

**THE STRUCTURE OF INFORMATION AND KNOWLEDGE IN A MARKET
RESEARCH COMPANY: SYSTEMS OR WEBS?
[RESEARCH IN PROGRESS]**

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ABSTRACT

Interpretivist research in progress in a market research company is reported. Market research is information and knowledge intensive. The problem addressed concerns sharing information and knowledge among business partners over multiple computer networks. The aim of the research is to develop appropriate concepts for knowledge work. The second order concept of web is developed and contrasted with the system concept. For knowledge work, the web concept is proposed as a conceptual tool to develop applications better suited for business organisations dealing in information and knowledge.

1. INTRODUCTION

Is the application of information technology (IT) to organised human activity best progressed by thinking of it in system terms, or do we require an alternative? This question forms the basis of a case study of a market research company. The aim of the research is to examine the socio-technical structure of information and knowledge in the company, and to propose concepts that best explain the data. The result is the concept of *web*. It describes how IT/IS is used to aid *action*. It should not to be confused with the physical World Wide Web. The term web is used here as a second order concept - one that helps us to conceptualise empirical observations. It should be regarded in the same category as the system concept (Churchman, 1968), in the sense of its use to explain and think about the application of IT/IS.

The web concept is particularly suited for co-ordinative and collaborative knowledge work. Such work requires individuals and groups to interact, and the objectives and resources available to the task determine the nature of interaction, which is achieved through a web-like social interaction. It is this social aspect of webs that is important in applying network technology, as become apparent in the case company. The web concept is developed by juxtapositioning it with the system concept. It emphasises the view that advances in computer and network technology requires a fresh look at our conceptual tools for applying them in information and knowledge intensive work. The case company is then briefly described in section 4, and the interim data is presented in section 5. The web concept is generalised as the basis for the design of action tools for knowledge work. The final section is a summary of the argument posed and considers areas of research that are still in progress.

2. RESEARCH PROBLEM AND APPROACH

The problem addressed concerns sharing information and knowledge among business partners over multiple computer networks. The aim of the research is to develop concepts for knowledge intensive work. The interpretivist research epistemology is used to conduct the study, as it allows for researchers' influences on the social construction of knowledge (Walsham, 1993), and the web concept is such a construction. The primary objective of the research was thus to develop concepts for knowledge work. Such concept building provides a tool for understanding and explaining empirical observations, for example the system concept is used to do this in diverse fields. It also provides a way of thinking about how to apply IT and develop appropriate IS, acting as a reference model for researchers and practitioners.

In-depth interviews were used as the primary research method, and the interviewees composed the managing director, IT/IS director, client project managers, and project members. Observation was used primarily to verify the researcher's own interpretation of interview data. The data reported are those gathered to date. Three further interviews remain to be done, of which one is a second interview with the IT/IS Director. Another case is being negotiated to verify the web concept. Verification is not meant to be in the tradition of positivist science, but in the sense of confirmation of the *value* of the web concept.

3. SYSTEMS AND WEBS

The web concept has emerged from the researcher's interpretation of the case data discussed in section 5. For theoretical reasons, the web concept is presented in comparison with the concept of system. This is done to allow other researchers to assess its value and potential contribution to inform analyses and to enable research and practice in knowledge work.

Systems thinking as a field of study has been with us for less than fifty years (Skyttner, 1998). When giving an account of research in systems thinking Checkland and Holwell (1998, p.xiii) are surprised by the lack of systems ideas in the application of IT, though some researchers have applied them to IS (Avison and Wood-Harper, 1986). Yet, the advances during the 1990s in computer networks, telecommunications, and software conceptions such as the Web and browsers, are possibly developments that supercede systems ideas.

Table 1: THE Nature of Webs and Systems	
Systems	Webs
Control	No control
Feedback	No feedback
No Sharing	Sharing
Time-specific	Continuous, ongoing
Problem-solving tool	In-the-situation action tool
Problem-structuring	Not problem structuring
Whole	Networked
Boundary	Open Access
Elements	Nodes, interconnecting, interoperable
Conceptual ('conceptual world' of SSM)	In-the-world action
Emerged from scientific thinking	Rooted in human communication and coordination

The web concept draws together recent disparate developments in the IS field. First, it incorporates the notion of IS development and use as evolution, rather than the traditional view of IS as discrete project events and products. Practitioners and researchers recognise the effect of organisational change on IS (Mumford and Beekman, 1994; Patel, 1999). Situated action is a second prime feature of the web concept. A web is *formed* in a social context for a specific purpose. A third feature recognises the impact of computer

network technology on organisational forms, in particular Web technology. Finally, and allied to the last point, is the recognition of coordination and collaboration, in the form of business processes, required of IS.

