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Analysis of technological, individual and community factors influencing the use of popular Web 2.0 tools in LIS education

Popular Web
2.0 tools in LIS
education

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Abstract

Purpose – This research paper aims to explore the technological, individual and community factors influencing the use of popular Web 2.0 tools in library and information science (LIS) education to prepare LIS students for Library 2.0. The study was guided by the activity theory (AT) and technology acceptance model (TAM) of Davis as a lens. The study reveals a set of factors concerning the technical tools, subjective perceptions, goals of online discussion, social presence within a community, rules for participation and roles of the participants that affect their online engagement patterns.

Design/methodology/approach – This study was performed during the 2015 academic year; it used a descriptive analytical research approach for exploring and analysing technological, individual and community factors influencing the use of the popular Web 2.0 tools in LIS education.

Findings – The results show that at the technological level of the AT, educators in the sample found the WhatsApp instant messaging and Twitter to be the easiest tools to use, selecting those tools at, respectively, 73.2 per cent (standard deviation = 0.450) and 61.1 per cent (standard deviation = 0.490). WhatsApp and Twitter also lead at the individual level of the AT, as the most valuable platforms for sharing information and knowledge. Video, text and photo objects are the most commonly shared items, used by 90.7, 93.5 and 98.9 per cent, respectively.

Originality/value – This study may be useful to help information science educators to prepare graduates for the emerging Web 2.0 environments and to prepare students for Library 2.0.

Keywords LIS education, Activity theory, Technology acceptance model, Web 2.0

Paper type Research paper

Introduction

Web 2.0 plays a key role in facilitating information sharing, collaboration and communication between librarians and patrons and among librarians (Wordofa, 2014). The use of Web 2.0 tools, such as blogs, wikis WhatsApp, YouTube, Facebook, Twitter and Google+, in teaching and learning has presented new challenges to education. Web 2.0 tools used in online teaching and learning provide online learners with opportunities to share knowledge in learning communities through social communication and interactions (Nelson *et al.*, 2009). From a research viewpoint, information science instructors need to prepare graduates for the emerging Web 2.0 environment, to help them discover how to reap the educational benefits of Web 2.0 tools in online instruction. These needs provide strong motivation for the use of Web 2.0 tools in information science education and the incorporation of related themes into information science curricula.

This study explores factors influencing information educators' participation in online discussions through the popular Web 2.0 tools of WhatsApp, Google+, Facebook and



Twitter. The study also explores the educational benefits of these tools in information science education and the types of information shared most often between information science instructors and their students. To accomplish these goals, the technological, individual and community factors introduced in activity theory (AT) (Engeström, 1987) and the perceived usefulness and ease of use of systems as discussed in the technology acceptance model (TAM) (Davis *et al.*, 1989) are used to guide this study. Joint (2009) found that LIS needs to evolve its Web 2.0 strategy to promote this aspect of its services. In the same context, the present study is useful for providing knowledge to information science educators about how online discussions can be better promoted, sustained and enhanced, and about how to harness the educational potential of social networking websites for the emerging Library 2.0 environment.

Literature review

The use of Web 2.0 applications in enhancing teaching and learning

Educational Web 2.0 tools have emerged with great potential to facilitate the sharing of knowledge between students and teachers in the context of learning and teaching (Pence, 2007). However, with the use of Web 2.0 learning activities, students seek to not only obtain information but also create and share it. Used correctly, online learning activities should require students to situate their knowledge within a discussion about real-life and disciplinary contexts, thus providing an authentic learning environment (Herrington *et al.*, 2003). Connectivism-based Web 2.0 applications are an important source of interaction between students and their teachers in online instruction. Interaction is one of the key roles of information and communication technologies (ICT) in promoting online learning, especially through Web 2.0 learning activities (Beauchamp and Kennewell, 2010). Connectivism using Web 2.0 applications helps students construct new knowledge through social interactions to meet their learning targets and perform problem-solving activities (Wilson, 1996).

Strijbos and Fischer (2007) noted in their research related to learning communities that collaborative and cooperative learning strategies based on the Web 2.0 applications are useful for constructing and sharing information, skills and knowledge between individuals in online lectures when an instructor or an online tutor is present to guide learners in their interactive learning process. AT stimulates professionals to renew knowledge by exploring factors that influence subjects' participation in online discussions. A qualitative study by Deng and Tavares (2013) identified factors that influence student participation in online discussions via Moodle and Facebook. The study was based on interviews of 14 pre-service teachers. AT, the theoretical lens for that study, states that technological tools, subjective perceptions, roles and rules regarding online discussions, as well as social presence and interaction within a community, influence learners' participation and adoption of Facebook compared to Moodle in a learning environment.

