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Understanding the information seeking and decision making of community intermediaries[1]

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ABSTRACT

A research methodology called "Information Environment Mapping" (IEM) was developed for use in the Community Intermediaries Research Project (CIRP). The CIRP was a study of the role of information and communication technologies (ICT) in community organizations that provide social services in the form of intermediation between community members and governmental and private sector organizations. One aspect of the CIRP was to understand the use of ICT in problem solving performed by community intermediary staff. Pilot studies suggested that people often find creative solutions to everyday problems that may not be obvious to those outside of their organizations or lines of work. The IEM methodology was developed in order to create a problem-solving environment for use in the CIRP in which respondents were encouraged to reveal unique perspectives on their information needs and any creative responses they employ to deal with challenges they face in getting at and using information. This methodology was adapted from a human-computer interface evaluation technique called cognitive walkthroughs. This paper provides and overview of the IEM methodology.

Author Keywords

information environments, information needs, access, constraints, user behaviour, design, requirements analysis, systems analysis, use cases

ACM Classification Keywords

D.2.10 Design

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INTRODUCTION

This paper presents a research methodology developed to facilitate part of a larger project to study intermediation by community organizations on behalf of clients. The Community Intermediaries Research Project (CIRP) was a study of the role of information and communication technologies (ICT) in community organizations that provide social services in the form of intermediation between community members and governmental and private sector organizations [1]. One aspect of the CIRP was to understand the use of ICT in problem solving performed by community intermediary staff. These included organizations that provide health care, job training, and community development services. One goal was to understand the knowledge that staff members in these organizations had about information available to help them solve problems for their clients. The expected benefits of this research were that it would help to identify creative solutions to problems of accessing information critical to the community organizations and the clients they serve. It was important, specifically, to understand: (1) the types and sources of information that staff use in their jobs, (2) how they access those sources, and (3) what unique problems exist for them in accessing information. These three facets define a staff person's *information environment*.

A staff member given a task will be aware of one or more potential sources of information to help them, such as books, people, or Web sites. Each of these sources may be reachable by one or more means, such as telephone, e-mail, or by traveling in a car to see someone. The staff person may face constraints or be influenced in the sources and how they choose to access them. That staff person's information environment map is depicted in *Figure 1* in an abstract way.

A research methodology called “information environment mapping” (IEM) was developed as a means to capture a depiction of one's information environment. Anecdotal evidence suggested that people often find creative solutions to everyday problems that may not be obvious to those outside of their organizations or lines of work. Examples included the use of cell phones or Web-mail for communication to compensate for a person's lack of a stable address.

The IEM methodology creates a problem-solving setting in which respondents are encouraged to reveal unique perspectives on their information needs and any creative responses they employ to deal with challenges they face in getting at and using information. This methodology was adapted from the *cognitive walkthroughs* heuristic human-computer interface evaluation technique Wharton et al. [7].

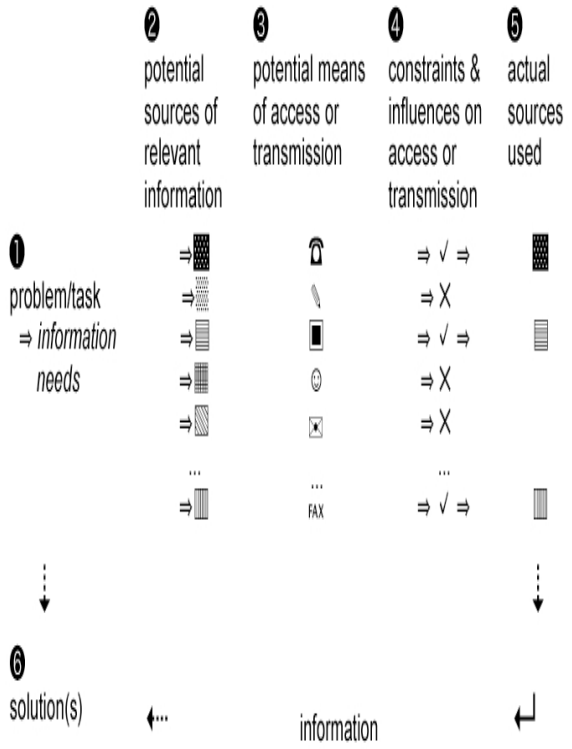

Figure 1. An information environment map (IEM).

