A Conceptual Social Learning Ontology for Higher Education in E-Learning 2.0

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Abstract—**In Web 2.0 era, social learning occurs when a group of individual interacts to support each other in learning process using any media; one of them is social media. From many perspectives particularly for educational, it is interesting to examine how social media can contribute to the learning process. This channel can support an interactive process that occurs when a group of learners collaborates with other to combine their knowledge into new insights. This research focuses on identifying social learning factors framework that enable higher education to be sustainable and be more adaptive. It also depicts conceptual social learning ontology according to Zachman Framework for enhancing collaboration and increasing responsiveness by leveraging social media channel in higher education. The objective of this study is to support classification scheme for descriptive representations of the social learning model. That is not only doing the design artifacts, but it depicts all supportive components to the organizational perspective. This set of view appears to be universal of the subject or object being described, including what (data), how (function), where (network), who (people), when (time), and why (motivation). The primary method of this study is systematic literature review process to define social learning factors that can be mapped into Zachman Framework. The result of this research is conceptual of ontology model for social learning that can be implemented for higher education.**

Keywords—component: Social learning, Web 2.0, Ontology, Zachman Framework

I. INTRODUCTION

The era of Web 2.0 and Web 3.0 have changed how people communicate with other in many various sectors. They spend many hours on the internet, especially for social media. This phenomenon shift a new model of learning process for higher education because social media are becoming popular among students and teachers in higher education [1]. With the emergence use of web 2.0 and web 3.0, a significant number of higher education institutions are embracing the "new ecology of information" offered by social media [2]. Social media is not only implemented in learning process as the tools for curricular learning, but it has potential to bridge formal and informal learning through participatory digital cultures [3]. Instead, social media need to be identified and used as the media channel of activities in communities [4]. According to this fact, there have been attempts to collaborate e-learning which is used in formal education and social media which is a channel for non-formal education. However, the functionality of social media in higher education has been skewed to the development and implementation. As the new channel media in higher education, social media has been adapted to some education environment. Consequently, it often not only included as a communication channel, but also it changes the learning process. In order to respond the limitations of e-learning system as well as shifts in educational paradigm, social learning provides an alternative method that makes learning process more interactive, easier to access learning sources, and increases interaction among learners and between learners and instructor that is boundless using social media as a channel. The concept of social learning refers to learning done in or by a group, an organization, or any cultural cluster. With social interaction in the online platform can help university students to share experiences and collaborate on relevant topics [5].

The evolution in distance education particularly needs an organization to define social learning model that appropriate to support the collaboration in learning process both concept and technical aspects. It needs a considerable standard as an approach to meet many strategic goals and objectives of organization. Standards are identified and documented at several levels throughout the enterprise architecture process to establish an effective method.

Enterprise architecture is one of the most challenging roles for the organization to adapt new model and to support organizational changing because enterprise architecture provides the blueprint model for the system and the project that shows a framework of enterprise components. Moreover, Enterprise architecture can describe the underlying

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infrastructure, thus providing the groundwork for the hardware, software, and network to collaborate each other [6]. The value of enterprise architecture is derived from the sum of all components that supports between strategic and operational for sustainable enterprise solutions. By defining standards and specifications from a different perspective for how systems will improve interoperability and integration. It can help higher education to drive standardization of process and develop consistent implementation operational policies.

According to the identification of conceptual social learning model, the objective of this research is to summarize an ontology component for social learning model in higher education, which would provide learners and instructors the opportunity to obtain any and all class-related material. The results of this research can be used to develop and implement social learning model for higher education.

II. LITERATURE REVIEW

The following are some theories in e-learning, social media, social learning, and enterprise architecture to enlarge the concept of this research background

A. E-Learning

Lately, e-learning education has increased for higher education. E-learning system provides new ways to deliver educational programs. The term e-learning refers to electronic learning, which describes the delivery course using electronic media, such as internet, intranet, extranet, etc[7].

E-learning was first introduced in developed countries across different societies and region [8], with many different countries, the adoption of e-learning in the context of higher education has become trending topic of research because e-learning has become important for various reasons, such as the rise of information and global economy. Learner of the 21st century desires a flexible process and structure that allows them to study, work, and socialize at the same time.

According to that demand, a numerous number of higher education try to adopt e-learning strategies in their institution. A successfulness of E-learning are not only depending on availability of high technology but also on the collaboration between learners and instructors, that are supported as they explore and develop innovative ways to collaborate technology into their learning process [9].

