networking Research must be discussed in a context. This context should be associated with several maturity and growth stages, which reveal the hidden value of the application of social networks in Higher Education.

To find out current issues in HE in context of Technology Enhanced Learning the survey questionnaire was created using Google sheets to ensure that it was possible to get answers from different countries at the same time. Respondents were contacted through the researchers' personal contacts and asked for the questionnaires to be filled in by various faculty members, administrators, and students, thus gaining an opinion from all stakeholders involved in HE. The survey questionnaire consisted of 20 questions (in this paper there will be analyzed data which are important in context of role of Social Network in learning process); in the first part, respondents were asked to provide demographic information about themselves such as their current status in HE, country of origin, gender, and the field of science they represented. The following questions were administered regarding technologies used by respondents in their learning process, evaluating frequency of use on a Likert scale ranging from 1 (*never*) to 4 (*during each class*).

After these questions, respondents were asked about using different forms of online learning. They can elaborate on their experience using different kinds of learning such as Learning Management Systems, Social Media Applications and MOOCs.

Next part consisted of questions to evaluate possibilities to use different ICTs in learning process and possible reasons why ICT are not fully used to gain all the possible benefits of them.

All the quantitative data gathered was coded and inserted in SPSS program to make calculations to find out answers to research questions.

#### 5. Results

140 respondents completed the questionnaires. 65 of them were women while 75 were men. Out of these respondents, 23 identified as students, 22 identified as researchers, 75 identified as professors etc., out of these four administration representatives identified themselves as students/researchers. Regarding the areas of science identified by respondents, the breakdown of the data was as follows: 67 identified as technology/IT/CS (Computer Sciences) experts; 40 identified as experts in the social sciences; 36 claimed that their educational studies were different but were currently engaged in TEL aspects of the learning process; 26 indicated that they were experts in learning theories; and 19 other areas were indicated with a small number of experts in these areas. In general, the survey was completed by respondents representing 38 countries, with the largest number of respondents from Latvia (24), followed by Pakistan with 15 respondents, then Greece and Poland, each with 11 respondents. Seventeen countries represented one respondent per country. Currently, there is not enough data from each country to perform data analysis by country. There were not also a sufficient number of respondents' views coming from different areas. Therefore the data was not analyzed in a comparative way, but in general way instead.

In this paper, authors analyze data where respondents had the opportunity to say whether or not they use some kind of Learning Management Systems, Social Media Applications and MOOCs and answers were coded by 0—if the system is not used by the respondent and by 1—if the system is used. The results are summarized in Table 2 and it can be concluded that most popular online learning is use of LMS (N 105) which provides the opportunity to organize teaching-learning process out of time and place, collect data on student activity, provide specific assignments by professors. The Social Media applications for learning were chosen by 57 respondents and MOOCs by 23 respondents of the survey.

These results show that structured learning platforms which are represented by LMS are preferred in HE.

**Table 2.** Descriptive Statistics on use of online learning possibilities.

	N	Sum
Learning management systems (LMS) (Blackboard, MOODLE etc.)	140	105
Social Media applications for learning	140	57
Massive Open Online Courses	140	23
Valid N (listwise)	140	

As the following step calculations were made on the answers about the possibilities in use of ICT and results are summarized in Table 3 where respondents could express their opinion by evaluating statements provided by researchers in Likert scale from 1–5 where 1 was disagree but 5—fully agree. The Mean and Standard Deviation was calculated to find out how the statements about the possibilities of ICT were evaluated. Results allowed to conclude that respondents are highly positive in their opinion that the use of ICT improves the effectiveness of teaching and learning (mean 4.46 and Std. dev. 0.714) and that the use of ICT in the teaching process promotes students' active engagement in the process (mean 4.35 and Std. dev. 0.758). The less positive opinion were expressed about the statement that the use of LMS fosters students' active engagement in the teaching and learning process (mean 3.76 and Std. dev. 1.001) and it enables the authors to conclude that different forms of online media should be used to foster active learning processes and that Social Media applications can be one of such possibilities. The last statement provided for evaluation was about not fully exploring the benefits of LMS use by professors and results show that the majority of respondents confirm that opinion (mean 4.09 and Std. dev. 0.928).