A recent study by Fasae and Adegbilero-Iwari (2016) showed that, among the various social media networks available in public universities in southwest Nigeria, Facebook (93.5 per cent) is the most recognized and most famous, followed by Google+ (63.8 per cent) and Twitter (47.8 per cent). Their findings indicated that Google+ (52.2 per cent) is the most beneficial social media network, followed by Facebook (29.7 per cent) and Wikia (23.9 per cent). A study conducted by Yu *et al.* (2010) reported that online discussions between students through social networking improved social relationships among students, heightened their self-esteem and boosted their learning performance.

Theoretical framework

The theoretical framework centres on the notion of AT-based technological, individual and community factors (Engeström, 1987) and the TAM-based ease of use and utility of information systems (Davis *et al.*, 1989). The AT and TAM provide a theoretical lens for data analysis and discussion in the present study.

Activity theory and its principles

Since its origin, AT has been conceived as a way to unify individual and social behaviour (Engeström and Miettinen, 1999). AT has no ambition to be a big theory; instead, it aims to be a theory based on real subjects and concrete cases. Today, AT has become a multidisciplinary approach – especially when investigating the relationship between work and new technologies (Engeström and Miettinen, 1999).

AT was developed by Engeström (1987) under the name cultural – historical activity theory (a theory of activity historically constructed). Given that the integration of ICT into educational practices is supposed to change those practices, applying AT to the study of ICTs in education can be highly useful for analysing factors that influence their use in learning and teaching (Engeström, 2001).

Engeström (1987) developed an extended model of AT that adds the idea of community sharing of the same object. This model includes rules for mediating between a subject and the community, as well as a division of labour to mediate between an object and the community. AT aims to understand the mental capabilities of a single individual; however, the theory rejects isolated individuals, such as people learning autonomously outside of a learning community. In fact, the theory considers such isolation as an insufficient unit of analysis. AT is applicable when analysing both cultural and technical aspects of human action (Bertelsen and Bødker, 2003).

In AT, the pertinent point of analysis is an activity oriented to an object that motivates the activity, giving it a specific direction. For this reason, AT contains the principle of object-orientedness. AT emphasizes activities in which people are engaged, tools they use in these activities, social context, goals and outcomes of the activities (Jonassen and Rohrer-Murphy, 1999). Engeström (1987) introduced the notion of a learning community in the activity system, stated that activity-based human–computer interaction must be achieved in a community, and rejected the principle that isolated individuals can achieve activity.

AT is based on six related elements integrated into three levels (technological, individual and community factors) as described in the following sections.

Technological level: usability and habits. Tools or tool mediation is the technological aspect of AT-based usability and the habits of subjects in an activity process. Tools include artefacts used by individuals in an information system. Technological tools influence the interaction between users and the system structure. Tools are also influenced by culture, and their use provides a way to accumulate and transmit social knowledge. The ease of use and the usefulness of technological tools directly influence their adoption by users (Davis *et al.*, 1989; Engeström and Miettinen, 1999).

Individual level. Perceptions triggered by the ease-of-use and utility of the system. The individual level is composed of object-orientedness and the subjects of the activity system.

- *Object-orientedness:* The objective of the activity system. The object refers to the objectiveness of the reality; items are considered objective according to natural sciences but also have social and cultural properties.

- *Subjects* are individuals engaged in activities within the activity system. This is considered the individual level of AT; students are contextual subjects engaged in collaborative learning.

Community level: social presence, roles and rules. The learner is a member of a community in which other learners and teachers participate. The community mediates the learning process for itself and its members, and controls a specific distribution of the work through social interactions. Cooperative and collaborative learning occurs between the teacher and the group of learners (Donato, 1994). There can be moments when all learners in a group collaborate to fulfil a task or gain a common expertise, not for any individual in particular, but for the entire group. Elements of the community level are as follows:

- The community or external activity in the system is considered the social context and community level of AT when all actors are involved in the activity system (such as a learning community consisting of a group of students engaged in social interaction for the construction and sharing of knowledge).
- The division of labour is considered a hierarchical structure of activity based on the division of activity processes among subjects in the system.
- Rules include codified rules, conventions and guidelines that regulate activities in the system, such as rules of discussion between students in collaborative learning.

