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A FRAMEWORK FOR DEVELOPMENT OF A PUBLIC PARTICIPATION SYSTEM FOR URBAN REGENERATION: METHODOLOGICAL ISSUES

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ABSTRACT: This paper introduces work being carried out by the VULCAN (Virtual Urban Laboratory Computer Aided Networks) research project undertaken at the University of Salford in the UK. The project aims to develop a technical system to facilitate public participation in the urban planning process based on the Chapel Street re-development area of Salford. This will combine geographic information system (GIS) and virtual reality (VR) technology. The participation will also take the form of iterative, user-led design through a user-needs analysis.

This paper focuses on establishing an appropriate framework with robust methods capable of handling the complex, multi-disciplinary nature of this project and its problems. It is essential for the research to be grounded properly if reliable and valid conclusions are to be drawn. Discussion in this paper focuses upon the qualitative vs. quantitative debate and the appropriate methods for data collection and systems design that result from these two conceptual approaches.

Keywords – research methods, information systems development, qualitative analysis

1.   INTRODUCTION

The VULCAN (Virtual Urban Laboratory Computer Aided Networks) project at the University of Salford is focused upon the urban regeneration taking place in the areas surrounding the University and the application of new technologies to enhance this process for the various stakeholders involved. The overall aim is to "...design and deploy virtual and augmented reality technology for the construction of a model of the [Chapel Street] corridor that will engage local authorities, developers, community groups, individuals and professionals in a series of research projects to improve the transparency, quality, effectiveness and efficiency of the regeneration process" (Joyce et al. 2001).

This paper will focus on the research methodology issues related to this project. The history and development of epistemology - the theory of knowledge and how we acquire it - in psychology provides a clear illustration of the issues and problems faced by those wishing to undertake research in this and other social science disciplines. Hirschheim (1985) argues that these issues are valid and applicable to information systems (IS) research as the IS approach views such systems as social rather than technical in nature. He does concede however, that the scientific paradigm is "appropriate to information systems only insofar as it is appropriate for the social sciences".

1.1   The Research Question

The aim of the project is to develop an information system which uses VR and GIS technologies to facilitate public participation in urban planning and regeneration. The public is defined as any

stakeholders living or working in or with the local Chapel Street regeneration area and includes residents, business owners, local government, built environment professionals and researchers.

2.   THE SCOPE

The VULCAN research study will focus on two organisations, the VULCAN project team as a whole and the stakeholder groups involved in developing the system. The former is significant as it provides a secondary context in which the work will be completed, and already a number of factors have emerged which could hinder both progress and the success of the VULCAN sub-group.

2.1   Stakeholder identification

A very flexible approach will be taken with data collection being essentially ethnographic in nature, especially in the early stages. Using this approach the ethnographer "immerses himself in the life of people he studies" (Lewis 1985) and seeks to place the phenomena studied in its social and cultural context. This will allow the scope to remain wide, thus preventing exclusion of significant people and processes. Once the roles and relationships of the stakeholders have become more established, it will be easier and more suitable to define some boundaries. This result will come about by the application of Checkland's Soft Systems Methodology (Checkland and Scholes, 1990), most usefully the creation of 'rich pictures' which aim to simplify complex problem situations and stimulate discussion of the problems and to validate the pictures. This is the most suitable method for dealing with complex problems which have a strong human and organisational emphasis such as this one which has already shown itself to be messy politically. It would also seem appropriate given the multi-disciplinary nature of the project and its stakeholders: literature from psychology, sociology, planning and information technology (IT) will be used to establish a deeper understanding of the issues related to learning, organisations, communications and decision-making to name a few.

The ethnographic approach will be used continually for the duration of the PhD with greater detail being sought when necessary e.g. for requirements capture. This longitudinal work will highlight significant events which influence the project and their outcomes as they occur and it shall determine a change of direction or emphasis for data collection, should this be needed.

2.2   User requirements and system development

The development of the demonstrator system is an on-going and iterative process, driven by the stakeholders' data, technical and social requirements as they are collected and constantly re-evaluated. This flexibility has had to be built into the development design, as the exact identity and commitment of the stakeholders are still undefined. The application of an interpretive, user-led approach means that all functionality and data needs will be defined by the stakeholders and translated into 'hard' system functionality by the model builders. The social functions may be collected through collaborative work with sociologists. System data requirements and user functionality will be captured through in-depth sessions conducted with stakeholder focus groups. Data modelling techniques - entity-relationship and data flow diagrams - will be used in parallel as an additional aid in this requirements phase.

