Using Social Networking Sites for Requirements Elicitation: Perspectives and Challenges

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Abstract: The primary aim of any software system is to fulfill users' needs by providing functionality that matches what users are expecting. The success of any software application depends on the requirements elicitation (RE) processes that are the main determinant of software quality. This paper is intended to undertake a preliminary investigation into the ways in which popular social networking sites (SNS) could offer support for RE activities. This research used two approaches, quantitative and qualitative in means of a survey and focus group, and seeks to understand the opinions and perceptions of system developers, system analysts, and IT managers working in Kuwait about the use and the effectiveness of Social Networking Sites (SNS) to elicit end user requirements and to discover whether SNS technology can be of assistance in terms of ways we gather, priorities, and negotiate stakeholder requirements. In addition, this research aims at investigating factors that influence the sudden adoption of SNS as used for RE within Kuwait before and during the Covid-19 pandemic, and to shed light on the opportunities and challenges. The results of this study reveal that participants indicate that SNS can be used for requirements elicitation processes, and can help hear what stakeholders have to say about the system under investigation. Participants indicated that SNS could encourage the generation of new ideas and will speed the elicitation process. The interesting finding is that among the SNS, WhatsApp is mostly used by the participants for RE activities.

1. Introduction

The most crucial element of the system development life cycle (SDLC) is requirements elicitation (RE). Today, initiatives to develop large software systems involve a significant number of stakeholders or individuals or groups who can shape or be influenced by a software project's success or failure. The requirement engineer gathers requirements from stakeholders using several approaches, including face-to-face meetings, focus groups, interviews and surveys, a requirements workshop, joint application development (JAD) and brainstorming (Kaushik, Krishna, & Joshi, 2017). RE is a vital phase of the software development life cycle (SDLC). Its primary aim is to elicit, document, and satisfy the needs of stakeholders (Hujainah, Bakar, Abdulgabber, & Zamli, 2018). We may define requirements as being the needs or demands that the system is designed to fulfill. Satisfying stakeholders' requirements is regarded as the essential function of all high-quality software systems (Dar, 2018). From an RE perspective, social networking providers have offered many new opportunities for software developers to learn about what end-users require without

directly surveying them. In recent times, RE researchers have begun to think about using social networking sites (SNS) to increase end users' involvement in developing software systems. An ecosystem's quality can be guaranteed by collecting data regarding software requirements from such a vast population of anonymous users. The standard methodologies of RE, e.g., interviewing, all-day seminars, and surveys, are extremely costly, particularly when respondents are spread across the world.

Social networking sites enable a substantial number of software end-users to share publicly what they feel about the software they have used. In terms of software engineering, this data can be collated and subjected to analysis to assist those developing software in predicting the new demand that users will have and harvest feedback regarding their systems. SNS, as a communications channel, has assisted many software developers. It supports software developers in overcoming the many drawbacks to standard RE techniques through the elicitation, prioritization, and negotiation of user demands. To assist in this field, numerous Internet-based social networking strategies are effective in RE field (Guzman, Ibrahim, & Glinz, 2017; Pagano & Maalej, 2013; Guzman, Alkadhi, & Sey, 2016; Ali, Kim , & Hong, 2016). This research will attempt to discover which social networking site/service is the most useful in offering

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support for RE activity and which will provide enhancements for the processes that capture and elicit the needs of end-users regarding the system being developed. The research will be undertaken that comprises a survey using a questionnaire supplied to those working in the software engineering field, e.g., application developers, system designers, project managers, and system analysts.

In recent times, social networking sites (SNS) have become well-known for providing a means for billions of global users to use status updates in sharing their opinions, activity, and experience (Ali, Hong, & Chung, 2020; Al-Hunaiyyan, Alhajri, Al-Ghannam, & Al-Shaher, 2021). The enormous quantities of a wide range of real-time data that can be harvested from SNS have been revolutionary in many research sectors, particularly in the data sciences. Data from users of SNS can be employed for predicting the stock exchange's daily fluctuations, marketing trends, and political opinions (Bollen, Mao, & Zeng, 2011). The literature reviews are undertaken by (Genc-Nayebi & Abran, 2017) and (Martin, Sarro, Jia, Zhang, & Harman, 2017) examine how researchers have used reviews on mobile applications stores to assist RE activity. In terms of software engineering, SNS has offered many new ways in which those who develop software can monitor the opinions of substantial groups of end-users (Alhajri, Al-Sharhan, & Al-Hunaiyyan, 2017).

This paper is intended to undertake an investigation into the ways in which popular SNS could offer support for RE activity in terms of eliciting, prioritizing, and negotiating requirements. The aim of this research is the advancement of scientific knowledge regarding understanding of the parts that social networking sites/applications can play in RE activity and discover the challenges such strategies face. This research is regarded as groundbreaking in terms of researching the topic, with very little work having been undertaken regarding SNS as used for RE within Kuwait. The outcomes of the research will assist in demonstrating the difficulties those working in RE may face employing SNS in their work. Additionally, the research will reveal contemporary cutting-edge practices in terms of using SNS for RE, and will offer those working in software engineering suggestions and recommendations that could make online RE successful and help to develop new systems and applications. The authors predict that this research will increase the body of scientific knowledge in this sector. It will also be significant in its provision of a number of suggestions/recommendations to those practicing software engineering to help the elicitation of requirements online become more successful and to assist in the development and updating of systems and applications.

This article is organized as follows: Section 2 provides the research objectives. Section 3 review the literatures, while the methodology of the study is explained in section 4. Research results are presented in section 5, while section 6 discusses and concludes the study.

2. Research Objectives

The considerable amount of extremely varied real-time data available from SNS has been revolutionary in a number of areas of data analysis, including predicting fluctuations in the stock markets, analyzing sentiment, and predicting political affiliation. From the perspective of software engineering, SNS provides an unparalleled chance for software developers to undertake monitoring of an extremely large cohort of software users. Data extracted from SNS can be employed to discover responses to new systems, and allows software developers rapidly to require social and technical feedback regarding these.