B. Social Media

The functionality of social media has substantially shifted the objectives in which many people or institutions interact with each other. Moreover, in this web 2.0 era, social media can also serve as a tool facilitating intra and inter-organizational activities[10].

Basically, social media is defined as a group of internet based applications that build on the pedagogical and technological foundations of web 2.0 [11]. Today, many universities have already adopted or are planning to adopt social media in their learning process. Particularly, social media in higher education have already become communication tool in both university staff and student daily live. The growth of learning course being delivered online has pushed higher education to identify effective delivery learning that move beyond "read and click"[12]. Social media consist of a wide range of online activity, word of mouth forums including blogs, company sponsored discussion boards and chat rooms, email, forum, internet discussion boards, blogs, and social networking websites [13]. As an education purpose, social media are used for a number of purposes, namely [3]:

- Managing group collaborations
- Composing ideas
- Collaborations with instructors and peers
- Resources sharing
- Progress documentation
- Project outcomes sharing
- Assessment and evaluation.

Therefore, this challenge can be a motivation for educators to take managed risk and explore creative methods of learning and teaching [14].

C. Social Learning

The digital era revolution has certainly entered education industry. It has shifted the communication way from passive to interactive with easily created user-generated content, include text, tags, pictures, or videos [15]. The influence of social media is so tremendous that we could not have imagined it a few years ago [10]. When students participate active in knowledge creation for themselves and their peers, they are changing the way to interact each other [12].

A new way of social media has significantly changed the pattern how people learn from others online. A social plug-in embeds information from a friend, acquaintance or even a stranger on a webpage that you are visiting [16]. Social media have changed a culture of the learning method that has always been pervasive in the classroom. The teaching learning process is supported by technology resources that offer different method of communication [17]. According to this concept, social learning arises based on Albert Bandura's theory which highlights how learning occurs in the social media setting. He further reiterates that a combination of an environmental and psychological factor allows social learning to occur and that people's social behavior is influenced. Therefore, it follows that when social media are used as learning platforms, the behavior of a student or a group of students is influenced by observing the action of other in learning community [18].

D. Enterprise Architectures

The implementation of Enterprise Architectures has increased in many sectors as standardization of business and creating a more integrated environment to support the organization activity. The definition of Enterprise architecture (EA) is a practice and emerging component intended to improve how organization manage and organize the function of a complex structure of enterprises and information systems supported. The most important role of enterprise architecture is to analyze IT assets and business process and to define a set of governance principles that drive an ongoing discussion about business strategy and how it can be implemented through IT [19]. With EA, an organization can design the future of standard procedure business and IT entities [20]. EA should cover all factors of the EA lifecycle; include the planning for enterprise to understand project, the analysis of business and users requirements, the design of systems, the evolution of systems, and the ongoing enhancement of all above. EA knowledge can be systematized, refer to Enterprise Architecture Framework (EAFs). EAF have two distinct groups approach, which are: (1) the Enterprise Integration (EI) movement of the Industrial Engineering community. It focuses on manufacturing systems engineering to achieve seamless information, control, and material flow across the enterprise and the supply chain, and (2) the Information Systems (IS) community focusing on development methods. It mainly concentrating on the development of software systems for institutions, but acknowledging that software is only one part of the enterprise's information system [21].

One of the well known frameworks for Enterprise Architecture and Information Systems Architecture was introduced by John Zachman The Zachman framework is the basically foundation to build enterprise architecture. It generates a cumulative set of representations relevant to describe an institution [22].

Fig 1. Zachman Framework

III. METHODOLOGY

In this study, we conduct a literature survey to enable us to understand the component of social learning that can extract some valuable information to build social learning model. Then we conducted a mapping social learning component into Zachman Framework. The data are gathered from several sources, namely:

- ACM Digital Library (dl.acm.org)
- IEEEXplore Digital Library (http:/ieeexplore.ieee.org)
- Inderscience (www.inderscience.com)
- Elsevier (www.elsevier.com)
- Emerald (www.emeraldinsight.com)
- Sage (http://online.sagepub.com/)
- Science Direct (www.sciencedirect.com)
- SERSC (www.sersc.org)
- Springer Link (link.springer.com)
- Taylor Francis (http://taylorandfrancisgroup.com/journals/).