The requirements identified will form the criteria by which the system's functionality is subsequently measured. This evaluation will allow comments to be made to allow further development of continuing functionality shortfalls until most of the groups are satisfied.

3. METHODOLOGICAL ISSUES

This section looks at previous research, mainly from the field of psychology, on quantitative and qualitative research methods. The emphasis here is discussion of the applicability of research methods to development of an information system which itself will be used in the built environment. Amaratunga and Baldry (2001) discuss the methodological issues in greater depth – including the validity-reliability trade-off and data collection and analysis techniques – and evaluate them in direct relation to the built environment field. The advantages and disadvantages of qualitative and quantitative approaches are better demonstrated here however, by the discussion of two classic papers which utilise each technique to investigate user-led design.

3.1 The Empirical Method

Psychology's bid to become accepted as a science in the early 20th century drove its rejection of the subjective methods of the time, the use of introspection, or self-analysis of mental processes, applied by Wundt (1874) and others to understand the mechanisms of the mind. However, an element of measurement, of the stimulus and resulting thought processes, differentiated psychology from philosophy (Gross 1996).

The validity and usefulness of this method was questioned, particularly by behavioural psychologists such as Watson who believed that approaches that are more scientific should be utilised to obtain data which could be proved or disproved. The psychology that he advocated should concern itself with measurable and observable phenomena. According to Mach (1886), who was responsible for the rapid growth of empiricism, the only accurate description of the natural world is that which is experienced by one or more of the five senses. The re-emergence of positivism in the philosophy of science was 'logical' in its attempts to be coherent and free from internal contradiction and positivistic in its rejection of metaphysical explanations (Deese 1972). Positivism is described as an epistemology "which seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements" (Burrell and Morgan, 1979). This legacy continues today: Coolican (1999) argues that a majority of psychologists would agree that, at the very least, research should be "objective, controlled and checkable", with "reliable and valid" findings.

Whilst this approach has yielded many useful, interesting and surprising results, it does raise a number of questions.

3.2 Criticisms of the empirical method

Strictly controlled experiments held in laboratories are often criticised on their lack of applicability to the real world, as the environment and experiment itself can influence people to act in unrealistic and atypical ways. They are seen as an inappropriate way of investigating human behaviour which many feel cannot be reduced to numbers. Hirschheim (1985) argues that the way in which the activities of researchers are conceptualised is relevant: he suggests that researchers need to be seen as people who build rather than just use tools, otherwise knowledge acquisition techniques can be distorted. He uses the following proverb to illustrate this point: "For he who has but one tool, the hammer, the whole world looks like a nail". Deese (1972) goes further by arguing that there are implications for researchers and he uses quantification as an example which can limit useful thoughts, especially where the concept varies in type as well as or instead of amount, such as motivation. The nomothetic approach emphasises a search for generalisable laws which can lead to a tendency to generalise across different contexts. There is

an ethical dimension inherent in this which can have dangerous implications, especially if alternative explanations are not investigated. In his review of all the literature in the US examining intelligence and IQ scores, Jensen (1969) found that blacks scored an average 15 IQ points lower than whites and controversially concluded that this was due to genetic factors, a fact which had far-reaching implications for years afterwards.

The nomothetic nature of this paradigm not only provides a fixed snapshot of what is occurring at a given time, but it fails to show or explain what may occur outside of this measurement time. The ontology of positivism is aligned with one of realism whereby the universe is objectively given and its structures exist as empirical entities independent of the observer's appreciation of them. In looking for rules, it fails to consider an individual's experiences. Reason and Rowan (1981) argue, somewhat sweepingly, against 'quantophrenia': "There is too much measurement going on. Some things which are numerically precise are not true; and some things which are not numerical are true. Orthodox research produces results which are statistically significant but humanly insignificant; in human inquiry it is much better to be deeply interesting than accurately boring." This raises the question of what reality is. Whilst some objects in the environment can validly be described independent entities, if the subject matter is human behaviour then a relativist or epistemological ontology is more appropriate. This puts forward reality as a subjective construction of the mind which is transmitted socially but which varies between language and culture so what is subjectively experienced as an objective reality exists only in the observer's mind. Hirschheim (1985) supports this by arguing that "Knowledge is therefore not infallible but conditional; it is a societal convention and is relative to both time and place. Knowledge is a matter of societal (or group) acceptance".

