Towards a Homogeneous Status of Communicated Research

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Abstract
This paper justifies how research results can be more effectively and efficiently communicated between interested parties. In particular, it will focus on the process of seeking research results that most of the time interested parties do not know when they will be communicated. This makes the entire retrieval method a very time consuming approach and most importantly not always a successful one. To this extent, the paper will propose a method of how interested parties can effectively and efficiently keep informed of up-to-date research work relevant to their enquiry and most importantly how to establish a homogeneous status of communicated research work. Although further work has been conducted, this is still based on a PhD research study conducted at De Montfort University. Its research outcome consists of a validated Soft Systems Methodology (SSM) based theoretical model for the achievement of the aim of how design research results can be more effectively and efficiently communicated between design researchers. Although the validated model aimed on the improvement of communication of design research work between interested parties, it was argued that the SYSTEM could also allow interested parties to communicate based on multiple research topics, i.e. design, computing, mathematics, physics and chemistry.

Preface

"Nik Bessis is a Lecturer in the Department of Computing and Information Systems at the University of Luton, UK. Dr Bessis leads the research activities in the department and currently teaches managing information, soft SYSTEMs methodology, information SYSTEMs analysis and development, decision support SYSTEMs and online database SYSTEMs. He holds a Ph.D. from De Montfort University, Leicester."

Introduction

Repeatedly searching the WWW for information on a particular topic of interest can be both time-consuming and frustrating. A set of technologies collectively referred to as 'Push', 'NetCasting', 'WebCasting' or 'PointCasting' [1] was introduced in April 1996. This set of technologies allowed the automation of the search and retrieval functions. Within a year of its emergence, Push technology gained considerable popularity. Its benefits were more than obvious; herewith some of them [2]:

- The subscriber always has the latest information
- Automatic downloading of software upgrades and fixes
- Only new and changed information is to be sent to the subscriber

However, there is no technology without its drawbacks. Based on a user-profile, a Push-based agent was able to automatically search a database or interact with other agents for specific information and deliver it to the subscriber [3]. One of the major disadvantages of Push as per 1998 was that Push channels were capable of either pushing content to subscribers without them searching for it or to inform them of changes within a particular site. To exemplify this, when someone chose to be kept informed on the weather forecast for a particular geographical location they would be satisfied. The vendor was pushing content relevant to weather forecasts at scheduled time intervals or when weather forecasts have been changed. This triggered the author to question as to what happens if someone interested to be kept informed of a particular value or, a set of keywords. For example, to be informed only "when" temperature in the particular geographical location of subscriber's interest reaches 5 degrees Celsius. This was considered as the main cause for the author to research and investigate whether the "when" dimension of Push technique could be feasibly developed and employed as a tool to enable a more efficient and effective communication of design research work to interested parties.

Outline of the Paper

The following lists the key points covered and stands as a guide to the structure of this paper:

- Brief presentation and description of the problems and conflicts with communicating design research work to interested parties via a Rich Picture
- Brief presentation of the theoretical position as the behind framework used to support an improved communication of design research work
- Description of the operational structure and the available technologies employed in developing and implementing such a prototype
- Brief presentation of the SYSTEM and the evaluation exercises results aimed to identify whether technolo-

gies employed support or contradict the theoretical position

Problems Encountered with Communicating Design Research Work

Bearing in mind that developments in communication and information technologies attempt to empower the communication process in terms of how information is exchanged and communicated, the question raised as to how effectively and efficiently on-line SYSTEMs used for the communication of design research in UK facilitate the communication of information. It was found that a number of them do not provide certain on-line facilities. Most of these SYSTEMs do not provide the ability to on-line contribute information neither the ability of users to communicate with each other (two way communication process for the purpose of feedback and criticism). On the contrary, mail based SYSTEMs allow two way communication, feedback and on-line information exchange however, the reliability and validity of their information content vary. They are more like a social communication tool for design researchers; not an actual communication SYSTEM supporting just refereed design research information content. To further justify the problems encountered with available SYSTEMs for communicating research, Soft Systems Methodology (SSM) employed as a general learning framework for problem identification prior to the application of problem solving techniques. Based on the SSM, a conceptual model was developed. Input from 87 design researchers via the form of a questionnaire was employed in order to rate the importance of available computer based sources as contributors to their research activity. Most SYSTEMs available in UK were examined. Results from this examination indicated that design researchers were dissatisfied with the use of all the examined SYSTEMs. Design researchers indicated problems with the structure, content, representation, classification, taxonomy, reliability/validity and update frequency of information. Others problems included the availability of communication and search options. It was therefore argued; that such a dissatisfaction with the use of all computer based sources needs to be removed and this added to the need for this research.