Data Extraction

This study examined 312 papers from all sources and criteria. From 312 reviewed papers, there are 198 papers which were selected to be the candidate for study based on the title of papers and abstract to answer the research questions of this study. In the last process, we chose 72 papers which can be used in this research, based on the content of those papers. The following is data extraction result to describe the filtering process of this study:

TABLE I.   DATA EXTRACTION IN INCLUSION DATA

Source	Found	Candidate	Selected
ACM	12	7	4

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Elsevier	14	9	2	
Emerald	3	2	2	
IEEE	92	62	33	
Inderscience	1	1	1	
SAGE	13	3	1	
ScienceDirect	114	73	15	
SERSC	1	1	1	
Springer	7	4	4	
Taylor & Francis	35	23	4	
Other	20	13	5	
Total	312	198	72	

IV. RESULT AND DISCUSSION

While most of the studies highlighted the phenomena of social media in every aspect of education, this research tries to compose the enterprise architecture component as a conceptual model for higher education based on literature on social learning component. There is 147 factors component of social learning found from the selected study literature which divided into each major components in Zachman Framework, which are: What (Data), How (Function), Where (Network), Who (People), When (Time), and Why (Motivation).

TABLE II.   SOCIAL LEARNING FACTORS

No.	Social Learning Factors	ZF	#	%
1	Annotation	D	1	1%
2	Cognitive Presence	D	2	3%
3	Constructivism	D	1	1%
4	Content	D	8	11%
5	Course	D	2	3%
6	Curriculum	D	3	4%
7	Information Quality	D	1	1%
8	Learning Experience	D	2	3%
9	Pedagogy	D	14	19%
10	Policy Driven	D	1	1%
11	Profile	D	1	1%
12	Reputation	D	1	1%
13	Research Laboratory	D	1	1%
14	Resources	D	1	1%
15	Rich Media Content Support	D	1	1%
16	Rich User Profile	D	1	1%
17	Sense of Belonging	D	1	1%
18	Accessibility	F	3	4%
19	Acculturation	F	1	1%
20	Active Learning	F	2	3%
21	Assist in Solving Problem	F	1	1%
22	Classroom Teaching	F	1	1%
23	Communication	F	7	10%
24	Connection	F	2	3%
25	Content Generating	F	1	1%
26	Content Management	F	1	1%
27	Content Sharing	F	2	3%
28	Design Process	F	1	1%
29	Device Support	F	1	1%
30	Digitalization	F	2	3%
31	Discussion/Communication	F	1	1%
32	Ease of Use	F	2	3%
33	E-Learning mode	F	1	1%
34	E-Learning tool	F	1	1%
35	Encounter	F	1	1%
36	Interaction	F	2	3%
37	Knowledge Construction	F	1	1%
38	Knowledge Sharing	F	2	3%
39	Media Sharing	F	1	1%
40	Monitoring	F	1	1%
41	Ontology Parameter	F	1	1%
42	Open Group Sourcing	F	1	1%
43	Peer Assessment	F	1	1%
44	Personal Filter Subscription	F	1	1%
45	Practical	F	1	1%
46	Presence	F	1	1%
47	Privacy	F	1	1%
48	Pro-activity	F	1	1%
49	Process	F	1	1%
50	Promotional tool	F	1	1%
51	Push Model	F	1	1%
52	Reflection	F	1	1%
53	Relationship	F	2	3%
54	Restricted Access	F	1	1%
55	RSS	F	2	3%
56	Rules/regulation	F	1	1%
57	Scaffold	F	1	1%
58	Security	F	1	1%
59	Self Determination	F	1	1%
60	Send Announcement	F	1	1%
61	Service Desk Integration	F	1	1%
62	Service Platform	F	1	1%
63	Sharing	F	5	7%
64	Social	F	3	4%
65	Social Analytic	F	1	1%
66	Social Bookmarking	F	1	1%
67	Social Collaborative Learning Pattern	F	1	1%
68	Social Constructivism	F	1	1%
69	Social CRM	F	1	1%
70	Social Influence	F	1	1%
71	Social Interaction	F	5	7%
72	Social Media Analytics	F	1	1%
73	Social Navigation	F	1	1%
74	Structured Program	F	1	1%
75	System Quality	F	1	1%
76	Task & Project Management	F	1	1%
77	Teaching & Learning Strategies	F	3	4%

