



Research article

Identifying factors that influence students performance through social networking sites: An exploratory case study

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ABSTRACT

Social network sites (SNSs) are the most essential communication tools among students, especially at higher levels of education. The purpose of this study is to identify and examine the factors that have an impact on the academic performance of students by using SNSs. The suggested factors that affect student performance are interactions with colleagues, interactions with instructors, engagement, and cooperative learning. The primary research objective of this case study is to determine which factors affect students' academic performance while using SNSs. In this study, i.e., quantitative research, a survey was conducted to analyze the factors associated with student's performance, among undergraduate and graduate students during the 2016/2017 academic session. The survey data were analyzed using descriptive statistical correlations and regression models. The findings indicate that SNSs have a significant positive effect on interactions with colleagues, interactions with instructors, engagement, cooperative learning, and student performance. In addition, interactions with colleagues and instructors while using SNSs simplify the communication between students and instructors, which leads to an enhancement of cooperation, knowledge sharing, and improvement and development of the learning process and also provides many learning chances.

1. Introduction

The Internet and technology are a virtual world that is part of our lives and changes our experiences. We use internet services to find information, shop online, watch TV channels, use maps, and connect with others by using social network sites (SNSs). Social media technologies were engendered new ways of interacting among individuals (Hanna et al., 2011). Indeed, the inception of Web 2.0 has made a significant development that facilitates social connections through the use of a group of technologies that allows users to add or edit the information space (Andersen, 2007; Yu et al., 2010). SNSs are highly popular, precisely between younger internet users, the term "Facebook addict" was included some time ago in the Urban Dictionary (Kaplan and Haenlein, 2010). SNSs permit users to share personal information, receive and send messages, be connected online with friends regardless of geographic distance, share photos, videos, and bookmarks, join groups, conduct business, and become educated (Hinduja and Patchin, 2008). Users are wasting time on SNSs such as YouTube, Twitter, Google+, Facebook,

WhatsApp, Snapchat, and LinkedIn. Common SNSs for business are Skype, Facebook, and LinkedIn. Myspace and Facebook are common SNSs for interactions among all people, and the most common SNS used by students is Facebook (Murray, 2008).

The most significant component of the learning and education field is the use of technology. In the past, the learning environment was considered to be a passive process, whereby the teacher taught the students in a classroom, and the students only took notes (Franklin, 2011). However, nowadays, by applying SNSs in the education and learning environment, students can be a part of an active learning environment where they take part in more interaction and engagement with others.

Many educational organizations put great efforts into applying network technologies to have a communication framework between their instructors and students; they have implemented online systems, such as blackboards, to simplify the connection and cooperation between instructors and students and to let the students submit assignments and download documents. Consequently, this makes the learning process

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more useful (Holsapple and Lee-Post, 2006; Sun et al., 2008; Roblyer and Ekhaml, 2000; Piccoli et al., 2001).

Blackboard is an education management system used by several universities to easily facilitate educational activities. Education management systems support a constructivist approach to learning (Salavuo, 2008). However, SNSs allow more cooperation between students, in alignment with the educational model of social activity (Huijser, 2008). The cooperative possibilities of SNS technology have attracted a lot of approval for its usage in academic learning (Kelm, 2011). In terms of producing and sharing information, SNSs are an example of Web 2.0 technology, which is a good method of learning, supporting cooperative and active student cooperation (Maloney, 2007; Gunawardena et al., 2009). SNSs have been used in academic fields to facilitate communications between students, participation in cooperative learning, and the collection of information (Kitsantas et al., 2016).

Facebook gives users a chance to create their own profiles and interact with other friends. Similarly, Twitter is an SNS that allows users to post up to 140 characters in an easy way. Greenhow (2011) argues that Facebook can be used as the best environment for education, supporting students' academic performance and engagement. The most commonly used SNSs in Saudi universities are Facebook and Twitter (Ahmad et al., 2013). In addition, Facebook, Twitter, YouTube, and LinkedIn are used at King Fahd University of Petroleum and Minerals (KFUPM) (Ahmad et al., 2013). Cooperative learning through using SNSs allows students to have active classes and creates a continued attitude towards sharing activities (Carnaghan and Webb, 2007). Previous studies show that students' academic performance is a function of cooperative learning, academic skill, and students' attitudes and characteristics, along with time wasted on SNS usage. This study aims to investigate four key factors that affect the academic performance of students while using SNSs. These factors focus on the quality of the interaction between colleagues and instructors and how it is increased by using SNSs (Banks, 2006).

SNSs offer a connection between individuals and groups at any location, making it an open and simple way to exchange data and information, exchange videos and picture files, create blogs, and transmit and receive messages. Some studies showed that between 67% and 75% of university students have used SNSs (Jones and Fox, 2009; Lenhart et al., 2010). Around 92% of university students spend an average of 100 min on SNSs every day (Junco, 2012a, 2012b).

Education provides a basis for students to become informed, empowered, and engaged by creating an active learning environment in which individuals achieve knowledge and experience. SNSs are rising in use among university students. Some researchers have pointed out that using SNSs in education can support student engagement and active learning, and they can be used as a connection tool compatible with today's students (McLoughlin and Lee, 2010; Selwyn, 2010). Limited research has been conducted to evaluate the relationship between SNS use and academic performance (Glass et al., 2013).