Table 1 identifies aspects of systems thinking to compare with the concept of web. Systems thinking is regarded as a conceptual tool for problem solving and structuring, as shown in the left column. The actual use of information and knowledge happens in the situation, and is better regarded as a web of action, as shown in the right column. An important difference is that systems has its origins in scientific thinking while the concept of web is rooted in human communication, coordination and co-operation (Tim Berner-Lee, 1991), aspects that are critical in organised human activity. The contents of the table enable a conceptualisation of web to take shape and show differentials with systems ideas.

Phenomenological grounding is intricately related to the aspect of content in Web-like applications. Knowledge workers are best suited to construct information and knowledge architectures in an enterprise. The structure and syndication of a web itself is determined by its content. By syndication is meant both the node connections and the human participants. These connections in turn determine the structure of the web, and shape the localised nature of the web. By localised is meant the sharing of information and knowledge among interested users, who exist on the computer network, and who are not necessarily physically local.

The systems era is composed of rational thought (Parnas and Clements, 1986), optimising behaviour, and scientific methods of research (Galliers and Land, 1987). Computer networks and the Internet has given rise to the web era, applications that reflect satisficing behaviour, the social context, users as active aspects of technology use, and situated or grounded uses of technology. Content being increasingly important in these latter applications. Whilst the systems approach has supported the tendency to develop models, a web approach would not place such heavy emphasis on it. Webs are not models. They are part and parcel of the situation in which digital technology is applied and used. Webs are used to store, analyse, and communicate information and knowledge in real as opposed to model worlds and real analytical power is directly embedded in webs. This analytical power is its essential differentiator. As the research develops further, the concept itself will be further elaborated in an extended paper.

4. MARKET RESEARCH - THE CASE COMPANY

The market research company is in London, England. The company is innovative and growing fast within the IT and telecommunications industries. It is a full service agency specialising in IT, e-business and telecommunications. Its current clients include Microsoft, BTCCellnet, Ericsson, amongst others. In its IT operation, the company employs staff for data processing, writing software for its Computer Aided Telephone Interviewing (CATI) system, and programming its QPS software for statistical data, analysing and checking data and output tables, charts and managing projects. Data are integrated with Lotus Notes and other systems.

Much of market research involves gathering and analysing product and consumer behaviour data. Employees need to be able to communicate and share knowledge using ICTs. A specific project team is set up for each client, and it lasts for the duration of the client's contract. The teams' method of working is flexible, though regular project meetings ensure progress. As well as the intranet, teams make use of Lotus groupware to organise, communicate and manage relevant information gathered from various sources.

Project teams' requirements for information and knowledge from IS/IT cause particular application design and implementation problems to the company. New requirements continuously arise which are not stated in the Business Requirement Document for system development and implementation. Some user requirements are unclear to designers and require lengthy meetings to define. As one analyst put it: "Every one has a different set of requirements." Requirements appear to grow because they are not fully understood. It is this type of system development practice that gives rise to the notion of a Web-like information structure, as illustrated next with case data.

5. WEB-LIKE INFORMATION AND KNOWLEDGE STRUCTURES

Data from the study is presented in this section to illustrate the web concept outlined in section 3. A particular problem in applying IT in the case company is to do it in an integrated way, so that the company is reflected as a whole in its applications. The term 'information flows' is widely used in the IS literature and a web-like information structure is able to accommodate such information flows. The data presented here illustrates that information and knowledge management are particular issues in the company that requires an integrated approach.

An objective of the IT/IS Director therefore is to provide seamless platforms to allow the transfer of data from various sources. From a project team leader's perspective, information about products and markets is sought from whatever source is available:

"We are given a fixed time to research a particular product type. Though we have our internal library sources, most often we need to lease with companies specialising in certain products. They've got all the information we need. But we can't use it directly, our computer people have to make some changes before we can use them on our system."

Once brought into the company, the information is shared within the team through the Intranet and Lotus Notes. This illustrates the communicative and coordinative aspects of web-based applications, a feature highlighted in Table 1. The company's work is knowledge intensive, and each client project requires a different set of skills. This type of knowledge intensive work, in turn, requires flexible organisational structures that are better supported by Webs. Webs create new ways of working, and lead to emerging, novel organisational structures.

The company's e-business is facilitated through the web concept. It has set up business-to-business relationships with its clients and information suppliers on its server. It does not find it difficult to get its corporate clients to use the facility to exchange data, as its blue chip clients make use of extranets. As the IT/IS Director put it:

"We are fortunate that our blue chip clients are comfortable with e-business. We have set up our server for extranets with our clients, and we exchange documents and share information over HTML format. At present we make limited use of XML, but we intend to expand its use because of its flexibility in data formatting."