To enjoy success and to be able to handle swift time-to-market turnarounds, there is a requirement for methodologies that are quick, simple, and cheap. Nevertheless, the majority of cutting edge RE approaches/tools are created from the perspective of RE and need end-users to have familiarity with specific systems and procedures. Because of this, we predict that new approaches to RE will switch round to consider the perspectives of end users. To achieve this, we must carry out investigations of the ways in which popular SNS can help with negotiating, prioritizing, and eliciting requirements. It is vital that the extant problems with RE tools regarding being accepted by end-users and encouraging their involvement should be overcome. Nevertheless, from RE perspectives, such strategies could throw up new difficulties. Popular SNS are not created for RE and so it is possible that they may not be able to provide adequate support for RE activity. Because of this, the aim of this research is to discover whether the mechanisms of existing SNS are capable of supporting RE activity, and how this can be achieved.

In light of the above, the aim of this research is to undertake an investigation into the potential and means whereby SNS could possibly support RE strategies. This research has three primary objectives:

1) To undertake a review of the literature related to RE activity and to understand the outcomes of practical research.
2) To discover the advantages of social networking sites (SNS) in requirement elicitation (RE) compared to conventional elicitation strategies, and the degree of its' usage.
3) To undertake an investigation into the challenges/issues regarding SNS in terms of RE activity and to offer recommendations for improvements to existing practice.

3. Literature Review

Involving end-users as stakeholders using social networking is essential for successful software engineering (SE) generally and specifically for requirements engineering (RE) (Kujala, Kauppinen, Lehtola, & Kojo, 2005). One of the essential areas involved here is requirement elicitation, how a developer will seek, capture, and incorporate users' demands (Dar, 2018). SNS, e.g. Facebook and Twitter, has revolutionized numerous data science sectors through the production of enormous quantities of useful data daily (Storey, Singer, Cleary, Figueira, & Zagalsky, 2014). Many researchers regard SNS as a superior way of undertaking RE activity (Seyff, Todoran, Caluser, Singer, & Glinz, 2015; Kukreja, 2012; Begel, DeLine, & Zimmermann, 2010; Xiao, Yin, Wang, Yang, & Chen, 2015). Seyff et al. (Seyff, Todoran, Caluser, Singer, & Glinz, 2015) employed SNS as support for listing, prioritizing, and analyzing requirements. The researchers undertook a trio of experimental studies to show how effective SNS could be in the RE sector. The outcomes demonstrate that the popular SNS such as Facebook are useful in supporting distributed RE (Alzayed & Al-Hunaiyyan, 2021). However, the research population was limited to university students, which may not represent the range of potential respondents globally.

The literature reviews undertaken by (Genc-Nayebi & Abran, 2017) and (Martin, Sarro, Jia, Zhang, & Harman, 2017) examine the ways in which researchers have used reviews on mobile applications stores to assist RE activity. In recent times, social networking sites (SNS) have become well known for their provision of a means for billions of global users to use status updates in sharing their opinions, activity, and experience (Ali, Hong, & Chung, 2020). The enormous quantities of a wide range of real-time data that can be harvested from SNS has been revolutionary in many sectors of research, particularly in the data sciences. Data from users of SNS can be employed for predicting the stock exchange's daily fluctuations, marketing trends, and political opinions (Bollen, Mao, & Zeng, 2011). In terms of software engineering, SNS has offered many new ways in which those who develop software can carry out monitoring of the opinions of substantial groups of end users.

Social networking has revolutionized everyday life and could potentially have a significant influence on the way that RE activity is carried out. Researchers (Seyff, Todoran, Caluser, Singer, & Glinz, 2015) stated that systems rooted in social networks will permit us to surpass the restrictions of traditional methods and permit end users to play a more active part in RE, especially those who would not usually be accessible to development organizations. Involving end users as stakeholders using

social networking is essential for successful software engineering (SE) generally and specifically for requirements engineering (RE) (Kujala, Kauppinen, Lehtola, & Kojo, 2005). One of the essential areas involved here is requirement solicitation, the way in which a developer will seek, capture, and incorporate to the demands of users (Dar, 2018). In addition, (Ali, Kim , & Hong, 2016) undertook an overview of a substantial quantity of research papers in order to discover the ways in which SNS assist with RE. They found that research in this area is in its infancy but is swiftly expanding over time.

Eliciting, analyzing, and managing requirements on the basis of semantics as part of the process of developing systems is problematic as there are a substantial quantity of requirements with sizeable system engineering projects. Experts are generally faced with many limits in terms of how much information they can elicit and analyze (Alzayed & Al-Hunaiyyan, 2021). Because the requirement elicitation process is important, numerous global researchers have worked in identifying best practice and potential difficulties. Groundbreaking research looking at requirement elicitation came from (Hess, Randall, Pipek, & Wulf, 2013) who reported on the way in which online communities can participate in product development. This work demonstrates the way requirements can be elicited from users and communities. The researchers targeted a substantial cohort of users distributed across the globe and promoted interactions with them through the use of online applications. In addition, they showed that within online communities, user representatives play a crucial part. Additionally, (Bajic & Lyons, 2011) presented research on social media as employed by a number of different software developers. This research demonstrated that smaller companies employ social media for garnering customer feedback. The research carried out an investigation into the extent to which companies have integrated search mechanisms within development processes and also whether they have completely scrapped standard RE practices. Companies like UserVoice.com (UserVoice, 2021) have implemented reductions in the barriers preventing end users become involved in the process of developing software through the provision of services that can harvest customer feedback (Alhajri, Al-Sharhan, Al-Hunaiyyan, & Alothman, 2011; Alhajri & Al-Hunaiyyan, 2016).

