The 4W Framework of the Online Social Community Model for Satisfying the Unmet Needs of Older Adults

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Abstract—**Human's cherished and respectable desires could be fulfilled by social integration through interaction with their friends and families. These kinds of interactions are critical for the elderly, particularly for someone who has retired. Online social communities could assist them and offer a beneficial impact on the elderly. However, because the elderly people are hesitant to use new technology, researchers have attempted to integrate specially built social networking applications into simple user-interface gadgets for the elderly through the context aware systems. A proper understanding amongst the aged and the supporting community people is needed for optimal execution of the platform. The study presents a 4W framework (Who, What, Where, When) to effectively comprehend and portray the online social interaction community model's application in assisting the elderly in satisfying their unmet needs, as well as to improve the system's efficiency in addressing the elderly's unfulfilled demands. It is essential to discover what the users are keen on and provide a chance for the community group to take good decisions by utilizing the insights gained from these events.**

Keywords—Online social community; elderly's unmet needs; 4w framework; elderly's requirements

I. INTRODUCTION

Nowadays, digital media has grown ubiquitous and are easier to utilise through tablets, internet as well as the smartphones. As so much information, services, goods, and people are most often exclusively available on the internet, staying online has now become more attractive [1]. Furthermore, an age group is not a fixed category. Several elder people have grown up with digital media and they do not need to stop even when they reach the age of 65 [2]. Since they might lose some links with their co-workers when they retire, they gain more free time to spend with their families and friends. However, when it comes to their digital media requirements and preferences, elderly people are the least studied age groups, and researchers know only little about the differences in their use [3]. Through online support platforms and other means, the resources streaming through social media could assist both the younger and older persons.

People become much more sensitive when they grow old and feel socially isolated. This is primarily because of various factors like residing alone or in rural areas, as well as health factors such as health issues, mobility issues, and so on [4]. Elderly people suffer both physically and mentally when they are left alone. It is also vital to maintain the elderly as active and make them participate in society, both cognitively and physically. Social networks could provide emotional support to elderly individuals, which is important since social integration is necessary to meet basic human requirements like being connected and loved [5]. Communication and interchange with friends and other senior people especially family members could aid in the development of social connectivity feelings and the expansion of social relationships.

The digital interactions with their family and friends provide a lot of social support that are observed to be especially essential for older persons with mobility issues [6]. This was also evident in their daily actions, like finding quicker ways to maintain their residences and preparing healthier dishes [7]. Despite the challenges of a complicated user interface and an abundance of data, social media platforms such as Twitter, Facebook, Pinterest, Google Hangouts, and Instagram have recently seen greater adoption rates amongst the elderly [8]. Online Social Networks have expanded options for social interaction and collaboration, allowing users to communicate and collaborate with others as part of a continuous social dialogue. Computerized systems must have a better knowledge of the situations in which they offer services or activities, and they must be able to adjust correspondingly. It could be accomplished through context awareness.

In this paper, a 4W framework that offers a general view of the online supporting community model is presented. The framework gives a comprehensive overview of the concepts in the elderly supporting community and serves as a foundation for defining the elderly's needs. The 4Ws mapping data could be used to develop national emergency response plans, as well as to detect discrepancies in supply, human resources, geographic and target group coverage, and technical competence. Participating groups can also utilize it to manage their fund raising and programming efforts. This framework enables us to observe the model's fundamental requirements, review existing ways towards geriatric support, and identify emerging research topics in this sector. It may be applied onto any project under this area and is used for analysis.

The rest of the sections are summarized as follows. Section II explains the recent literature works of supporting frameworks for the elderly people, Section III illustrates the proposed online social community module with components and the tasks performed by each components. Section IV illustrates the application of 4W framework on the proposed online social community model. Section V provides the evaluation of the proposed model through User journey map

followed by its results and finally, section VI concludes the paper.

II. RELATED WORK

This section gives a background review in the field of using 4W in the social media. Related issues and problems that have been solved in previous works are reported. A context aware system for business-to-government (B2G) information exchange in the container shipping domain was developed in [9] for identifying what environmental components are the significant context, what are the required elements to recognize and adjust to context, and what are the rules for the adapting the system under various circumstances. The highly organized manner in which the elements and criteria are formed from insight into context gives a technique for dealing with the tremendous complexity of the context in this approach along with ambiguity elimination.

