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Study of characteristics of effective online help systems to facilitate nurses interacting with nursing information systems

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Abstract
Topic area and paper objectives: Through identifying characteristics of Online Help System (OHS) that could facilitate nurses effectively interacting with information system, this paper proposes a framework that could guide the development of OHS written for a Nursing Information System (NIS). Background and concise literature review: User training is an important mechanism to guarantee the success of information system implementation. This is particularly true for a user group such as nurses. When faced with unfamiliar tasks, a user requires assistance to get the system to work. An OHS is supposed to be helpful in such situation. However, to date it is not well understood how users interact with an OHS. Literature on OHS indicates that an OHS can be useless, even impair users’ performance, especially for novice users like nurses who do not have sufficient technical backgrounds to understand the help system. Nurses have an important role in the implementation of NIS, so it is imperative to research this area that strongly impacts on the adoption of NIS. Defining a quality framework for an effective OHS is a first step towards the actual build up of such a helpful OHS. Methods: A grounded theory approach is taken for this research. Extensive literature review of previous research on effective OHS and nurses’ socio-psychological characteristics have been undertaken to define the quality framework for OHS. Results and discussion of implications: A framework consisting with 5 dimensions is proposed. These dimensions are content, structure, functionality, aesthetics, and usability. There are specific criteria under each dimension. The framework has double value for effective OHS. Content, structure, functionality and aesthetics could serve as recommendations for designing an effective OHS for nurses considering the characteristics of nurses and the problems of OHS. The 5E (i.e. effectiveness, efficiency, engaging, easy to learn and error-tolerance) can be applied as usability evaluation tools for effective OHS.

Keywords
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Study of characteristics of Effective Online Help System to Facilitate Nurses Interacting with Nursing Information System

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Background and concise literature review: User training is an important mechanism to guarantee the success of information system implementation. This is particularly true for a user group such as nurses. When faced with unfamiliar tasks, a user requires assistance to get the system to work. An OHS is supposed to be helpful in such situation. However, to date it is not well understood how users interact with an OHS. Literature on OHS indicates that an OHS can be useless, even impair users’ performance, especially for novice users like nurses who do not have sufficient technical backgrounds to understand the help system. Nurses have an important role in the implementation of NIS, so it is imperative to research this area that strongly impacts on the adoption of NIS. Defining a quality framework for an effective OHS is a first step towards the actual build up of such a helpful OHS.

Methods: A grounded theory approach is taken for this research. Extensive literature review of previous research on effective OHS and nurses’ socio-psychological characteristics have been undertaken to define the quality framework for OHS.

Results and discussion of implications: A framework consisting with 5 dimensions is proposed. These dimensions are content, structure, functionality, aesthetics, and usability. There are specific criteria under each dimension. The framework has double value for effective OHS. Content, structure, functionality and aesthetics could serve as recommendations for designing an effective OHS for nurses considering the characteristics of nurses and the problems of OHS. The 5E (i.e. effectiveness, efficiency, engaging, easy to learn and error-tolerance) can be applied as usability evaluation tools for effective OHS.

1. Introduction:

The electronic nursing documentation not only saves time, but also increases the accuracy and accessibility of patient information. However, the application is not a common practice in the current Australian healthcare industry. Mismatch of user information needs, poor interface design and ineffective user training are some of the major causes of the problem [1]. Significant investment has to be made in training the user population. As failure to do so will frustrate staffs unable to effectively use a system and they might reject it, and this will lead to the system implementation failure [2]. How to help nurses to effectively interact with computers is vital to the successful adoption of IT into nursing profession [3]. Online help offers numerous advantages over hardcopy delivery [4]. An effective OHS, which seamlessly bridges the gap between complexity of the...
software and users’ need for simplicity, is one of the best solutions. It is imperative to research this area because it strongly influences the adoption of NISs by adult nurses. The objective of this research is to identify characteristics of an effective OHS which could be integrated into the proposed quality framework. This framework should be relevant to nurses and guide the development of OHS for a NIS.

2. Research methodology

This study took a descriptive approach as the researchers have tried to identify the information and procedural needs of nurses when interacting with OHS. An interpretive process was adopted that was based on grounded theory, whose basic idea is to generate theory from data [5]. Grounded theory approach guided the whole process of data collection and analysis. After collecting data from literature research, constant comparative method was utilized to analyze and integrate information to build the theory. The quality framework was constructed through such iterative processes.