Social networking sites, e.g. Facebook and Twitter, has revolutionized numerous sectors of data science through the production of enormous quantities of useful data daily (Storey, Singer, Cleary, Figueira, & Zagalsky, 2014). The user feedback available from this can be employed for eliciting user requirements. Many researchers regard SNS

as a superior way of undertaking RE activity (Seyff, Todoran, Caluser, Singer, & Glinz, 2015; Kukreja, 2012; Begel, DeLine, & Zimmermann, 2010; Xiao, Yin, Wang, Yang, & Chen, 2015). Seyff et al. (Seyff, Todoran, Caluser, Singer, & Glinz, 2015) employed SNS as a support for listing, prioritizing, and analyzing requirements. The researchers undertook a trio of experimental studies to show how effective SNS could be in the RE sector. The outcomes demonstrate that the popular SNS such as Facebook are useful in supporting distributed RE. However, the research population was limited to university students, which may not be representative of the range of potential respondents globally.

Another study conducted by (Guzman, Ibrahim, & Glinz, 2017) interviewed 27 software developers to discover the ways in which SNS could assist with software development. The research found that developers are frequently reliant on a variety of online resources, e.g. Twitter, to gather information regarding the way users are responding to their systems. They also found that Twitter assists software developers in keeping up-to-date with changes in their industry and available technologies. They also found that developers like to learn from Twitter. Dolly and Khanum (Dolly & Khanum, 2016) undertook a review of the ways in which SNS was employed for RE, comparing the popular SMS applications Telegram, Facebook, and WhatsApp from a variety of perspectives, including the way ideas are discussed and commented upon, group chat, automatic backups, and security. Whilst they found that each of these SNS was useful, they undertook further investigations employing Facebook and WhatsApp. Stakeholders can become actively involved in RE employing widely used SMS such as the ones previously mentioned.

Research by (Williams & Mahmoud, 2017) suggested approaches employing Twitter as a means of eliciting user requirements. Firstly, the authors undertook analysis of 4000 tweets related to 10 different software systems, categorizing them into spam, miscellaneous, user requirements, and reporting bugs. Classification structures were used alongside other techniques for the automatic classification of tweets. This research revealed that sentiment features did not have an influence on classification outcomes. Additionally, (Guzman, Alkadhi, & Seyff, 2017 B) employed Twitter for listing user requirements. This research investigates content, usage characteristics, and potential for automatic classification for user tweets regarding software evolution and RE. The researchers investigated a dataset containing 10,986,495 tweets regarding approximately 30 software applications employing lexical sentiment analysis, content analysis, and descriptive statistics.

Research by (Ali, Kim , & Hong, 2016) elicited domain requirements from SNS for supporting the development of software product lines. They undertook analysis of Twitter, LinkedIn, and Facebook. Facebook and Twitter were chosen as the platforms for eliciting user requirements on the basis of the outcomes of the research. Furthermore, (Khurshid, Waqas, & Zareen, 2018) undertook research to discover the ways in which SNS could be empowering for RE. It was demonstrated that of the respondents, 10% were business analysts, 31% were team leaders, and 41% were software developers. A majority of the respondents were in agreement that RE represents communicative activity, with 73.8% of respondents stating that they had faced communications difficulties when trying to elicit requirements. 57% of respondents stated that Facebook was their favorite platform for eliciting user requirements. In addition, (Groen, Joerg, & Sebastian, 2015) suggested a crowd RE strategy for eliciting user requirements. The researchers regarded the crowd as being contributors of feedback, with software companies being receivers. User feedback was divided into two categories, push feedback and pull feedback. Pull feedback is feedback from the crowd which has been specifically requested by software developers, with push feedback being feedback originating from users in the crowd discussing software. In either instance, user feedback was employed for a eliciting user requirements. In a similar manner, Seyff et al (Seyff, N. et al, 2018) suggested strategies based on the crowd and sustainability to semi automate the process of analyzing, negotiating, and eliciting user requirements. Such a platform would allow a specific widespread cohort of stakeholders in connecting and negotiating what they require from the platform.

The consequences and constraints of the requirements elicitation approach in the instance of the COVID-19 pandemic restrict techniques that do not involve end-user-site-based activities. Due to the pandemic, requirement elicitation techniques could not be created, causing development project members to fear a lack of concentration. Herrmann et al (Herrmann, Imort, Trojanowski, & Deuter, 2021) described a technique for eliciting requirements that can be accomplished by utilizing web conferencing tools. Combining two approaches for requirements formulation, namely Rupp's formulation template and the Easy approach to requirements syntax, along with the requirements stack methodology for combining elicited requirements. To create an effective and enjoyable software solution, system developers must accurately collect and comprehend requirements. Nonetheless, requirements are primarily communicated via textual specifications, which are frequently vague and difficult to comprehend. The work of (Karras, Klünder, & Schneider, 2016 B)

introduces an initial set of guidelines to aid in the identification of requirements specification information that can be enhanced with videos. The authors believe that video conferencing is widely recognized as a viable documentation method with a high potential for achieving an easily comprehensible information representation. Videos can enhance a reader's comprehension by serving as extra material to printed documentation. (Morrison-Smith & Ruiz, 2020). In addition, Video conferencing and video recording are used as additional options to capture more information, including non-verbal gestures. (Karras, Kiesling, & Schneider, 2016) proposed the combination of textual minutes and video with a software tool for requirements engineering activities.

4. Methodology

This research is regarded as groundbreaking in terms of researching the topic, with very little work having been undertaken regarding SNS as used for RE within Kuwait due to the focus on the traditional work, cultural issues, gender, and type of businesses processes (Alzayed & Al-Hunaiyyan, 2021). The covid-19 crisis added a new dimension to this practice. This motivated the researcher to conduct this investigation to understand the factors that influence the sudden adoption of SNS as used for RE within Kuwait before and during the pandemic, and to shed light on the opportunities and challenges.