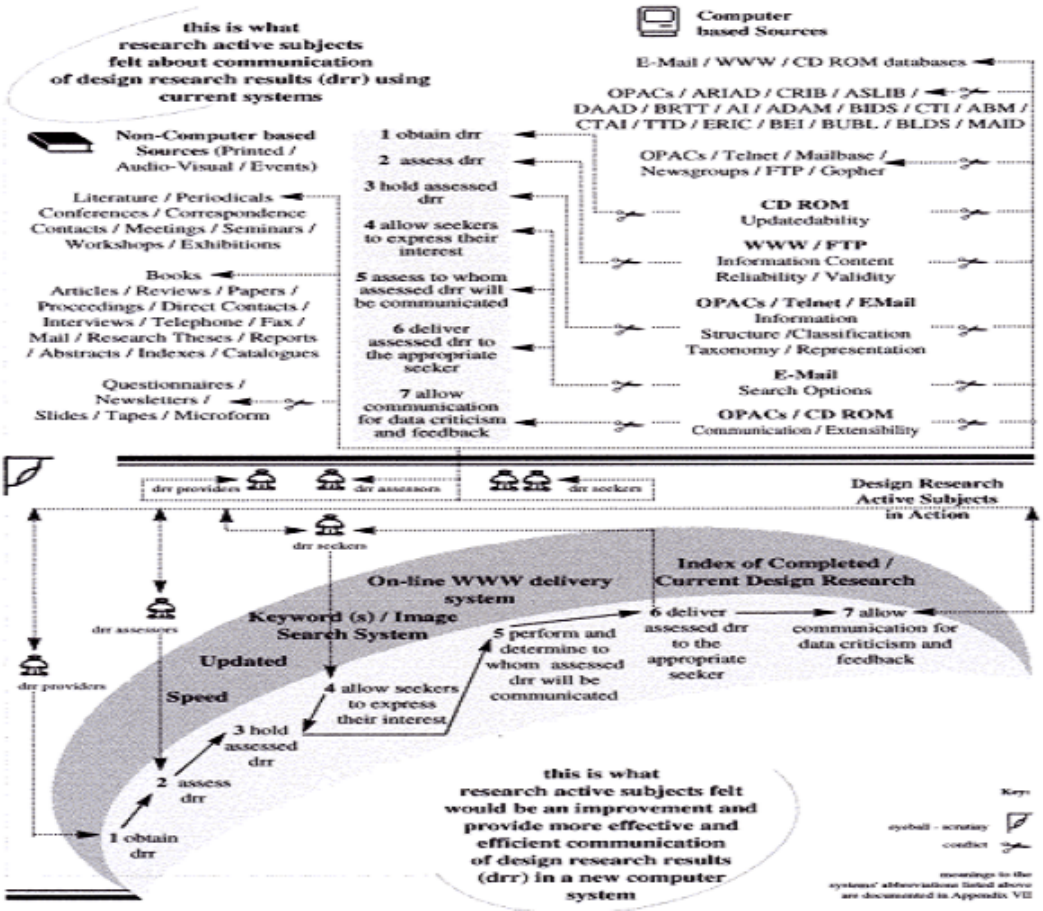


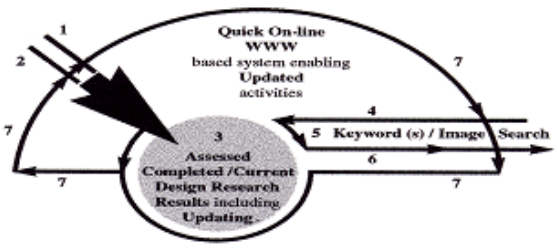
Fig. 1: A Rich Picture concerning the problems with communicating design research [4]

