Five Challenges for Research to Support IS³
A Position Statement

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1. INTRODUCTION

While many problems remain to develop effective IS³s (Information Seeking Support Systems), I have identified five issues that focus primarily but not totally on the information consumer, reflecting a user rather than system centric focus. These include: a better understanding of needs, tasks and intentions; an examination of applicability of collaboration to IS³, the development of search as a "real" application; the identification of what constitutes success for IS³; and a call for more holistic exploration of the IS³ ecology.

2. THE CHALLENGES

2.1 Needs, Tasks and Intentions

Why does a person search for information (either implicitly or explicitly)? To date this has been explained in multiple ways from Taylor's initial conceptualization of need [3], to that of task. Confusing is the interchangeably use of expressions of needs, intentions of the consumer, articulation of task, and query.

In recent years, task has emerged as a significant mediator of the search process, and as a result, many taxonomies of task have been developed (see [4] for example). Immersed in task is the consumer's intention for the search. A single task may result in multiple, but inter-related intentions that are often expressed as information tasks, each of which may result in one or more queries or other mechanisms for acquiring information. Thus what is often described as a need or as a task is in fact a dynamic complex process that starts from a realization and works toward resolution, some of which is internalized to the individual and some of which is manifested in system interaction. Research to date has focused primarily either on the query, or on the high level task.

Queries are, falsely, often considered synonymous with need and task. Analogically, a three to four word query can be equated with a doctor-patient exchange in which the patient expresses the problem as "pain arm" and the doctor is expected to distinguish among a host of problems from a potential heart attack to a bug bite. The predominant two to five keyword queries suffer from the same problem. How can consumer intensions, information goals, and/or tasks be predicted from such a limited amount of information?

At the other end of the spectrum, significant qualitative work have explored task, but not at a level that enables operationalization of task. Confusing also is the multiple roles that task takes in an experimental human study. Tasks are the vehicle by which the system use is observed, and at the same time may be the experimental variable that is being tested. As a result, tasks when developed for experimental purposes have so many confounds that it is difficult to assess which aspect of task (if any) makes a difference. We tend not to create exemplars that are representative of particular categories of task.

Untangling needs, from intentions and tasks is a first step that is needed before designing how those intentions can be converted into concrete interaction-able processes.

2.2 Collaboration

Collaboration has become a new element in the search research agenda fueled by the massive effort in mining and analyzing community use relationships, e.g., links/hubs, popularity, and recommendations. But a community is distinctly different from a team or group whose activities occur via collaboration. Collaboration, the process by which a team or group works together with a shared purpose, may involve a dyad (i.e., two person groups) or a team of three to ten people (more and the group will become a community) who may share a common physical space within a common timeframe.

The challenge for collaboration in IS³ is sifting through the information space to separate distinctly individual activities or processes from those that can be performed by a group. Collaboration may be performed in multiple configurations: work is handed off from one person to the next so that the work is done in an asynchronous like way, or work is done at the same time and

in the same or different place. Now rather than a single information consumer, multiple people are sharing in the operation. Whatever the process, the needs for IS^3 will differ. But first we need to know how much of information seeking/search is truly individual and which aspects are performed more effectively by a group. Within an IS^3, is the "handed off" type of collaboration more likely than the joint collaboration, or does it matter?

2.3 The Search Dashboard

The search interface has been anchored in the query-box structure – a dumb waiter style of interaction – since that format was imposed on the search environment without any requirements assessment. We have essentially replaced the Unix command line prompt with a box. Sadly, now a global information consumer community has been "trained" to think only in those terms, and to think of search as the two-mouse-click/three-web-page solution that has been promoted by Google's minimalist design. From a design perspective, search has been treated only at the physical level of interaction: push a button, get a response. Yet, much like any other application there is immense potential for tools and widgets to aid the search process, and for re-thinking search as an application, and not just as a support tool.

Part of the challenge is that search is often thought of in the generic one-size-fits-all sense, yet search is integral to practically all other applications, from simple help functions in typical office applications (e.g., word processors, accounting information systems), to standard content-rich systems (e.g., newspapers and the global information network – the web), and intense information use environments such as educational programs and knowledge work in business and government. What tools (other than a query box) are required to aid the search for and use of information in those settings? Will they vary from application to application (e.g., news reading versus help systems)? In particular what tools are needed to support the original "work" task (including intention and use) that triggered the information quest? This will require an examination of search as an application (e.g., a place to collect useful pages, methods for visualizing results and content, support for query construction and results assessment). Notably these tools are tightly interwoven with aggregation of the content that are created using association and relationships among the various information objects.

Part of this is also re-assessing the two-mouse-click/three-web-page solution that currently exists: is there a one-page, no mouse-click solution? An element that bears assessing is the concept of awareness which emerged as a core element within CSCW (computer supported cooperative work) research and application development. Awareness is often referred to as "knowing what is going on;" rarely does a search interface provide the type of fluid information that is required to maintain control over action with useful feedback from the system. It is not just about the results.

2.4 Measurement and Evaluation

Together, topical relevance and usability have driven the measurement of search systems for the past few decades. Yet the research community continues to be challenged by what to measure, and in turn what constitutes appropriate metrics for each. We tend to measure the obvious (e.g., time on a (sub)process,

mouseclicks, number of words) and report what is easily countable or quantifiable in some way.