4.1. Research Procedures and Instruments

This research used two approaches, quantitative and qualitative in means of a survey and focus group. The Goal Question Metric (GQM) was used to generate the questionnaire statements that were used both in the focus group and survey. GQM is a well-established top-down approach to developing software metrics from goals (Basili, Caldiera , & Rombach, 1994; Prashanth, 2017). The researcher developed the quantitative questionnaire and conducted the qualitative focus group discussion. The focus group session was organized and run by the researcher who began by stating the objective of the study to 10 participants (3 systems analysts, 5 developers, and 2 IT managers) of the focus group, and emphasized on the importance of the feedback on improving the questionnaire. Informed consent was obtained, and the participants were assured that the information extracted from their feedback would be used for scientific research only. The researcher instructed the participants to introduce themselves some of whom knew each other, which seemed to improve the group dynamics. The focus group discussion was guided by the sequence of the statements in the questionnaire. The focus group feedback was analyzed using the "three coding-framework" reported by Nyumba et al. (2018). This helped in shaping the final statements of the questionnaire. The session lasted for about 50 minutes.

The questionnaire was developed And adapted from the work of (Hujainah, Bakar, Abdulgabber, & Zamli, 2018; Seyff, Todoran, Caluser, Singer, & Glinz, 2015; Lee, Kim, Kim, Lee, & In, 2011; Ridzuan, et al., 2015). The questions and scales used in the questionnaire were appropriate to the scope of this study and adjusted based on the outcome of the focus group session. The questionnaire harvests demographic data and then asks respondents to demonstrate the level to which they agree or disagree with various statements on a five-point Likert-type scale (1 = strongly disagree to 5 = strongly agree).

A pilot study was conducted two weeks prior to the study. Twenty people from various institutions government and private (system analysts and developers) participated in this pilot study to assess the feasibility of the survey, to ensure that the questions are clear and straightforward, and to validate the initial results. The questionnaire's reliability has been calculated by finding Cronbach's alpha by using SPSS. The total score of Cronbach's Alpha is (0.88). So, the questionnaire can be generalized to the basic study sample, and the results can be trusted. Some improvements were made to the questionnaire such as rephrasing a few questions for straightforwardness. The questionnaire was then administered online to software engineers, application developers, system designers, project managers, and system analysts working in Kuwait. Responses were collected over ten days. The results were then analyzed using SPSS in which frequency, percentage, mean, and standard deviation (SD) was used for the analysis.

4.2. Study Sample

The online questionnaire was randomly distributed in which 109 participants responded. The participants of this study were software engineers, application developers, project managers, and system analysts from various institutions in Kuwait, representing both private and government sectors. Data were then collected for analysis using the survey monkey application and SPSS. The statistical analysis of the questionnaire was considered based on 109 valid responses. Statistical analysis was used to provide an objective assessment of any differences observed between variables.

5. Results

This section presents the outcome of the qualitative data and the quantitative analysis based on the statistical tests. This will lead to understand the effectiveness of social networking sites on requirement elicitations and to provide recommendations for the scientific in the field. The subsections below provide results related to the characteristics of the participant, such as their frequent use of some of the social media applications for general purposes; and participants' frequent use of some of social

media applications for requirement elicitation; then participants' perceptions about the use of social networking sites for eliciting end-user requirements; participants' opinions about the suitable features of SNS for requirement elicitation; finally, participants opinions of the SNS video conferencing tools used for requirement elicitation

5.1. Participants Demographic Information

This section represents the characteristics of the participant of this study (109 responses). The outputs of the first 3 questions (gender, job title, and work experience), are displayed in Table (1) and Figure (1). There were 68 male and 41 females. They fall into 3 job titles, 24 participants were "System analysts/System designers", 53 participants were "Project/IT managers", and 32 participants were "Programmers/Developers".

Demographic Information	Frequency
Gender	
Male	68
Female	41
Job Title	
System Analysts/ System Design	24
Project & IT manager	53
System Developer	32
Work Experience	
Less than 5 years	27
5-10 years	23
More than 10 years	59

Table (1): Background Information of the Participants
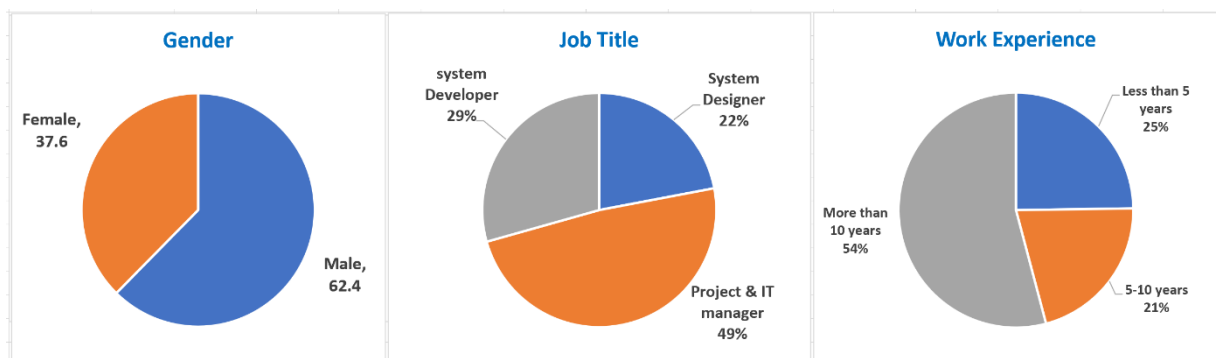
Fig. (1): Demographic Information of the Participants

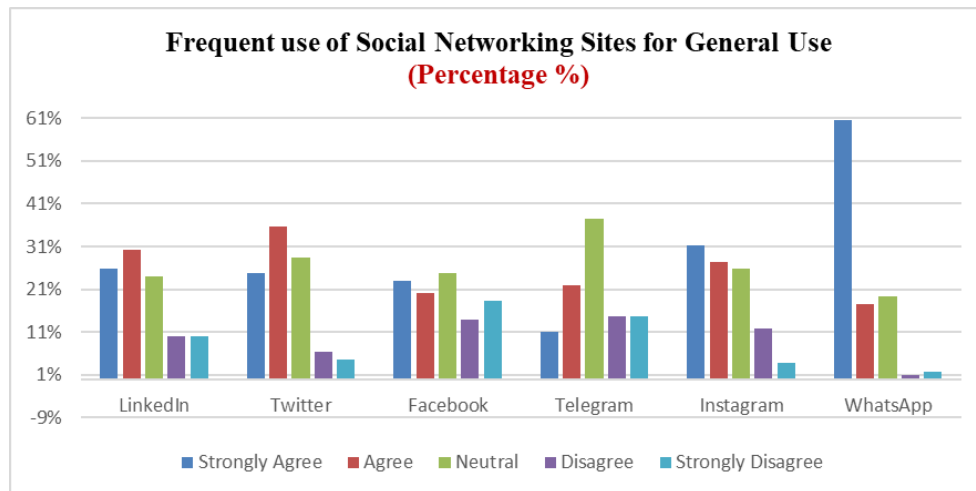### 5.2. Participants' Frequent use of Social Networking Sites for General Use

Part 2 of the questionnaires examines participants' frequent use of some of the social media applications for general purposes such as LinkedIn, Twitter, Facebook, Telegram, Instagram, and WhatsApp. The results are presented in Table (2) and Figure (2).

SNS	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	Std. Deviation
LinkedIn	25.7 %	30.3 %	23.9 %	10.1 %	10.1 %	3.51	1.259
Twitter	24.8 %	35.8 %	28.4 %	6.4 %	4.6 %	3.70	1.059
Facebook	22.9 %	20.2 %	24.8 %	13.8 %	18.3 %	3.16	1.409

Telegram	11.0 %	22.0 %	37.6 %	14.7 %	14.7 %	3.00	1.186
Instagram	31.2%	27.5 %	25.7 %	11.9 %	3.7 %	3.71	1.141
WhatsApp	60.6 %	17.4 %	19.3 %	0.9 %	1.8 %	4.34	0.945

Table (2): Participants' use of social media applications (In general)

Fig. (2): Participants' use of social media applications (in general)
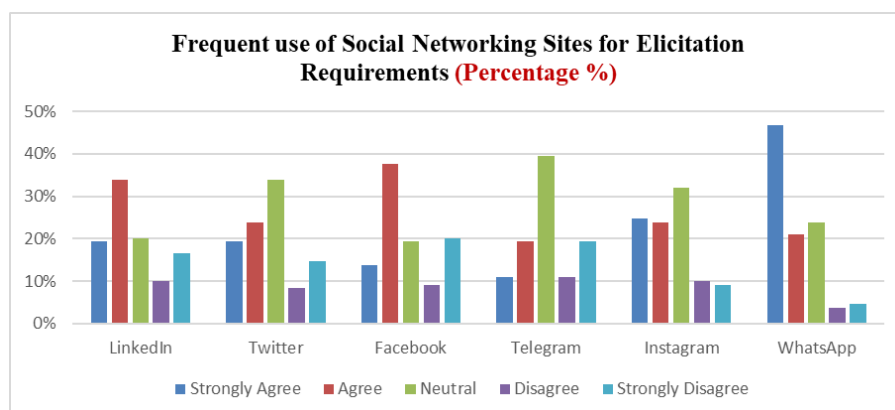
5.3. Participants' Frequent use of Social Networking Sites for Eliciting End-User Requirements

Part 3 of the questionnaires examines participants' frequent use of some of the social media applications for eliciting end user requirements such as: LinkedIn, Twitter, Facebook, Telegram, Instagram, and WhatsApp. The results are presented in Table (3) and Figure (3).

SNS	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	Std. Deviation
LinkedIn	19.3 %	33.9 %	20.2 %	10.1 %	16.5 %	3.29	1.342
Twitter	19.3 %	23.9 %	33.9 %	8.3 %	14.7 %	3.25	1.278
Facebook	13.8 %	37.6 %	19.3 %	9.2 %	20.2 %	3.16	1.348
Telegram	11.0 %	19.3 %	39.4 %	11.0 %	19.3 %	2.92	1.233
Instagram	24.8 %	23.9 %	32.1 %	10.1 %	9.2 %	3.45	1.228
WhatsApp	46.8 %	21.1 %	23.9 %	3.7 %	4.6 %	4.02	1.130

Table (3): Participants' use of social media applications (for Requirement Elicitation)

Fig. (3): Participants' use of social media applications (for Requirement Elicitation)

Social networking sites offer opportunities to help system analysts and enrich the requirement elicitation process. Social networking sites have transformed everyday life and could potentially have a significant influence on the way that RE activity is carried out. They have also revolutionized numerous sectors of data science through the production of enormous quantities of useful data daily (Storey, Singer, Cleary, Figueira, & Zagalsky, 2014). Results presented in section 5.2 and 5.3 indicated that WhatsApp, Instagram, Twitter are mostly used for general purposes by participants with means (4.34, 3.71, 3.70), however, WhatsApp, Instagram, and LinkedIn were mostly used for requirement elicitations by the participants with means (4.02, 3.45, 3.29) as shown in Tables 2 and 3. This reveals that participants see a potential and prefer to use social networking sites for requirement elicitation. What is interesting and requires more investigation is why WhatsApp comes first place as

a social application that is used for both general purpose and for requirement elicitation? Is it related to popularity, ease of use, or functions?

5.4. Social Networking Sites for Eliciting End User Requirements

Part 4 of the questionnaire is used to measure participants' perceptions and attitudes towards Social Networking Sites' use for eliciting end-user requirements. Table (4) reflects participants' perceptions. A percentage is used to know the proportion of selected choice (5 strongly agree to 1 strongly disagree). In addition, Mean is used to give the general average of their opinions, while Standard Deviation (SD) is used to provide an indication of how far participants responses to a question vary or "deviate" from the mean. We noticed in tables 4 that the value of SD is around 1, which indicates that the answer to each question is close to the average.

