Refereed paper

Understanding end-user support for health information technology: a theoretical framework

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ABSTRACT

Background Support is often considered an important factor for successful implementation and realising the benefits of health information technology (HIT); however, there is a dearth of research on support and theoretical frameworks to characterise it.

Objective To develop and present a comprehensive, holistic, framework for characterising end-user support that can be applied to various settings and types of information systems.

Method Scoping review of the medical informatics and information systems literature.

Results A theoretical framework of end-user support is presented. It includes the following facets: support source, location of support, support activities, and perceived characteristics of support and support personnel.

Conclusion The proposed framework may be a useful tool for describing and characterising end-user support for HIT. it may also be used by decision makers and implementation leaders for planning purposes.

Keywords: end-user support, health information technology implementation, scoping review, socio-technical issues

Introduction

In the past decades, the implementation of health information technology (HIT) has been an ongoing challenge. Despite large investments and significant efforts by governments and healthcare organisations, success remains limited. Even when adopted and put into use, the potential benefits of HIT applications are often not fully realised. Support is often mentioned as an important factor for successful implementation. In

a recent systematic review, Lluch[1] has identified two types of support: support from managers and colleagues and technical support.

In this paper, we do not address the issue of managerial support such as creating the organisational atmosphere, and allocation of resources required for implementation. Rather, our focus is the end-users and the support that enables them to use HIT more efficiently and effectively. We broadly define end-user support as any information or activity that is intended to help users solve problems with, and better use, the system. This definition also includes support from colleagues and training, which has also been identified as an important factor in HIT implementation.[1] There is currently a dearth of research on support for HIT implementation, and theoretical frameworks to understand it, that take a holistic view. Previous studies and frameworks focused mainly on technical support for HIT in hospital settings.[2] In this paper, we propose a comprehensive, holistic framework for characterising end-user support which can be applied to various settings including community-based primary care. Implications and potential uses of the framework are discussed.

Methods

We conducted a scoping literature review. A scoping review is 'a technique to map relevant literature in the field of interest'.[3] In contrast to a systematic review, it usually covers a broad topic, may include various research designs, and the quality of included studies is often not assessed.[3] We searched medical, information systems (IS) and general databases including PubMed, the Association for Computing Machinery (ACM) digital library, the Association for Information Systems's (AIS) digital library, and Thomson Reuters' Web of Knowledge. Search terms included 'end user support', 'help desk', 'information center' and 'technical support'. Abstracts of retrieved papers were reviewed and papers of which the main focus was end-user support were selected for in-depth review. References and papers citing selected articles were sought and also reviewed. Based on this review, a comprehensive, multi-faceted framework for characterising and describing end-user support for (health) information technology was developed.

Findings and proposed framework

Based on our literature review, we propose a framework which includes the following facets of end-user support: (1) the source of support, (2) location of support, (3) support activities, and (4) characteristics of support and support personnel. Each of these facets is described in detail below and the full framework is presented in Table 1.

Source of support

Following Munkvold,[4] we propose a 2×2 classification of support sources as either personal or impersonal and formal or informal. Personal support is provided by a person. However, many impersonal sources of assistance are available in the form of documentation (e.g. user manuals), help menus within the software, video tutorials and more. Both personal and impersonal support may be formal – e.g. provided by a person or entity whose job it is to help users – or informal – e.g. assistance from colleagues, online user communities, or tutorials and manuals developed by users.

Location of support

Support may be provided either on-site or remotely.[2] Examples of remote support include help desk telephone lines and the use of remote support software which allow technical support personnel to access the user's computer via network connections to change settings and solve problems. On-site support, by contrast, requires the physical presence of the support provider on the same site where the user is located (e.g. fixing a hardware problem by a technician).