3. Review of study on effective Online Help System

The issues regarding how to design an effective OHS were first considered in 1980s [6]. In 1995, Duffy et al. conducted a comprehensive study on how to design and evaluate OHS [4]. Their work was regarded as a milestone in OHS research area. Duffy et al. designed an evaluation tool for quality OHS. This evaluation tool contained four dimensions for determining a “good” help system (usability, functionality, aesthetics and system documentation). This was a comprehensive classification. However, it lacked specific and concrete subsets of attributes in each dimension to describe what attributes and features a quality OHS should offer. Failure to include these subsets in the evaluation would lead to problematic measuring of the effectiveness of the OHS.

In the same year, another similar mechanism for classification of criteria was devised by Garzotto [7], i.e. content, structure, presentation and dynamics. Similar to Duffy, Garzotto also emphasized system documentation, aesthetics and functionality, but in different terms. However, Garzotto ignored usability as the overall quality indicator of an OHS system.

These criteria were still not comprehensive enough to cover the entire dimension for determining an effective OHS. As the research continued in this field, assessing quality documentation attracted more researchers’ attention. For example, Hargis et al. [8] defined three overriding categories (i.e. easy to use, easy to understand and easy to find) with specific characteristics under each element. This was a thorough model to assess quality information. However, the usability issues were still missing.

Following the work of Duffy, Hackos [9] emphasized on usability of OHS and complemented Duffy’s model by refining and further developing the usability criteria. Neilsen [10] provided a structure for usability evaluation, which is applicable to examine the quality of system documentation. Recently, Quesenbery defined 5 dimensions of usability: effectiveness, efficiency, engaging, error tolerance and easy to learn. The 5Es are helpful in planning usability testing [11].
4. Framework of development

Obviously, for the purpose of building an effective OHS, nurses’ general socio-psychological characteristics when interacting with computers have to be considered. In the preliminary study, Qiu et al. [12] identified such characteristics of nurses, which have great implication for their interaction with computer:

- The majority of them do not have sufficient computer literacy and information literacy;
- The majority of them are women;
- They have heavy workload, so time is pressing for them;
- They are normally willing to adopt IT into workforce if it is beneficial;
- They lack confidence in their initial attempt to use computers.

Based on the research on the characteristics of effective OHS and nurses’ socio-psychological characteristics, a framework of effective OHS for Nursing Information System was developed, as depicted in Figure 1. The framework consists of five overriding dimensions (usability, content, structure, functionality and aesthetics) associated with specific criteria under each dimension. The four dimensions which Duffy et al. [4] defined are adopted as the major elements for this framework. Among them, system documentation criterion is divided into two categories: content and structure in light of Garzotto’s classification [7]. Usability is considered as the underpinning element for each dimension of OHS in this framework because it is the final determinant of overall performance of OHS [4]. Quesenbery’s 5Es are utilized to measure usability [11]. A breakdown of each component and its sub-dimension is shown in Figure 1.

![Figure 1 A framework of effective Online Help System](image)

The following sections will elaborate on what each sub-dimension for a dimension of the framework addresses.
4.1 Content

Content is the core component of an OHS. Content analysis may be the most important mechanism in assessing an OHS’s effectiveness. Content may consist of static media or active media [7]. Numerous evaluation criteria [4, 8, 10, 13] or heuristics [14, 15] can be applied.

- **Accuracy**: the content of information must be correct. Information provided to nurses must be correct, because they do not have enough knowledge about the NIS and time to justify accuracy of information.
- **Usefulness**: Content contains valuable and helpful information to nurses. As nurses are busy and they are novice computer users, they cannot afford extra time to explore a new NIS.
- **Conciseness**: means providing minimal but adequate guide to users. Busy nurses do not have patience to read lengthy texts from a computer monitor.
- **Understandability**: uses user familiar vocabulary instead of system-focus terms that do not make sense to users. If nurses do not understand the information provided to them, they will lose confidence to use the OHS.
- **Completeness**: OHS also should provide comprehensive information for users who would like to seek in-depth explanation and cater for different user types, especially for nurses, the majority of whom are computer novice users.
- **Consistency**: explanation of the same thing should have the same meaning. This will be convenient for nurses to follow and understand the help information.
- **Clarity**: Content should not contain ambiguous information to users.