No	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
1	I use SNS as communication process in my daily activities?	42.2 %	39.4 %	12.8 %	3.7 %	1.8 %	**4.17**	**0.92**
2	SNS can be used for requirements elicitation processes	22.0 %	45.0 %	25.7 %	4.6 %	2.8 %	**3.79**	**0.93**
3	SNS can help to hear what stakeholders have to say about the system	22.0 %	39.4 %	33.9 %	1.8 %	2.8 %	**3.76**	**0.91**
4	SNS is a great value for requirements gathering	27.5 %	33.0 %	30.3 %	4.6 %	4.6 %	**3.74**	**1.06**
5	SNS enable user requirements to be publicized, critiqued and adjusted based on the feedback	22.0 %	43.1 %	28.4 %	4.6 %	1.8 %	**3.79**	**0.90**
6	SNS can encourage the generation of new ideas	30.3 %	41.3 %	22.0 %	6.4 %	0.0 %	**3.95**	**0.89**
7	Do you think that using SNS will speed the elicitation process	16.5 %	40.4 %	33.9 %	6.4 %	2.8 %	**3.61**	**0.93**
8	Do you agree that using SNS will increase end users' participation in RE activities	19.3 %	42.2 %	31.2 %	5.5 %	1.8 %	**3.72**	**0.90**

Table (4): Participants' Perceptions of Social Networking Sites for Requirement Elicitations

Regarding investigating participants' perceptions and attitudes about the use and the effectiveness of Social Networking Sites to elicit end-user requirements, the results presented in table 4 reveal some interesting findings. Participants indicated that they use SNS as a communication process in their daily activities with a mean (4.17). They also indicate that SNS can be used for requirements elicitation processes with mean (3.79). Participants indicated that SNS can help hear what

stakeholders have to say about the system under investigation with a mean (3.76). They also think that SNS enables user requirements to be publicized, critiqued, and adjusted based on the feedback with a mean (3.79). Participants believe that SNS could encourage new ideas with a mean (3.95), and think that using SNS will speed up the elicitation process with mean (3.61), also agree that using SNS will increase end users' participation in RE activities with a mean (3.72).

5.5. Perceptions of Features to be available in SNS for Requirement Elicitation

Part 5 of the questionnaire is used to measure participants' perceptions and attitudes about the important features and functions that should be provided by social networking sites and its' effectiveness to elicit end-user requirements as in Table (5).

No	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
1	Easy access	36.7 %	47.7 %	14.7 %	0 %	0.9 %	**4.19**	**0.751**
2	Post queries	27.5 %	45.9 %	24.8 %	0.9 %	0.9 %	**3.98**	**0.805**
3	suitable time	31.2 %	42.2 %	22.9 %	0 %	3.7 %	**4.01**	**0.833**
4	Comments on queries	28.4 %	42.2 %	25.7 %	2.8 %	0.9 %	**3.94**	**0.859**
5	user needs	33.0 %	40.4 %	22.0 %	3.7 %	0.9 %	**4.01**	**0.887**
6	Approval	30.3 %	37.6 %	27.5 %	1.8 %	2.8 %	**3.91**	**0.948**

Table (5): Participants' Perceptions of Features to be available in SNS for Requirement Elicitations

Social networking sites as indicated by the participants are suitable requirement elicitation tools as it allows easy access to stakeholders "Mean=4.19", allow posting queries "Mean=3.98", can be reached users at suitable times "Mean=4.01", make it easy for stakeholders to comments on queries "Mean=3.94", satisfy user needs "Mean=4.01", and approval "Mean=3.94". The overall results reveal that SNS provides suitable tools that support RE activities. The easy access feature comes first as participants indicated. Need more

5.6. Perceptions of Video Conferencing used in SNS for Requirement Elicitation

Part 6 of the questionnaire is used to measure participants' perceptions of the video conferencing applications provided by social networking sites for RE as in Table (6).

No	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
1	Skype	14.7 %	39.4 %	20.2 %	12.8 %	12.8 %	**3.30**	**1.244**
2	Facebook	6.4 %	16.5 %	33.9 %	24.8 %	18.3 %	**2.68**	**1.146**
3	WhatsApp	34.9 %	28.4 %	25.7 %	6.4 %	4.6 %	**3.83**	**1.121**
4	MS teams	48.6 %	22.9 %	22.0 %	1.8 %	4.6 %	**4.09**	**1.093**
5	Google meet	20.2 %	29.4 %	25.7 %	11.9 %	12.8 %	**3.32**	**1.283**
6	None	2.8 %	11.0 %	37.6 %	20.2 %	28.4 %	**2.39**	**1.097**

Table (6): Participants' perceptions of video conferencing used in SNS for Requirement Elicitations

Regarding video conferencing provided by social networking sites for requirement elicitation participants indicated that MS-Teams comes first with "Mean=4.09", then WhatsApp "Mean=3.83", Google Meet "Mean=3.32" and Skype "Mean=3.30", finally Facebook with "Mean=2.68" are mostly used to meet with stakeholders.

6. Discussions and Conclusion

The primary aim of any software system is to fulfill users' needs by providing functionality that matches what users are expecting. The success of any software application depends on the requirements elicitation (RE) processes that are the main determinant of software quality. Social networking sites enable a substantial number of software end-users to share publicly what they feel about the software they have used. In terms of software engineering, this data can be collated and subjected to analysis to assist those developing software in predicting the new demand that users will have and harvest feedback regarding their systems. SNS, as a communications channel, has assisted many software developers. It supports software developers in overcoming the many drawbacks to standard RE techniques through the elicitation, prioritization, and negotiation of user demands.

This paper is intended to investigate the ways in which popular SNS could offer support for requirement elicitation (RE) activity in terms of eliciting, prioritizing, and negotiating requirements. This research used two approaches, quantitative and qualitative in means of a survey and focus group and seeks to understand the opinions and perceptions of system developers, system analysts, and IT managers working in Kuwait about the use and the effectiveness of Social Networking Sites (SNS) to elicit end-user requirements and to discover whether SNS technology can be of assistance in terms of ways we gather, priorities, and negotiate stakeholder requirements. In addition, this research aims at investigating factors that influenced the sudden adoption of SNS as used for RE within Kuwait before and during the Covid-19 pandemic, and to shed light on the opportunities and challenges. The results of this study reveal that participants indicate that SNS can be used for requirements elicitation processes, and can help hear what stakeholders have to say about the system under investigation. The outcomes of the research will assist in demonstrating the difficulties those working in RE may face employing SNS in their work. Additionally, the research will reveal contemporary cutting-edge practices in using SNS for RE. It will offer those working in software engineering suggestions and recommendations that could make online RE successful and help to develop new systems and applications.