The expanded version of the activity system is represented by the bottom part of the larger triangle in Figure 1, which shows three levels of AT: technology, individual and community.

AT has been recommended as a useful framework for examining factors influencing the use of ICT-supported learning environments (Hewitt, 2004; Nardi, 1996). AT is largely used in this respect to analyse factors influencing human–computer interaction.

Technology acceptance model

As early proponents of the model of reasoned action, Davis et al.(1989) developed the TAM, which, compared to AT, is more specifically concerned with predicting the acceptability of an information tool and identifying modifications that should be made to the system to increase its acceptability to users. The TAM postulates that the acceptability of an information system is determined by two factors: the users’ perception of its usefulness and their perception of its ease of use (Davis et al., 1989; Harker and Van Akkeren, 2002).

The perception of usefulness is defined as the degree to which people believe that using a system will improve their performance. The perception of ease of use refers to people’s

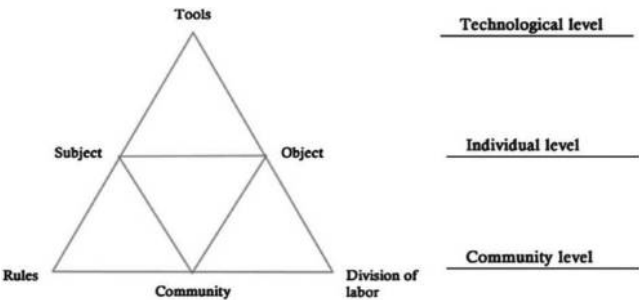


Figure 1.
Three levels of
factors that influence
online participation

degree of belief about how difficult a system will be to use (Davis *et al.*, 1989). Several factorial analyses demonstrated that the perceptions of usefulness and ease of use can be considered as two different dimensions (Hauser and Shugan, 1980; Larcker and Lessig, 1980).

According to Davis *et al.* (1989), the perception of ease of use will also significantly influence an individual's attitude via two main mechanisms: auto-efficiency and instrumentality. Indeed, according to Bandura (1982), the easier a system is to use, the greater the user's feelings of auto-efficiency. A tool's ease of use can also provide users with a sense of control over tasks (Lepper, 1982). Efficiency is one of the main factors underlying intrinsic motivation (Bandura, 1982; Lepper, 1982), illustrating the direct link between the perception of ease of use and a subject's positive attitude towards an information system. The perception of the ease of use of a tool is also an instrumental contributor to performance improvement. Indeed, the effort saved due to ease of use can be redistributed to perform more work while expending no additional effort (Davis *et al.*, 1989).

According to Davis *et al.* (1989), all other factors not explicitly included in the model are assumed to *influence* intentions and usage through ease of use and usefulness. The TAM has undergone several extensions by researchers integrating other external variables, including Davis *et al.* (1989) and Ben Zakour (2002). In this work, the authors seek to determine the degree of acceptance of popular Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter).

In this study, attitudes of information science educators towards integrating popular Web 2.0 tools in education can be explained by the ease of use and the usefulness of these tools. If information science educators perceive the tools as both useful and easy to use, they will be more likely to encourage their students to use them. Moreover, if students perceive these tools the same way, they will increase their use of the tools in their academic and professional careers.

Research questions and aims of the study

The study aims to explore whether information science academics were familiar with Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter) and whether they made use of these popular Web 2.0 tools in their teaching and research processes.

The three research questions listed below guided the present study:

- RQ1. Based on the activity theory and the technology acceptance model, what are the factors of usability and habits of information science educators in using each popular Web 2.0 tool (WhatsApp, Google+, Facebook and Twitter)?
- RQ2. Based on the activity theory and the technology acceptance model, what are the factors of individual level (perception) of the subject in information science education towards the affordance of popular tools (WhatsApp, Google+, Facebook and Twitter)?
- RQ3. Based on the activity theory and the technology acceptance model, what are the factors of the community level (social presence, roles and rules) influencing or motivating subjects' participation in online discussions through cited popular Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter)?
- RQ4. What are the educational benefits of popular Web 2.0 tools and types of information shared from information science instructors' viewpoints?

Research methods

The present study was both analytical and descriptive. The goal of the study was to explore factors that influence the use of four popular Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter) in information science education from an educator’s point of view. The study used a Web-based survey questionnaire to collect data from 108 information science educators.