The next part of the questionnaire consisted of statements about the possible reasons why potentials of ICT are not fully used. The respondents were asked to evaluate given statements in Likert scale from 1–5 where 1—was for the opinion “strongly disagree” and 5—for the opinion that “it is the highest risk” and results are summarised in Table 4. It can be concluded that respondents believe that highest risks that professors are not aware of all the possibilities of ICT (mean 3.6) but these results are quite diverse because the Std. Deviation is 1.023. Also respondents as highly risky evaluate following aspects: There is not enough ICT available in educational environment (mean 3.24 and Std. dev. 1.085) and The ICT used in education are not interactive enough to ensure active learning processes (mean 3.19 and Std. dev. 1.175).

As the next steps authors grouped and coded 15 different fields indicated by respondents. In this stage there were 4 groups: students (N 29), academia (N 109), and administration (2). The group of students were made of respondents who do not have other connection with HE, if a respondent indicated that he or she is a student and researcher for HE, then they were coded for the group-academia where were included those who work in HE as lectures, professors, researchers and other academic personnel who are involved in academic responsibilities. The administration group consists of respondents who indicated themselves as administrators in HE but in group of others there are included those who have other roles but who cooperates with HE (IT consultant, business owner etc.). This grouping was necessary to find out is there differences among the groups on their opinion why there is not used the full potential of ICT. Results are summarized in Table 5. The mean calculation was chosen because the size of groups is not the same and Standard deviation is calculated to find out the diversity in respondents' opinions.

**Table 3.** Case Summaries of opinions on possibilities of use of ICT.

	The Use of ICT in Education Improves the Effectiveness of Teaching and Learning	The Use of ICT in the Teaching Process Promotes Students' Active Engagement in the Process	The Use of ICT in the Teaching Process Fosters Students' Creativity, Independent Thinking and Problem Solving Skills	The Use of ICT in Education Promotes Students Awareness and Willingness to Look for Additional Information in Other Sources	The Use of LMS Fosters Students' Active Engagement in the Teaching and Learning Process	Smart Use of ICT in the Teaching Process Might Foster the Development of Students Liberal Worldview, Open-Mindedness, Respect for Others	The Benefits of the Use of LMS Are Not Fully Explored by Professors
<b>Mean</b>	4.46	4.35	4.02	4.15	3.76	3.91	4.09
<b>St. Deviation</b>	0.714	0.758	0.925	0.856	1.001	0.948	0.928

**Table 4.** Case Summaries about the reasons of not using full potential of ICT.

	Students Get Bored Very Quickly	Students Lack the Necessary Skills to Use IT Enhanced Methods of Teaching	Professors Are Not Aware of All the Possibilities of ICT	There Is Not Enough ICT Available in Educational Environment	The ICT Used in Education Are Not Interactive Enough to Ensure Active Learning Processes
<b>Mean</b>	2.78	2.54	3.60	3.24	3.19
<b>Std. Deviation</b>	0.898	0.962	1.023	1.085	1.175

**Table 5.** Case Summaries about the reasons of not using full potential of ICT by groups of respondents.

Status		Students Get Bored Very Quickly	Students Lack the Necessary Skills to Use IT Enhanced Methods of Teaching	Professors Are Not Aware of All the Possibilities of ICT	There Is Not Enough ICT Available in Educational Environment	The ICT Used in Education Are Not Interactive Enough to Ensure Active Learning Processes
student	Mean	2.83	2.41	3.34	2.86	3.38
	Std. Deviation	0.966	1.018	1.173	1.187	1.293
academia	Mean	2.79	2.56	3.70	3.37	3.15
	Std. Deviation	0.882	0.946	0.979	1.010	1.141
administration	Mean	2.17	2.67	3.00	2.67	2.83
	Std. Deviation	0.753	1.033	0.894	1.506	1.329
other	Mean	3.50	3.00	4.00	4.00	4.00
	Std. Deviation	0.707	1.414	0.000	0.000	0.000
Total	Mean	2.78	2.54	3.60	3.24	3.19
	Std. Deviation	0.898	0.962	1.023	1.085	1.175

The analyses of results show that there is not big differences in opinions of students and academia for the statements. In students opinion the higher risk is that Professors are not aware of all the possibilities of ICT (mean 3.34) but results of Std. Deviation show that their opinion inside the group is quite diverse and it shows that they have different experience with professors. Representatives of academia assumes this risk as the most important (mean 3.7) and results of Std. Deviation shows that their opinion was more focused and can indicate that they feel that there can be done more to incorporate different ICT in learning process. Another quite interesting results are for statement “The ICT used in education are not interactive enough to ensure active learning processes” where results of students show that in their opinion it is the highest risk (mean 3.38) although the Std. Deviation shows the diverse opinion within the group, but for academia this risk is evaluated as third in line of importance (mean 3.15, Std. Deviation 1.141) and it confirms that the cycle of technology development influences the HE where processes of changes are slower than changes in possibilities provided by technologies and this uncertainty became more and more influential in teaching learning process and it also influences the use of social networking in learning process.