Social networking sites offer opportunities to help system analysts and enrich the requirement elicitation process. Social networking sites have transformed everyday life and could potentially have a significant influence on the way that RE activity is carried out. They have also revolutionized numerous sectors of data science through the production of enormous quantities of useful data daily (Storey, Singer, Cleary, Figueira, & Zagalsky, 2014). Results presented in section 5.2 and 5.3 indicated that WhatsApp, Instagram, Twitter are mostly used for general purposes by participants. This reveals that participants see a potential and prefer to use social networking sites for requirement elicitation. What is interesting and requires more investigation is why WhatsApp comes first place as a social application that is used for both general purpose and for requirement elicitation? Is it related to popularity, ease of use, or functions?

Regarding investigating participants' perceptions and attitudes about the use and the effectiveness of Social Networking Sites to elicit end-user requirements, the results presented in section 5.3 reveal some interesting findings. Participants indicated that they use SNS as a communication process in their daily activities and can be used for requirements elicitation processes. In addition, participants believed that SNS can help hear what stakeholders have to say about the system under investigation, and also think that SNS enables user requirements to be publicized, critiqued, and adjusted based on the feedback. In addition, participants indicated that SNS could encourage new ideas and think that using SNS will speed up the elicitation process and increases end users' participation in RE activities. Furthermore, Social networking sites as indicated by the participants include suitable requirement elicitation tools such as allowing easy access to stakeholders and allowing posting queries and comments anytime/anywhere. MS Teams and WhatsApp were found to be mostly used by participants to meet online with stakeholders for requirement elicitation. In support of these findings, (Karras, Kiesling, & Schneider, 2016) believe that video conferencing is known as a good documentation option with a large potential to achieve an easy-to-understand content representation and the proposed combination of textual minutes and video with a software tool for requirements engineering activities. Enriching SNS with advanced video conferencing tools and futures will support RE activities.

SNS include a vast quantity of information, including user experiences and expectations. This data could be utilized by software developers to comprehend the experiences, desires, and expectations of their intended end users. The mining of SNS, particularly user opinions, may provide software development organizations with useful information for the evolution of software products. It would be beneficial for software development organizations to obtain user feedback regarding reported bugs in existing applications and anticipated features. Although there are few research studies investigating consumers' opinions on SNS, the results gained are positive. Therefore, from the perspective of RE, a new study of SNS metadata will provide a detailed image of user preferences and perspectives because of more advanced research investigations. Software development organizations could use user feedback to perceive their anonymous audience.

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References

[1] Alhajri, R., & Al-Hunaiyyan, A. (2016). Integrating Learning Style in the Design of Educational Interfaces. ACSIJ Advances in Computer Science: an International Journal, Vol. 5, Issue 1, No.19 , January 2016. ISSN : 2322-5157.

[2] Alhajri, R., Al-Sharhan, S., & Al-Hunaiyyan, A. (2017). Students' Perceptions of Mobile Learning:

CaseStudy of Kuwait. International Journal of Educational and Pedagogical Sciences, Vol:11, No:2.

[3] Alhajri, R., Al-Sharhan, S., Al-Hunaiyyan, A., & Alothman, T. (2011). Design of educational multimedia interfaces: individual differences of learners. Proceedings of the Second Kuwait Conference on e-Services and e-Systems, (pp. 1-5). Kuwait.

[4] Al-Hunaiyyan, A., Alhajri, R., Al-Ghannam, B., & Al-Shaher, A. (2021). Student Information System: Investigating User Experience (UX). International Journal of Advanced Computer Science and Applications, Vol. 12, No. 2, 80-87.

[5] Ali, N., Hong, J., & Chung, L. (2020). Social network sites and requirements engineering: A systematic literature review. Journal of Software Evolution Process. Volume33, Issue 4. 2021; 33:e2332. https://doi.org/10.1002/smr.2332.

[6] Ali, N., Kim , S., & Hong, J. (2016). Listen closely, respond quickly: Enhancing conformity of SPL domain requirements through SNS. In Proceedings of the 2016 International Conference on Information Science and Communications Technologies (ICISCT), (pp. 1-5). Tashkent, Uzbekistan, 2-4 November 2016.

[7] Alzayed, A., & Al-Hunaiyyan, A. (2021). A Bird's Eye View of Natural Language Processing and Requirements Engineering. International Journal of Advanced Computer Science and Applications (IJACSA). Volume 12, No. 5, 81-90.

[8] Bajic, F., & Lyons, K. (2011). Leveraging Social Media to Gather User Feedback for Software Development. Proceedings of the 2Nd International Workshop on Web 2.0 for Software Engineering.

[9] Basili, V., Caldiera , G., & Rombach, D. (1994). The Goal Question Metric Approach. Encyclopedia of software engineering, 528-532.

[10] Begel, A., DeLine, R., & Zimmermann, T. (2010). Social media for software engineering. In Proceedings of the FSE/SDP Workshop on Future of Software Engineering Research, (pp. 33–38). Santa Fe, NM, USA, 7–8 November 2010.

[11] Bollen, J., Mao, H., & Zeng, X. (2011). Twitter mood predicts the stock market. Journal of Computational Science, Vol 2, Issue 1, 1-8.

[12] Dar, H. (2018). A Systematic Study on Software Requirements Elicitation Techniques and its Challenges in Mobile Application Development. IEEE Access. 6. 10.1109/ACCESS.2018.2874981.

[13] Dolly, B., & Khanum, M. (2016). Requirement Elicitation in Mobile Apps: A Review. In the Conference Proceedings of ACEIT.

[14] Genc-Nayebi, N., & Abran, A. (2017). A systematic literature review: opinion mining studies from mobile app store user reviews. Journal of Systems and Software. 2017;125, 207-219.