RELATED WORK

The Cognitive Walkthrough (CW) methodology was proposed by Wharton et al. as a low cost usability evaluation method for human-computer interfaces. One purpose was to permit the testing of "story boards" or written specifications of interfaces before software is implemented, thus providing a low-cost method of identifying problems in an interface early.

CWs are one of several inspection evaluation methods for user interface mock-ups or early prototypes. The other class of inspection methods is heuristic evaluation [6].

The basic CW process consists of preparation and execution phases. Investigators perform the following tasks in the preparation phase:

- develop a problem solving scenario (e.g. Saving a file) and
- specify user population requirements (e.g. Their expected skill levels and knowledge).

Each problem solving scenario consists of:

- a sequence of correct actions leading to a successful solution;
- expected system responses to each action; and
- what information a user must know prior to a given action (e.g. The location of a the file menu.).

In the execution phase, the investigator observes users as they attempt to use an interface. According to

Wharton [7], the investigator is to seek answers to the following questions for each action in the sequence:

- Will the user attempt to achieve the correct effect?
- Will the user notice that correct actions are available to achieve the desired outcome?
- Will the user associate the correct action with the desired effect?
- If the user performs a correct action, will they notice that progress is being made toward a solution?

The investigator records observations throughout the process for analysis.

The goals of the IEM methodology differ somewhat from those of the CW methodology. Like the CW methodology, the IEM approach attempts to create a setting where researchers can observe respondents solving a real world problem. Unlike the CW method, however, no sequence of correct actions for solving the scenario is assumed when constructing an IEM. The goal for this new methodology is to observe the unique perspectives and problem solving approaches of each respondent.

The IEM methodology can be seen as having some relation to user requirements gathering activities within systems analysis methodologies. These are often used as a prelude to detailed systems design. The prime example of such methodologies is the unified process [2].

The IEM approach differs from user requirements gathering in that the goal is not to design a new system. Rather, an existing system is only to be observed. Since the sources and access methods within an information environment may not involve ICT, it is important that a methodology be developed which enables both the technological and non-technological perspectives of a given environment to captured. Though traditional systems analysis methods such as the unified process encourage the construction of technology-independent analyses, the focus on constructing requirements – as opposed to observing the current state of an information environment – is seen as more likely to lead to technologically-determined outcomes. In a system analysis process, assumptions are often made about the basic functionality being sought in the new system. No assumptions are made about desired functionality in using the IEM approach. It is the current view of an information environment that is of interest. This may include the current views of respondents with regard to changes they would like to see in their environment, but the methodology itself poses no assumptions in this context.

MODEL

The proposed questions are intended to support what is being termed an "inductive" form of the cognitive walkthrough process. The normal process assumes that the investigators define a priori both correct actions and expected system responses to each action. In contrast, our approach attempts to induce the respondent into defining these for the observer by immersing them in a problem-solving task. No correct actions are defined in our approach nor are assumptions or judgments about responses to those actions made. The respondent's answers indicate possible or correct actions as well as expected responses to situations related to their organizational experience.

Analysis of the results was performed on the basis of an augmented version of McCreadie and Rice's [4, 5] taxonomy of information types, means of access to information, and influences and constraints on access to information. We have modified the definitions of most of the categories in their taxonomy, introduced several new categories, and have defined a set of information formats.

The first section of the taxonomy defines perspectives on information.

Information as commodities: This category is defined as any information which must be purchased by users before it can be accessed.

Information as data collected within an environment: This category includes artifacts, natural phenomena and unintentional communications.

Information as representations of knowledge: This category includes printed and recorded items as well as indexes or references to them. In addition, we include oral information as knowledge.

Information as data exchanged as part of a process: This category includes any data exchanged during communication and organizational processes.

Information as a data format: This category includes both electronic and physical formats. Examples of electronic formats would be: file, Word document, Web page, and electronic database. Examples of physical formats would be: DVD, printed material, natural sounds, or natural images. Some data formats, like FAX or E-mail, might also be seen as a means of access. We address these types using both perspectives.

The second section of the taxonomy defines the following perspectives on accessing information.

Access to knowledge: This category includes any processes necessary to access information that is a representation of knowledge, including printed documents, electronic files, and oral information.

Access to technology: This category includes any device or software required to access information.

Access to process: This category includes any human-defined process required to access information. Examples include: conversations, meetings, or request processes.