In Table 6, we introduce the Social Learning Networking Strategic Grid. In fact, a stage and growth model metaphor of strategic impact of Social Networking Research for Learning is introduced. The overall proposition is that nine key variables and dimensions of value delivery are integrated in Social Networking Research for Learning, namely: Content, Context, Collaboration, Social Interaction, Development, Assessment, Level of Integration, Policy Making, and Leadership/Innovation. These are the critical perceived value carriers and should be considered as critical success factors. Any initiative related to the adoption of Social Networks Research for learning should provide flexible methods, practices, and strategies for the realization of these factors. The current practice shows different approaches and extremely diversified value propositions. In a very abstract generalization for these eight value carriers, we define two perceptions about the strategic impact of their adoption. Their low and high strategic impact on learning quality. As we will present in abstract level, different strategic impact is linked to three Growth-Maturity stages:

- The Epos of Inquiry: Limited, not institutionally integrated social networking initiatives
- The Epos of Actualization: Integration of SN, in academic practice, towards active learning and engagement.
- The Epos of Value Delivery: Strategic use of SN, integrated with various other technological capabilities including Learning Analytics, Visual Learning, Cognitive Computing and Cloud.

**Table 6.** Social Learning Networking Strategic Grid.

Dimensions	Strategic Impact of Social Networking for Learning	
	<i>LOW/Epos of Inquiry</i>	<i>HIGH/Epos of Actualization</i>
Content	Packaging	Annotations; Dynamic Programs
Context	Static	Student-Centric
Collaboration	Social Networking	Social Enabled
Social Interaction	Instruction flow	Social Skills driven
Development	Knowledge Transfer	Problem Solving
Assessment	Content based	Critical Thinking
Policy making	Adoption	Evolution
Level of Integration	Course-based	Organization-wide
Leadership/innovation	No consideration	Entrepreneurship Driven

In the current era of evolution in Social Networking research for learning, there are some important facts. Most of the implementations in terms of content focus on packaging and the flexibility of delivering of micro contents. Most contexts for exploitation are static and predefined learning activities that provide a rather narrow environment for student engagement. Limited reflection on the results of collaboration can be understood. The focus of the collaboration is mostly facilitated by a given social networking strategy where static profiling of student characteristics provides the connectivity.

The emphasis on the social interaction of learners, professors and other stakeholders is focused to instruction flows. Additionally, the development strategy is mostly concerned with the knowledge transfer rather than problem solving capabilities. The assessment in most of the Social Networking for Learning is content based, and the strategizing of learning through adoption of social networks is in alignment with given narrow institutional policies. In most cases, there is also limited analysis of the linkage between social networking and innovation and leadership.

We call this maturity stage, '*Epos of Inquiry*'. In this stage academic institutions experiment at a limited base with Social Networking Tools. They do believe that there is a potential for this integration but they still have critical inquiries and questions to answer. The various initiatives are not integrated; there is not a concrete institutional strategy for the wide adoption of social networks in courses or programs.

The strategic impact of social networking for learning is realized in the next stage, which we call '*Epos of Actualization*'. In this maturity stage, social networking is exploited for the continuous creation of content annotations through collaborative filtering and profiling analysis permitting the dynamic construction of Dynamic Curricula across Programs. Social networking is no longer used as a typical facilitator of a technology driven-context, but the social characteristics of learners are exploited for dynamic provision of meaningful personalized context for learning. The modes of Social Interaction are also strategized toward the construction of Social Skills and not only as parts of a limited instruction flow and design. Developmental strategy in the Epos of Actualization is organized around Problem Solving advanced capabilities and social networks facilitate this. Assessment is promoting critical thinking and social networking tools exploited for delivering arguments, evidence and justifications. A collaborative, peer-based, systematic work is informing an Organization-wide level of integration permitting Evolving Policy Making. In this growth stage, Social Networks are integral parts of Institutional Strategies for Active Learning and Innovation Programs. The entire approach can be characterized as an out-of-the box Paradigm shift. (See Table 7). We need to highlight the importance of the alignment between this proposed conceptual framework for social networks and new technologies with the national educational strategy of a country and/or region.