Most recently biometrics have emerged as another technique for measuring – something! And that leads to the crux of the problem: we still have not clearly defined "success" in the context of IS^3 [6]. When is a IS^3 successful? Only when a relevant item is located? Only when no relevant items are located? Only when something that is immediately useful is located? When the process has been engaging? When the system is intuitive? Likely success is a complex element with multiple mediating factors.

Well known in the management information systems area is the Delone and McLean model of information systems success in which information, system and service quality predict use and intention to use which predicts benefits [1]. The intent is a holistic perspective that is not focused only on one aspect of the problem, e.g., topical relevance or user satisfaction. The Delone and McLean model provides a useful example of what is needed in IS^3.

In addition to evaluating outcomes, we have no way of evaluating process. Since the process of information seeking/searching is a dynamic one with all variables in a constantly changing mode, we need a novel method to do that assessment.

2.5 Complexity of the Search Problem

The information seeking/searching environment is a complex world of multiple competing variables that impact how information is sought, what information is examined and how information is subsequently used, and thus on the design of systems to support information seeking/searching. There are multiple competing factors, each of which has an impact on how an IS^3 is subsequently used. A view of the complexity is illustrated in Figure 1 which is derived from [5].

We know for example a little about how individual differences (e.g., experience, spatial ability, knowledge) among consumers affect their search capabilities, but we know little about how the design of IS^3 s can account for those differences. We have focused primarily on analysis of the content of information objects, but have rarely taken into account the classic metadata that has existed and used primarily in library science for decades (e.g., genre, date, author, specialized indexing) to examine their contribution to meaning or to meaningful results (see [2] for one example). The formal "work" task has been all but ignored and the relationship between the work task and the resulting information task is tenuous. Except in discussions of information behaviour which tend to provide only a high level and non-operational view of information seeking, we rarely find the situation or work environment considered as a factor in the information seeking.

Overall we know something about some of these variables but we know little about the inter-relationships among the variables. Which ones are the most influential? What is the most parsimonious set that will influence the use of an IS^3? Once we understand more about the information ecology of the process, then we will be in a better position to determine the requirements for an IS^3.

3. REFERENCES

[1]   DeLone, W.H., & McLean, E.R. 2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update, Journal of Management Information Systems 19(4 2003), 9-30.

[2]   Freund, L, Toms, E.G., & Clarke, C. Modeling task-genre relationships for IR in the workplace. In *Proceedings of the 28th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval: SIGIR '05, Salvador, Brazil, August 15-18, 2005*, pp. 441-448.

[3]   Marchionini, G. Exploratory search: from finding to understanding. *CACM* 49(4 2006,) 41-46

[4]   Taylor, R.S. Information use environments. *Progress in Communication Sciences*, 10 (1991), 217-255.

[5]   Toms, E.G., Bartlett, J., Freund, L., Dufour, C., & Szigeti, S. Identifying the significant contextual factors of search. In: *Proceedings of the SIGIR 2004 Workshop on Information Retrieval in Context, ,Sheffield (UK), 29 July2004.*

[6]   Toms, E.G., O'Brien, H., Kopak, R. & Freund, L (2005). Searching for relevance in the relevance of search. In *Context: nature, impact, and role: COLIS5: Proceedings of the Fifth International Conference on Conceptions of Library and Information Sciences (Glasgow, UK, June 5-8*, 2005), pp. 59-78. Lecture Notes in Computer Science 3507
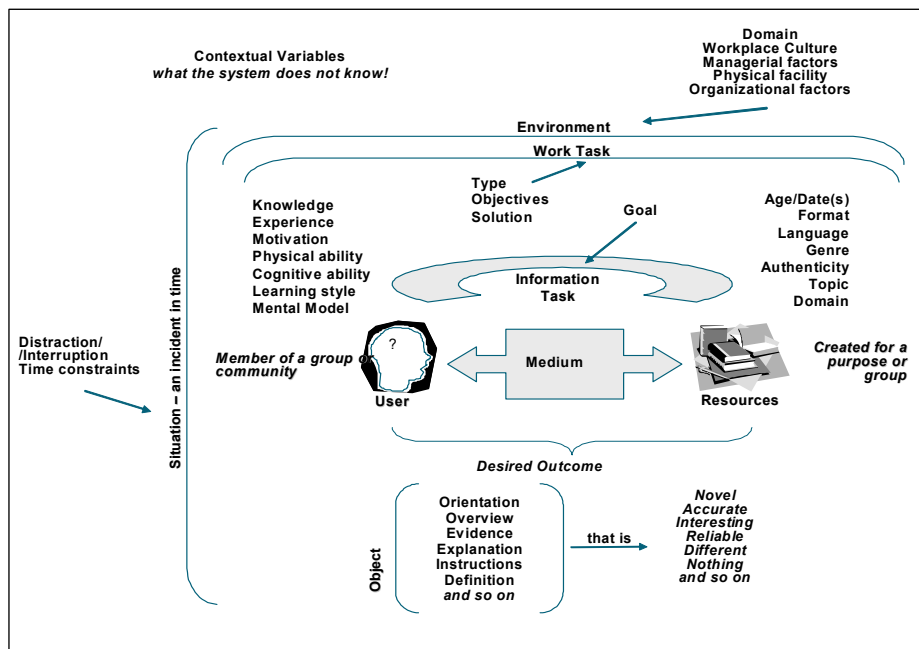
Figure 1. The IS[3] Environment (adapted from [5])