2.1 The Theoretical Position

Based on the SSM approach, a theoretical model concerned with how design research results can be more effectively and efficiently communicated between design researchers was:

'An on-line WWW based communication and information SYSTEM owned, managed and operated by design researchers in which, they should be able to act, react and/or interact, and communicate with each other their completed / current design research results with speed. In particular, a SYSTEM in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The SYSTEM should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search SYSTEM (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the SYSTEM should further allow design researchers to communicate on-line with each other in order to act, react and/or interact on-line to provide criticism and feedback on completed / current design research results' [4]

It is also argued, that the model produced is a generic one; and therefore, any real-world SYSTEM could use it as the behind framework for its deployment. Based on this, the model could be used for the communication of multiple research topics, i.e. art, design, architecture, engineering, computing, mathematics, physics and chemistry. An illustration of the model can be seen next [4]:



Key:

1. obtaining completed / current design research results from contributors / providers
2. assessing contributed completed / current design research results by assessors
3. holding assessed completed / current design research results in a storage system
4. allowing seekers to express their interest in relation to stored assessed and completed / current design research results
5. performing & determining to whom stored assessed completed / current design research results will communicated
6. delivering stored and assessed design research results to the appropriate seeker based on 4 and 5
7. allowing communication ability for design researchers either as contributors, assessors or seekers
to act, react and / or interact with each other based on activities 1. 2. 3. 4. 5. 6 and 7 for feedback & content criticism

Fig. 2: A Theoretical Model for an improved communication of design research [4]

The Operational Structure and the Technologies Involved

Based on the model presented above, a specification framework was developed in the form of an operational structure. As it can be seen in the following diagram, potential users of the SYSTEM can be contributors, potential reviewers, qualified reviewers, or seekers of information. The SYSTEM should support on-line engagement of all activities. Users willing to review others' research need to qualify first. They will need to submit their details via an on-line form. Applicants will need to state in their submission from the area of discipline they think they can undertake commitment as reviewers. It was proposed that a decision support SYSTEM would help assist the editors of the SYSTEM to decide whether they are qualifying applicants. Qualification will be based on experience, publication and referee history. Qualified referees will be kept informed of new research and then, they will decide whether research work will be made available on the SYSTEM. Contributors can submit their personal details and manuscripts via a form. These details will be kept in a temporary container and they will be pushed to appropriate and available qualified reviewers. Seekers of information can use the conventional retrieval method and search for their interest. Seekers who would like to be kept informed of updated information will need to fill the subscription to updates form. They will need to specify their e-mail address, a set of keywords that best describe their interest and finally the period in which they would like to be kept informed.