The development of various novel technological capabilities in the last few years has a critical impact on the radical change of the previous two growth stages. The adoption of social networking research in Smart Education Research is entering a new phase of maturity and potential contribution in the higher education. This new stage, the Epos of Value Integration is powered by the introduction of Learning Analytics, Visual Learning, Cloud and Cognitive Computing solutions together with a new generation of wearable technologies and advanced Human Computer Interaction methods. In Table 7 below, we present the key characteristics of this new Maturity Level with a reference to the key enabling technologies. This is according to our perspective—the new challenging research context for Open and Distributed Learning.

**Table 7.** Social Learning Networking—Epos of Value Integration.

Dimensions	Enabling Technologies and Strategic Impact of Social Networking for Learning	
	<i>Enabling Technologies</i>	<i>TOO HIGH/Epos of Value Delivery</i>
Content	Analytics & Cloud Computing	Flexible, Different Media
Context	Mobile Learning Analytics & Visual Learning	Context-Aware
Collaboration	Cognitive Computing & analytics	Multimodal
Social Interaction	Analytics, VR and Cloud	Augmented, Enriched
Development	Cognitive Computing, Recommender Systems	Personalized
Assessment	Analytics & Cloud	Evolution, Personality
Policy making	Smart Cognition	Sustainability in Education
Level of Integration	Integral approach	Worldwide
Leadership/innovation	Integral Approach	New Radical Knowledge Creation

The diffusion and integration of the emerging technologies in the social networking research for Sustainable Higher Education will promote a number of radical changes. Pioneers in the strategic

planning for the realization of this growth stage will be rewarded by the outcomes of the education systems in terms of both, critical thinking and creativity. In a way, the next generation social networking for higher education will:

- Promote dynamic learning contexts through advanced packaging, flexible designs, in different media with multiple annotation schemas that will focus on learning delivery and integration with other domains. The integration of learning domains with other significant human activities will provide a transparent, ubiquitous and pervasive infrastructure available anytime and from any place. Context-Awareness will exploit advanced learning analytics capabilities aiming to provide tailor made learning based on specific features of learner's profiles.
- Collaboration will be facilitated by multimodal social networking connections, which will be context aware and powered by sophisticated layers of analytics, most of them focusing in the value dimension of learning as perceived by learners and in the formulation of effective learning teams. This is one of the most promising area of this research which we will summarize in a next section of this vision article.
- The Social Interaction will be augmented and enriched with new learning experiences powered by wearable technologies and advanced Virtual Reality gadgets. It is our belief that in the next generation of Social Networking, the role of virtual and augmented reality will be crucial. Visual Learning will promote further video lectures, with the provision of advanced Learning Labs enabled by VR technologies. Consider for example the case of a Visual Learning Lab for Medical Training, where the social networking profiles of learners will be facilitating common virtual sessions and experiments.
- The Developmental dimension of Social Networking will be advanced and personalized. Sophisticated capabilities for portfolio management and repositories of active learning stories will maintain a systematic learning management system to analyze the learning requirements and personalized learning paths of learners.
- For the challenging dimension of Assessment, Higher Education institutions must adopt new ideas. Evolution and Personality will be the main factors for assessment methods. Given the fact that knowledge is available everywhere, and that social networking applications can promote effective update, retrieval, collaborative filtering, and rating of knowledge, the challenge then is on how to cultivate an assessment culture in which personality empowerment and evolution are promoted.
- Policy making related to the integration of Social Networks Research in Education will focus on Sustainability in Education. This is a critical step towards sustainable, strategic adoptions of information technologies in the educational context. The main dimensions of sustainability will be respect for the human entities, strategic and wise use of technical resources and embodiment of sustainable developmental ideas in designing programs and curricula.
- The integral exploitation of the emerging technologies will enable global initiatives putting together unexploited human and mental capacities for the fostering of innovation and entrepreneurship. This can be unpredictable in terms of impact. In future scenario, consider distributed academic programs where students will attend few courses from many institutions in the context of agreements and specializations.
- The maturity of this level will promote a strategized new Knowledge Creation campaign at worldwide level. The human capacities through social networking, mobile learning analytics, visual learning and cognitive capabilities of learning systems will bring together unexploited capacities of learning peers and institutions. Those who capable of envisioning this forthcoming reality earlier are going to benefit the most.

We understand that moving towards the Epos of Value Delivery is an uneasy case. Educational organizations suffer from several inefficiencies, most of them related to slow procedures, bureaucratic decision-making capabilities, slow adoption to the environments, and limited understanding

mechanisms to the demands of the society and the industry. In this situation, though, we do believe that several pioneers and innovative institutions will lead the big change.

