Memotree: Using Online Social Networking to Strengthen Family Communication

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Abstract. This study describes the design and development of Memotree - a basic service platform for family social interaction. Memotree features a Family Tree which displays the family relationships and links among family members, with features to encourage family interaction based on the Family Communications Scale. The system and its associated hardware are designed to be optimally accessible to family members of different generations. Finally, Heuristic Evaluation was used to evaluate Memotree usability. Test subjects affirmed the Memotree concept and provided positive feedback.

Keywords: social networking sites, family tree, family communication scale, heuristic evaluation.

1 Introduction

In the context of filial piety, Asian societies place particular emphasis on kinship relations and rely on family trees to record the family's history and clan associations. Family trees are based on kinship ties, using the family surname to establish a family genealogy, recording the history of lineages and family factions descending from a common ancestor in a presentation integrating vertical and horizontal descent lines and spherical descent tables. The eldest in the family holds a place of particular respect within the family network[1, 2]. Traditional Chinese families typically consist of the elderly parents, adult children and non-adult grandchildren, commonly referred to as "three generations under one roof". In such arrangements, the grandparents are typically cast as the family historians, maintaining the family's history, recording the family's life experiences, and holding the family close together[3]. Generational interaction and mutual support not only contributes to general life satisfaction and well-being for the elderly, but also influences the family values and attitudes of the adult children and non-adult grandchildren. However, as society has become increasingly urban, industrial and commercial, an increasing number of families consist of conjugal or nuclear families, at the expense of extended families. These changes to residence style and family type have reduced the frequency of contact between generations which not only affects the psychological well-being of the elderly and the fulfillment of their social needs, but also raises critical issues for the family relations and support of modern families[4, 5].

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The application of internet technology today allows non-cohabitating family members stay in touch[6, 7]. The rapid development of modern online social networking sites (SNSs) has not only changed traditional social models, but have emerged as a critical social tool for today's youth[8]. Elderly people, despite their relatively low rates of use of computers or the internet, have been found to express a high degree of interest in learning to use such tools as a means of increasing their interaction with the younger generation[9]. Research has found that SNS-based communication do not replace face-to-face or telephone communication, but rather creates a new domain of family communication, providing family members with rich opportunities to maintain contact[10]. Unfortunately, currently most research into SNSs focus on personal networks rather than maintaining family relationships or the promotion of intergenerational exchange. Therefore, this study describes the design and development of Memotree - an only social platform suitable for promoting familial social interaction. Memotree not only imports the family genealogy concept from online SNSs, but also focuses on social interaction and communication between family members, thus promoting the maintenance of family relationships and intergenerational communication.

2 Memotree Design and Development

The product of collaboration between designers and engineers, Memotree offers social functionality similar to today's SNSs, but presented from the perspective of the user's family tree in the context of the user's family history and kinship structure, creating the elements of a Family Communication Scale to promote communication among family members. In addition, Memotree is designed to take into account the difference between older and younger people in terms of usage habits and experience to provide appropriate social platforms and hardware, ensuring that users of different generations are able to get the most out of the experience.

2.1 Importing the Family Tree Design Concept

In this research, the Family Tree feature is used to diagram the user's family relationships, family's lineage and kinship organization. In Memotree, the user can manually manage the Family Tree by adding or deleting family members, or using the Calendar feature to record family holidays, birthdays, anniversaries, etc. It's worth mentioning that, in the Family Tree network, the relationships are closest among the three above-mentioned generations of family members, thus Memotree prominently features these intergenerational relationships in its main display, allowing the user to locate themselves within the context of their preceding or succeeding generations (Fig. 1). Once the Family Tree is populated, it can automatically determine the kinship between various users. If a relationship meets the criteria for kinship, users can establish the relationship, eventually recreating their extended family. In addition, the system automatically recognizes the identity of the user within the family and the specific relationship with other members.

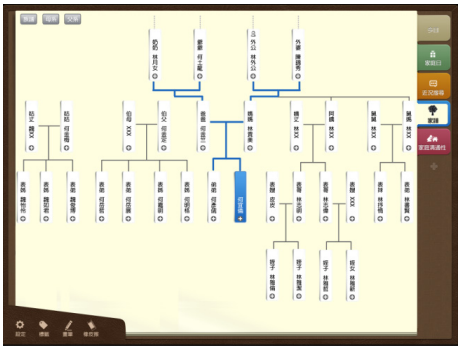

Fig. 1. Family tree

Fig. 2. MemoTree main page

2.2 Functional Design Based on the Family Communication Scale

To promote interfamily communication and interaction, this study based the design of Memotree functionality on Olson's Family Communication Scale (FCS), which identifies five general types of family communication skills by which the degree of family communication can be assessed: listening skill, speaking skill, self-disclosure, tracking, and respect and regard[11, 12]. This study first analyzed the characteristics of the social functions of current SNSs. Ten pairs of grandparents and grandchildren were then recruited as respondents, including 7 grandmothers and 3 grandmothers (with an average age of 72.4 years), along with 2 grandsons and 8 granddaughters (with an average age of 25.5 years). By evaluating the degree of family communication among these pairs and interviews regarding their family interaction needs, this study determined the gap between these needs and the functionality of current SNSs. Finally, based on the research results, we designed interactive functions to match the FCS results and users' family interaction needs (see Fig. 2). The interactive functions are described as follows:

- Listening skill: Listening skill is defined as empathy and attentive listening. Memotree's Listening functions include video conferencing and chat rooms which not only allow users to hear each other's voices but also help family members share opinions and viewpoints. However, video conferencing is generally easier for elderly users than text-based chat rooms.
- Speaking skill: Speaking skill is defined as talking to another person. Memotree's Speaking features include video conferencing and chat rooms which not only allow users to converse with others about personal issues but also help people express their feelings. In addition, the video feature allows users to sense each other's presence while speaking, thus mimicking face-to-face interaction.
- Self-disclosure: Self-disclosure is defined as sharing one's feelings with others. Memotree's Self-disclosure features center around status updates and photo sharing. The status update feature allows users to share their current mood or recent events with family members. In addition to allow test subjects to freely

share personal information with privacy, Memotree's Self-disclosure space is divided into public and private areas, providing users with the ability to share feelings and thoughts so that family members might better understand one another.

- Tracking: Tracking is defined as pausing on a topic. Memotree offers tracking through its comment feature. Family members can post text-based or icon-based replies on a given topic, thus providing family members emotional support and encouragement. It's worth pointing out that the Memotree system collects messages for each topic and, based on the message properties and the topic header, saves them to the Family Calendar system, allowing all family members view the daily, weekly and monthly activity of other family members, thus giving them insight into their recent situation.
- Respect and Regard: Respect and Regard is defined as the emotional side of family communication. Memotree includes a Family Calendar system which records important family events such as birthdays, memorial days and anniversaries. Memotree users can specify certain days as Family Days, setting the Family Calendar to send out appropriate messages to other family members to show respect and concern.
- Family Communication Measure: Taking Olson's Family Communication Scale as the basis for evaluation, the Memotree system collects statistics on monthly activity by family members to calculate the level of family communication. In addition, the system will also provides statistics on average number of communication instances between family members which not only helps users better understand the level of interfamily communication, but also provides timely recommendations and reminders to help users and their families maintain better contact (Fig. 3).

Fig. 3. Family communication measure

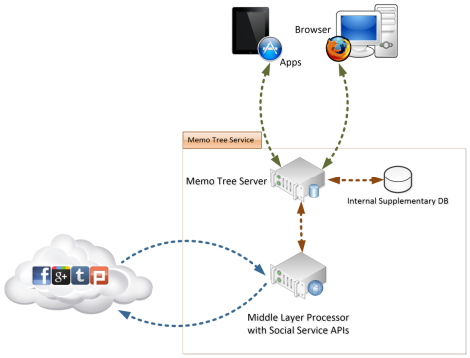

Fig. 4. System architecture of Memotree Service

2.3 System Interface and Hardware Designed to Accommodate User Habits

The Memotree user interface provides a Family Notepad to emphasize interaction between family members and to record family events (Fig. 2). The Memotree system also links to popular SNSs such as Facebook and Google+, allowing younger users to

simultaneously interact with the Memotree system and other social platforms. In terms of hardware, the Memotree system supports most browsers and smartphone devices, including tablets, thus allowing elderly users who are potentially unfamiliar with PC operation to easily operate the Memotree family communication platform. Figure 4 illustrate the overall Memotree system architecture. The system is divided into a server side and a client side. The server side includes an intermediary server responsible for managing all APIs for community service software and communications. The intermediary server is designed so that updating the server software obviates the need for API updates and updates to the client side software. In addition, the intermediate server also conducts data Fusion, synchronously a user's data throughout different community services. The Memotree server is responsible for all system operations and controls. Most data is obtained through the server, which synchronously updates user information with community services. The Memotree system only records some statistical data and account data to an Internal Supplementary DB. Users can access their Memotree services through a tablet-based application or through their PC browser. Overall, the Memotree system uses Fusion to integrate the band-end community services and uses the Re-Render concept to re-interpret community services.

3 Validation

Heuristic Evaluation was proposed by Nielson as a means of evaluating usability, and is now widely used to assess a variety of systems[13, 14]. For example, Hart et al. applied the approach to evaluate interface usability problems on Facebook[15], Pinelle et al. applied it to assess interactive games[16], and Lee & Kozar used it to evaluate the relationship of usability to purchase intention on e-commerce sites[17]. Accordingly, this study uses Heuristic Evaluation to assess usability of the Memotree family social interaction platform.

3.1 Test Subjects and Experimental Design

We invited three experts in user interface design or ergonomic engineering to participate in the usability assessment of the Memotree system, including two experts with rich experience in information engineering system design, and one expert with a strong background in interface design and usability. The experts were asked to assume the role of a general user for system evaluation. All interaction with the system was observed and recorded to identify problems, solicit opinions, determine usability design flaws and analyze their causes. In addition, to obtain the point of view of actual users, the solicited 42 subjects between the ages of 20 to 30 to test the Memotree system. After testing, subjects were asked to provide recommendations regarding the system interface and functionality.

3.2 Results

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(a) Expert evaluation results

Heuristic Evaluation uses ten usability evaluation principles to identify potential interface usability issues[13, 14]. The three experts were asked to assess the Memotree system according to the ten criteria in Neilsen's Heuristic Evaluation. In the inspection process, the researchers recorded whether the experts considered the system to present usability issues for each criteria, with an increasing number of reports indicating an increased need for remedial action. The expert evaluation results for the ten Heuristic Evaluation criteria are as follows:

- Visibility of system status: In terms of system status presentation, the experts indicated that the user could easily recognize his or her location within the system, and that system information displays were clear and useful. However, they felt that the display text size may be too small for older users, and thus cause them difficulty in reading.
- Match between system and the real world: The experts felt that the Memotree system corresponds well to user operation, and the user can be made immediately aware of the changes caused by his/her actions within the system.
- User control and freedom: In terms of user control and freedom, the Memotree system is fairly uncomplicated. Action selection are clearly differentiated, and the experts felt that further user control mechanisms were unnecessary.
- Consistency and standards: The experts felt that the Memotree system's color scheme and type face selections fulfilled design principles for consistency, but some minor adjustments should be made to ensure the consistency of some icons.
- Error prevention: Memotree system does not provide an error-handling mechanism. The experts felt that the system's relatively uncomplicated design and ease of use should reduce the user error rate.
- Recognition rather than recall: The experts felt that the Memotree system's menu system was highly navigable. This reduces the amount of information the user needs to remember, thus reducing the user's cognitive loading. However, the expert evaluators also mentioned that the clickable buttons should be adjusted to clearly differentiate clickable links and general information.
- Flexibility and efficiency of use: The three experts noted that all Memotree system functions are shown on the system interface, such that users do not need to search

for the location of function. Therefore, although the system does not provide any shortcuts, the expert evaluators all affirmed the current approach in terms of flexibility and efficiency of use, and did not raise any further recommendations.