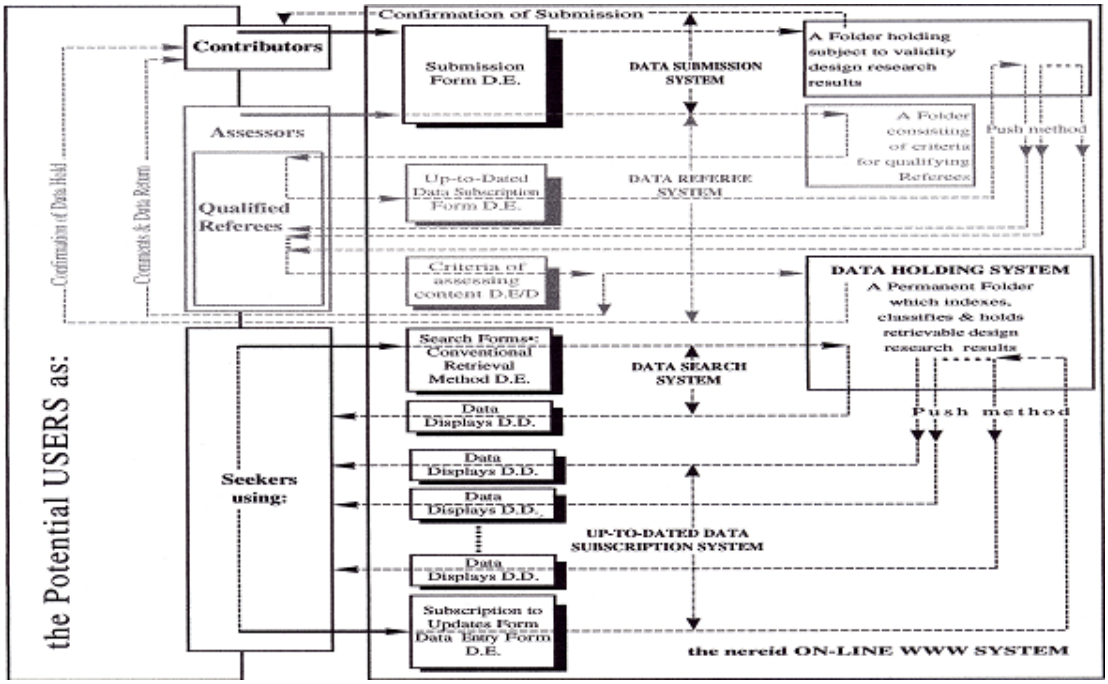


Fig. 3: The Operational Structure of the proposed SYSTEM [4]

Oracle, Sybase and mSQL were primarily considered for developing the database (a recent version of it can be seen at http://81.130.202.151:591/etd2003/ welcome.htm). However, the author had no access to these resources and therefore, a FileMaker Pro database on a G3 Apple Mac Server was developed. The combination of HTML and CDML was used to built the abilities of the contribution, store, search and retrieve completed/current design research results. CDML was also employed in order to enable users to communicate with each other via Eudora e-mail application. However, some other aspects were needed further attention in order to be implemented. In relation to the contribution of the full content of research work and audio-visual material, FTP was used. This technique, allowed contributors to drag and drop their file documents located on their computer desktop into the SYSTEM's prototype folders. In relation to the subscription to updates ability, technologies including CDF, Autonomy AgentWare, PointCast, and Castanet Marimba were considered. As experimentation proved that they were not capable for handling the identified need [4], a FileMaker tailored script was authored. This script allows users to subscribe to requested enquiries. The script allows users to be kept informed of new submissions that match subscribed search criteria via Eudora mailing SYSTEM for the specified time subscribed. In order to improve relevance of matches, a thesaurus was proposed. To come back with the example mentioned in the introduction section, the script allows subscribers to be informed only "when" temperature in the particular geographical location of subscriber's interest reaches 5 degrees Celsius. Part of the script follows:

```
scriptcheck
Enter Browse Mode []
Perform Script [Sub-scripts, external:
"imform.fp3"]
do search
.....
Perform Script [Sub-scripts, external:
"collect ids"]
collect ids
Enter Browse Mode []
if ["Status(CurrentFoundCount)0"]
Set Field ["g_alIlDs", "'*'"]
Go to Layout ["all fields"]
Else
Set Field ["g_alIlDs", "''"]
Go to record/Request/Page [First]
Loop
Set Field["g_alIlDs", "g_alIlDs & Record ID &
'¦'"]
Go to Record/Request/Paste [exit after last,
Next]
End Loop
End if
Copy [Select, "g_alIlDs"]
Perform Script [Sub-scripts, external:
"imform.fp3"]
Send email
```

In considering literature on the use of Push technology, one may observe of its limitation to cope with current bandwidth. For this SYSTEM it is proposed that a five-tier architecture should employed to alleviate problems relating to the available bandwidth. Diagram 4 illustrates this process.