In the next section, we elaborate further in this vision. We provide the most promising areas for future research related to the four technologies already mentioned. It is in fact the next stage in our research methodology to test empirically these theoretical propositions aligned to the maturity model.

## 6. Future Research Directions

The next step of our research is to analyze how the key components of value in social networking can be mixed with the new value propositions of four technologies namely: Virtual and augmented reality, cloud services, learning analytics and visual learning. In Table 8, we summarize the main aspects of scenarios of services for social networking value adding services powered by emerging ICTs in connection to our theoretical proposition.

**Table 8.** Future ICT enabled research areas for social networking in education.

Social Networking Strategic Dimensions	Future ICT Enabled Research Areas for Social Networking in Education
Content	<ul style="list-style-type: none"> <li>• Integration of value layers in content blocks</li> <li>• Packaging of Visual Learning sessions</li> <li>• Dynamic matching of learning paths to content</li> <li>• Distributed repositories of learned-generated content</li> <li>• Codification of reactions and learners' interventions</li> <li>• Feedback as learning content for future use. Mobile learning analytics.</li> </ul>
Context	<ul style="list-style-type: none"> <li>• Distributed Context for Open Learning with exploitation of wisdom gained from recording of learning stories</li> <li>• Active Learning over Augmented Reality Learning Networks</li> <li>• Social Networking for Community Building awareness</li> <li>• Social Responsibility as a context for Social Action</li> <li>• Decomposition of Academic Context for flexible learning</li> </ul>
Collaboration	<ul style="list-style-type: none"> <li>• Learning Analytics Strategies for enhanced Problem-Solving oriented professional learning</li> <li>• Multimodal Distributed Platforms for Exchanging Learning Experiences</li> <li>• Marketplaces of Collaborative Interventions</li> <li>• Agora of Collaborative Augmented Reality Learning Stories.</li> </ul>
Social Interaction	<ul style="list-style-type: none"> <li>• Visual Profiling</li> <li>• Social learning experiences</li> <li>• visual labs</li> <li>• Distributed, social learning networks</li> <li>• Open Learning Systems against poverty.</li> </ul>
Development	<ul style="list-style-type: none"> <li>• Massive Open Visual Learning Systems</li> <li>• Competencies models and assessment scenarios</li> <li>• Annotations of group skills</li> <li>• Organizational Development</li> <li>• Faculty Promotions</li> <li>• Global Faculty Research Networks</li> <li>• Social Responsibility Programs in Higher Education.</li> </ul>
Assessment	<ul style="list-style-type: none"> <li>• Distributed Assessments. Developmental plans of individual, groups and institutions</li> <li>• Institutional Assessments</li> <li>• Cloud Portfolios and Profiles</li> <li>• Backward Integration of Lessons Learnt.</li> </ul>

Table 8. Cont.

Social Networking Strategic Dimensions	Future ICT Enabled Research Areas for Social Networking in Education
Policy Making	<ul style="list-style-type: none"> <li>• Academia Industry Collaborations</li> <li>• Experimentations at Postgraduate and Professional Education</li> <li>• Quality of Education integration and Mobile Learning Analytics</li> <li>• Higher Education Organizational Memories.</li> </ul>
Level of Integration	<ul style="list-style-type: none"> <li>• Global Distributed Learning Services</li> <li>• Global Open Visual Labs.</li> </ul>
Leadership/Innovation	<ul style="list-style-type: none"> <li>• Social Networks of Innovators</li> <li>• Global Training of Advanced Technologies and Competencies</li> <li>• Smart Education Research alliances for New Knowledge Creation.</li> </ul>

## 7. Discussion & Conclusions

Social networks will continue to play a significant role in Smart Education Research. The progress made the previous years has convinced several stakeholders for the critical need to support social learning interactions. Given the fact that most of the inefficiencies stated in education are related to limited collaboration between learners, narrow scenarios for active learning engagement, limited use of social media and rather limited exploitation of scientific knowledge available, thus we will shortly welcome a new Era of Open and Distributed Learning. More Open, Enriched, Global, Personalized, Social Engaged, with Social Responsibility and Sustainable. With only one prerequisite: That the coming change will not make afraid strict academic institutions and old fashion academic policy makers. Eventually the pressure set by learners eager to apply scientific knowledge into real problems for innovative solutions will cause a revolution to Education. We are looking forward to collaborating towards this new era of learning, knowledge and innovation.