Another model of a context aware approach was presented by Hossain et al. [10] for supporting the elderly for entertainment. It covers the entertainment demands of the aged people and allows multiple residents (e.g., caregivers and old adults) to connect multiple media sources in either a formal and informal manner so as to improve the quality of their experience of life in diverse circumstances. The model aids in the development of entertainment systems and services for the aged people, allowing them to more effectively address the issues that arise from their ability to live independently, happily, and actively.

For a persistent Elderly Homecare, Pung et al. [11] developed a Context-Aware Middleware framework for supporting the elderly. It assists through designing and implementing a variety of geriatric home healthcare activities, including location-based emergency response, patient monitoring, unusual daily task detection, persistent accessing of health data, and social networking. This approach has a high level of context query processing efficiency and activity recognition accuracy. However, it confronts challenges in dealing with enormous amounts of data from various sources.

Another platform presented in context aware filed called the OCare Platform to support for caring the persons in independent living facilities. This conceptual, data-driven, cloud-based back-end platform supports people to live independently through providing residents and their informal caretakers with information and knowledge-based services. This system has the potential to offer a realistic working environment and adapt considerably and more quickly [12].

III. ONLINE SOCIAL COMMUNITY MODEL

In this stage, model components were designed according to the requirement of users. The proposed architecture consists of six core components based on requirements analysis [13]. More detailed description on these components is given in Section 4B. However, the complete system architecture of the proposed model which includes the online social interaction, unmet needs interaction, profile management, recommendation component and unmet needs plan is represented in Fig. 1.

A. The Concept Groups

The suggested framework's core assumption is an online social community model for elderly Libyans assistance. The broad perspective of the 4W framework is formed by the concept groupings Who, Where, What, and When. The methods that follow to build this framework is similar to that used to build Zachman architecture [14] and Angelov and Geffen models [15]. However, according to Abowd et al. [16], the definition of context is given as, "Any information that can be used to characterize the situation of an entity", where "an entity can be a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves".

This definition outlines four distinct kinds of elderly supporting concepts that could be modeled. They are: Where concept (location context); Who concept (Identity context); What concept (Activity context); and When concept (Time context). Similarly, the definition of the online community by Rheingold (1993) which is "[online] Communities are social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form Webs of personal relationships in cyberspace" is used to build the 4W framework of the online social community process for elderly Libyans. The next section details how these four concepts can be represented by the process of model components.
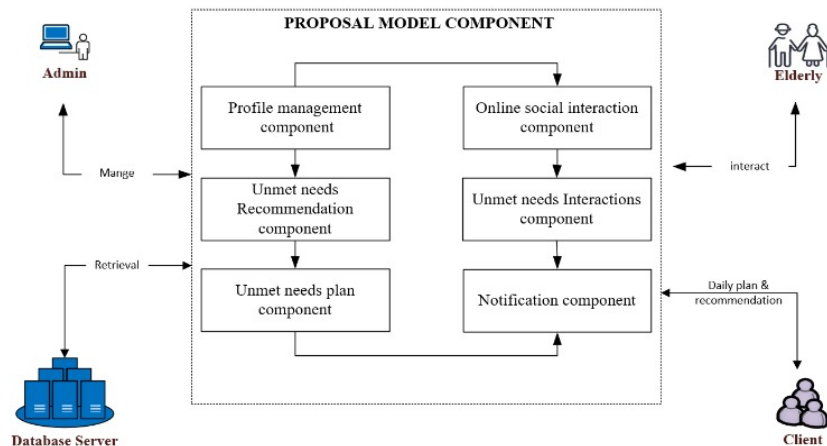

Fig. 1. The Online Social Community Model of Elderly Libyans.

TABLE I.   THE TASKS THAT RELATED TO EACH COMPONENTS' FUNCTION

Code	Task	Descriptions	Component
Task 1:	Build your private network community with name (your name care community)	Registering in the community, creating community groups under the name "your name care community" and inviting your family members or friends to this community	Online Social interaction
Task 2:	Provide a comprehensive assessment of the ability to perform activities of daily living and health status	Evaluating your ability to perform activities of daily living and health status.	Profile Management
Task 3:	Fulfill your daily unmet need "looking after your home"	Interacting your need "looking after home" with social group network to share interaction requests.	Interaction Unmet Needs
Task 4:	Generate a plan of your frequently unmet daily needs for this week.	Creating plan of list of your unmet needs for the current week with an optimal balance of work and care duties of your community members.	Unmet needs Plan
Task 5:	Find a way to get emergency support from group members	Sending an emergency post to a social group members or to a specific recommended member.	Online Social
Task 6:	Accept any recommendations about your unmet daily need "looking after your home" sent by community group members.	Posting an acceptance on the advice or suggestions about your unmet daily need "looking after your home".	Unmet needs recommendation
Task 7:	Track your unmet need "looking after your home" and look up activated members who will accept.	Tracking your unmet need "looking after your home" requests and the state of activate group members.	Interaction Unmet Needs

B. Corresponding Model Components

The 4W Framework process in the online social community is modelled by representing the model components and applying a set of tasks related to each components' function. However, the tasks represent the components that frame the model as shown in Table I.

IV. THE 4W ONLINE SOCIAL COMMUNITY FRAMEWORK PROCESS

The 4W online social community framework process is shown in Fig. 2. Each concept is associated with their corresponding components which is represented by the task. The 'what' and 'who' concepts corresponds to all of the seven tasks. The 'What' concept represents the activity contexts that responses the question what is happening in the circumstances;

in the case of model, it represents the activity that is going to be done by elderlies. The 'Who' concept illustrates the identity contexts that responses the question who is the individual, which is elderly Libyans or their community members. The 'Where' concept corresponds the location contexts that responses the question of where the elderly is located or where the task is going to be completed. For instance, tasks such as fulfilling their unmet needs, generating the daily unmet need plans, sending the emergency report and tracking the request with where concept will represent the place that the task starts or completest in it. 'When' concept corresponds to tasks such as building the private network, fulfilling the unmet needs request and tracking the request (represents the time contexts that responses the question when the task defining the circumstances is occurring to record when the task was).
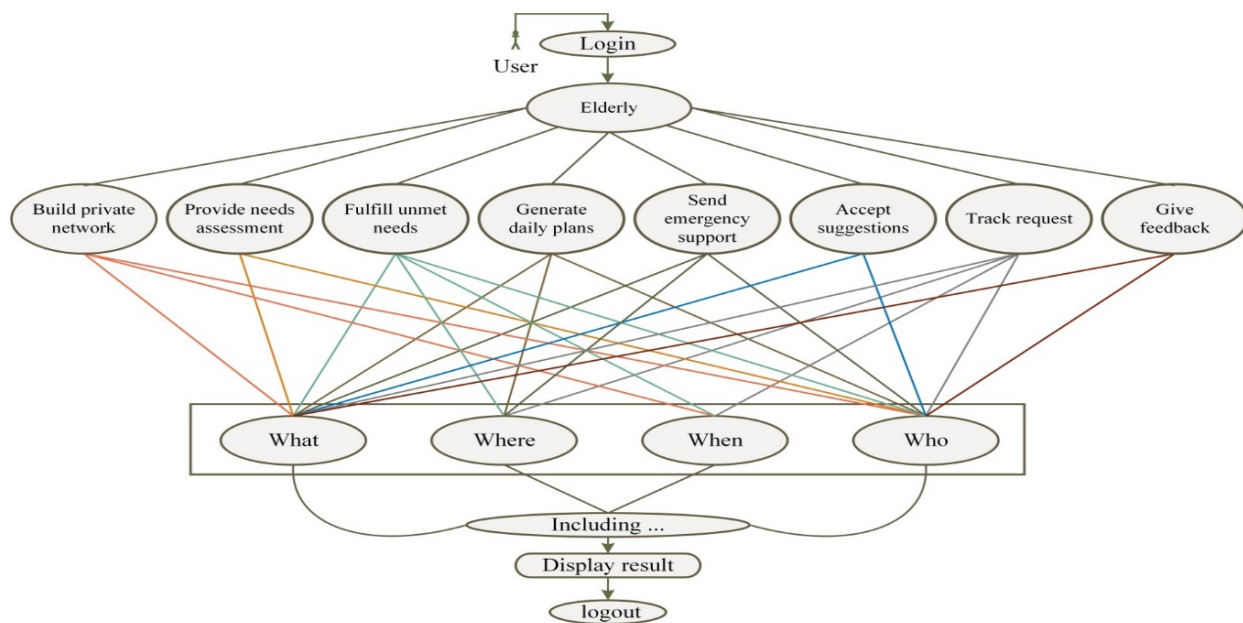

Fig. 2.   The 4W Online Social Community Framework Process.

The online social interaction component is related to the task one and task five. It creates the confidential social network community set up for the elderly as well as the service expert volunteers for helping the elderly Libyans. It also sends an emergency post to social group members or to a specific recommended member in case of seeking emergency support. The profile management component is related to task two. It provides a comprehensive assessment of their ability to perform activities of daily living and their health status. It maintains the elderlies' as well as the caretaker's profile, and thereby it regulates and keeps the elderly profile updated. The unmet needs interaction component is related to task three and task seven. It develops a brief layout of the list of unmet needs and frequent sending of daily need requests, it also keeps trace of the status of the recent unmet needs and the existence of currently active supporting community members, and promotes responding to the elderly's request. The unmet needs plan component is related to task four. It creates a plan of list of unmet needs under every time slot with an optimal balance of work and care duties of the community members. The unmet needs recommendation component is related to task six. It corresponds to the elderly requirements towards the supporting services. It also endorses a suitable group or an individual to assist the elders in satisfying their unmet requirements. It posts an acceptance on the advice or suggestions about elderly Libyans' unmet daily needs.

In this section, the process of 4W online social community framework is elaborated in a detailed manner. The four groups of concepts which are who concept, where concept, what concept and when concept describe with the online social community component representation.

A. The Who Group of Concepts

The 'Who' concepts describe the actors who participate in a community framework for supporting the elderly people towards fulfilling their unmet needs as it can be seen in Fig. 3. The members in 'who' concept would be a family member, relatives, neighbours, or social supporting community members.

In 4W online social community framework, the 'Who' concept represents many entities based on the task which is performed. In case of building the private network, the 'Who' concept represents the elderly who request for the unmet needs and the private network members who are going to satisfy these needs. Only the group community members who accept to fulfil the elderly needs will represent 'Who' concept. It also represents the member who accepts the elderly person's daily needs plan to satisfy their unmet need request, the member who supports the elderly people when they seek any emergency support. Fig. 3 shows all actors who represent the 'Who' concept in the 4W online social community framework.

B. The Where Group of Concepts

The 'Where' group of concepts describe the place or location from where the requests arise as shown in Fig. 4. The place could be either from their residence, in private or public place, schools, or markets. It focusses on the location from where the unmet need request arises, the location of the elderly

and the location of their activity in order to generate the unmet needs plan, elderly coordinates to support the elderly in requirement of emergency support. Fig. 4 describes the details of 'Where' concept in the 4W online social community framework.

C. The What Group of Concepts

The 'What' group of concepts describes what the elderly's request about, what the elderly people exactly need in their request or what are the contents of the daily unmet needs required to be fulfilled. The unmet needs of elderly Libyans come from the geriatric Assessment or the group community member's suggestions based on comprehensive assessment. The nature of those needs is what represents the 'What' concept which includes building community group, needs assessment and unmet needs request, daily plan generation, emergency support, and accepting suggestions. Fig. 5 details the description of 'What' concept in 4W online social community framework.
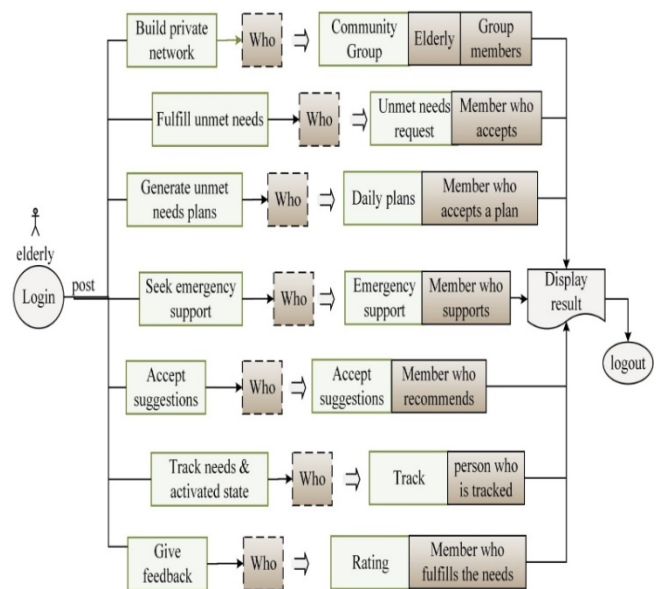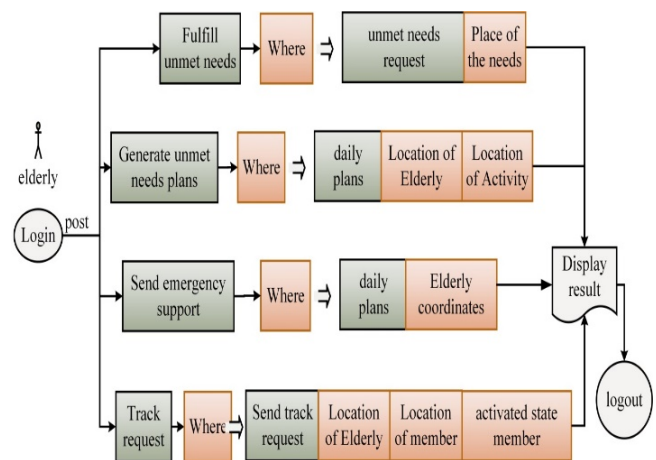

Fig. 3. Detailed Who Concept.
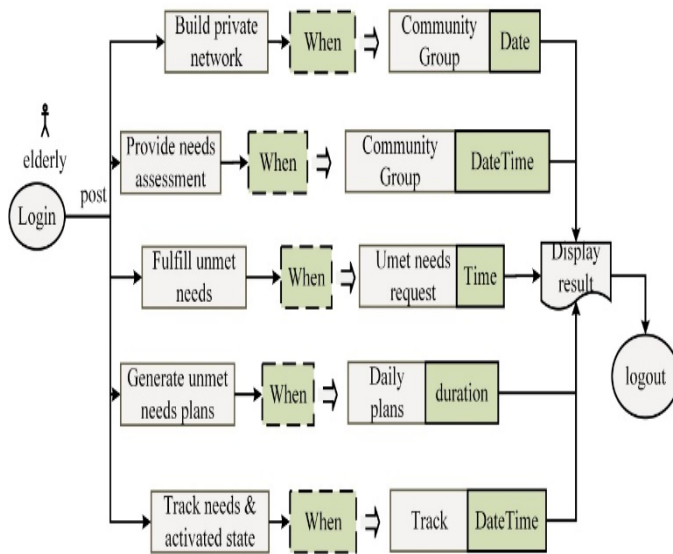

Fig. 4. Detailed Where Concept.

Fig. 5. Detailed When Concept.

D. The When Group of Concepts

The 'when' group of concepts represents the time context that responses the question when the event defining the circumstances is occurring. In 4W online social community framework, the 'when' group represents the duration of the daily needs plan, at which time and date the elderly information are traced, when to generate the unmet daily needs plan. It also focuses on at which time the unmet daily needs are fulfilled and when to provide the comprehensive assessment of the needs. Fig. 6 shows detailed process of 'When' concept in 4W online social community framework.
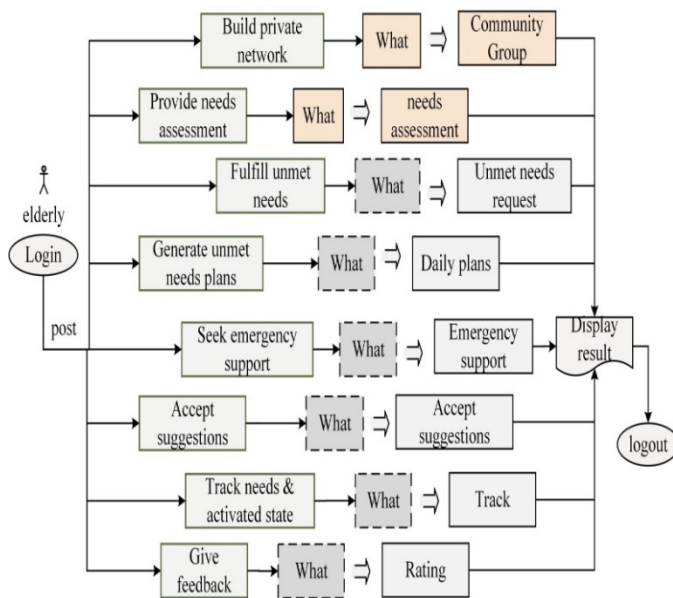

Fig. 6. Detailed What Concept.

V. EVALUATION USING USER JOURNEY MAP

In order to visualize the user's experience towards the developed model, the user journey map is developed. User journey mapping was chosen as a method for this analytical study as it gives the understanding of the positive and negative feelings that the user was experiencing while completing their journey. In this section, one user journey map for multiuser was created to understand how users would interact with the prototype. It also reflects the interaction between the user and the interface. This allows for further improvement of the prototype and makes the design better suit the elderly Libyans. The journey maps defined in this section includes four categories as "Pain point", "Action", "Touchpoint", and "Emotion". "Pain points" refers to burdens and obstacles which prevent a user from using a feature. "Action" is how the user interacts with the channel and what actions they undertake. "Touchpoint" refers to places that customers can interact within the channel. "Emotion" refers to how customers feel during each phase of the journey. Table I shows the tasks were assigned for each user when they drew their journey map. However, to empathize with the user experience and understand the issues they are facing, only four personas were considered in this study to draw one journey map.

A. User Journey Map Results

The results of applying a journey map based on participants' emotions and actions while they were accomplishing their tasks are discussed below. This highlights the importance of graphic design, attitudinal behaviour, and control and emotional issues in the interface design process for elderly people. Fig. 7 depicts the outcome of the journey map of four elderly people with eight steps based on their tasks. It displays their emotions through each step.

The Four personas are created based on randomly chosen but with made-up identity information such as names, ages, gender, and what they like or dislike with different perspectives. Creating personas allows the researcher to understand user emotions with the interface. Therefore, the final interface would be more efficient and user-friendly.

In general, elderly Libyans in most cases felt comfortable and confident while using the prototype interface because of the overall design and the information layout. Also, they feel more comfortable when the map window is kept at the centre of the user. In contrast, they were disappointed in waiting for group members' acceptance which led to providing some clues to make improvements in the design interface, for instance, notifying the users that they are in a waiting status.

From the user journey map, it is observed that the users feel comfortable and satisfied with the social interaction component of the model as it simplifies the process of interaction and login into the account and inviting their relatives and friends to become members of their group community for fulfilling their unmet needs.
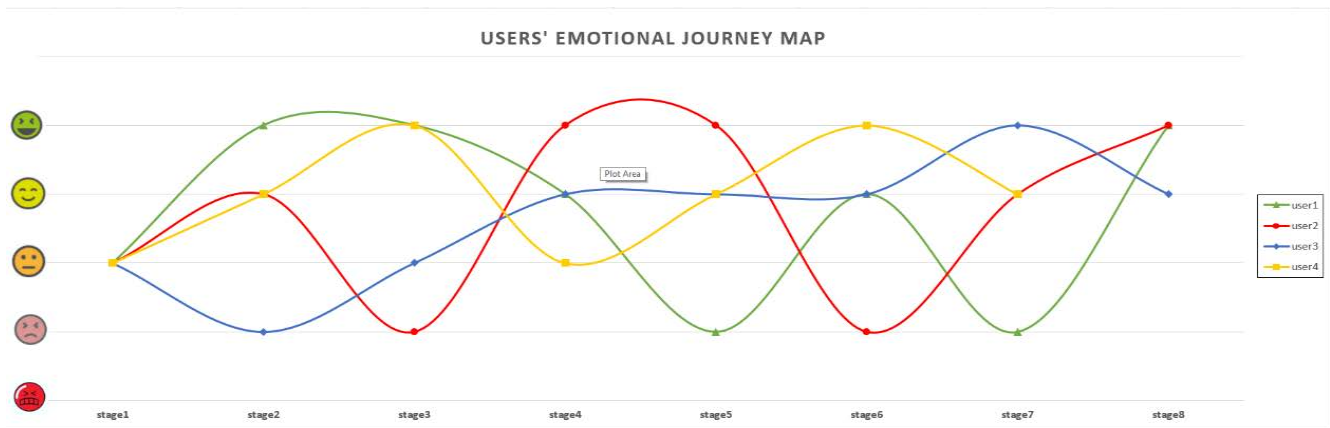
Fig. 7.   User Journey Map Outcome.

Researcher: "Are you able to send invitations?"

User: "Yes, I'm trying. I'm attempting to click on the image but I am unable to do so. It's lame. It would be good if it was a button for me because I am a visual person. But for me it is ok, it's clear I can overcome it."

According to the findings, the interface designing should be carefully developed to address consumers' concerns. It's critical to provide a "home" section for elderlies to return to when they feel insecure or misplaced in order to promote a sense of confidence. This establishes the user satisfaction toward the interface of prototype.

Researcher: "So, which one do you prefer?"

User: "I prefer a simple navigation system. I'd go home because everything is there".

Returning to the home page during doing the tasks gives the elderly a sense of safety and security, reassuring them that they are in the correct place. When elderlies couldn't locate what they were doing or searching for, they all opted to return to the main page. It was comfortable for users to return "home."

One of the participants said, "I'd probably go to the main page because it's crucial."

The participants feel very comfortable when they discover what they're accomplishing of tasks on the platform. They wish to use a single working window with lists in order to control window proliferation. It would be more helpful for them if the tool tip pop-ups are provided while the elderly move the pointer towards the key elements of the graphical user interface. Hence, they could get easy access to the task elements of the interface design.

Researcher: "How do you feel mentally, say do the icons of choices in front of you (in the header bar region) make you feel comfortable?"

User: "I feel better instead of searching; I can access many options with this bar."

Researcher: "Where can you usually obtain a list of all available members?"

User: "So maybe back to Home... in the profile of members or friends. I will go to the profile. No... No..., Here… in the member icon on the home page. Why there is no direct link get me here?"

In some cases, the elderly feel quietly disappointed in waiting for group members' acceptance to join and they feel difficulty in inviting the community members to their group. Once they get the response, they feel much happy and excited for the attendance of the supporting community member.

Researcher: "Why are you looking not comfortable?"

User: "Ummm… they have to do something to show we're in a waiting status." Moreover, while creating the list of unmet needs plan, they feel confused of where to slide.

Researcher: "So, what prompted you to return home?"

User: "I have no idea... I just felt it should be a separate part; however, it would've been preferable to keep with unmet demands down the bottom and see if it generates any plans."

Researcher: "How are you feeling right now?"

User: "A little sad."

Researcher: "So, you start from the Home page. Isn't it?"

User: "I'm not sure what they're saying, but there's something."

Also, participants felt unsatisfied to read long text rather visual images. Elderly Libyans respond more quickly to images. One of them expressed the following: "It appears to be in good working order. However, I'm sure there would be more information available on this. I love to work with pictures just because I am a visual person." Besides that, there was no quick access heading bar that allows users to quickly navigate between module components without getting lost.

VI. DISCUSSION

This designed model includes the reorganization of tasks, a reorganization of data entry windows, and a reorganization of asset groups. The user could also perform the real task of creating the 4W grid using this prototype. The design prototype contains two side panes, left and right pane. The left pane contains the group details and the right pane contains the

details regarding the group members as well as the group recommendations. And, the task pane is available at the centre of the window that switches among the various tabs like recommendations and unmet need plans.

The created website model matched the users' desires and functionality, as per the user task analysis. Users had easy access to the web page and navigation. The majority of users were delighted with the webpage usability characteristics, such as navigation, accessibility, attractiveness and design consistency. The findings demonstrate that the proposed design process efficiently fulfils the webpage accessibility and functionality objectives.

VII. CONCLUSION

In this paper, the 4W framework of online supporting community model for supporting the elderly towards satisfying their unmet needs is presented. It assists in determining what characteristics of model elements could be upgraded and what new opportunities could be introduced to the supporting community model. From the current design, the participants found that most of the tasks are easy to access and apply. The created platform model matched the users' desires and functionality, as per the user task analysis. Elderlies had easy access to the web page and navigation. The majority of elderly users were delighted with the webpage usability characteristics, such as navigation, accessibility, attractiveness and design consistency. The findings demonstrate that the proposed design process efficiently fulfils the webpage accessibility and functionality objectives of the user.

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