Access to control or participation in formation of information: This category includes control of or participation in authorship or other production tasks necessary to create or format information.

Access to participation in a social or organizational context: This category includes advocacy, debate and interpretation of information within a specified social or organizational context.

Access through referral (indirect access): This category refers to actions that an organization undertakes to refer a client to a source of information. Under this access type the organization does not receive information from the information source. It is the client that makes access to the information source once they have been referred to it by the organization.

Access as an intermediary: This category refers to an access to information for purposes of transferring it directly to a client, possibly with processing or interpretation of the information prior to transfer. It is expected that this type of access will usually be identified in relation to the other perspectives on access to information defined here.

The third section of the taxonomy defines perspectives on influences and constraints that might be faced in accessing information.

Technical influences and constraints: This category includes issues relating to interoperability, data and communications protocols, and processing efficiency.

Physical influences and constraints: This category includes geographic and environmental barriers. Constraints related to physical environments are usually understood in terms of the ergonomics of work and accessibility.

Cognitive influences and constraints: This category includes comprehension, awareness, literacy, competency, and satisfaction.

Affective influences and constraints: This category includes attitudes, confidence, and comfort in accessing information.

Economic influences and constraints: This category includes not just the actual cost of information, but perceptions of value of the information being sought. For example, valuations of information are

sometimes difficult because the commodity to be consumed often has unknown content and usefulness, such as tomorrow's newspaper. Thus, valuation is often influenced or constrained by a potential user's beliefs [4].

Social influences and constraints: This category includes cultural norms, class, background, and social networks. Central to social influences on access is that certain groups or organizations may claim privileged access to sources of information [3]. They may have power to establish and control the discourse around the formation, access and dissemination of information coming from those sources. Their position of privilege may also influence technological development related to those information sources.

Organizational influences and constraints: This category includes any factors that might arise as the result of community, organizational or governmental structures, relationships, policies or decision-making processes.

RESEARCH DESIGN

In our approach, each subject is presented with a hypothetical scenario in which they are asked to solve a problem. The scenario should present the subject with tasks and goals that are closely-related to those they normally face in their work environment.

In principle, the researcher can construct a scenario such that the issues it presents to a group of respondents are on average broader than any individual's normal job functions. First, this is likely to occur without the specific intent of the researcher because of the impracticality of designing individualized scenarios for an entire population under study. Second, it might be done intentionally because a less narrowly-focused scenario might encourage respondents to draw even more on the knowledge they have of their information environment by forcing them into slightly unfamiliar terrain. The overall goal here is for respondents to develop and discuss new insights into their information environment.

After reading the scenario, subjects are asked to construct a step-by-step plan for solving the problems presented in the scenario. For each step in their plan they are asked to identify three facets of the information needed to complete the step:
(1) the type of information required to carry out the step,
(2) sources of that type of information, and
(3) the means by which the information would be accessed (e.g. Telephone, voice, e-mail).

In many cases, these facets need not be identified explicitly. For example, a web page identified as an information source implies a certain means of access. Exceptional conditions should be identified of course.

The scenario that was used for one organization was the following:

Health Information Services Scenario: Suppose you are approached by a person who has never been to your organization. They were users of a certain brand of diet patches and heard a rumour that there are serious problems with the product and even that refunds might be available. They are uncomfortable about contacting the company directly and are coming to your organization to get help. You are to be their personal guide in reaching this goal.

This scenario was designed through an examination of the services offered by the organization under study and literature on events related to within their domain of service.

It was explained to each subject that: (1) the purpose of the interview was not to evaluate them on the

basis of a set of correct answers; and (2) we did not assume any one approach to be correct. Further, it was explained to the subject that their unique perspective and knowledge was being sought.

The breadth of services offered by one organization presented a challenge to the Information Environment Mapping methods described above. The investigator thought that no one scenario would be useful enough in eliciting a comprehensive mapping from staff members. Therefore, it was decided for this field study site to ask each subject to inventory the information sources they used to carry out their job function along with the means by which they accessed each source and then to conduct an interview using the inventory they produced.

Generic information environment survey: Subjects were asked to: (1) list their job duties; (2) to list (a) the information types they used along with each information type's (b) possible sources and the (c) means of access to each source. For each of the items in 2(a), subjects were allowed to list more than one item for 2(b) or 2(c).