The promotion of sustainability in Higher Education also requires a social inclusive participation in the new era of ICTs. Towards this direction critical policies are needed:

- Soft Skills training programs for faculty, administrators and students in the use of advanced SN services, as well as cloud computing, virtual reality, visual learning and learning analytics enabled services
- Feasibility and Sustainability studies for the contribution of Education and Technology enhanced learning to social inclusive economic growth
- Integration of Smart Learning to Smart Cities and regional development initiatives
- Policies to promote intercultural understanding and collaboration at educational level
- Policies to enhanced research collaboration and social impact
- Policies that develop and promote cross-cultural international networks of research and innovation excellence
- Development of transparent, open, distributed learning services with advanced accessibility and transparency
- Continuous improvement of learning infrastructures.

In our ongoing research, this is the ultimate objective: To draw the lines for a new era of sustainable adoption of emerging technologies in technology enhanced projects and initiatives. The maturity model introduced in this study is just an invitation to researchers, and scholars to understand the multidimensional character of Social Networking concept in Higher Education and its direct linkage to several emerging technologies. We are confident that social networks in higher education will be totally different from the current anticipation.



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## Appendix A. Questionnaire

### Demographics

1. Which of the following technologies/tools you think may be useful in the teaching and learning process and how frequently? (during each class, very frequently, frequently, rarely, never)

- internet, incl. YouTube and videos available on-line
- Social Networking applications
- Students’ smart phones
- tablets
- personal computers
- educational games
- robotics
- virtual reality applications
- cloud applications
- Other

2. If you chose ‘other’, what would it be?

3. Can you outline an example of an innovative use of learning technologies in your class?

4. Do you find it difficult to use technology in the process of teaching in your class?

5. What hinders the use of technology-enhanced methods in your teaching?—OR—What stops you from enhancing the set of tools you already employ?

6. Which learning management systems (LMS) you use to support your teaching (or you use as a student)?

7. What is your perception of the use of information technologies in your teaching practice and strategy

8. Would you agree that the use of information technology in education improves the effectiveness of teaching and learning?

9. Would you agree that the use of information technology in the teaching process promotes students’ active engagement in the process?

10. Would you agree that the use of information technology in the teaching process fosters students’ creativity, independent thinking and problem solving skills?

11. Would you agree that the use of information technology in education promotes students awareness and willingness to look for additional information in other sources?

12. Would you agree that the use of LMS (Blackboard, MOODLE etc.) fosters students’ active engagement in the teaching and learning process?

13. Would you agree that smart use of information technology in the teaching process might foster the development of students liberal worldview, open-mindedness, respect for others?

14. Would you agree that the benefits of the use of LMS (Blackboard, MOODLE etc.) are not fully explored by professors

15. In your teaching, have you ever used technology-enhanced approaches to boost students’ awareness of their civic rights and responsibilities?

16. If you answered ‘yes’ above, can you tell you what did you do?

17. Please evaluate the following statements about the use of information technologies (ICT) in the teaching and learning process. The use of ICT in the teaching process.... (Strongly disagree, Mostly disagree, In some situations it can be so, I agree, Fully agree)

- helps students to better understand the topic and be prepared to use them in knowledge construction
- helps to ensure active learning processes for students
- provides additional opportunities to get access to knowledge for disadvantaged groups
- boosts the value of education
- depends on teaching strategies chosen by professor
- may contribute to the development of liberal, democratic worldviews and great civic engagement
- depends on the age and ability of students to use them
- depends on students' attitude to them
- depends on professors' attitude to them
- depends on the availability of infrastructure and the devices

18. Please evaluate the challenges/risks related to the use of ICT in the teaching and learning process (Scale: Strongly disagree, Mostly disagree, in some situation it can be a risk, In most situations it can be a risk, It is the highest risk)

- Students get bored very quickly
- Students lack the necessary skills to use IT enhanced methods of teaching
- Professors are not aware of all the possibilities of IIT
- There is not enough ICT available in educational environment
- The ICT used in education are not interactive enough to ensure active learning processes

19. Please evaluate the following statements regarding actions which might foster the use of ICT in the teaching and learning processes (Scale: It doesn't matter, it can be solved in some level, It is not a problem in our institution, It should be one of the first priorities, It is the highest priority)

- Professors should be trained to use ICT in teaching process
- There should be more cooperation among technology developers and educational institutions
- There should be more ICT available in educational environment
- The ICT used in education should be previously evaluated from the view of their sustainability
- The ICT used in education should be with high level of interactivity to ensure active learning processes

20. Would you prefer the 'old style' ICT-free teaching, i.e., no powerpoint, no youtube etc.

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