Population and sample

The population in the present study comprised 108 educators selected randomly from different universities in the Kingdom of Saudi Arabia and who were contacted by WhatsApp messaging if the GSM number is provided and by e-mail if the GSM number is not provided. The sample of educators was selected from those specializing in teaching information sciences and learning resources. Generally in the Arab world, and specifically in Saudi Arabia, academics in information science and learning resources education use popular Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter) to varying extents to interact with their students in blended learning-based continuity between in-class and online learning (Barhoumi and Rossi, 2013); however, some use of the Web 2.0 tools was a requirement for completing the questionnaire.

Data gathering instruments

The questionnaire used to gather data in this study was constructed based on content validity established by a group of teachers in information science education. The questionnaire contains four parts. The first three parts respect the rules specified in AT and the TAM to explore factors that influence the use of the tools, based on the principles of AT. Part 1 of the questionnaire concerned technological factors, Part 2 was related to individual factors and Part 3 concentrated on community factors. The questionnaire also contains a Part 4 that gathered data about the instructors’ perceptions of the benefits of Web 2.0 tools in information science education. The questionnaire is available online at the following Web address: https://docs.google.com/forms/d/1jImIyXiQ2A8mb4cO0yOcGOU5BoEEoVhhueDFV_KAL-HU/viewform

Validity tests of the instrument

The validity tests of the questionnaire instrument included the validation of all items of the questionnaire by experts in the field of LIS education from the Department of Information Sciences and Learning Resources at Taibah University:

- The researchers sent the questionnaire and all its items for validation by a group of 13 experts in the field of LIS education from Taibah University. Experts in the field of LIS were contacted by e-mail.
- The researchers used Cronbach’s alpha to test internal consistency; that is, how closely related a set of items are as a group. Cronbach’s alpha is considered to be a measure of scale reliability. Technically speaking, Cronbach’s alpha is not a statistical test; it is a coefficient of reliability (or consistency). Generally, in most social science research situations, a reliability coefficient of 0.70 or higher is considered acceptable.

Table I shows the internal consistency between the items of the survey instrument for different levels of Cronbach’s alpha (α) (Cortina, 1993).

Table II shows the internal consistency between the 40 items of the survey instrument of the present article using Cronbach's alpha (α).

The alpha coefficient for the 40 items of the survey instrument is 0.74, suggesting that the items of the questionnaire distributed to the sample have relatively high internal consistency. (Note that a reliability coefficient of 0.70 or higher is considered acceptable in most social science research situations.)

Justification of measures

The questionnaire was distributed online via a Web-based survey tool. Each information science educator received an e-mail and a reminder containing a link to the survey. To construct some of the questions, the researcher used typical Likert (Likert, 1932) five-point scale questions (e.g. agree strongly, agree, neutral, disagree and disagree strongly). The scores on the responses (1-5) are also based on the Likert scale. Other questions were multiple-choice questions. The statistical package for social sciences was used to analyse the data (arithmetic means and standard deviation).

Why and how was AT used in this paper?

The AT is a framework useful for studying a group that exists largely in virtual form. Its communications are mediated largely through electronic and printed texts and it is used largely in papers exploring technological, individual and community factors influencing the online participation of a group of online actors. In the present paper, AT was used as a framework for understanding and analysing technological, individual and community factors influencing the use of popular Web 2.0 tools in LIS education to concentrate on factors for the emerging Library 2.0 environment. The TAM is a model used to explore only technological factors influencing the use of Web 2.0 tools and, hence, supports the technological level of the AT.

Findings

This section presents the results for technological factors, individual factors and community factors based on the principles of the AT and the TAM. The educational benefits and type of information resources shared in popular Web 2.0 tools adopted by information science educators will also be presented.

Cronbach's alpha (α)	Internal consistency	Table I. Internal consistency between items for different levels of Cronbach's alpha (α)
$\alpha \geq 0.9$	Excellent	
$0.9 > \alpha \geq 0.8$	Good	
$0.8 > \alpha \geq 0.7$	Acceptable	
$0.7 > \alpha \geq 0.6$	Questionable	
$0.6 > \alpha \geq 0.5$	Poor	
$0.5 > \alpha$	Unacceptable	

Cronbach's alpha (α)	No. of items	Table II. Reliability statistics
0.740	40	

Table III.
Percentages,
arithmetic means and
standard deviations
of each variable of
the technological
factors

Technological factors: usability and habits (subjects)
Table III shows the percentages, arithmetic means and standard deviations for the technological factor variables. The technological factors are the first internal and principal factors of both the AT and the TAM (**Figures 1** and **2**).

The first and the second questions in the survey instrument addressed the technological factors of usability and habits. Students' habits and past experiences using Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter) and the perceived ease of use of these tools shape their attitudes towards these technologies (Davis *et al.*, 1989). The first question covers the perceived usefulness of the Web 2.0 tools most used by the sample of instructors in information science education. The second question covers the ease of the use for each Web 2.0 tool used by the sampled individuals.

Individual factors: perceptions (objects)
Table IV presents the percentages, arithmetic means and standard deviations of each item of the individual factors based on the principles of AT and TAM. Individual factors are an external variable in the TAM (**Figure 2**).

The survey covers individual factors using two questions. The first question asks about the most valuable tool for sharing ideas, experiences, information and sometimes knowledge. The second question queries instructors about their students' degree of orientation towards the popular Web 2.0 tools (**Table IV**).

Community factors
Table V shows the percentages, arithmetic means and standard deviations for the community factor variables.

Question	Variable	(%)	Arithmetic mean	SD
Usefulness of Web 2.0 tools in information science academic life	WhatsApp	73.2	0.73	0.450
	Google+	8.3	0.08	0.278
	Facebook	25	0.25	0.435
	Twitter	61.1	0.61	0.490
Ease of the use of the Web 2.0 tool in information science academic life	WhatsApp	75	0.75	0.435
	Google+	7.4	0.07	0.263
	Facebook	26.9	0.27	0.445
	Twitter	47.4	0.57	0.497

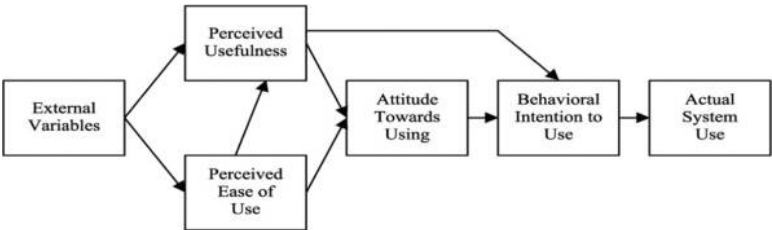


Figure 2.
Technology
acceptance model

Source: Davis *et al.* (1989)

In Table V, the community factors are based on two questions. The first question asks about the role of Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter) in improving the social presence of groups and the degree of their interaction in the learning community. The second question asks instructors how much they think their students use the Web 2.0 tools without an instructor being present and about the degree to which members of the online community respect the roles and rules.

Table VI shows the percentages, means and standard deviations of each type of information frequently shared by instructors on popular Web 2.0 tools.

Table IV.

Percentages of items, arithmetic means and standard deviations of items for the first question and variables for the second question of the individual factors

Question or variable	Item	(%)	Arithmetic mean	SD
A valuable platform used to share information and knowledge in information science education	WhatsApp	72.2	0.72	0.450
	Google+	6.5	0.06	0.247
	Facebook	28.7	0.29	0.454
	Twitter	60.2	0.60	0.492
The majority of my students are connected to the Web 2.0 tool that I'm using it	Agree Strongly	71.3	4.52	0.891
	Agree	15.7		
	Neutral	7.4		
	Disagree	4.6		
	Disagree strongly	0.9		

Table V.

Percentages, arithmetic means and standard deviations for the community factors

Question	Variable	(%)	Arithmetic mean	SD
The Web 2.0 tool is improving social interaction and social presence in the learning community	WhatsApp	88.0	0.88	0.327
	Google+	8.3	0.08	0.278
	Facebook	29.6	0.30	0.459
	Twitter	58.3	0.58	0.495
The Web 2.0 tool is run by the students themselves without the instructor; the role and rules are negotiated	WhatsApp	84.3	0.84	0.366
	Google+	7.4	0.07	0.263
	Facebook	27.8	0.28	0.450
	Twitter	60.2	0.60	0.492

Table VI.

Type of information frequently shared in popular Web 2.0 tools

Question	Variable	(%)	Arithmetic mean	SD
Type of information shared through Web 2.0 tools and used frequently	Library things	63.0	0.63	0.485
	Podcasts	18.5	0.18	0.390
	Forums	31.5	0.31	0.467
	SMS	80.6	0.81	0.398
	PDF file sharing	75.9	0.76	0.430
	Video sharing	90.7	0.91	0.291
	Photo sharing	93.5	0.94	0.247
	Text sharing	89.9	0.90	0.304
	Blogging	71.3	0.71	0.454
	Bookmarking	14.8	0.14	0.357
	Others	4.6	0.05	0.211

EL
35,5*Educational benefits of Web 2.0 tools*

[Table VII](#) shows the percentages, means and standard deviations for every perceived popular educational benefit of popular Web 2.0 tools in information science education. [Table VII](#) shows the open-ended questions in the survey instrument intended to explore the benefits of using the popular Web 2.0 tools.