4.2 Structure

Structure is the organization of content [7]. For example, text, tables, bulleted lists, headings, and other methods of emphasis are common ways of physically and conceptually organizing information [4]. A number of criteria [8, 14, 16] can be applied in structure dimension as follows.

- **Efficiency**: as time is pressing for nurses, it is essential to consider organizing online information in an efficient way. For example, the frequently sought information should be located at high levels of the structure.
- **Consistency**: structure of information should be consistent throughout the OHS. It helps to create an ease of use environment for nurses and reduce their panic when using computers.
- **Retrievability**: presents and organizes information in a way that lets users find information quickly and easily.
- **Task orientation**: structure content in a task-oriented format to facilitate users to complete tasks that fit with their workflow. Due to pressure of the heavy workload, only when nurses really encounter problems in operating an NIS, do they seek help.
- **Function orientation**: structure content based on potential flow of interaction of users with functions of the application.

4.3 Functionality

Assessing functionality includes how sophisticated an OHS is, how well technology is adapted to support the needs of users, how well users interact with OHS and so on. Queries and navigation are the most important functions. However, it is important to be aware of the issue that technological
sophistication alone does not lead to usability [4]. Several criteria can be applied in this category [4, 7, 9, 14, 17-19] as follows.

- **Accessibility**: is about how efficient the system is for nurses to navigate and access to help information. This issue directly affects the usability of OHS.
- **Non-intrusiveness**: only invoked when the nurses request help. Does not distract the nurses’ attention from their work before being invoked.
- **Ease of use**: in order to provide an encouraging and pleasing environment for novice users like nurses, ease of use is a critical goal. It means it does not require extra effort to learn how to use the OHS.
- **Flexibility**: providing several paths to access to the same information is beneficial for nurses to access efficiently to help information.
- **Consistency**: function should follow the same pattern throughout the OHS.
- **Trouble-shooting**: OHS should have the ability to provide solutions and troubleshooting tips to nurses and prevent nurses from making errors.
- **Intelligence**: OHS should be sophisticated enough to handle novice users’ interaction.

### 4.4 Aesthetics

Hackos [9] predicted that the next generation of online help will begin with the user interface. In essence, aesthetics is about how content and functions are shown to users [7]. It is a very important criterion, because a poorly designed screen will increase the effort the user spends in searching for information, which directly influences the effectiveness of the OHS.

- **Visual effectiveness**: effective employment of multimedia to present information for nurses.
- **Cost effectiveness**: issue with regard to the cost of applied technology should not be ignored.
- **Consistency**: presentation of information on various pages is consistent so that differences between pages are meaningful.
- **Readability**: information is presented in a size and color that is easy to read.

### 4.5 Usability

A usable help system is one that aids the user in diagnosing and repairing his or her problem with minimum time or effort. Usability is considered as the base of OHS in this framework. Quesenbery’s 5Es are essentially five indicators of usability. In OHS, the 5Es can be understood as:

- **Effective**: What is the completeness and accuracy of an OHS? What percent of users’ goals were reached successfully? How well was a task completed?
- **Efficient**: How fast and accurate is the user’s work? How quickly does the user reach his/her goals? How quickly was a task completed?
- **Engaging**: How distinct and consistent is the visual presentation, graphic images, and colors? How clear and distinct is the design and readability of text on screen?
- **Error Tolerant**: Does the OHS prevent the user from making errors? Is there information on how to recover from errors?
- **Easy To Learn**: Is the OHS predictable? Can anyone use the help system with confidence, given a basic skill set required to use?
5. The future research

The next step of the research is to test the applicability of the theoretical framework. Firstly, a prototyping approach will be taken to develop an OHS for a specific NIS based on the theory proposed in the paper. Afterwards, the validity of the quality indicators would be tested by users through directly using the OHS. The participants are nurse users. In order to understand their perception about the system, the participating nurses will be followed up and interviewed. Based on feedback from participants, the OHS will be improved and the quality framework for effectively OHS justified.

References:
