**WEBFRAME: A FRAMEWORK
FOR INFORMING WEB DEVELOPERS'
METHODOLOGY SELECTION**

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Abstract

This research explores web information systems developers' choices and use of methodologies. The stated aim of the research is to seek to identify key features of the developers' requirements for methodologies and then from this, to design a framework for use in practice. The literature review reveals that a great many methodologies are available but recent research also suggests that these are poorly used in practice. This study explores whether or not this is so and if so, why. Using an interpretevist epistemological framework the principles of Grounded Theory Methodology are used to conduct a mixed methods investigation. Structuration Theory offers a theoretical framework for analysis and development of the theory. An initial web-based survey aims to capture a breadth of developers' views and experiences. This is then followed with semi-structured interviews which enables exploration of the area in depth. The findings suggest that web information system developers are not following a published methodology but prefer instead to develop their own 'bespoke' approach to suit the project. The developers seem to be aware of, and are using, traditional information system tools and importing them as appropriate into the web development methodologies. They are however, less aware or concerned with published web methodologies apparently needing greater flexibility and choice for developing web information systems than the published methodologies offer. Thus, the proposed new framework (entitled WEBFRAME) aims to provide web developers with a set of key principles to facilitate development of web information system development methodologies. This proposed framework is evaluated and validated by an expert panel of web developers with findings from this evaluation and validation reported here.

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Contents

Chapter One

Rationale for the thesis

1. Introduction

This research originated in both my personal practice in web information systems development (WISD) and also my academic work as a university lecturer. In both arenas I have become increasingly frustrated at the lack of guidance available for developing web based information systems in a structured organised way. In University, students were devising web based help desks, e-commerce systems, generic e-commerce system generators, web based 'CRM' systems and hundreds of other web based information systems, but repeatedly, they were confused by the plethora of approaches recommended for web development. Having worked as an Information Technology manager, systems capacity planner, disaster recovery specialist and in various software development houses, I was aware of the need for organisation; also, of the importance of commonality of approach, coordination of nomenclatures and techniques and the importance of communication in solving Information Technology (IT) related problems. This is what I taught to my students. However, I watched the students struggling to apply the principles of organisation and structure taught to them when developing traditional information systems (IS), to web information systems methodology development. Additionally and perhaps unsurprisingly, I felt immense frustration at the lack of structure and published guidance available.

Certainly, cgi and shell scripting allowed data to be published on request making the web more personal and responsive to the users needs. In addition web forms, 'put and get' statements in PHP, ASP and JSP allowed myself and my students to develop interactive systems, not only disseminating information but also collecting and collating and storing it in relational databases and together we waited for industry (in collaboration with academia) to develop appropriate WISD methodologies.

A **software development methodology** is defined here as a framework for the structure and control of the process of developing an information system.

A **method/tool/technique** is defined here as a set of steps used to perform a task within the chosen methodology.

I looked forward to educating my students in the logic of the chosen approach, to guiding them through the pitfalls of WISD from within the structure of a recognised, widely adopted, industry relevant 'Web Information Systems Development Methodology'.

Earlier, my masters' degree course had allowed me to investigate the area of prototyping and its user centred systems development approach by conducting an investigation into the extent that IS developers had adopted the approach. My research had revealed the confusion that existed in development approaches but also illustrated the responsiveness of developers to taking up new techniques. Later, this developed into a personal interest in James Martin's Rapid Application Development methodology (RAD) (Martin, 1991) and the freedom this approach offered developers to produce 'bespoke' responses. Yet, alongside such innovation the general structure and guidance for web systems development appeared to be lacking.

Students and workers from other disciplines appeared to see the power of the web and rapidly became able to participate in the development of web applications. However, without formal training the old problems of IT development (Avison & Fitzgerald, 2003) raised their heads in this arena. Standards and techniques were not being applied and new techniques were used often without the benefit of years of problem solving in the traditional sense (Avison & Fitzgerald, 2006). I concluded that the industry was in danger of reinventing the software crisis. Indeed, even the terminology being used, sometimes synonymously and sometimes to indicate differences – 'Web based information systems development' or simply, 'web-based systems development' offered potential confusion.

For this thesis then in order to situate web systems in its parent discipline of information systems (IS) and to provide clarity, the terms 'web information systems' (WIS) and web information systems development' (WISD) will be used.

Recognising the apparent confusion in the area I decided that if industry and academia were not able to provide guidance in WISD this must be an area that needed researching into. However, I did not want to create yet another academic WISD methodology. Rather, I wanted to see why a "champion" had not come forward. Indeed, several questions were unanswered for me. Academics were promoting their

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(often disparate) WISD methodologies (eg RMM (Isaowitz & Balasubramian, 1985) WebML (Ceri *et al.,* 2000), WISDM (De Troyer & Leune, 2001) OOHDM (Schwabe *et al.*, 1996) and yet it was not clear why the industry was apparently not universally adopting a particular one. Indeed, many development houses seemed (anecdotally) to prefer to create in-house approaches (Barry & Lang, 2001). Was this because the academic solutions were not known outside the academic world? Or, perhaps they were not seen as relevant? Were different organisations actually doing the same thing without realising it? Similarly, were the methodologies being developed in academia being replicated in various organisations? Or perhaps, the problem was one of communication.

I hoped that by investigating some of these questions, it might become apparent as to why no "champion" methodology had come forward and thus, a response might be found to enable students, academics and developers to select or develop their own route through the maze of WISD methodologies, tools and techniques. Such questions and practical issues led to my research problem, expressed as follows:

1.2 Research problem
Where best to find structured web information systems development methodologies – if they in fact exist?

1.3 Research Underpinnings
Arguably, the most important decision when embarking upon a research study is to choose an approach which facilitates exploration of the research issues and questions. It was clear that the study necessitated investigation and interpretation of human action. Therefore, a positivist, realist epistemology which advocates the "primacy of the external world rather than the actor's interpretation of it" (Payne & Payne 2004 p172) would seem inappropriate. Rather, an interpretevist approach which argues for the "uniqueness of human inquiry" (Schwandt 1998 p223) appears to be more useful. (This discussion is considered in more detail in Chapter two.)

Within such a broad epistemology, in one sense it could be argued that an approach broadly based on Action Research formed the basis of the study in that the research question and problem arose from practice with an answer needing to be found. Further, Action Research is research which, "identifying a social problem is primarily

designed to provide an empirical test of a possible solution (Payne & Payne, 2004 p9). However, in Action Research the emphasis is largely upon the solution; it is not an equal partnership between research and intervention (Sapsford & Abbott, 1992). Certainly, this project aims to investigate whether or not it is possible to identify a theoretical framework for use by developers of WIS in the selection of appropriate methodologies, but the emphasis is not on the development and testing of a solution. Rather, it investigates the development of WIS methodologies from the perspective of academics writing about it and also from the perspective of those using them in their work everyday. It explores whether or not web system developers are actually following the same methodologies that are written about in the academic press, but perhaps are not discussed in work environments, without being aware of this. Or, whether academics and practitioners are actually developing totally disparate methodologies; in which case, questions are necessarily raised concerning what – and how – to best guide students who may well be the practitioners of tomorrow.

1.4 Research Questions

Thus, the research questions for the thesis are as follows:

1. How far are web developers following a recognised web information system development methodology?

2. How far is it possible to develop a framework to assist web-designers' adoption of appropriate web information systems development methodologies?

3. How far might this be acceptable to web information systems methodologists in practice?

1.5 Research Framework

As stated above, though the research originated in personal practice it also aims to develop a framework - or 'theory' of the development of WIS methodologies through exploration of issues and decisions made by practitioners in conjunction with the academic position argued in the literature. As such, the research approach is located securely within a Grounded Theory methodology. As Strauss and Corbin (in Denzin & Lincoln, 1998) state "Grounded Theory is a general methodology for developing theory that is grounded in data systematically gathered and analysed" (p.158). It is

also a methodology that is being advocated increasingly, for qualitative investigations of social phenomena in IS research (Hansen and Kautz, 2005).

It is widely believed that Grounded Theory derives its roots from Symbolic Interactionism (Mead, 1934). The notions that individuals are self-aware and that inter-subjectivity influences behaviours, are then central. Symbolic Interactionism asserts that social interactions are meaningful and these shared meanings are influential in social systems and society generally.

Stemming from the work of Mead, Glaser and Strauss' (1967) initial work was initiated as a challenge to the assumption that the purpose of social research is to uncover pre-existing and universal explanations of social behaviour. They proposed Grounded Theory as a practical method for conducting research that focuses on the interpretive processes by analysing the "actual production of meanings and concepts used by social actors in real settings" (Gephart, 2004, p 457). They further argued that new theory could be developed by "…paying attention to the contrast between the daily realities (what is actually going on) of substantive areas" (i.e. features of daily life for which there is a theoretical underpinning and a practical lived experience) (Glaser and Strauss, 1967, p239) and the interpretations of those daily realities by those engaged in them.

This initial 1967 publication is generally regarded as the 'classic' account of the method though later disagreement between the two researchers led to Glaser following one path which emphasised creativity and openness to unanticipated interpretations of the data, and Strauss teaming up with Juliet Corbin, to advocate more prescriptive analytical procedures, though they always warned against a mechanical application of the method (Straus & Corbin, 1990).

The two key concepts of Grounded Theory initially advocated by Glaser and Strauss (1967) as being central to Grounded Theory were "Constant Comparison" wherein data are collected and analysed simultaneously, and "theoretical (or purposive) sampling" in which choices about the data to be collected and the research sample are determined by the theory that is being constructed.

This study utilises both quantitative and qualitative research tools (survey and subsequent semi-structured interview) to gather the data from 'the ground' and through the processes of constant comparison and theoretical/purposive sampling in combination with the academic position presented in the literature, the theory gradually emerges. This then acknowledges that Grounded Theory does not demand 'inductive' research alone. As Glaser and Strauss (1967) commented "It is more desirable and usually necessary to start the Grounded Theory from a substantive theory. The theory not only provides a stimulus to a good idea but it also later gives initial direction to developing relevant categories and properties…indeed, it is difficult to find a grounded formal theory that was not in some way stimulated by a substantive theory" (Glaser & Strauss, 1967 p79).

As Pandit (1996 p1) cautions "It is from conceptualisation of data, not the actual data *per se*, that theory is developed". And Strauss and Corbin (1998 p 167) remind us of the "…unquestionable fact (and advantage) that trained researchers are theoretically sensitized"

1.6 Theoretical framework

Though it is readily acknowledged that this study has a practical application, not least in my personal professional lecturing role, it is also argued that given that this study is submitted for a higher degree a theoretical framework for contextualising the results is both necessary and – to quote Strauss and Corbin (1998) – "an advantage". The overarching substantive theory for this study is Structuration Theory (Giddens, 1984) as this facilitates exploration of human agency and social structure, together with the synthesis of the two elements, for web-based information systems design. Arguably, the relationship between agency and structure is among the most pervasive and difficult issues in social theory. It is highly pertinent to the study of WISD methodologies as elements of both must necessarily be taken account of for successful system implementation. Specifically, the individual designer must interact with, and work within, the demands of the structure, yet his/her individual agency and action are fundamental to successful operations. Analyses of how the actions of individual agents are related to structural features are complicated and complex yet, theorising must not be undertaken for its own sake, but rather, to contribute to an increase in effective practice. To date, there has been little attempt to 'operationalise'

Structuration Theory within IS research. Rose (2001) argued that within an applied field – such as IS and by implication, web development – "it should be taken as axiomatic that useful theory should lead to improvements in the capacity for effective action." Accordingly, this research will review the theory in a context of its application to practice, though as discussed in Chapter 4, this is not the common-place application of Structuration Theory.

As noted above, WISD is located within the broader field of IS, which is itself an applied field and thus, the use of Structuration Theory within this research must necessarily contribute to increased effective practice such that theory aids understanding of the important features of WISD within IS. Thus, a pertinent framework for exploration is vital. This is offered by Structuration Theory. Structuration Theory has been utilised in other IS research, most notably by Orlikowski (eg. 1991, 1992, 2000) and Walsham (eg. 1991, 1993, 1995). Both these researchers recognised its potential for exploring the important role that social theory has to play in understanding societal, organisational and personal features of IS since without the impact of social theory, arguably the technological elements are devoid of context.

1.6.1 Dualism: Structure and Agency

In his exposition of Structuration Theory Giddens (1984) noted the dualism between structure and agency. He argued that until his theory these two key forces had necessitated consideration singularly. In contrast, Structuration Theory offers a way of conceptualising the two symbiotically. He proposed an understanding of structure as that which gives form and shape to social life, but it is not itself the form and shape. That is, structure exists only in and through the activities of human agents (Giddens 1989, p256). For this study, structure is identified as that which gives form and shape to the WISD – that is the web-developer's home context or organisation and also the WIS being utilised and implemented. The rationale for such interpretation is that both embody form and shape to which the individual agent must respond.

Similarly, Giddens viewed agency not as something just located 'within' the individual. That is he asserted that it does not refer to people's intentions in doing things but rather to the 'flow' or 'pattern' of people's actions. Necessarily, such

patterns depend upon social structures and the individuals' actions therein. Giddens emphasized that 'action, which has strongly routinized aspects, is both conditioned by existing cultural structures and also creates and recreates those structures through the enactment process' (Walsham 1993, p34). He suggests that while structural properties of societies, organisations and social systems are real, they have no physical existence. Rather, they depend upon patterns of social practices ordered across space and time (Giddens 1984, p2).

For this study, then, agency is asserted to be the patterns and flow of the individual as s/he actions WISD. These patterns are necessarily contextualised within the social structure of wider society, of the IS community and of WISD and as such, they are dependent upon it. Additionally, such patterns of action then necessarily become features of the WISD and are further enacted in the recreation of their implementation for that web-designer and for WISD more generally.

For this study Structuration Theory enables discussion of the individual web-developer's choice of methodology both in terms of the context of the structure and functional demands of the social structure/organisation and the methodology. It also facilitates investigation of the individual human agency involved and the synthesis of the two elements in WISD. As WISD is a dynamic enterprise involving human, organisational and technological interface, exploration of all these factors, together with their synthesis is central. Structuration Theory facilitates such exploration.

To date, no research has been found which explores WIS methodology adoption using a theoretical framework of Structuration Theory. The application to this project will be further discussed in Chapter 4.

1.7 Thesis aims and objectives
The thesis aim and objectives are given as follows:

Aim:

To identify web developers' current methodologies (both personal or published) to inform the development and validation of a framework for developing a web information systems development methodology.

In order to achieve this aim seven objectives have been identified. They are as follows:

1. To investigate the status of WISD methodologies evidenced in the academic literature.
2. To explore the current status of WISD based on data collected from web developers.
3. To compare and contrast the literature on WIS and traditional IS in order to determine the differences between methodology, methods, tools and techniques used in the development of each type of system
4. To determine whether or not WIS developers who claim not to be following a methodology are actually doing so without being cognisant of the fact.
5. To design a framework based in research findings and framed within Structuration Theory, to inform the choice of WISD methodology
6. To validate the framework.
7. To evaluate the research project.

1.8 Structure of the thesis

Chapter 2 outlines the research design for this thesis. It discusses the philosophical underpinnings to the research and presents the rationale for the choice of approach used in this study. A discussion of the methodology adopted – Grounded Theory - together with a brief introduction to the research tool and data analysis is given.

Chapter 3 discusses IS development methodologies which then provide a context for a later discussion of WIS development methodologies. The Chapter discusses the fact that WIS methodology development parallels IS development. It continues on to explore and detail current tools and techniques used and culminates in a discussion of the current status of WIS methodology development. Chapter 4 outlines Structuration Theory and its application to this study giving the rationale for its adoption as a theoretical framework for this research. The Chapter also details how Structuration Theory was used to inform the development of the research tools. Chapter 5 details the development of the research tool/method. It presents the rationale for, and implications of, internet research. Following this the internet survey is discussed and located within a context of the methodology. The research population is outlined and

the difficulties and challenges of the research method are presented. The results of the pilot study are discussed, together with the ensuing re-designed research tool, accompanied by the rationale for this. This Chapter also presents the second re-design and implementation of the research tool together with the analysis of results from all the Internet survey research contextualised in Structuration Theory. Chapter 6 outlines the Interview. The rationale for the use of interview as a research tool is presented, together with its location within the methodology. The research population is outlined together with the interview procedure. The chapter concludes with an analysis of the interview data set within a context of Structuration Theory. Chapter 7 proposes a framework for future working practice in WISD methodology based on the results of the research in this study. The proposed framework – entitled *Webframe* – is an original approach to WISD methodology based in a context of Structuration Theory. It aims to address the demands and requirements expected by WIS developers. Chapter 8 presents a review panel for validation of the framework, discussing construction of the interview questions together with the analysis of the findings of their responses. Chapter 9 presents a summary of the research and a reflection on it. The Chapter also states the thesis' contribution to knowledge and suggests possible strategies for future work based on this study.

The structure of the thesis, focus and content of each chapter is summarised in the table below:

Chap	Focus	Content
1	Introduction	Rationale for and background to the thesis
2	Research Approach	Philosophical underpinnings to research. Choice of research approach
3	IS & WIS development	IS development and WIS development discussed and compared.
4	Structuration Theory	Outline of Structuration Theory. Structuration Theory applied to WIS development methodology
5	Development of the research tool – survey	Internet survey. Results from pilot study. Redesigned survey and results. Second redesign of Internet survey and results.
6	Development of the research tool- interview	Interview questions. Analysis using Grounded Theory coding. Data analysed in a context of Structuration Theory.
7	Proposed framework	Development of framework in a context of Structuration Theory
8	Validation of proposed framework	Validation of the framework

9	Summary of research	Summary of and reflection on research. The thesis' contribution to knowledge. Suggestions for future work

Table 1.1 structure of the thesis

1.9 Ethical Considerations and Code of Conduct

The term 'Ethics' refers to rules of conduct and conformity to a code or set of principles (Reynolds, 1979). The thesis is located within IS and as such necessarily conforms to the code of conduct guidelines of the home professional body of British Computer Society (BCS). Additionally, ethical approval was sought and obtained from the Faculty of Computing, Staffordshire University prior to commencement of the research. According to the Faculty Ethical regulations there are three aspects that need to be considered: i) respect for participants, ii) conforming to good scientific practice, iii) contributing to knowledge. Addressing all these factors the major categories to be considered together with an explanation of their application to the current study are detailed below:

1.9.1 Respect for Participants

Consent: Wherever possible, *informed consent* of participants should be obtained prior to commencement of the study. For the internet survey clear information regarding the study was presented before the survey. (Details of this are given in chapter 4.) Submission of the survey denoted participants' consent to participate. For the interview all participants were given an information sheet and asked to sign a consent form to state that they understood the purpose of the study and agreed to participate. Specific consent was obtained for the use of tape-recording participants' responses. The researcher's contact telephone number was provided. No payment was offered or made to any of the participants. All participants were informed that they were under no obligation to take part in the study and that they were able to withdraw at any point. With the internet survey this was made possible by pressing the quit button.

Deception: This issue relates to the withholding of information concerning the study, both in terms of general information and that concerning its purpose from participants. For the current study information regarding the study was given at the beginning of the internet survey prior to any questions being asked. Prior to interviewing for the current study all participants were provided with an information sheet detailing the background and purpose of the study. The purpose of the study was stated and no deception was attempted on the part of the researcher. It is not possible to comment on whether or not the participants deceived the researcher.

Withdrawal: As previously stated, participants were advised that withdrawal from the study at any point was legitimate. Additionally, participants were also informed that they had a right to withdraw retrospectively any consent given, and to require that their own data, including recordings be destroyed. For the internet survey similar procedures were in place (this is detailed in Chapter 5.)

Debriefing: In the internet survey participants were thanked at the end and informed that if they required any further information they were able to contact the researcher. Participants were debriefed fully after the interview. They were thanked for their contributions to the research and informed that they were able to see and read the research project on its completion. As stated above, participants were also in possession of the researcher's name and contact number and were invited to contact the researcher if they had any questions following participation in the study.

Confidentiality: Subject to the requirements of legislation, including the Data Protection Act, information obtained about a participant during an investigation is confidential unless otherwise agreed in advance. Participants were informed that data they provided would be used only for the research study and if published, would not be identifiable as theirs. Interviews were stored securely with computer records of the survey and interview narratives being password protected in order that access was able to be obtained only by the researcher.

Protection of Participants and the Cost-Benefit ratio:
Noble-Adams (1999) suggested that ethical justification for research is determined primarily by the anticipated outcomes – specifically the potential benefits - of the

research. It is anticipated that this research will provide information regarding the current status of web information systems methodology development and potentially provide a background to potential future working. During the interviews participants were made fully aware that they should relate only that information with which they felt comfortable. They were informed that they were able to decline to discuss any issue they did not feel appropriate. Additionally, they were informed that all information they did narrate would remain confidential to the research. It would not be given to work colleagues, for instance.

1.9.2 Conforming to good Scientific Practice

In addition to the factors detailed above, including issues of reflexivity, which relate to good scientific practice it is pertinent to discuss elements of validity and reliability of research (Hammersley, 1992). In qualitative and interpretevist research the preferred terminology is transparency and reflexivity, which are noted as useful markers for good scientific practice. As Avis (2005) noted, "...transparency, reflexivity and critical examination of the evidence in light of relevant theory" (p8) are key to sound research practice.

Throughout the research process for this study the researcher has engaged in reflexive practice continually meeting with supervisors to discuss progress and consider research findings. Relevant theory has been reviewed throughout the research including a situating of the research findings in a context of pre-existing theory and research identified in the review of relevant literature. Finally, at all times transparency and an audit trail have been considered and presented.

1.10 Intellectual Challenge and Contribution to Knowledge

This section details the intellectual challenges within this thesis and the contributions to knowledge made by the work.

1.10.1 Intellectual challenge

As stated at the beginning of this study the work originated in a thwarted attempt to locate a recognised and accepted WISD methodology in the academic literature and also one which was recognised, accepted and utilised by WIS methodology developers. In the absence of such a framework the initial aim of this study became to discover whether or not such a methodology existed – either in the academic literature and/or in everyday WIS methodology practice - and whether or not both parties were communicating the methodology to each other. Additionally, the academic challenge then became to theorise possible reasons for the lack of a framework and also, to suggest a possible approach for effective WIS development applicable to both developers' practice and academic's published work.

1.10.2 Contribution to knowledge claimed at the commencement of the research

The following factors were identified at the outset of this study as giving it value at PhD level. The final contributions to knowledge claimed by the completed study are presented in Chapter 9.

At the outset of the study it was identified that:
1. The study utilises a Grounded Theory methodology to explore the research question. Though utilised in previous IS research, to date no research has been identified which uses this methodology to investigate choice and practice in web information systems methodology development.
Therefore, this is the first contribution to knowledge claimed.

2. The study explores whether or not WIS developers are following a designated model or framework in practice but without necessarily recognising this. To date no research has been identified which undertakes this.
This is the second contribution to knowledge claimed.

3. The study evaluates the research findings in a context of Structuration Theory in order to investigate personal tensions between human agency and structure. To date,

no research has been identified which explores WIS methodology adoption using a theoretical framework of Structuration Theory.

This is the third contribution to knowledge claimed.

4. The research proposes a framework for practice relevant to both WIS developers and academic published work.

This is the fourth contribution to knowledge claimed

1.10.3 Publications

In addition to both the ethical considerations detailed and the contributions to knowledge claimed above, many professional organisations urge consideration of the need for publication of research once the study has been completed. For example, Smythe & Murray (2000) state the need for researchers to consider what will happen to research findings and to obtain consent for its use post the research process. Arguably, it is important that the information obtained in studies is published in order that constructive debate might be furthered. Participants were informed of this and gave their consent.

1.11 Summary

This introduction has given the rationale and background to the thesis. It has located the work in a theoretical framework and presented the research problems and questions to be answered. It has indicated the contribution to knowledge provided by the thesis. The chapter has also identified the structure of the thesis, presenting an outline of the content of each chapter in order that the reader might be provided a clear guide to the work. The next chapter provides a sound discussion of and rationale for, the research paradigms and methods utilised.

Chapter Two
Research Design

2.1 Introduction

Having outlined the research and defined its context in Chapter 1 this chapter presents the research design. It commences with a discussion about the chosen research paradigm, presenting a consideration of different paradigms and then detailing a rationale for the choice of interpretevism. Included in this is a reflection on the differences, commonalities and applications of qualitative and quantitative approaches, together with their epistemological and ontological bases. This is then followed by a discussion of possible methodologies for the study. A rationale for, and explanation of, the adoption of Grounded Theory methodology is provided with process and procedure briefly outlined. Consideration is given to the research methods used in the study. There is also a discussion of issues of sampling, the role of the researcher and the subjectivity of the approach. The Chapter ends with a plan of the research design.

2.2 Research paradigm

A research paradigm provides a conceptual framework for seeing and making sense of the social world. According to Burrell and Morgan (1979 p24) "To be located in a particular paradigm is to view the world in a particular way." Similarly, Patton (1970, p37) terms a paradigm as a "world view". Within the research process the beliefs a researcher holds will reflect in the way they research is designed, how data is both collected and analysed and how research results are presented.

Epistemological and ontological factors must be considered when selecting an overarching research paradigm, methodology, research tool and method of analysis. Included within these factors are issues of sampling and underlying assumptions concerning the role and status of the researcher. All these factors must reside harmoniously if an appropriate research approach is to be adopted.

2.3 Qualitative and quantitative research

Discussions around research often centre on the differences between quantitative and qualitative methods and methodologies, though the distinctions between

methodologies and methods, and quantitative and qualitative approaches, is not always clearly made. For prudence, a definition is given here of methodology and method before discussing the distinctions between quantitative and qualitative approaches to research.

A methodology is a framework in which to situate research; it refers to and informs the choices we make about cases to study, methods of data-gathering, forms of data analysis etc. in planning and executing a research study (Silverman, 2006). In brief, the choice of methodology defines how to go about studying phenomena. Silverman (2006, p.15) suggests that a methodology comprises the following: A theory of scientific knowledge (a set of assumptions about the nature of reality, the tasks of science, the role of the researcher and the concepts of action and the social actor) a range of solutions, devices and stratagems used in tackling a research problem and a preference for certain methods.