[15] Groen, E., Joerg, O., & Sebastian, A. (2015). Towards Crowd-Based Requirements Engineering. A Research Preview. 10.1007/978-3-319-16101-3_16.

[16] Guzman, E., Alkadhi, R., & Sey, N. (2016). A needle in a haystack: What do twitter users say about software? In Proceedings of the 24th International Requirements Engineering Conference (RE), (pp. 96–105). Beijing, China, 12–16 September, 2016.

[17] Guzman, E., Alkadhi, R., & Seyff, N. (2017 B). uzman, Emitza & Alkadhi, Rana & Seyff, Norbert. (2017). An Exploratory Study of Twitter Messages about Software Applications. Requirements Engineering. 22-5 10.1007/s00766-017-0274-x.

[18] Guzman, E., Ibrahim, M., & Glinz, M. (2017). A little bird told me: Mining tweets for requirements and software evolution. In Proceedings of the IEEE 25th International Requirements Engineering Conference (RE), (pp. 11-20). Lisbon, Portugal, 4–8 September 2017.

[19] Herrmann, J., Imort, S., Trojanowski, C., & Deuter, A. (2021). Requirements Elicitation for an Assistance System for Complexity Management in Product Development of SMEs during COVID-19: A Case Study. Computers. 2021; 10(11):149.

[20] Hess, J., Randall, D., Pipek, V., & Wulf, V. (2013). Involving users in the wild—participatory product development in and with online communities. Int J Human-Computer Stud 71(5), 570–589.

[21] Hujainah, F., Bakar, R., Abdulgabber, M., & Zamli, K. (2018). Software Requirements Prioritisation: A Systematic Literature Review on Significance, Stakeholders, Techniques and Challenges. IEEE Access, 6, 71497–71523.

[22] Karras, O., Kiesling, S., & Schneider, K. (2016). Supporting Requirements Elicitation by Tool-Supported Video Analysis. IEEE 24th International Requirements Engineering Conference (RE), (pp. 146-155).

[23] Karras, O., Klünder, J., & Schneider, K. (2016 B). Enrichment of Requirements Specifications with Videos - Enhancing the Comprehensibility of Textual Requirements. . TPDL 2016 – 20th International Conference on Theory and Practice of Digital Libraries 5-9 Sep. 2016. Hannover, Germany: Springer .

[24] Kaushik, D., Krishna, S., & Joshi, S. (2017). Web Based Requirement Elicitation Tool. International Journal of Advanced Research in Computer

Engineering & Technology (IJARCET) Volume 4 Issue 9.

[25] Khurshid, R., Waqas, M., & Zareen, K. (2018). Social Networking Sites Empower Requirement Engineering. Conference: 31st IBIMA Conference. Milan, Italy.

[26] Kujala, S., Kauppinen, M., Lehtola, L., & Kojo, T. (2005). The role of user involvement in requirements quality and project success. In: Proceedings of the International Requirements Engineering Conference (pp. 75–84). Piscataway, NJ, USA: IEEE.

[27] Kukreja, N. (2012). Winbook: A social networking-based framework for collaborative requirements elicitation and WinWin negotiations. In Proceedings of the 34th International Conference on Software Engineering, (pp. 1610–1612). Zurich, Switzerland, 2–9 June 2012.

[28] Lee, Y., Kim, N., Kim, D., Lee, D., & In, H. (2011). Customer Requirements Elicitation based on Social Network Service. KSII Transactions on Internet and Information Systems, vol. 5, no. 10, 1733-1750.

[29] Martin, W., Sarro, F., Jia, Y., Zhang, Y., & Harman, M. (2017). Martin W, Sarro F, Jia Y, Zhang Y, Harman M. A survey of app store analysis for software engineering. IEEE Transactions on Software Engineering. 2017; 43(9), 817-847.

[30] Morrison-Smith, S., & Ruiz, J. (2020). Challenges and barriers in virtual teams: A literature review. SN Appl. Sci. 2020, 2,, 1–33.

[31] Nyumba, T., Wilson, K., Derrick, C., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and Evolution (MEE), 9, 20–32.

[32] Pagano, D., & Maalej, W. (2013). User feedback in the appstore: An empirical study. In Proceedings of the 21st IEEE international requirements engineering conference (RE), (pp. 125–134). Rio de Janeiro, Brazil, 15–19 July 2013.

[33] Prashanth, S. (2017). Data for Business Performance: The Goal-Question-Metric (GQM) Model to Transform Business Data into an Enterprise Asset First Edition. Basking Ridge, NJ.

[34] Ridzuan, A., Ridzuan, H., Bolong, J., Suyurno, S., Kamal, R., & Jafri, F. (2015). Developing SNS Factors Structures Towards Consructing SNS Survey Questions. Journal of Human Capital Development Vol. 8 No. 2.

[35] Seyff, N. et al. (2018). Crowd-Focused Semi-Automated Requirements Engineering for Evolution Towards Sustainability. International Requirements Engineering Conference (RE).

[36] Seyff, N., Todoran, I., Caluser, K., Singer, L., & Glinz, M. (2015). Using popular social network sites to support requirements elicitation, prioritization and negotiation. Journal of Internet Services and Applications, V. 6. 1.

[37] Storey, M., Singer, L., Cleary, B., Figueira, F., & Zagalsky, A. (2014). The (r) evolution of social media in software engineering. In Proceedings of the on Future of Software Engineering, (pp. 100–116). Hyderabad, India, 31 May–7 June 2014.

[38] Williams, G., & Mahmoud, A. (2017). Mining Twitter Feeds for Software User Requirements. IEEE 25th International Requirements Engineering Conference (RE), (pp. 1-10).

[39] Xiao, M., Yin, G., Wang, T., Yang, C., & Chen, M. (2015). Requirement Acquisition from Social Q&A Sites. In A. M. In: Liu L., Requirements Engineering in the Big Data Era. Communications in Computer and Information Science, vol 558 (pp. 64–74). Berlin, Heidelberg: Springer.