At present the company is placing particular emphasis on the XML language because of its customisation features. XML has been designed by the World Wide Web Consortium (W3C) specifically to allow tailored information solutions for its users, enabling tailored data communications (see Patel, 1999 for tailorable information systems). In this sense, the language caters for setting up nodes and interconnections to information in a web as described in Table 1.

Continuous and ongoing development is a feature of a web. Practitioners are faced with the problem of changing user requirements, which can be either new requirements (to support business functions or processes) or creeping requirements, those requirements that enlarge a project. At present, software project managers attempt to address these problems by concentrating on improving the process of software development. The advantage of web technology is that such changing requirements are enabled. For example, through the use of hypertext links in Lotus Notes, thus addressing the problem of continuous and ongoing development.

Webs enable situated action and allow users to experience the immediacy of the information and knowledge, which is shown in Table 1 above as "in-the-world action". A project manager for a mobile phone client commented:

"Notes is dynamic. We can set up documents and pass them around. That way everyone in the team's got the same information. It allows us to be on the ball. No one can say they didn't get the information. It's real, it's here - not in some datafile somewhere."

Of all the features of webs listed, this aspect of acting in the world is the most significant. In business organisations especially, decision-making and other types of action needs to be *actual*. The use of webs, such as intranets and groupware, enables situated action that is actual. Because of its importance this theme is discussed further in the following section.

6. DISCUSSION: INFORMATION SYSTEMS OR ACTION WEBS?

In a complex and dynamic world there is a need for concepts and tools to act in the complexity. The web concept is proposed as such a tool. A web is an *in-the-situation action tool*, developing Bush's initial ideas on the Memex system (Bush, 1945). The foundation for developing better information and knowledge intensive work applications is the recognition that humans are social and perform action. Human affairs often change while analysts meticulously apply their techniques, making the proposed solutions seem far removed from actuality.

An early application of the system idea was in human decision making. Churchman (1968) reasoned that human decision-makers required a systems approach to prevent 'the fallacies of narrow minded thinking' (p vii). The essential purpose was to provide "measures" as a guide for human activity, and apply logic to human action. Churchman further adds that '*the* systems approach really consists of a continuing debate between various attitudes of mind with respect to society' (Preface, xi). In the era of the information society, it may be appropriate to drop that debate, as the notion of webs offers a radical alternative. The use of information and knowledge is governed by factors such as social context, satisficing behaviour, and immediacy of action and not necessarily logical thinking. As Berners-Lee notes:

"The world-wide web is conceived as a seamless world in which ALL information, from any source, can be accessed in a consistent and simple way." (Tim Berner-Lee, 1991).

As shown in the preceding section, webs provide a universe of network-accessible information. A web is integrated *into* organised activity, and provides extra value to it. Metacalf's Law states, that the value of a network grows roughly in line with the square of the number of users. (Robert Metcalf is a pioneer of computer networks.) This is true of webs, because their value is the result of pooled information and knowledge from relevant users. In this sense a web is more social (Berners-Lee, 1999) than systems thinking. The collection, storage, and processing of information may have systemic properties at the level of computer hardware, but the use of information and knowledge in organised social activity requires action webs. The structure of information and knowledge in organisations is web-like and it needs to be immediately actionable. As the case data illustrates, action webs may be thought of as the development and configuration of IT that is integrated in social behaviour and affords *immediacy of action*.

7. CONCLUSION

Ongoing interpretivist research carried out in a market research company is presented. The web concept is developed to understand and explain the data. The web concept has value as a second order concept that can be used as a tool to inform the design of better information and knowledge intensive applications of IT in networked social organisations.

The Internet and the World Wide Web has arguably created new types of data that transcend systemic thinking. Whilst the conversion of data to information through algorithmic processing may be analysable in systemic terms, new Web enabled data such as digitally created content (academic libraries), audio, film, and TV applications require alternative thinking, Web thinking. Such data may even require a new name, currently called "content". Such applications are arguably not systems as we have come to understand the term. Indeed current knowledge work design and actual knowledge work supports a generalisation of the web concept. Knowledge taxonomies, ontologies, lexica and thesauri are all based on Web-like connections. Connections that enable easier access to information that becomes ever more meaningful as new connections are brought to light through a web structure.

The research reported here is in progress, and the data reported are those gathered to date. Three further interviews remain to be done, of which one is a second interview in the case reported here. Another case is being negotiated to verify the web concept. Key elements of the web concept such as satifying behaviour, social context, people as active subjects, grounding, and content will be investigated further. Verification here is not meant as in the tradition of positivist science, but in the sense of confirmation of the *value* of the web concept, as in the post-modernist sense.

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