There is a positive effect from SNS usage in the field of education through the provision of communication, interactions, motivation, engagement, and cooperation in learning, which can add value to learners' experiences (Lim and Richardson, 2016). This study investigates the use of SNSs in learning and education in terms of the facilities for sharing information among colleagues and instructors, allowing communication between colleagues and instructors and helping to improve the academic learning process. In addition, this study evaluates the environment that provides an opportunity to improve the engagement between SNS usage and student performance. Moreover, it examines the participation of students in course discussions, developing their ability to explore information and to create inventive ideas by communicating with others (Al-Mukhaini et al., 2014).

The remainder of this paper is as follows: first, a research theoretical model is developed according to the literature, and hypotheses are proposed. Second, the details of the research method are presented, followed by results and discussion. Finally, the paper ends with the conclusions.

2. Theoretical development and hypotheses

2.1. Definition of SNSs

SNSs are tools that allow users to gain benefits and knowledge via public resources for sharing, communication, collaboration, and interaction. According to Boyd and Ellison (2010), SNSs are web-based facilities that let people create a public or semi-public profile, indicate a list of other users with whom they wish to share a connection, and view lists of other friends. SNSs are designed mostly to facilitate conversations between groups and individuals, which happen for different reasons (Kietzmann et al., 2011). The nature and terminology of these networks may differ from one site to another. Nonetheless, all those SNS programs and applications have made communication between people faster and much easier.

The first SNS, SixDegrees.com, was started in 1997. It lets users make a profile, list their friends, and, through a facility established in 1998, see a friend's list. Although the number of users was in the many millions, this SNS failed to survive, and in 2000, the service was closed. Between 1997 and 2001, there were many groups and SNSs that began to care about numbers of profiles and publicity through friends, such as Black Planet, MiGente, and Asian Avenue, which allowed users to make professional, dating, and personal profiles. In 2001, Ryze.com was started as a service for people's business networks. In 2002, Friendster was started and served people both personally and professionally. A number of new SNSs were launched from 2003 and have been widely analyzed by the social software analyst Shirky (2003). In 2003, LinkedIn, lastFM, tribe.net, Hi5, and MySpace were launched. MySpace was started in 2003 in Santa Monica, California, to contend with sites such as Friendster, Xanga, and Asian Avenue. In 2004, youths started to join MySpace, but unlike older users, most teens never used Friendster. Facebook expanded among high school students who began to create their own profiles in 2005. In 2005, Cyword, Yahoo!360, Black planet, and YouTube started (Junco et al., 2011). In 2006, Twitter was launched.

As of 2010, many SNSs had been created, such as Friend, which began in 2007. Ping.fm was created in 2008. In addition, Net log was identified in 2009 as Face box and Bing box. Further, Google buzz started in 2010. Google buzz is a social networking and messaging application, which was added to the web-based email program Gmail service, allowing users to share their status, pictures, and links with followers of their network.

2.2. SNSs for academic purposes

In education and academic fields, SNSs have developed quickly (Chen and Bryer, 2012). There are many activities that can be carried out online: web searching, online chatting, email, blogging, instant messaging, which has facilitated cooperation among students (Hrastinski and Aghae, 2012), gaming (Cotten, 2008), and online meetings (Mazer et al., 2007). In academic life at university, online activities have become central to day-to-day life (Jones et al., 2008). Greenhow (2011) argued that using SNSs in an academic context is all about developing inventive ideas and sharing them with other users, as well as receiving support and recommendations about class assignments or other day-to-day issues that arise during study, which increase and boost the interaction between students in a shorter time.

A case study in a South African University investigated the effect of the use of SNSs on student learning (Mbodila et al., 2014); it described the scale of engagement and cooperation between users while they were using Facebook. Students joined in with 'Foundation Information Technology (FIT)' through SNSs at the School of Mathematics and Natural Sciences, at one South African university. The group included 150 students, divided as 70% females to 30% males. The study considered the use of Facebook as a platform for many academic activities. Mbodila et al. (2014) distributed a semi-structured questionnaire to the students at the start of the course to find out how aware they were of Facebook and its effect on students' cooperation and engagement. The results showed that

83% of the users believed that the FIT helped them to engage and know about the unit in- and outside the classroom, and 80% of the participants agreed that the technology ought to be used for all foundation programs. The use of Facebook positively affected students' cooperation and engagement.

2.3. Effects of SNSs on the performance of students

SNSs can be used as learning applications to help students cooperate and engage. There are many studies to demonstrate how SNSs affect the academic performance of students. One of them was conducted at Sultan Qaboos University, which designed a questionnaire for students and sent it out through the university email server. The results showed that 52% of the participants stated that their favorite courses were ones using IT, and only 1% of them would take a traditional course without IT. In total, 59% considered that IT helped develop their learning, 55% agreed that IT allowed them to be more active, and 49% agreed that IT makes course work and knowledge more useful.

Out of the 230 students who argued that SNSs are the best medium for academic learning and connection, 100% stated that Facebook and other SNSs are great for communication, 100% stated that SNSs let them exchange messages, photos, and links, 100% talked about groups where they can meet and explain issues, and 74% talked about the use of SNSs for quickly finding people to interact with. The internet provides students with the chance to be introduced to information and provides them with training for communicating (Jabr, 2011).