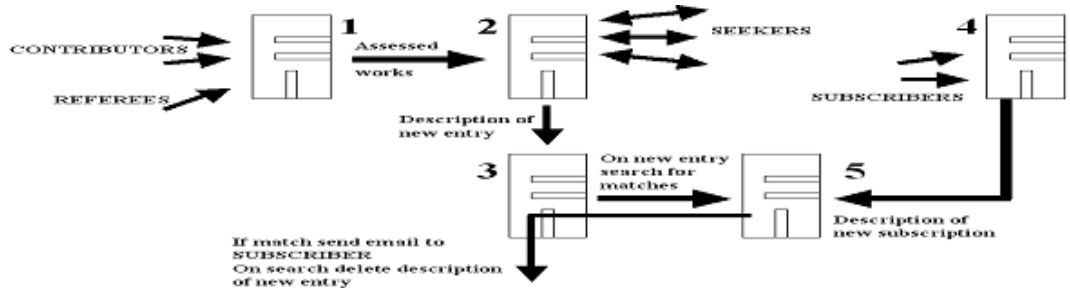


Fig. 4: The Architecture of the proposed SYSTEM

Once assessed work passes to the second tier, a file consisting the URL of the work and all possible subscriber form values will be created and passed to the third tier. At once, the tailored script will run and if there are matches with the fifth tier then, the third tier will fire the email notification. Regardless of whether there are matches or not, all files created in the third tier will be erased once the script runs. The fourth tier will collect subscriptions the same way, as contributors submit their work via the first tier. Once a subscriber submits his profile a file consisting the subscriber's keywords and his email address will be created and passed to the fifth tier.

The Evaluation Exercises

A series of formative and summative evaluation exercises (16 in total) with up to 30 participants was employed to assess whether the proposed SYSTEM is an improved method for communicating design research work. Participants of the exercises were asked to navigate the SYSTEM and to use the functions of search, communicate with others, subscribe to updates and contribute information. Based on this, participants were asked to rate amongst others, the degree of satisfaction, speed and accuracy with the way completed/current design research is communicated by using the prototype SYSTEM. In relation to the subscription to updates function, participants were very satisfied with the awareness, availability, accuracy, convenience and speed for been informed about subsequent reseach [4].

Conclusion

Overall, the results drawn from the evaluation exercises indicated that participants found the proposed model and its prototype SYSTEM taken as a whole as an improved, efficient and effective means of communicating design research work. By allowing interest parties to subscribe in the field of their interest and keep them informed of the latest information as they become available makes the whole field of the discipline informed at the same time. Some of the benefits include:

- Unvarying state of awareness about the latest work
- Work with the latest valid information
- Higher degree of competence
- Higher quality of subsequent work
- Observe and monitor latest activities
- Improved decision making
- Identify opportunities

However, there is no work without its drawbacks. One of them is the limitation of the set of technologies used. Currently, Oracle is considered as the real-world solution for the proposed SYSTEM. It is hoped that this version will utilise the leading vendor advantages and it will be sufficiently enough for the research communities involved. Based on Oracle Web Services high scalability, communication and interaction of applications over the Web regardless of platform, language, or data formats will be effectively and efficiently deployed [5]. The key ingredients of this set of technology include XML, SOAP, WSDL, and UDD. They can leverage existing J2EE technologies to build a complete and fully interoperable web service that complies with current XML standards [6]. However, it is still strongly recommended that multi-tier architecture and multicasting need to be deployed for communication between multiple research communities across the world. In this respect, core Grid technologies (Globus Toolkit) need to be considered as to enhance sharing of heterogeneous data across multiple research communities [7].

In conclusion, Push techniques have gone from hopeful to hopeless within the first two years of their emergence. They failed for a number of reasons including the well-known bandwidth problem. However, the aim of this paper was not to contradict or support known limitations with Push; but to put forward concepts of how Push could employed to help assist certain problems with communicating research. Five years ago, there was a question of what if 'I want to be informed "when" temperature will reach 5 degrees of Celsius in a particular geographical location of my interest'. Today, there are too many answering the question. There are others too also trying to solve the bandwidth problem. One for sure, this

also will be answered in the future. Meanwhile, the question raised is a threefold one: "Why, When, What". In other words, "why" someone is interested "when" 'temperature will reach 5 degrees of Celsius in the particular area of interest, "what" caused the value of 5 to happen, even more; "what" will be the effect of the 5 degrees of Celsius. It may seem too philosophical as a viewpoint but pro-activity as a term is of mutual interest for both Push technology and research activity.

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