The nature of the problem and the way that it is framed will be crucial when selecting the suitability of the research method. Galliers (1985) argues that making a distinction between data analysis and information analysis is useful: "Data analysis is a very useful tool for efficient database design. It is much less useful as a means of identifying information requirements (especially where these are "fuzzy" and unstructured), or in allowing different viewpoints to be taken into consideration. Too often based on an analysis of current situations, data analysis - in the extreme case - is a great way of encapsulating organizational ineffectiveness in the resultant database!" This is important as it will affect the validity and reliability of the results obtained and conclusions that are drawn.

The criticisms levied at empiricism and changes in the philosophy of research in sociology saw the increase in popularity of a paradigm attempting to understand *meanings*: hermeneutics had been supported/forwarded by Wilhelm Dilthey and others at the turn of the 20th century to try to preserve the autonomy of human sciences against natural sciences and argued that to do this: "behaviour cannot be objectified as things disconnected from human subjects; instead they are laden with values and must be understood in the context of their time and cultural setting" (Bem and Looren de Jong, 1977). Coolican (1999) argues that quantification, if possible, of an experience may not convey the impact of that experience, possibly in comparison with other experiences. Instead, the data type and collection techniques will be different: "Quantification means to measure on some numerical basis……Qualitative research, by contrast, emphases meanings, experiences (often verbally described), descriptions and so on……Qualitative data can later be quantified to some extent but a 'qualitative approach' tends to value the data as qualitative" (Coolican 1999).

This brings the focus back to an important question of 'what is science?' It is the authors' opinion that science does not necessarily imply empiricism, an opinion which will be supported by the following discussion of two classic papers. Rather, science is the use of the scientific method - the *appropriate* tools, conventions, techniques and approaches for the subject studied. Snyder (1978) argues that: "Science is something that people do. It is not a particular set of assertions or theories, but a set of activities that may or may not produce organized theories". Related to this, it is important to discuss method and methodology and their roles in research. Following Jayaratna's suggestion (1994), 'methodology' is taken here in this paper to mean 'the study of methods', as opposed to the commonly held misconception, in the IS field in particular, to mean the same as 'method'. Avison and Wood-Harper's definition (1990) is very appropriate here, devised as it is from Checkland's soft systems approach, as: "a coherent collection of concepts, beliefs, values and principles supported by resources to help problem-solving groups to perceive, generate, assess and carry out, in a non-random way, changes to an information situation". Jayaratna argues (1994) that this highlights two important issues for consideration, the structured or coherent aspect of the values that are implied and the problem-solving intention of the methods users. In contrast, Jayaratna (1994) argues that framework implies structure or integration of a set of models; in contrast, he argues that a methodology is differentiated by its time-dependent aspect or structure into stages for thinking or action.

3.3 The use of methods in Information Systems development

There has been a parallel shift of a similar nature in information systems and the methods for their development, which is reflected by the philosophical changes described above. The movement has been away from the computer as a computational device, automating repetitive processes, to the development of information systems as intelligent, decision- and collaboration-support tools.

Despite their promotion, Hidding (1997) found methodologies (his words) to be used by only a third of practitioners. This non-adoption is thought to be due to the inadequacy of most methods for modelling major aspects of complex systems (Floyd 1986, cited in Kautz et al 1999) and practitioners' perceptions that they are complex in nature and lacking in advantages. There is often a gap between the developers understanding and the adopters perception of them, so they are oversold or poorly communicated (Raghavn and Chand, 1989). Underwood (1999) supports this view by arguing that problematic aspects inherent in the theories themselves, rather than a more general failure to follow them, could be the cause of end-user dissatisfaction and then practitioner failure to then use them. He argues that Actor-Network Theory (ANT) may be a solution, as it allows consideration of technical and political circumstance within the organisation. This is in contrast to the approach to problem-solving which the RAND Corporation popularised in the 1950s. Empirical in its methods, it advocated prescriptive and scientific methods following the stages of problem definition, solution search, selection of the best alternative, implementation and evaluation. In their own words: "Across a broad range of subjects, RAND research is characterized by its independence, objectivity, and nonpartisanship; its empirical foundation; its high quality, scientific rigor, and interdisciplinary approach; and its dedication to improving policymaking on the major issues of the day" (Rand Corporation). Examples of the research conducted highlights this *scientific* nature and include development of theories and tools for decision-making under uncertainty and contributions to game theory, linear

and dynamic programming, mathematical modeling and simulation, network theory, and cost analysis.

Underwood (1999) concludes that a combination of ANT and discourse theory proved itself to be a powerful interpretive tool in the case study he provides, but that its success was dependent upon a number of factors.

3.4 Research exemplars

Two classic papers reflect these disparate philosophical issues and illustrate two different approaches that can be taken to systems development, and more specifically in this case, user involvement in the design process.