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Discussion and theoretical implications

The attitudes of information science professionals and instructors towards using the most popular Web 2.0 tools (WhatsApp, Google+, Facebook and Twitter) to share information and knowledge were found to be drastically different. A wide range of factors affect the motivation of information science professionals and instructors when interacting with students to complete information science activities. AT ([Engeström and Miettinen, 1999](#)) and the TAM ([Davis *et al.*, 1989](#)) are both used as theoretical lens of the present study to explore technological, individual and community factors influencing educators' adoption of popular Web 2.0 tools in information science education. The ease of the use and the usefulness of a technology, the usability of the tool and users' habits are all factors to study at the technological level. This section of the paper closely examines the factors at the technological, individual and community levels.

Technological factors of using popular Web 2.0 tools in information science education

In [Table III](#), the survey results indicate that information science educators perceived the ease of use and usefulness of WhatsApp instant messaging and Twitter positively, whereas their familiarity with and perception of the ease of use and usefulness of Google+ and Facebook is limited and more negative. In particular, educators' familiarity with Google+ is very limited. Only 8.3 per cent (standard deviation = 0.278) indicated that Google+ is useful for their information science academic environment. In contrast, educators indicated that WhatsApp and Twitter are both useful and easy to use. The sample results show that 75 per cent of the educators feel that WhatsApp is an easy-to-use platform for sharing information and knowledge (standard deviation = 0.435). Similarly, 47.4 per cent of the educators indicated that Twitter is an easy-to-use platform (standard deviation = 0.497). The issue of WhatsApp and Twitter popularity in the Arab world has affected the usability and habits of these Web 2.0 tools. The results of the technological factor-based ease of use and usefulness of the information system are consistent with TAM ([Davis *et al.*, 1989](#)), which maintains that the ease of use and the usefulness of an information system directly influences its adoption by individuals. Indeed, 73.2 per cent of the educators indicate that WhatsApp instant messaging is a useful system for sharing knowledge, whereas 61.1 per cent think that

Table VII.
Percentages,
arithmetic means and
standard deviations
of popular
educational benefits
of Web 2.0 tools

Question	Variable	(%)	Arithmetic mean	SD
The educational benefits of incorporating popular Web 2.0 in information science education	Facilitating communication and interaction	94.4	0.94	0.230
	Promoting team working skills of the students	88.9	0.90	0.316
	Presenting resources in different formats	88.0	0.88	0.327
	Improving writing skills of the students	80.7	0.81	0.396
	Preparing students for Library 2.0	66.1	0.66	0.476
	Increasing information literacy skills	56.0	0.56	0.499
	Improving the image of information science education	41.3	0.41	0.495

Twitter is useful for sharing knowledge. In contrast, only 25.0 per cent of the educators in the sample consider Facebook a useful platform in their academic environment. The standard deviation of the majority of items is close to 0, indicating that the data points tend to be very close to the mean (see the standard deviations in [Table III](#)).

Information science instructors' habits and past experiences using WhatsApp instant messaging and Twitter to share knowledge and their perceived ease of use and simplicity shape their attitudes towards similar technologies. Based on TAM, the perceived ease of use and usefulness of a new technology affect the attitudes of users towards it positively ([Davis et al., 1989](#)). WhatsApp instant messaging and Twitter, which provide easy-to-use interfaces coupled with newsfeed features, allow information science instructors to be informed quickly when updates within the community occur and to respond in a timely manner. Instructors in information science education are quite willing to adopt easy-to-use and useful Web 2.0 tools to share information and knowledge with their students.

Individual factors: perceptions

As shown in [Table IV](#), the instructors held different beliefs towards the affordances of the popular Web 2.0 tools in information science education. WhatsApp and Twitter messaging are considered valuable platforms for sharing information and sometimes knowledge, ideas and experiences, for discussing social issues, or for seeking help and support during student learning activities (72.2 and 60.2 per cent, respectively). WhatsApp and Twitter help users share knowledge faster to improve learning, exchange experiences and ideas and discuss various academic concepts. It appeared to be natural for educators to create posts, share information and conduct online discussions. In contrast, only 6.5 per cent of the information science educators agree that Google+ is a valuable platform for sharing information and knowledge in information science education. This low percentage reflects the low percentage of educators using Google+ for academic purposes. The adoption of WhatsApp and Twitter by the instructors motivates students to connect to the same Web 2.0 tools. Indeed, 71.3 per cent of the sample respondents agree strongly that students choose the Web 2.0 tool most frequently used by their instructors (standard deviation = 0.891). In results at the individual level, the standard deviation of the majority of items is close to 0, indicating that the data points tend to be very close to the mean ([Table IV](#)). Students seek to connect with their instructors so they can interact with them and share ideas, experiences and ask course-related questions.

Community factors: social presence, roles and rules

As shown in [Table V](#), the community factor results indicate that 88.3 per cent of the educators agree that WhatsApp messaging improves the social interaction and social presence in their learning communities, whereas 84.3 per cent agree that students use WhatsApp instant messaging without the presence of an instructor and that roles and rules are negotiated. Respondents indicated that the Twitter platform improves social interaction and social presence (58.3 per cent) and that learners manage Twitter groups and respect roles and rules (60.2 per cent). The standard deviation of the majority of items is close to 0, indicating that the data points tend to be very close to the mean ([Table V](#)).

The presence of the instructors in popular Web 2.0 tools appears to help students connect with their teachers both to gain knowledge and to share it. Knowledge is socially constructed and is facilitated by peer interaction ([Mohammadi et al., 2015](#)). Social networking sites also serve as major sources of information ([Chaudhry et al., 2015](#)). Previous studies on online educational communities consider the presence of an instructor as a

principal factor influencing students' motivation for social interaction and collaboration with their instructor in online teaching and learning.

The teacher played a central role in collaborative learning. The frequency of social interaction decreased remarkably when the teacher was excluded. Students use these tools to receive quick feedback from instructors. An individual's perception of their own sense of belonging to the community is most strongly correlated with their centrality in exchanging advice networks (Haythornthwaite, 1998). The study of Scifleet *et al.* (2013) showed the importance of social media as a significant social record that is used widely in research. The present study supports the findings of Strijbos and Fischer (2007) who demonstrated that social interaction in learning communities is very useful for constructing and sharing knowledge. Community-based social media is characterized by its ability to support information sharing and collaboration between individuals (Zhang, 2011). The use of social media can enable users to invite others with common interests to build their own communities (Hsu *et al.*, 2015). Appropriate types of social media can be selected that will fit their own purposes and they can develop strategies that will encourage their members to contribute to their communities through social media (Oh and Syn, 2015).

Table VI lists the cooperative and collaborative Web 2.0 objects shared in learning communities, including library resources, podcasts, forums, simple messages, files, videos, photos, texts, blogging, bookmarks and other items that appeared on the questionnaire. Respondents were asked to choose the tools used most frequently in information science education. The answers to this question have been summarized in Table VI, which shows clearly that photo sharing (93.2 per cent), video sharing (67.0 per cent) and text sharing (67.0 per cent) are shared most frequently.

The role and rules of instructors to enhance the use of Web 2.0 in teaching students

The principal role of an instructor in a connectivist learning environment is remembered in using Web 2.0 learning activities based on WhatsApp, Twitter and so on. In this context, a recent study of Lu and Churchill (2014) stated that teachers play a central role in guiding students in the e-learning process in Web 2.0. This study showed that the social interaction tool to construct and share knowledge was teacher-centred; the teacher played a central role in collaborative learning and creating, and managing learning communities, as well as distributing roles to students and rules of discussion to be respected. The density of social interaction decreased remarkably when the teacher was excluded from the learning environment.

Analysis of the results of the educational benefits of popular Web 2.0 applications in information science education

The results of the present research (listed in Table VII) show that useful and easy-to-use Web 2.0 tools have the following educational benefits in information science education:

- Facilitating communication and facilitating interactions (94.4 per cent of respondents) are the primary educational benefits. Useful and easy-to-use popular Web 2.0 tools facilitate online discussions and collaboration between students and their educators at school, from home or from any computer connected to the internet. Online students can simply respond to Web 2.0 posts and discuss topics related to the course.
- Promoting students' teamwork skills is another educational benefit (88.9 per cent). Indeed, useful Web 2.0 tools facilitate the creation of class information that students

can publish and easily edit through collaborative online applications related to the course.

- Presenting resources in different formats is the third educational benefit (88 per cent). The tools encourage students to easily share knowledge and work through various learning resources, such as PDFs, videos, images and animations.
- Web 2.0 tools improve students' writing skills (80.7 per cent).
- Web 2.0 tools help prepare students for Library 2.0 (66.1 per cent).
- Web 2.0 tools increase information literacy skills (56 per cent).
- Web 2.0 tools improve the image of information science education (41.3 per cent).

Useful and easy-to-use Web 2.0 tools provide all these educational benefits when integrated into blended courses because they support continuity between in-class courses and Web 2.0 learning activities, allowing teachers and students to discuss content taught in class. In the educational benefit results, the standard deviation of the majority of items is close to 0, indicating that the data points tend to be very close to the mean (Table VII).

How to use and benefit from using Web 2.0 applications in teaching students

The principal functionality of popular Web 2.0 tools, especially WhatsApp and Twitter, is the easiness of using these systems. WhatsApp has swiftly grown from a small start-up to one of the most popular messaging apps in the world, with over one billion users.

The WhatsApp application gives the possibility to its users to share multimedia objects, such as text, sound, image, video and animation. In addition, the WhatsApp features allow users to easily create a private group to share knowledge, including sending the same message to multiple people without them knowing. Users of WhatsApp can now share documents directly from Google Drive and iCloud Drive in a WhatsApp chat. WhatsApp possesses features improving the sense of community indicated in AT, and the sense of easiness of using this application is supported by TAM and AT in its technological level. Features of the WhatsApp application include supporting technological, individual and community levels of AT and, from the view of the participants, helping to improve and support teaching and learning, especially in the case of blended learning- and teaching-based continuity between in-class learning and online activities through the WhatsApp application (Barhouni, 2015, 2016).

Twitter is an application popular at the Taibah University and all its features are easy to use. Twitter improves social interactions and creates a learning community to discuss courses taught in class by teachers. WhatsApp and Twitter are improving flexible instruction (Barhouni and Rossi, 2013).

Limitations

Limitations of present study are as follows:

- The study is interested in only the most popular Web 2.0 tools and further research needs to be done on other Web 2.0 tools.
- This study was conducted only in the context of information science education.
- This study was conducted during the academic year 2015 with 108 information science educators.

Conclusion

In general, there has been a growing interest by researchers in collaborative learning activities and a sense of learning community in the educational context, and cognitive, motivational and affective benefits of collaboration have been found. Aspects studied include students' productive engagement in peer interactions (Volet *et al.*, 2009), features of group dialogue and discourse leading to high-quality learning shared regulation of the joint activity and the relationship between online group work and social and emotional aspects of peer interaction (Kutnick *et al.*, 2008).

In conclusion, the present research paper shows that ease of use and usefulness of the Web 2.0 tools adopted by information science educators directly influence the attitudes of users towards them, in accordance with their definition in AT and TAM as factors that influence positive attitudes towards technological innovations. WhatsApp instant messaging and Twitter are considered valuable platforms for sharing information and knowledge in information science education. These tools are also frequently used by students, who tend to follow the lead of their information science educators when choosing Web 2.0 tools. These results are confirmed at the individual level of the AT.

The study shows that individuals in information science education have positive attitudes towards the construction of learning communities – and respect the roles and rules of communication. Social presence and social interaction by information science educators are helpful to students in achieving their academic tasks. Researcher interest in studying collaborative learning activities in information science education is growing, and studies have found cognitive, motivational and affective benefits of collaboration.

Based on the results of the present study, the researchers recommend that information science teachers and actors in online teaching and learning choose useful and easy-to-use Web 2.0 learning activities for blended courses to share knowledge with their students. Anything posted by students or teachers in the Web 2.0 space will be instantly accessible online by students at school and at home through RSS feeds.

The results of the present research show that useful and easy-to-use Web 2.0 tools have the following educational benefits in information science education-based statistical data: facilitating communication and interaction, promoting the team working skills of students, presenting resources in different formats, improving the writing skills of students, preparing students for Library 2.0, increasing information literacy skills and improving the image of information science education. All of these educational benefits are provided by useful and easy-to-use Web 2.0 tools in information science education to integrate this technology in the blended course-based continuity between in-class courses and Web 2.0 learning activities to discuss content taught in class.

In the present article, the TAM (Davis *et al.*, 1989) is a model used to explore the technological factors influencing the use of Web 2.0 tools and, hence, supports the technological level of AT. This model needs to be improved to support individual and community factors influencing the use of popular Web 2.0 in education to fit with our new society.

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