Twitter was suggested to increase student engagement and have a positive effect on the upgrading of student grades. Discussions and student conversations were observed to continue after lessons, and it was suggested that there may be more interactions between students in Twitter than in the classroom (Junco et al., 2013). In addition, Junco et al. (2013) argued that the methods used by teachers and participation on Twitter can raise student engagement and improve performance. Also, another study argued that Facebook has a positive effect on English writing skills and vocabulary (Shih, 2011).

2.4. Using SNSs for motivation and engagement

In education, the primary goal of teachers is to engage and motivate students (Sullo, 2007). There are different types of motivation that exist, but the most commonly cited ones are through connection with student activity in the classroom intrinsically and extrinsically (Deci and Ryan, 2002).

Intrinsic activities motivate students to participate in an activity based on personal satisfaction, such as for the fun it offers, the learning they acquire, or the sense of achievement they get, while extrinsic activities motivate students to perform for external reasons such as teacher approval or grades (Lepper, 1988). The motivation of different students in different activities can vary greatly, even if they are similarly motivated to share in an activity. However, there are small differences between 'motivation to learn' and 'student motivation', which refer to value, and the interest of the academic work to the learner (Marshall, 1987).

These ways of engaging and motivating students allow them to use interactive education games and virtual learning environments. This environment gives them more interaction through involvement in a social network, which engages students in active learning and motivates them to learn (Franklin, 2011). Mazer et al. (2007) suggested that teachers improve students' motivation and attitude when they use SNSs, especially Facebook. They demonstrated that when students like or add their teacher's page on Facebook, they feel a higher level of motivation and a more positive attitude about their teacher, course, and perceived classroom (Mazer et al., 2007).

Information and communication technology (ICT) contain many teaching methods based on many traditional and new educational techniques. The efficiency of ICT in education has been proved by the

implementation of communication objectives, and efficiency has also been demonstrated by savings in cost, time, and effort. In a study by Baran (2010), more than 60% of students interconnected with friends through a Facebook group and argued that it supported their motivation to learn. In addition, many studies have argued that SNSs have positive effects on the education field, well in excess of traditional educational techniques by providing engagement, interaction, and student motivation (Dabbagh and Kitsantas, 2012; Albayrak and Yildirim, 2015).

Another study relating to ICT was done by Stockely et al., in 2013. In their study, they interviewed students and instructors and found that ICT creates motivation and has a positive effect on interaction, cooperation, and supporting students' skills. Pascarella and Terenzini (2005) argued that student academic performance was associated with student engagement; in particular, a more engaged student will have the opportunity to continue to achieve better grades (Pascarella and Terenzini, 2005).

2.5. Use of SNSs by young adults

In 2001, a report from the Pew Internet & American Life Project hinted at the increasing social connections through technology in the lives of young adults. It was demonstrated that three-quarters of all young adults between the ages of 12 and 17 were using the Internet as an important part of their lives. Moreover, 48% of them argued that usage of the Internet improves their relationships with friends, and 32% of them said that internet applications have helped them to create new friends. In 2007, the same organization demonstrated that approximately 93% of young adults use the Internet and the usage of email is decreasing; however, SNS usage is increasing. In 2014, it was demonstrated that 71% of adults use Facebook (Junco, 2015).

There are many studies about the frequency and duration of logging onto SNSs. In one study, the researchers found that about half the members of an SNS log on every day, 22% log on many times every day, 26% once a day, 17% three to five days each week, 15% one or two days each week, and only 20% log on every few weeks (Lenhart et al., 2009). Also, one study revealed that the duration of Facebook use fluctuates from 10 to 30 min every day among U.S. college students (Ellison et al., 2007).

The results from research in which SNS usage by college faculty members and students and their perception of social networking sites were compared by Roblyer et al. (2010) showed that the number of Facebook accounts differed between students and faculty members. Around 95% of the students had an account, while about 73% of the faculty members had an account. Similarly, Poellhuber et al. (2011) demonstrated that the most common age for SNS users is between 18 and 24, and the most used public network sites were YouTube and Facebook.

2.6. Research variables and hypotheses

The theoretical model for this study is presented in Figure 1.

The research hypotheses for the current study are:

Hypothesis 1. Interactions with colleagues through using SNSs improve students' performance.

Hypothesis 2. Interactions with instructors through using SNSs improve students' academic performance.

Hypothesis 3. Engagement through using SNSs improves students' academic performance.

Hypothesis 4. Cooperative learning through using SNSs improves students' academic performance.

To examine the above hypotheses between the study variables, the following model was applied:

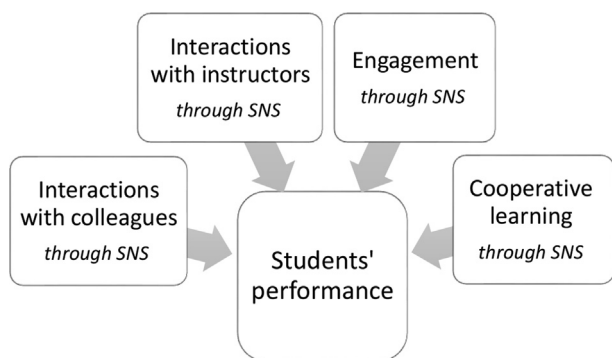


Figure 1. Theoretical model.

$$SP = f_{SNS}(INTC, INTI, EN, CL)$$

where SP represents the student performance (dependent variable), which is a function of the independent variables that have an influence on student performance through using SNS, the independent variable of the model are: INTC, which is the interaction with colleagues, SNSs provide easy, convenient and faster communication tool for students to interact with colleagues, which let them exchange messages, photos, and links, and explain academic related issues (Jabr, 2011); INTI, which is the interaction with instructors, INTI improves students' motivation and performance they use SNSs (Mazer et al., 2007); EN, which is engagement, using SNSs has a positive impact that increases student engagement and performance (Shih, 2011; Junco et al., 2013); and CL, which is cooperative learning, through SNSs students facilitate communications, make discussion groups, sharing academic activities and develop cooperative learning (Fonseca et al., 2014; Kitsantas et al., 2016).

3. Research method

In this study, a quantitative research method was used based on primary data. A survey was conducted to analyze the factors influencing students' academic performance when using SNSs at KFUPM. The data for the study were collected by distributing a questionnaire¹ among undergraduate and graduate students during the 2016/2017 academic session.

3.1. Research sample and population

At the time of this study, KFUPM in Dhahran city was educating about 6898 students, both undergraduates and graduates. The sample and population for this study were 364 students chosen randomly based on the sampling table guide for sample size decisions provided by Krejcie and Morgan (1970) to estimate sample size. The sample included 162 undergraduate students and 202 graduate students.

3.2. Research tool

3.2.1. Creating the research tool

The survey in this case study was designed with closed-ended questions that were easy to answer and to keep the respondents focused on the subject. The survey focused on the factors that influence students' performance when using SNSs at KFUPM. The questionnaire contained demographic information, social presence, and the use of SNSs in education as follows:

1. Demographic information developed by the researcher to develop an understanding of sample members (e.g., age, class rank, GPA).

2. General information about the use of SNSs (social presence) revised from Roblyer et al. (2010) (e.g., type of SNSs they were using, period of time using SNSs, time spent on SNSs, purpose of using SNSs, preferred SNSs for education).
3. Use of SNSs in education according to a five-point Likert scale with answers ranging from [1], strongly disagree, to [5], strongly agree, to measure the following:
 - Interactions with colleagues and the instructor; the researcher used a subsection of three statements for interactions with colleagues and three statements for interaction with the instructor revised from Fonseca et al. (2014).
 - Engagement; three statements revised from Gallini and Moely (2003) and So and Brush (2008) were used.
 - Cooperative learning; five statements revised from Fonseca et al. (2014) were used.
 - Students' academic performance; seven statements revised from Banks (2006) and Fonseca et al. (2014) were used.

3.2.2. Reliability of the research tool

To examine the reliability of the survey scale, Table 1 presents Cronbach's alpha test, which is the most useful measure to check the internal correlation and consistency of data. The Cronbach's alpha value for this study survey was 0.934. Therefore, the reliability of the survey tool was fully validated.

4. Results and discussion

The analysis of survey data (e.g., means, percentages, standard deviations) was conducted using descriptive statistics; correlation was used to estimate the relationship between variables in the entry regression model. The ordinary least squares (OLS) regression analysis model was used to measure the strength of the relationship between the independent variables and the dependent variable.

4.1. Participants demographic profile

The demographic characteristics of the 364 participants in this study were age, class rank and Grade Point Average (GPA). Age of the participants were distributed into four groups: 18–24 years old accounted for (191) 52.47%, 25–34 years old accounted for (159) 43.68%, 35–44 years old accounted for (13) 3.75% and 45–60 years old accounted for (1) 0.27%. For class rank the participants were divided as following: 9.1% were on orientation (33), 4.7% were freshman (17), 4.7% were sophomore (17), 6.9% were junior (25), 19.2% were senior (70) and 55.5% were postgraduate (202). The GPA of participants were divided as follows: 22.0% from 4 to 3.75 (80), 21.7% from 3.75 to 3.5 (79), 26.1% from 3.5 to 3 (95), 17.6% from 3 to 2.5 (64) and 12.6% from 2.5 to 2 (46).

4.2. Participants information about using SNSs

In this section, the participants were asked about using SNSs, types of SNS used, how long the participant had been using SNSs, the frequency of SNS usage, network size on SNSs applied, the purpose of using SNSs and

Table 1. Cronbach's alpha value.

Variable	Number of Items	Reliability	Validity
Interaction with colleagues (INTC)	3	0.738	0.859
Interaction with instructors (INTI)	3	0.873	0.934
Engagement (EN)	3	0.808	0.898
Cooperative learning (CL)	5	0.794	0.891
Student performance (SP)	7	0.884	0.940
Total	21	0.934	0.966

¹ Please see Appendix A.

Table 2. Descriptive analysis of study topic frequency.

Statement	Strongly Agree Number (%)	Agree Number (%)	Undecided Number (%)	Disagree Number (%)	Strongly Disagree Number (%)	Mean	SD	Direction
Interactions with Colleagues								
Using SNSs facilitates interactions with colleagues.	148 (40.7%)	148 (40.7%)	40 (11.0%)	10 (2.7%)	6 (1.6%)	4.19	0.87	Agree
Using SNSs is an effective way to communicate with colleagues.	174 (47.8%)	137 (37.6%)	28 (7.7%)	6 (1.6%)	7 (1.9%)	4.32	0.84	Strongly Agree
SNSs are used effectively to share class materials with colleagues.	168 (46.2%)	117 (32.1%)	30 (8.2%)	27 (7.4%)	10 (2.7%)	4.15	1.05	Agree
						4.22	0.75	Strongly Agree
Interactions with Instructors								
Using SNSs facilitates interaction with the instructor.	84 (23.1%)	112 (30.8%)	71 (19.5%)	63 (17.3%)	22 (6.3%)	3.48	1.20	Agree
Using SNSs is an effective way to communicate with the instructor.	90 (24.7%)	111 (30.5%)	70 (19.2%)	59 (16.2%)	22 (6.0%)	3.53	1.21	Agree
SNSs are used effectively to share class materials with the instructor.	89 (24.5%)	101 (27.7%)	59 (16.2%)	66 (18.1%)	37 (10.2%)	3.38	1.32	Undecided
						3.47	1.11	Agree
Engagement								
Using SNSs has strengthened my personal relationships with my colleagues and instructors.	76 (20.9%)	135 (37.1%)	69 (19.0%)	49 (13.5%)	23 (6.3%)	3.54	1.16	Agree
Using SNSs has helped me to develop a sense of cooperation.	72 (19.8%)	165 (45.3%)	59 (16.2%)	44 (12.1%)	12 (3.3%)	3.68	1.04	Agree
When using SNSs, I feel that my opinions aren't taken into account.	51 (14.0%)	131 (36.0%)	100 (27.5%)	56 (15.4%)	14 (3.8%)	3.42	1.04	Agree
						3.55	0.922	Agree
Cooperative Learning								
While using SNSs in cooperative learning, I felt it was effective.	55 (15.1%)	148 (40.7%)	90 (24.7%)	41 (11.3%)	18 (4.9%)	3.51	1.05	Agree
I was able to develop new skills and knowledge from other members of SNSs.	59 (16.2%)	155 (42.6%)	72 (19.8%)	47 (12.9%)	19 (5.2%)	3.53	1.08	Agree
SNSs promote students' motivation for learning.	52 (14.3%)	151 (41.5%)	75 (20.6%)	53 (14.6%)	21 (5.8%)	3.45	1.09	Agree
A cooperative learning experience in a SNS environment is better than in a face-to-face learning environment.	19 (5.2%)	42 (11.5%)	50 (13.7%)	112 (30.8%)	129 (35.4%)	2.17	1.20	Disagree
SNS discussion groups helped me to develop a sense of cooperation.	35 (9.6%)	161 (44.2%)	95 (26.1%)	38 (10.4%)	23 (6.3%)	3.41	1.02	Agree
						3.21	0.81	Undecided

perceptions about using SNSs in education along with the preferred SNS for education. The researchers were trying to identify participants' familiarity with SNSs and identify factors in their experience of SNSs.

The number (n) of participants who used SNSs was (352) 96.7%, and the number who did not use SNSs was (12) with 3.3%, which was excluded from the data analysis of the study in the next section. The most common SNSs for participants was WhatsApp with 29.86% (n = 335) using it. In second place was Facebook with 21.3% (n = 239) using it. In third place was Twitter with 16.9% (n = 190) of participants using it. LinkedIn received 13.8% (n = 155) and Snapchat received 13.7% (n = 154) while some participants used other sites, such as Skype, BBM, Instagram, path and YouTube 4.3% (n = 49). Majority of the study

participants had been using SNSs for more than six years 49.72% (n = 175). In total, 38% (n = 134) of participants had been using SNSs for four to five years, 11% (n = 39) had been using them for one to three years, and 1.1% (n = 4) had been using them for less than a year. Most of the participants thought that they were wasting their time on SNSs; also, 46.59% (n = 164) spent more than two hours every day on SNSs. A total of 26.42% (n = 93) spent two hours every day, 19% (n = 79) spent one hour every day and only 7.95% spent 30 min every day. The number of friends and followers on SNSs for participants in this study varied. In total, 51.14% (n = 180) had more than 200, 17.6% (n = 62) had 51 to 100 friends and followers, 17.6% (n = 60) had 101 to 200 friends and followers, 9.6% (n = 34) had 21 to 50 friends and followers

Table 3. Estimated model of multiple regression.

Coefficients ^a	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	0.173	0.168		1.030	0.304	−0.157	0.503
INTC	0.146	0.047	0.131	3.138	0.00	0.055	0.238
INTI	0.125	0.032	0.166	3.900	0.00	0.062	0.189
EN	0.213	0.047	0.233	4.532	0.00	0.121	0.306
CL	0.424	0.049	0.408	8.583	0.00	0.327	0.521
R Square	0.610						
Adjusted R Square	0.606						
F	135.8				0.00		

^a Dependent Variable: SP.

and 4.5% (n = 16) had 0 to 20 friends and followers. The majority of participants visited SNSs to be connected with their friends – 28.9% (n = 315). The second most common reason was to know and share information 25% (n = 273). The third most common activities related to study and to improve learning and education methods – 18.9% (n = 206). Some of the participants were using SNSs for their careers 10.6 % (n = 116), to let their friends and families know about their lives – 10.47% (n = 114) and for shopping 5.97% (n = 65). Most of the participants were using SNSs for activities related to education 76.7% (n = 270). Some of the participants did not use SNSs for learning 23.3% (n = 82). The most commonly preferred site for participants for studying and activities related to education was WhatsApp 67.90% (n = 239). In second place was YouTube 16.76% (n = 59). In third place was Facebook – 11.93% (n = 42). Twitter received 2.27% (n = 8) and Snapchat received 1.14% (n = 4).