Support activities

A wide range of support-related activities have been identified from the IS literature. Following Govindarajulu and Reithel,[5] we propose the following categories of support activities:

- Infrastructure support: e.g. purchase, installation, maintenance and repair of hardware, ancillary devices, servers and network communication.
- Software support: e.g. software installation and configuration, software updates and bug repairs.
- Functional support: e.g. assistance in learning how to use the various features of the system and perform various tasks with it.
- Data support: e.g. data backup, recovery and archiving; activities intended to ensure the completeness, accuracy and consistency of data input.
- Training and education: there is often a distinction between training and support in the literature. In contrast, we propose an inclusive framework in

Table 1 Proposed framework for characterising end-user support in HIT implementation

Facet	Attributes	Details
Support source	Formal	Support provided by person or entity whose job it is to assist users.
	Informal	Assistance from peers or others whose job is not to provide support; can include a local champion or super-user
	Personal	Support provided by a person
	Impersonal	Support provided by documents or websites. No direct contact with a person is involved.
Location of support	On-site	Requires the physical presence of the support provider on the same site where the user is located.
	Remote	Does not require physical presence of the support source and the end user at the same location; often involves use of telecommunication.
Support activities	Infrastructure support	Includes purchase, installation, maintenance and repair of hardware, ancillary devices, servers, and network communication.
	Software support	Involves software installation and configuration, software updates, and bug repairs.
	Functional support	Assistance in learning how to use the various features of the system and perform various tasks with it.
	Data support	Activities intended to ensure the completeness, accuracy, and consistency of data input
	Training and education	1. Intial training: teaching users how to use the program after the software is implemented. 2. Ongoing training to reinforce initial learning, teach users of advanced features, and training of new staff.
(Perceived) characteristics of support and support personnel	Timeliness	
	Knowledge	Includes all aspects of system knowledge (infrastructure, software, and functionality) and the ability of those providing support to understand the problem and provide an appropriate answer.
	Homophily	The degree of similarity between the support source and the end-user, and the degree to which the support source demonstrates understanding of the day to day work of the user.
	Counselling and communication skills	The ability of the person providing support to listen, to communicate patiently and in an empathetic manner, and with a willingness to try various alternatives.

which training and education are part of end-user support. This is consistent with studies of technical support which suggest that the roles and activities of support personnel also involve teaching users how to use software applications. This activity includes not only the initial training provided prior to implementation, but also counselling, training of new users post implementation, and ongoing training on advanced features and integrating the use of the system into clinical and organisational workflows.

Characteristics of support and support personnel

Characteristics of the support provided and of support personnel, especially as perceived by users, may be important factors in implementation success. Based on our literature review we propose the following characteristics of support and support personnel to be included in the framework:

- Timeliness of support: as healthcare providers become increasingly reliant on HIT to do their work,

solving problems and helping users perform tasks with the system in a timely manner is crucial.

- Knowledge: the degree and depth of technical knowledge and familiarity with the system's infrastructure and software functionality, as well as good understanding of the organisation's HIT needs, structures and processes, are important characteristic of support personnel that may affect problem resolution, user learning and users' self-efficacy.[6]
- Homophily is 'the degree to which two or more individuals who interact are similar in certain attributes'.[7] It is an important characteristic of support providers which enables them to bridge the gaps between the technical and clinical worlds.
- Counselling and communication skills: the ability of the person providing support to listen, and to communicate patiently and in an empathetic manner is another important characteristic which might affect problem resolution, user learning and users' self-efficacy.[6]

Discussion

In this paper, we describe a holistic framework for analysing and characterising end-user support for HIT that is based on a scoping review of the information systems and medical informatics literature. We believe this framework would be useful for both researchers and practitioners in the field of health informatics. Its purpose is to break down the often vague concept of support and provide a systematic way to analyse and characterise it. The focus of the framework is the end-user. It is broad enough to be applied to various settings including hospital- and community-based primary care, and capture multiple aspects of support and not just the technical ones. Researchers may apply this framework to better understand how end-user support, as we broadly defined it, affects the process and outcomes of HIT implementation. For policy makers and HIT implementation leaders, the framework may provide guidance for designing support services as all facets of the framework need to be considered and planned carefully.

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