- Aesthetic and minimalist design: The expert evaluators felt that the Memotree system interface messaging was concise, jargon-free, and easy to understand. In addition, the system page only displays information needed to help users easily recognize and operate the desired function.
- Help and documentation: Memotree system does not provide user manuals and guides. The three experts recommended including simple instructions to help new users quickly learn to operate the Memotree system.

(b) User viewpoint

Forty-two young test subjects, all familiar with the operation and function of online SNSs (e.g., Facebook, etc.) were invited to help test the Memotree system. To solicit their viewpoint, the testers were first asked to use the system and then provide comments and suggestions for the system interface and functionality. Feedback from the test subjects generally held that the interface design was attractive, the functions are well-defined, and the system provides meaningful and effective information. Three functions were singled out for specific recognition and appreciation: (1) the Family Tree specifies the kinship relationship between various family members as they interact in the system, (2) the interface design of the Family Calendar is not found in other current SNSs, and (3) the Family Day function allows family members to express emotion and concern, thus promoting cohesion among family members. Selected tester responses are organized below:

- Family Tree: Unlike other current SNSs, the Memotree system only provides communication between family members. Test subjects felt that the Memotree system's Family Tree feature depicts the identity of individual family members and their specific relationships with other members, while also providing the basic information and current status of each member (e.g., birthday, recent photos and current status). This allows users to get to know their family members better and also helps promote the continuation and maintenance of the traditional Chinese sense of family and familial culture. In addition, the Family Tree function automatically searches for family relationships and contacts between various members of an extended family, thus creating an elaborate kinship diagram for an extended family.

  User quote: "… This family tree feature is amazing – it organized my entire family's information…"

  User quote: "… I think this automatic editing feature in the family tree is very good – it can let me clearly see who's in my family…"

- Family Calendar interface design: Designed on the concept of conventional calendars, the Family Calendar interface is easy for novice users (especially elderly users) to intuit and learn, thus reducing the amount of time and effort needed to learn to use the system. The 42 young test subjects indicated that the interface

design was attractive, providing a simple and intuitive mode of operation which meets the cultural expectations and habits of elderly users, such as the inclusion of the lunar calendar. In addition, the calendar offers links to day-to-day family events and records the feelings of family members.

> *User quote: "… I'd show my grandfather the lunar calendar feature – he'll like that."*
>
> *User quote: "… the calendar is organized on a daily basis, allowing me to clearly see how everyone in my family is doing…"*
>
> *User quote: "… it's like reading a diary. It's very convenient and provides a way for family members to interact."*

- Promotion of emotional expression and concern through Family Day: The Family Calendar not only allows users to set specific Family Days (e.g., birthdays, anniversaries, family activity days, etc.), but the system also reminds users of upcoming Family Days to they can express their concern for the family. From an emotional point of view, this kind of interaction is a type of rich emotional transfer which can increase the intimacy between family members. In addition, the test subjects indicated that the inclusion of icons and emoticons along with text gave them a direct and convenient way to express their emotions and concern.

> *User quote: "On birthdays, I want to send my family members flowers or a birthday cake, and these cute icons help me express my best wishes…"*
>
> *User quote: "… these little gift [icons] are really great. I hope we can have a bigger selection of gifts. It would make me very happy to received such gifts…."*

4 Conclusion

To extend traditional Chinese family values and ancestral culture, and to adapt these concepts to modern popular digital social interaction modes, this study developed Memotree – a basic service platform for family social interaction. Memotree features a Family Tree which displays the family relationships and links among family members, with features to encourage family interaction based on the Family Communications Scale. The system and its associated hardware are designed to be optimally accessible to family members of different generations. Finally, Heuristic Evaluation was used to evaluate Memotree usability. Test subjects affirmed the Memotree concept and provided positive feedback. Specifically, the Family Tree, Family Calendar and Family Day features were seen as being conducive to promoting strong family bonds and rich communication and interaction among family members, thus satisfying the usage needs of different generations of the same family.

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