78	Teaching and Learning Activities	F	2	3%
79	Technology	F	9	13%
80	Wall	F	1	1%
81	Website tool	F	2	3%
82	Workflow	F	1	1%
83	Written Communication	F	1	1%
84	Assessment	M	2	3%
85	Certification	M	1	1%
86	Convenience	M	1	1%
87	Conversation	M	1	1%
88	Cooperation	M	1	1%
89	Critical Sense	M	1	1%
90	Cultural	M	1	1%
91	E-Learning Perception	M	1	1%
92	Explicit Knowledge	M	1	1%
93	Feedback	M	4	6%
94	Flexibility	M	1	1%
95	Graduate Capabilities	M	1	1%
96	Learning Methods	M	1	1%
97	Learning Outcome	M	5	7%
98	Learning Situation	M	2	3%
99	Learning Strategies	M	2	3%
100	Motivation of Student	M	2	3%
101	Online Reputation	M	1	1%
102	Performance	M	1	1%
103	Recognition & Rewards	M	1	1%
104	Recommendation	M	1	1%
105	Service Quality	M	1	1%
106	Student Engagement	M	4	6%
107	Support and Guidance for students	M	1	1%
108	Centralized	N	1	1%
109	Chat room	N	1	1%
110	Cross Platform	N	1	1%
111	Enterprise Computing	N	1	1%
112	Links	N	1	1%
113	Micro blog	N	3	4%
114	Network	N	2	3%
115	Public Social Networks	N	1	1%
116	Social Media tool	N	1	1%
117	Social Networking	N	7	10%
118	Social Presence	N	7	10%
119	University	N	2	3%
120	Academic Factor	P	3	4%
121	Alumni	P	1	1%
122	Attitudes	P	1	1%
123	Cohort based	P	1	1%
124	Collaboration	P	9	13%
125	Community of Practice	P	7	10%
126	Division of labour	P	1	1%
127	Educational Administrator	P	1	1%
128	Employers	P	1	1%
129	External user	P	1	1%

130	Faculty	P	1	1%
131	Group	P	2	3%
132	Groups & Permission	P	1	1%
133	Hierarchical Structure	P	1	1%
134	Identity Based	P	2	3%
135	Individual	P	2	3%
136	Industry	P	1	1%
137	Institution	P	1	1%
138	Instructor	P	3	4%
139	Learner	P	5	7%
140	Student	P	7	10%
141	Subject Matter Expert	P	1	1%
142	Support Staff	P	1	1%
143	Teacher	P	4	6%
144	Technical Support	P	1	1%
145	Trainee	P	1	1%
146	Response Time	T	1	1%
147	Time Bound	T	1	1%

From this finding, we can identify the most influence factor from every component from Zachman framework, which are:

- What (Data)
  Pedagogy (19%), Content (11%), Curriculum (4%), Cognitive Presence (3%), Course (3%), and Learning Experience (3%)
- How (Function)
  Technology (13%), Communication (10%), Sharing (7%), Social Interaction (7%), Accessibility (4%), Social (4%), and Teaching and Learning strategies (4%)
- Why (Motivation)
  Learning Outcome (7%), Feedback (6%), Student Engagement (6%), Assessment (3%), Learning Situation (3%), Learning Strategies (3%), Motivation of student (3%)
- Where (Network)
  Social Networking (10%), Social Presence (10%), Micro Blog (4%), University (3%), Network (3%)
- Who (People)
  Collaboration (13%), Community of Practice (10%), Student (10%), Learner (7%)
- When (Time)
  Response Time (1%), Time Bound (1%)

After that, we summarize the entire component into Zachman Framework:

Fig 2. Ontology Model of Social Learning

This ontology model focuses on social learning and web 2.0 technologies to enhance student motivation and engagement in learning process. Using this proposed ontology model, it can help organization who interest in implementing social learning system and to set up the infrastructure of learning platform.

V. CONCLUSION

In this research, we investigate the ontology components of social learning that can support social learning model for higher education. As a result, we can find the research factors and social learning that can be mapped into Zachman Framework, so it can describe a model of social learning that can be comply with higher education. For future research, it is important to assess all factors in more depth about the conceptual enterprise architecture model that suitable with social learning to measure the acceptance of this ontology.

VI. FUTURE RESEARCH

This study only identifies social learning factors based on study literature. It will need some validation from internal and external domain experts to verify whether the entire component can be applied in higher education or not. Moreover, statistic approach needs to be applied in future research as a tool to measure the quality of this factor.

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