



Protocol for a Systematic Literature Review
of Social Network Systems for Older Adults
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Overview

The purpose of this technical report is to present the review protocol of the systematic literature review on the social network systems (SNSs) for older adults. Kitchenham [60] and Wohlin [54] have provided guidelines for conducting systematic literature review. The latter of these two was adopted, because of less noise, less chances of missing a relevant paper. Another important benefit of using snowballing is the identification of even those papers that have used different terminologies, which are nearly impossible to find in case of search strings based search. Although, the guidelines of Wohlin [54] were adopted, but the basic steps and motivation of systematic literature review still remains the same.

It is divided into nine sub-sections i.e. inclusion and exclusion criteria, search strings, start set of papers, study selection refinement process, data extraction, general and special social networking systems for older adults, additional results, related attempts in this area and a few quotes from the studies about implications of SNSs. The details are given below.

1. Inclusion and Exclusion Criteria

The list of inclusion and exclusion criteria are depicted in Table 1(a) and Table 1(b).

TABLE 1 (A) INCLUSION CRITERIA

Inclusion Criteria
Answer one or more research questions.
From years 1990-to date.
Either a conference or a journal paper.
Written in English.
A primary study.
Peer reviewed.
Propose or describe an SNS that OA are shown to use (can include existing communication channels such as email, if the interface or other feature has been adapted to support OA)
Most recent or comprehensive of the studies will be selected, if the work is published in several articles.

TABLE 1 (B) EXCLUSION CRITERIA

Exclusion Criteria
Technical reports, book chapters, web links, magazines, symposiums, Workshop papers.
Full text of the article is not available online or in physical form.
Secondary (e.g. SLR), tertiary studies (e.g. SLR of SLRs), dissertations and Masters thesis.
Papers shorter than 2 pages.
Duplicated studies.

2. Search Strings

The first step was the creation of search strings with regards to the research questions specified earlier. The two main keywords in all of the search strings were “Older Adults” and “Social Networking Systems”. The “*” symbol was used to retrieve the derived words from the previous prefix for instance the words *elders* and *elderly* can be included in the derivation from *elder**.

These search strings were applied to various scientific bibliographic databases (listed in Table 2) and the sole purpose of this activity was the identification of a suitable start set that is very specific and covers a broad range.

Table 2 List of Databases and their URL's

Sr. No.	Name	URL
1.	ACM DL	http://dl.acm.org
2.	Google Scholar	https://scholar.google.com
3.	IEEE XPLORE	http://ieeexplore.ieee.org
4.	Science Direct	http://www.sciencedirect.com
5.	Springer	http://www.springer.com

The list of search strings applied in the databases is given below. (Note: There were slight changes made in the search strings, because every database accepts different syntax).

ACM

((“social networking service” OR social media* OR SNS*)) and ((older adult* OR OA* OR OAP* OR elder* OR senior*))

Number of Results= **30**

Google Scholar

(older adults) AND “social networking service”

Number of Results= **8**

IEEE Xplore

((“social networking service” OR “social media” OR “SNS”) AND (“older adult” OR “OA” OR “OAP” OR “senior” OR “elder”))

Number of Results= **10**

Science Direct

((“social networking service” OR social media* OR SNS*)) and TITLE-ABSTR-KEY((older adult* OR OA* OR OAP* OR elder* OR senior*)) [All Sources(Computer Science)]

Number of Results= **23**.

Springer

(older adults) AND “social networking service”

Number of Results= **8**.

A total of 79 studies were found on these initial searches. These were reviewed by the researchers and agreed to have a start set of 7 papers. The good thing about these 7 studies is that a recent literature survey [57] has also presented them as social networking services specifically for older adults, which was an endorsement for our selection. Also it is a diverse and unbiased start set because of broad coverage and from several different publishers. This start set is presented in the next section.

3. Start Set of Papers**Table 3 List of Papers Selected as Start Set**

ID	TITLE	Year
SS1	Computer communication as an aid to independence for older adults	1993
SS2	Social Networks as Health Feedback Displays	2005
SS3	Usability Analysis on online Social Networks for the elderly	2009
SS4	Easy-To-Use Social Network Service for People with Cognitive or Speech and Language Impairments	2009
SS5	What Seniors Value About Online Community	2012
SS6	Enriching in-person encounters through social media- A study on family connectedness for the elderly	2013
SS7	Older Adults as Digital Content Producers	2013

4. Study Selection Refinement Process/Iterations

This section explains the study refinement process by describing the details of two iterations of snowballing (backward and forward). Secondly, the efficiency of this literature review is also calculated and presented.

- Step 1 removed duplicate studies using the EndNote 1 reference manager, resulting in 576 studies.
- Step 2 discarded publications such as web links, book chapters, full books, theses, reports,

- blogs and those that were published before 1990 resulting in 417 studies.
- In Step 3, we read metadata (title, abstract, keywords) from these 417 studies and selected 77 research articles in accordance with the inclusion and exclusion criteria.
 - Full text reading of these papers further decreased the number of studies to 42 in step 4. Other were eliminated as we were interested in only those SNSs that OA are shown to use.
 - Step 5 involved a detailed validation of the 42 studies selected. To reduce researcher bias, two researchers examined the 42 studies. The second researcher was provided with the list of research questions, inclusion and exclusion criteria and a random list of 60 papers for selection. Researcher 2 made an individual assessment on each paper. Out of the 60 papers, there were 13 disagreements. These conflicts revealed that definitions needed to be strengthened, or where researcher 1 had made assumptions. Consequently, only 20 research papers were selected as primary studies. This was the end of the first iteration of snowballing.
 - Step 6 involved a second iteration of snowballing that followed the same steps as in 1-5 above. Both forward and backward snowballing was done in this case as well. 24 new studies were identified after completion of this second. Hence, a total of 51 articles formed the set of primary studies as indicated below.

Start Set	=	07
1 st Iteration	=	20
<u>2nd Iteration</u>	=	<u>24</u>
<u>Total Studies</u>	=	<u>51</u>

Efficiency of Literature Review

In this section, I will describe the efficiency in the three different steps of the whole process of Snowballing. Efficiency is basically the number of included papers in relation to the total number of candidate papers examined [54]. Number of investigated papers:

- **Start set:** 79 candidates for start set and 7 papers were included, i.e. efficiency= $7/79=8.86\%$
- **Iteration 1:** 417 candidates for inclusion were generated in backward and forward snowballing, and 20 papers were included = $20/417= 4.79\%$
- **Iteration 2:** 503 candidates for inclusion were generated in backward and forward snowballing, and 24 papers were included= $24/503= 4.77\%$
- The overall efficiency becomes $(7+20+24)/(79+417+503)= 5.1\%$

Here the candidate means those papers, which are left after duplicate checking and removing book chapters, theses etc.

5. Data Extraction

For data extraction, we conducted a careful full-text read of the 51 selected primary papers. The first thing that was identified was the year of publication so that the analysis can be presented chronologically. By executing the SLR protocol we found 43 SNSs specially proposed for OAs and 6 general SNSs customized to serve the OA overcome their problems. We extracted and recorded the relevant data from read papers that could be useful in answering the research questions. The application software that was used for the storage of the extracted data was Microsoft Excel. We faced some difficulties in finding data about a few SNSs online, therefore we tried to obtain as much information about the systems as we could by reading the papers several times. Some of the parameters that were extracted include the following.

- Sr. No.
- Title
- Year
- Glossary
- Country(ies)/ Culture(s)
- Empirical/Theoretical
- Qualitative/Quantitative
- Social Networking System Name
- Requirements of Older Adults – RQ1
- Characteristics of Social Networking Systems- RQ2
- Usage of SNSs by OAs – RQ3
- Difference in take-up of General and Special SNSs-RQ4

For sensitivity analysis, the following parameters were extracted.

- Method(s)
- Duration of Evaluation
- Number of Older Adults Involved

- Number of other people involved
- Age Range of Older Adults Involved
- Gender Division
- Data Collection methods

6. General and Special SNSs for Older Adults

TABLE 4(A) LIST OF SPECIAL SNSs USED BY OAS

Special SNSs used by OAs
Electronic Text Message System [3], Morris Solar Display [4], Meeteetse[5], ASTRA [6], Electronic family newspaper [7], Kaveripiiri.fi [8], Oldkids [9], Eons [9], About My Age [9], HomeNote [10], Epigraph [10], WhereaboutsClock [10], Magic Box [11], Collage [11], ePortrait [12], eBowl [12], Family Story Play [13], Storytelling System [14], Novel social network platform[15], Picture Frame Prototype[16], Life Frame[17], Photostroller[18], Family Portals[19], Building bridges device [20], Tlatoque[21], Sharetouch[22], Greypath [23], GuessMyCaption [24], TakeAPhoto [24], Wayve[25], Agile Life[26], Enmesh[27], Timely Present [28], Amcosop[29], InTouch[30], FridgeNet [31], Window to the outside world [32], Pinteresce [33], SocialConnector [34], Novel communication system[35], Tlatosketch[36], Social Connector TV [37] and Memotree [38].

TABLE 4(B) LIST OF TYPICAL SNSs USED BY OAS

General SNSs used by OAs
Facebook [40,43,44,45,47,48,50,51,52], Twitter [45], Netlog [42], SeniorNet [39,41], Flickr [39], Ning.com [41], MyFriendsOnline[43]

7. Additional Results

A. Evaluation Methods

The first step that is necessary to take after the development of any sort of technical-oriented solution in to test its quality and whether it meets the needs of the end users. To carry out this phase, the researchers have used a variety of methods such as field studies, home deployment, and user validation. Figure 8 shows these methods and the percentage of their usage. It is evident that home deployment is used in most cases for testing the usability of the SNSs. This is an important finding as it suggests that older adults are more comfortable in adopting new technology in a natural setting instead of asking them to go to a specific and controlled environment e.g. laboratory. The latter in itself is intimidating for OA, which could inhibit the motivation towards usage of SNSs.

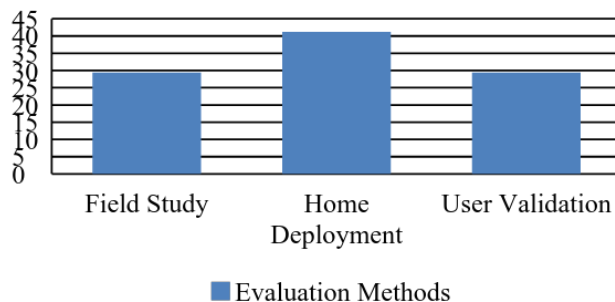


Fig. 1 Evaluation methods

B. Evaluation Duration

The duration of evaluation needs to be identified. The bubble chart in Figure 9 displays the evaluation duration in months of the studies within the review, and ranges from 0 to 6 months. The y-axis depicts the percentage of studies in which this length of evaluation is undertaken. It is clear from here that nearly 70 percent of the SNSs developed for OAs are evaluated for less than or equal to 3 months, with only 30 percent evaluated for more than 3 months.

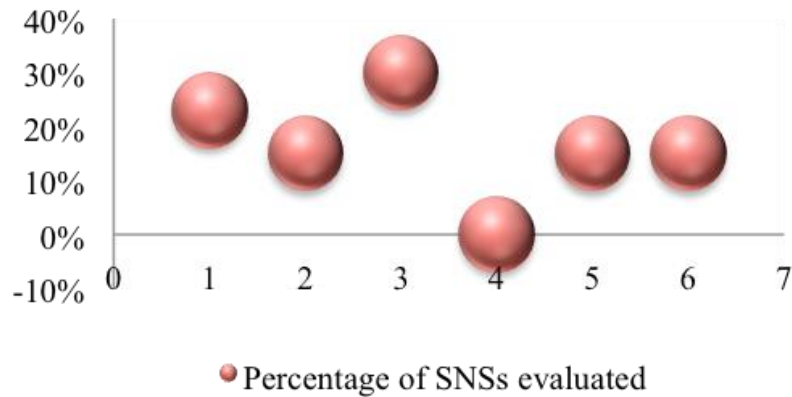


Fig. 2 Evaluation duration (in months)

C. Gender Division

It is also important to identify the participants. As the main subjects of this area are older adults, therefore the evaluation should involve a majority of OAs. According to the current sample, 65 percent of participants are seniors. The remaining 35 percent include family members, friends and caregivers who are below the age of 55. We also wanted to analyze the gender division, which revealed that, in majority of the cases, the evaluation was done by females i.e. 74 percent, as shown in Figure 10. Given that the numbers provided by United Nations state that the women account for 54 percent of the total global population aged greater than 60, and 61 percent of those aged 80 years or over in 2015 [63], the difference between total population and the participants is an interesting finding, and worth considering in the future.

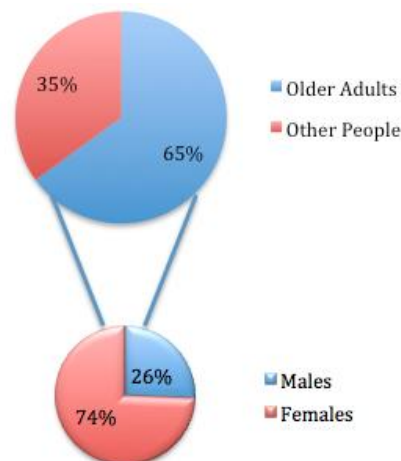


Fig. 3 Gender division

D. Data Collection Methods

Feedback collection was undertaken using a variety of methods - interviews, weekly check point calls, data logs, questionnaire and surveys. Figure 11 outlines these methods, showing in a bar graph the percentage of studies in which they were used. Interviews are dominant when developing and data logs for evaluating SNSs for OAs. This is an important finding which suggests that these methods are already well established in the field.

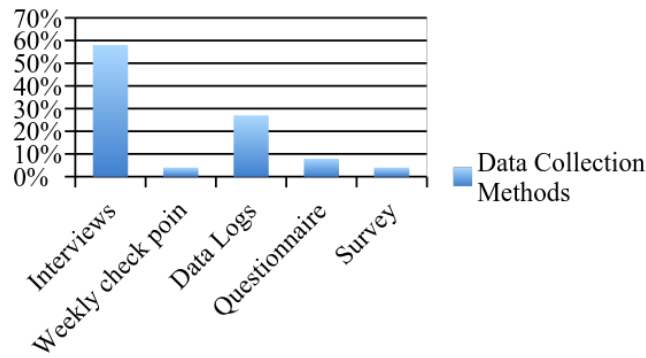


Fig. 4 Data collection methods

8. Related Work

It has become evident now that during the last few decades there many solutions suggested by researchers to solve the problems faced by the older demographic of population. Some have suggested modifications and improvements in the standard SNSs; others have gone further by proposing new and special purpose SNSs and social applications for OAs. But there has been little research done on integrating all of the work together in order to provide a summary. This form of work could serve as a baseline for developing more inclusive SNSs for OAs. If the requirements of OAs regarding SNSs are presented in a review then they could feed into more extended work. For example, we can compare the requirements of OAs elicited directly from them and those presented in existing literature. This will help to identify any differences or any change in needs that might have occurred with the passage of time. However, during the last year i.e. 2016, some attempts have been made in this regard. In the first quarter of the year, Campos [56] along with colleagues conducted a review targeted towards the analysis of proposals for ambient intelligence and social networking sites to integrate older people in the society. One of the reasons behind doing this was to identify any improvements that are still required in this field. The verdict that was made as a result of this study was that there still exist a room for significant contributions in the area of social networking services for integrating older people in to the society. Similarly, a survey [57] of social networking services and social applications used by older adults was published in the third quarter of 2016. The outcome of this work was the identification of 13 domains, which if improved, can lead to better quality solutions for older adults.

Although these two recently published reviews are quite wide, there are certain points that advocated the need for the work presented in this paper. First of all, the goals of our systematic literature review and the existing studies are different. Secondly, our work has included SNSs for OAs till date in comparison with the previous articles, which restricted the inclusion criteria till 2014 [56] and 2015 [57]. New papers have been published in 2016. Thirdly, the focus of the first review [56] was a single research question and the second one [57] did not have a specified research question. Contrary to this our work has four very comprehensive research questions aiming to touch every aspect of social networking systems use by older adults.

9. Quotes about Implications of SNSs

Social Integration

"The study participants indicated that they like using the system because it provided them with a vehicle for interaction and a chance to meet new people [3]". "Elders were more socially active when exposed to social-network visualizations [4]". "Elders' enthusiasm for tracking their social interaction (via the online journal) increased markedly with the introduction of the social displays [4]". "Participants reported that it helped social connection and created interactions outside the system; as one participant commented: 'It made me feel as though there was somebody there for me and I was there for somebody' (Louise)[20]". "Our findings demonstrate that creating and sharing content provides opportunities for older adults to build new social connections within a small peer community[27]". "This service tends to increase the social interaction flow from and towards the older adults [34]". "Tlatosketch provides the older adult with a new media for self-expression, and improves the family social experience, thus helping them remain active while ageing [36]". "Older adults participating in the study praised the new possibilities offered by the prototype application as a way to better engage with family-generated content, thus facilitating their social integration [37]".

Intergenerational Communication

"We believe it can promote the younger generation to pay more attention to the elders and to reconstruct an available communication channel between the two generations[15]".

Source of Entertainment

"Computer-based communication can aid this population by providing links to services and information, facilitating social interaction, and providing mental stimulation [3]". "Usage statistics show that people using the service seem to enjoy the changes: they visit more frequently and spend much more time per [8]".

Improvement in Health

"Photostroller often seems to involve more active engagement involving memory, interpretation, curiosity and communication. Engagement of this sort may be valuable in supporting residents' mental and social wellbeing [18]". "Our preliminary results suggest positive benefits in user self-perception of her health, evidence of in-person social interactions and the importance of inclusion of social family components on exer-games to maintain the older adult engaged with routine exercises [24]".

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