Olson and Ives's (1981) paper 'User involvement in system design...' investigates the assumption that user involvement leads to successful implementation. Two types of involvement are isolated 'mechanisms for implementing user involvement' and activities allowing involvement at various stages of the development lifecycle. The main objective was to re-examine the relationship between user involvement and two types of user attitude - user information satisfaction and satisfaction with the IS group - and to isolate types of involvement and the stages at which that involvement is most critical to ensure IS success. A cross-sectional design was applied to the independent variables (information dissatisfaction, IS function quality, user involvement perceptions, IS manager perceptions of user involvement) and dependent variable of success/involvement. Data was collected by on-site interviews and questionnaires. It was found that the only significant correlations were found between IS function quality and information dissatisfaction (negatively) and IS manager report (positively). This means that if users were dissatisfied with the system, they were less likely to rate the IS function positively: Also, the greater the manager's report of user involvement, the more positively the IS function would be rated. These correlations do not illustrate that these findings are causal in nature.

The most important conclusion was that there was almost no support shown by the findings here that involvement is related to greater user satisfaction. Olson and Ives argue (1981) that this may be due to an emphasis upon the overall picture as opposed to specific systems in detail, but they also concede that this may be due to the validity of the involvement measuring tool which could be improved by be related to actual behaviour, which would also make it more objective. They also suggest use of a process-oriented view which would help explain the lack of results, or a longitudinal approach which would allow firmer and causal relationships to be established. Additionally, they suggest that managerial competence and user motivation, unmeasured variables, may have confounded the results.

In contrast, Franz and Robey's (1984) paper "An investigation of user-led system design…." is an intensive case study running over a 2-year period. This highly cited paper became influential for highlighting that systems failure could be due to organisational politics rather than the engineering of the systems. The two overall objectives were to collect various types of evidence to produce a description of the process, and to establish the subjective interpretations from the actors about the events. From these it was expected that a number of dominant themes would emerge.

The development process was broken down into 3 phases, determined after data collection: enhancements of the old system, development of user functional specifications and design of programme modules, system logic and database. For each, details are provided in the article as to what each person did, the documents required and created in the process, the people they

worked with and the outcomes of these interactions. Two themes emerged for each stage, that the data collected could be interpreted from both a rational and a political perspective. This distinction proved useful as the former emphasised the objective actions taken to provide the deliverables and the latter the individuals' subjective interests and strategies to maintain these. They cite Boland and Pondy's argument (1983) that "rational and "natural" myths co-exist in organizations and that significant insights can be gained by understanding the interplay between them". Franz and Robey support this by arguing that political actions do not occur in a vacuum and it is often the case that rational elements can often be used to preserve political interests and not the other way around. They conclude that one of the major implications for managing system development is the continued use of more structured methods for whilst they are part of the lore of system development, they continue to be of use in determining rational outcomes, although the authors are clearly more in favour of non-structured methods.

Franz and Robey argue that longitudinal data collection has the advantage of improved measurement validity as data are collected as they occur and over a longer period of time, and this allows the constructs of "user involvement" and "system success" to be separated. This can provide alternative interpretations of events. Retrospective studies can become prey to both these factors: High correlations between involvement and system success would be expected given the tendency to attribute success to oneself and failure to others (Weiner 1974) and facts and opinions may become biased or forgotten due to post implementation outcomes.

The Olson and Ives study applied the commonly held belief at the time that for research to be pertinent, it should be empirical in nature, but they have demonstrated how crucial it is that the psychometric tools and designs applied are both valid and reliable, which they are not here. By its own admission, the study aims to obtain empirical evidence, but later concedes that a process-oriented view, more idiographic in nature, would have helped to yield a greater understanding of what was occurring. The method also prevents investigation of one of the major aims, to consider the types of involvement at the various stages in the process and establish the most critical actions for success. This could have been achieved by merely noting when and with whom involvement occurred, but little more is said. In the author's opinion, an ethnographic approach would have placed more emphasis on the occurrence of this and allowed for its significance to be examined more closely.

The total number of users involved is sufficient at 83, but drawing conclusions from observations made by maybe as few as 3 individuals per company is not when the evidence is empirical. In the article's abstract it is clearly stated that the user involvement-successful implementation relationship is rarely found when system usage and user information satisfaction - the variables used here - are used as indicators of such satisfaction. The authors conclude that this must be due to the greater complexity of the involvement concept, but knowing this from the literature review, one would think that a more appropriate and detailed method would be applied in the investigation. Linked in with this, whilst the high inter-rater reliability shows that the four variables are at least distinct from one another, it does not show whether the constructs being measured are actually the constructs named.