4.3. Descriptive statistics of the study topics

Descriptive statistics are summarized in Table 2, which shows the percentage, mean, and standard deviation (SD), which describe the responses of students to related factors for all 21 statements and the direction of each statement in the survey data.

4.3.1. Interactions with colleagues

In total, 80.14% of students agreed that using SNSs facilitated interactions with colleagues, 85.4% agreed that SNSs are effective way to communicate with colleagues, and 78.3% agreed that SNSs are used effectively to share class materials with colleagues. Overall, the students had a positive view about interactions with colleagues through SNSs to develop their academic performance.

4.3.2. Interactions with instructors

In total, 53.9% of students in this study agreed that using SNSs facilitated interaction with the instructor, 55.2% agreed that SNSs are effective way to communicate with the instructor, and 52.2% were undecided about whether SNSs are used effectively to share class materials with the instructor. Overall, the students had a positive view about interactions with instructors through SNSs to develop their academic performance.

4.3.3. Engagement

In total, 58% of the students in this study agreed that using SNSs strengthened their personal relationships with their colleagues and instructors, 65.1% agreed that SNSs helped them to develop a sense of cooperation, and 50% were undecided about whether SNSs allowed them to have their opinions taken into account. Overall, the students had a positive view about engagement through SNSs to develop their academic performance.

4.3.4. Cooperative learning

In total, 55.8% of the students in this study agreed that using SNSs in collaborative learning was effective, 58.8% agreed that SNSs helped them to develop new skills and knowledge from other members they connected with, 55.8% agreed that SNSs motivated them, 66.2% disagreed that an SNS environment is better than a face-to-face learning environment, and 53.8% agreed that SNS discussions groups helped them to develop a sense of cooperation. Overall, the students were undecided about the value of collaborative learning through SNSs to develop their academic performance.

4.4. Multiple regression model

The relationships between dependent (SP) and independent (INTC, INTI, EN, and CL) variables in the regression model demonstrated the influence of the independent variables on the dependent variable; the result is presented in Table 3². The model is applied to estimate the level of students' performance, taking into account the effects of INTC, INTI, ENG, and CL. The results indicate that independent variables were statistically significant and had a positive influence on students' academic performance. There was significant evidence ($R^2 = 0.61$) that the explanatory variables in the proposed model adequately described the influence on students' performance.

4.5. Verification of hypotheses

To test the validity of the hypotheses, Pearson correlation coefficient was applied with an alpha significance level of (0.01). The range for an accepted Pearson correlation is from -1 to $+1$, while a value of 0 indicates no relationship between the variables (Guilford, 1956).

4.5.1. First hypothesis

Null hypothesis: interactions with colleagues using SNSs do not improve students' performance.

Alternative hypothesis: interactions with colleagues using SNSs improve students' performance.

The result from Table 4 reveals that the p -value of this correlation test was significant; therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. The R-value between INTC and SP ($r = 0.521$), which was a moderate correlation, indicated that the INTC while using SNSs improved SP.

² The data variables followed a normal distribution; a linear relationship existed between independent and dependent variables, and the variance of errors was the same across all levels of the independent variable (i.e., homoscedastic).

Table 4. Summary of Pearson correlation analysis between INTC and SP.

Variable	Mean	SD	Correlation	p-Value
INTC	4.22	0.75		0.000
SP	3.35	0.84	0.521**	

** Significant at 95 percent.

Table 5. Summary of Pearson correlation analysis between INTI and SP.

Variable	Mean	SD	Correlation	p-Value
INTI	3.47	1.11		0.000
SP	3.35	0.84	0.565**	

** Significant at 95 percent.

Table 6. Summary of Pearson correlation analysis between ENG and SAP.

Variable	Mean	SD	Correlation	p-Value
EN	3.55	0.922		0.000
SP	3.35	0.84	0.680**	

** Significant at 95 percent.

4.5.2. Second hypothesis

Null hypothesis: interactions with instructors using SNSs do not improve students' performance.

Alternative hypothesis: interactions with instructors using SNSs improve students' performance.

The result from [Table 5](#) revealed that the *p*-value of this correlation test was significant; therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. The R-value between INTI and SP ($r = 0.565$), which was a moderate correlation, indicated that the INTI while using SNSs developed SP.

4.5.3. Third hypothesis

Null hypothesis: engagement using SNSs does not improve students' performance.

Alternative hypothesis: engagement using SNSs improves students' performance.

[Table 6](#) shows that the *p*-value of this correlation test was significant, the null hypothesis was rejected, and the alternative hypothesis was accepted. The R-value between EN and SP ($r = 0.680$) indicated that the EN while using SNSs improved SP.

4.5.4. Fourth hypothesis

Null hypothesis: cooperative learning using SNSs does not improve students' performance.

Alternative hypothesis: cooperative learning using SNSs improves students' performance.

The result from [Table 7](#) indicates that the *p*-value of this correlation test was significant; therefore, the null hypothesis was rejected, and the alternative hypothesis was accepted. The R-value between CL and SP ($r = 0.711$), demonstrating a high correlation between CL and SP, means that CL while using SNSs improved SP.

5. Findings and conclusions

To achieve the research objectives, a multiple regression analysis and a correlation analysis were applied to examine the relationships between the independent variables (INTC, INTI, EN, and CL) and the dependent variable (SP). The sample of this case study was 364 students at KFUPM, who answered voluntarily and anonymously through conducted surveys.

The majority of students, at 96.7%, have used SNSs; 49.72% of the students have been using SNSs for more than six years, 51.14% of the students have more than 200 friends and followers, and 46.59% of the participants spend more than two hours every day on SNSs. In several studies ([Bosch, 2009](#); [Baran, 2010](#)), it was found that students use SNSs to keep in touch with friends and for academic reasons, either daily or several times each day. The results of the noted studies are in line with the finding of this case study, suggesting that university students spend a significant amount of time on SNSs.

The preferred SNSs in this case study at KFUPM were WhatsApp (67.90%) and YouTube (16.76%). [Bicen and Cavus \(2010\)](#) found that Live Spaces and Facebook were the preferred SNSs used by students. [Ebrahimpour et al. \(2016\)](#) found that the SNSs most widely used by students were through Telegram, Viber, and WhatsApp. Those findings are in line with the findings of this case study.

The majority of participants in this study agreed with using SNSs in the field of education because it helped them to acquire new skills and knowledge from other members, facilitate interactions with the instructor and colleagues, share class materials, and promote students' motivation for learning. On the other hand, 35.4% did not agree with changing traditional learning methods to Web 2.0 technologies. [nullW](#) argued that educational institutions should implement SNSs to enhance personal learning processes and support "personalized" education.

The majority of students strongly agreed that using SNSs facilitates interactions with colleagues and that SNSs are an effective way to

Table 7. Summary of Pearson correlation analysis between CL and SAP.

Variable	Mean	SD	Correlation	p-Value
CL	3.21	0.81		0.000
SP	3.35	0.84	0.711**	

** Significant at 95 percent.

communicate with colleagues and share class materials. INTC implements and strengthens social relationships. Barczyk and Duncan (2013) found that SNSs facilitate communication between students about academic topics.

In addition, Rambe (2012), and Parveen et al. (2015) argued that students communicated with peers about the academic topic more easily while using Facebook, which reflected positively on their academic knowledge.

The majority of students in this case study agreed that using SNSs facilitates interactions with instructors, who can use SNSs as a portal to send their material, slides, and notes, and to give students an opportunity to access materials and ask questions at any time. Furthermore, instructors have flexibility to answer a student's questions at any time. DeAndrea et al. (2012) found that students can interact, collaborate, communicate, and develop the best possible relationship with their instructors and friends. Warren et al. (2014) showed that SNSs provide university students with a sense of more relaxed interaction with instructors.

The majority of students in this study agreed that using SNSs strengthened their personal relationships with their colleagues and instructors and developed their feeling of cooperation. In addition, Junco et al. (2013) pointed out that students can develop their outputs and improve their engagement when the teacher uses Twitter.

The majority of participants in this study agreed that using SNSs had a positive effect on their education, helped them to develop new skills and knowledge from other members of the SNSs, promoted students' motivation for learning, and developed a sense of cooperation. Al-Qahtani and Lin (2016) found that an SNS is an effective tool for developing students' skills through exchanging ideas, sharing knowledge and information, generating decisions, and brainstorming, which influence students' cooperative learning. Furthermore, Kitsantas and Dabbagh (2011) suggested that collaborative activities in SNSs influence students' self-monitoring and self-education.

This study examined the factors that influence the performance of students at KFUPM through the use of SNSs. In addition, SNSs are considered to be critical tools in providing and distributing ideas, knowledge, and information equally for the users. Moreover, SNSs offer the opportunity for sharing and managing educational knowledge by providing the best environment for students to share activities, concepts, and learning processes. It was found that there was a positive relationship between INTC, INTI, EN, CL, and SP while using SNSs as a learning tool. In addition, it was found that the most popular SNS for KFUPM students for learning and education was WhatsApp.

This study also found that interactions with colleagues and instructors while using SNSs simplifies communication, enhances cooperation, allows for sharing knowledge, improves and develops learning processes, and provides many learning opportunities. For example, when an instructor uses SNSs for online learning, the students will be able to exchange knowledge and ideas, get feedback, and thus improve their performance and strengthen their social skills. This study also supports and encourages instructors to integrate SNSs in their learning processes and thereby enrich their learning experiences. Through this, instructors will open a new opportunity with their students to assist them in their learning process by linking additional material and following related courses on websites. In addition, it is found that many students using

SNSs in the education field increased their level of engagement, which significantly affected their academic performance and motivation in the context of online learning.

Finally, online education is a component of the best universities in the world. Therefore, it is necessary for KFUPM to examine, implement, and develop the integration of SNSs into the university campus and encourage students and instructors to use them. Ideally a study considers both sides the males and females; and takes into account the opinions of instructors would enhance the quality of the findings established in this study as indicators of student's performance while using SNSs. Nevertheless, we believe that this study offers an important contribution to literature on online education and the results from it may be used as a yardstick for future studies.

6. Limitations and future research

This case study was limited for many reasons. All of the participants were volunteers from KFUPM only, which only has a male section. In addition, this study did not consider the opinions of instructors but only focused on students.

This field of research has a number of researchers who would be attracted by the findings of this case study. There are particular recommendations for researchers that would assist them; the first recommendation for future research is to examine the capabilities of using SNSs through mobile technology. For instance, Figueira and Oliveira (2016) described the perception of "Social Student Relationship Management" to manage the relationship among students in social networks, and to introduce a new method in the social system related to students. In addition, Oliveira and Figueira (2017) highlighted the challenges posed by the association of WhatsApp in the learning management system. The second is to compare the influence of using different SNSs in the field of education and then identify the best one. A final recommendation is to conduct this case study with the same factors at a private university and to conduct a comparison study between public and private universities.

Declarations

Author contribution statement

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The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Appendix A

Questionnaire

Dear Participant:

I invite you to participate in a research study entitled "Identifying the Factors That Influence the Performance of Students through the Use of Social Network Sites: A Case Study at King Fahd University of Petroleum and Minerals".

Your participation in this research project is completely voluntary. Your responses will remain confidential and anonymous. The following questionnaire will require approximately up to 10 min to complete. Data from this research will be kept locked and reported only as a collective combined total. No one other than the researchers have access to your individual answers to this questionnaire.

Thank you for your assistance in this important endeavor.

The researchers

SECTION A: Demographic profile

1. How old are you?
 - a. 18–24
 - b. 25–34
 - c. 35–44
 - d. 45–60
2. What is your class rank?
 - a. Orientation
 - b. Freshman
 - c. Sophomore
 - d. Junior
 - e. Senior
 - f. Graduate student
3. What is your GPA?
 - a. 4–3.75
 - b. 3.75–3.5
 - c. 3.5–3
 - d. 3–2.5
 - e. 2.5–2

SECTION B: General information about the use of SNSs

Social network sites (SNSs) are internet-web-based or mobile-based technologies that allow users to create a public profile to simplify connection, cooperation, and exchange of information through networks.

1. Do you use any SNSs?
 - a. Yes
 - b. No
2. Which types of SNSs are you using? (Check all that apply)
 - a. Facebook
 - b. Twitter
 - c. WhatsApp
 - d. Snapchat
 - e. LinkedIn
 - f. Other (Please specify)
3. How long have you been using SNSs? (Since you used your first SNS)
 - a. less than 1 year
 - b. 1–3 years
 - c. 4–5 years
 - d. more than 6 years
4. How much time do you spend on social network sites every day?
 - a. 30 min
 - b. 1 h
 - c. 2 h
 - d. More than 2 h
5. How many connections do you have on SNSs? (i.e., the number of Facebook friends or Twitter followers)
 - a. 0–20
 - b. 21–50
 - c. 51–100
 - d. 101–200
 - e. More than 200
6. What is the purpose of using SNSs? (Check all that apply)
 - a. Shopping
 - b. Activities related to study
 - c. Being connected with friends
 - d. Career networking
 - e. To let others know what is happening in my life
 - f. To know and share information
7. Have you used SNSs for education?
 - a. Yes
 - b. No

8. What SNSs do you prefer to use for class activities?
- Facebook
 - Twitter
 - WhatsApp
 - Snapchat
 - YouTube

SECTION C: The Study Topics

These statements are to indicate your opinion about using SNSs in the education field by using a Likert-type scale ranging from: (1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree)
Please click the answer that best reflects your statement.

1. Interactivity with colleagues: Independent variable

#NO	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Using SNSs facilitates interactions with colleagues.	1	2	3	4	5
2	Using SNSs is an effective way to communicate with colleagues.	1	2	3	4	5
3	SNSs are used effectively to share class materials with colleagues.	1	2	3	4	5

2. Interactivity with instructors: Independent variable

#NO	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	Using SNSs facilitates interaction with the instructor.	1	2	3	4	5
2.	Using SNSs is an effective way to communicate with the instructor.	1	2	3	4	5
3.	SNSs are used effectively to share class materials with the instructor.	1	2	3	4	5

3. Engagement: Independent variable

#NO	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	Using SNSs has strengthened my personal relationships with my colleagues and instructors.	1	2	3	4	5
2.	Using SNSs has helped me to develop a sense of cooperation.	1	2	3	4	5
3.	While using SNSs, I feel that my opinions are taken into account.	1	2	3	4	5

4. Using social networks for cooperative learning: Independent variable

#NO	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	While using SNSs in cooperative learning, I felt it was effective.	1	2	3	4	5
2.	I was able to develop new skills and knowledge from other members of SNSs.	1	2	3	4	5
3.	SNSs promote students' motivation for learning.	1	2	3	4	5
4.	A cooperative learning experience in an SNS environment is better than in a face-to-face learning environment.	1	2	3	4	5
5.	SNSs discussion groups helped me to develop a sense of cooperation.	1	2	3	4	5

5. Students' academic performance: Dependent variable

#NO	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	I use SNSs to facilitate academic activities and coordinate with colleagues and instructors.	1	2	3	4	5
2.	While using SNSs, I felt comfortable to participate in the course discussions.	1	2	3	4	5
3.	Using SNSs for the educational field would be convenient for me to get the best grade.	1	2	3	4	5
4.	Using SNSs would improve my academic learning process.	1	2	3	4	5
5.	Using SNSs has improved my understanding of course topics.	1	2	3	4	5
6.	Using SNSs has enhanced my reading and writing skills.	1	2	3	4	5
7.	Using SNSs has made me more connected to my learning community.	1	2	3	4	5

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