The transcripts of the recordings were then used for data analysis. In addition to their plans, subjects were asked to report their job function or position in their organization and if they had dealt with a scenario such as this before. The purpose of the former question was to provide one means of correlating perspectives on information environments over a collection of mapping sessions. The purpose of the question about their experience with similar scenarios was to provide a means for understanding the scenario construction process relative to the responses. Finally, subjects were asked to comment on the session to provide additional information with which to evaluate our methodology.

DISCUSSION

Each IEM was performed through an interview process. Respondents in this study were presented with hypothetical scenarios in which they were asked to assist a client in solving a problem. A unique scenario was developed for each community intermediary organization visited during the project and were based specifically on the services they provided for their clients. Audio recordings of each IEM session were made, transcribed, and analyzed using qualitative data analysis software. A total of 40 IEMs were performed across the four sites: nine at the health and wellness centre; seventeen at the job placement organization; eight at the skills and training organization; and six at the community development and employment resources organization. Each site was analysed separately. The output – or “mapping” -- is a qualitative analysis of the interview transcripts using as a framework a taxonomy of information types, access methods, and influences and constraints on access to information.

The following is an example of a scenario used to conduct the IEMs. It is based on an actual case brought by the Illinois Attorney General in the United States [8]. This was used in a health and wellness organization.

> Suppose you are approached by a person who has never been to your organization. They were users of a certain brand of diet patches and heard a rumour that there are serious problems with the product and even that refunds might be available. They are uncomfortable about contacting the company directly and are coming to your organization to get help. You are to be their personal guide in reaching this goal.

As a methdology, IEMs were found to be useful as one means of identifying information needs, uses, and seeking behaviors within community intermediaries. Staff at all of the community intermediary organizations showed that they have comprehensive views of their information environments. They have been creative and adaptive to influences and constraints in accessing information that they need to

help their clients. Priority has been given by staff to finding and using the best means possible to help clients. People within a given domain often find creative solutions to everyday problems, the uniqueness of which they may take for granted. Their solutions may not be obvious to those outside of the domain. Information environment mappings sought to capture these unique solutions and insights. Detailed results from the IEMs conducting in the CIRP are given in [1].

While the methodology was found to be useful, it showed several vulnerabilities relative to the researchers' formal perspectives on problem decomposition, process and data modeling. The IEM methodology emanates out of such perspectives, which the researcher's found at times to come into conflict with respondents perspectives and approaches to describing structures and processes involved in problem-solving.

First, some respondents were confused by vagueness in the scenarios that were presented to them. The scenarios did not specify exactly what types of goals respondents should work toward other than to help a hypothetical client as much as possible. The scenarios were intentionally constructed this way to avoid respondents constraining themselves too narrowly to solutions. Respondents were told that while it was recognized that they performed specific functions within their organization, they were to assume as broad a perspective as necessary to develop an information-seeking strategy. From the comments received from respondents this vagueness seemed to encourage them to think more deeply about their information environments and the ways in which they navigate them; however, prompting was often required to get respondents to provide sources of information and means.

Second, the ability to present a problem-solving process in a structured way seemed to reflect the educational or work experience of the respondent. Obviously, the few respondents with information science or computing backgrounds had little difficulty in expressing problem-solving or information flows in structured ways. Many respondents, however, were uncomfortable with producing informal diagrams or even lists of tasks to describe their problem solving process. In these situations, prompting and review were found to be useful to the interviewer in bridging the gap in descriptive perspectives on process and structure within the information environment.

Finally, during the IEM sessions a type of dilemma sometimes occurred were the interviewer was asked specific questions by a respondent about the desired solution of the scenario they were presented. These questions were of the general form: “is this the type of solution you desire.” At other times a respondent asked the interviewer about specific issues in the scenario and how to address them when the course of action desired by the interviewers in conducting IEMs was instead to have respondents show how they would address these information gaps themselves. In these situations, prompting the respondent to make the questions part of their plan seemed to be useful.

CONCLUSIONS

Flexible use of the IEM methodology was found to yield rich collections of data through which quantitative analyses identified unique approaches to information-seeking used by community intermediary staff members. The vulnerabilities in the methodology – as discussed above – call for continued research and experimentation to identify more effective ways to map divergent response types onto a framework that is amenable to structured perspectives useful to systems analysts. This would include, in particular, approaches to diagramming information flows and social networks that can be more easily grasped by respondents not trained in the computing professions.

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