For the results to be of interest, the correct analysis method should also be applied. In Olson and Ives's study, a causal relationship cannot be ascertained by a correlation, but also potentially confounding variables have not been measured for valid, post-hoc partialing out. Correlation coefficients are used to investigate the strength of linear relationships, but the information satisfaction scale would in fact create a bell-shaped, non-linear relationship with user

involvement. Therefore, failure to find a strong correlation does not mean that a significant relationship between the variables does not exist. Application of Guthrie's tool is also problematic as the scores obtainable are arbitrary and prevent objective comparisons, which is important as the data is taken from 23 unrelated sources (companies).

4.   DISCUSSION

Lundeberg et al (1981) argue that: "Information systems have value only if they contribute to improve the situation for people in the organization. They have no value of their own. It is therefore not enough that we study the contents of the information systems so that we can form an opinion about their values. We must instead study the activities that people perform in the organization and that somehow should be improved". It is the intention of the VULCAN researchers that the VR-GIS system being developed will improve the situation for the people in the organisation (the Chapel Street corridor) by facilitating participation in the improvement process. It will only be through in-depth investigation with the stakeholders that their relationships with and values related to this organisation can be determined. This will form the content of the information system and ultimately determine its value. Without this contextually derived information, the system will be useless for the purpose of participation.

To tie this in with the philosophical issues discussed earlier, the resulting design will have more ecological or real world validity than one where the designers stipulate the functionality from previous research. This is because:

- The users will be asked about issues they are familiar with and not 'what-if' hypotheses which may be beyond their experiences or expectations (particularly relevant for the residents);
- The users have a level of knowledge and understanding of the specific issues under consideration that the researchers could not possibly ever expect to have, whether related to crime, local history, social problems, planning restrictions;
- Furthermore, this knowledge is specific to the target area rather than generalisable from previous research.

The evaluation of the system will also be valid and reliable as use of the user criteria for analysis will help evaluate the system within the context for which it is designed to be used. These criteria will have face validity to those performing the evaluation, an ability to understand the purpose and relevance of the questioning, which will reduce the likelihood of participants responding in unhelpful and arbitrary manners, which can invalidate findings. It is this appropriate application of rigour that makes the research scientific in nature, if Rogers' (1961) description of 'scientific research' is taken to be accurate: "Scientific research needs to be seen for what it truly is; a way of preventing me from deceiving myself in regard to my creatively formed subjective hunches which have developed out of the relationship between me and my material".

An open and ethnographic approach is of particular use here as the system design is occurring in a partially post-hoc way, if consideration is made that some of the system development work has already started. More importantly though, attempting to implement a system which will have to overcome problems inherent in both the VULCAN and Chapel Street organisations and a great number of stakeholder-users in both, requires an approach which is specifically designed work through such multi-disciplinary problems, namely Checkland's Soft Systems Methodology and

other similar techniques. These have the advantage of focusing the researcher on the context-specific problems whilst allowing the more generic issues applicable to other case studies and systems development to be considered.

It is the authors' opinion that this work is unusual in that it has applied the rigour and discussion of research methods as used in psychology to a system to be used with construction professionals. This demonstrates the wider implications for such research methods to a number of academic or professional fields beyond IS and the validity of the issues discussed. It is the intention that as the project develops, other psychological research will be referred to enhance understanding of the organisations under consideration, the technology itself and the interfaces between the two.

5.　　RESULTS SO FAR

There are few results relevant to this aspect of the project to report to date. However, whilst initial meetings with the regeneration office were not as positive as had been hoped, the reaction from the first residents meeting attended was encouraging, the residents feedback in particular. This meeting was useful as it provided a flavour of the type of grievances and issues the residents have in relation to their neighbourhood.

Other meetings, held within the university, have focused upon the creation of an integrated work plan for those involved in the development of the VR-GIS system and to report on progress made by members of the wider VULCAN group. These have highlighted a number of organisational and political problems which have subsequently shaped the collaborative work plan.

6.　　CONCLUSION

This paper has briefly introduced the VULCAN project and addressed the methodological issues involved with carrying out information system research by looking at two papers which are concerned with the same aspect of systems development, but apply two very different approaches to evaluate the concept. The overall conclusion from this is that it is no longer necessary nor sufficient to utilise an empirical approach for research to be reliable and valid. This is especially true when the situation under consideration is complex, for multi-disciplinary, political, organisational or other reasons. However, it is not true either that qualitative methods are less rigorous or 'scientific'. These arguments provide strong support for the ethnographic research framework proposed for the VULCAN VR-GIS project.

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