Methods are specific research techniques or 'tools'. These include what is generally identified as quantitative techniques such as correlations, which are used to analyse quantitative data as well as techniques like observation and interview, which often analyse qualitative data (though can also involve quantitative data). It is important to state that perhaps the distinctions between 'quantitative' and 'qualitative' research are not as clear-cut, nor perhaps as useful analytically as they might at first appear. Indeed, as Hayes (1997) noted these distinctions might actually more appropriately be called 'ranges' of difference, rather than a dichotomy of views with *"...*any attempt to determine simplistic divisions between qualitative and quantitative research liable to fall apart on closer inspection" (Hayes 1997, p6). Smith *et al.,* (1995, p4) preferred terminology of difference is between 'the new and the old paradigm', though this also presents essentially a dichotomous view with both perspectives of difference seeming to relate more to the epistemological and ontological differences between positivism and interpretivism, rather than differences between qualitative and quantitative methodologies and/or methods.

Nonetheless, it is very important that research methods are appropriate to the methodology and to the research epistemology (eg interpretivism or positivism).

2.4 Philosophical underpinnings

Such distinctions between positivism and interpretivism reveal the philosophical underpinnings contextualising all research; though this is not always overtly discussed with the reader often left to position the work in order to gain a complete and full understanding. Denzin and Lincoln (1998) argue that the philosophical underpinnings of all research are actually located on a continuum, with "…rigorous design principles on one end and emergent, less well-structured directives on the other" (p.12). Nevertheless, a fundamental bifurcation of approach into positivism and interpretivism is arguably, generally accepted today. Some detailing of more recent developments is relevant to present here.

An important early attempt in recent times to classify the different research paradigms in a context of their philosophical underpinnings was made by Burrell and Morgan in 1979. They ascribed the differences to the issues of assumption and proof - aligned to the notions of relativism and realism - wherein a relativist, assumptive approach asserts that the observer is subjective and impacts the social world under investigation. Further, an interpretevist epistemology rests on the understanding that human beings do not passively react to an external reality but rather impose their internal ideals and in so doing, actively **create** their realities (Morgan and Smircich 1980). In contrast, a realist approach assumes an objective observer investigating a concrete world. Further, a realist ontology rests on the assumption that the issues and situations of interest exist outside the individual and are therefore concrete, objective and measurable (Burrell & Morgan, 1979).

Burrell and Morgan (1979) identified four paradigms – functionalism, interpretivism, radical humanism and radical structuralism. This categorisation has been developed over the intervening decades to incorporate some attempts at simplification such that an important framework was presented by Guba & Lincoln in 1994. They suggested four paradigms to include positivism, post-positivism, critical theory and constructivism. Again, however, arguably, the bifurcated distinctions of positivism and interpretivism are central with the first two adhering to positivist tenets and the latter two, to interpretevist ideals.

2.4.1 Positivism

The central tenet of positivism is that "…only events which can be observed, or that only propositions which are (at least in principle) testable, have a claim to truth (unless like logic, they are true by definition)" (Ashworth in Smith 2008, p10). Positivist research design emphasises "…the early identification and development of a research question, set of hypotheses, choice of a research site and assessment of sampling strategies and methods of analysis that will be employed" (Guba & Lincoln, 1998, p xii). Further, such designs aim to anticipate issues that may arise and have in place, strategies for their resolution. Positivist research aims to control variables in an objective search for "value-free objectivist science" (Carey 1989, p104) in order that generalisations might be made from valid and reliable research. In this way the purpose of research is to test hypotheses regarding relationships between variables and to develop theories which can begin to be regarded as having the status of scientific laws. As Carey (1989) notes, such research seldom critiques – or even makes explicit – "the moral and political commitments in [the]…work" (p104).

2.4.2 Interpretivism

Generally, this framework challenges the positivist assumptions of traditional scientific research, arguing that the positivist position of science's claim to objectivity is limited and asserting that science is part of the constructive process. It does not predefine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges (Kaplan & Maxwell, 1994). Interpretevism generally lends itself to the collection of qualitative data with analyses searching for themes to elicit meaning and experience. As such, a holistic – rather than reductionist – approach is adopted with the subjectivity of the researcher being a recognised part of the research process. Within IS, interpretive methods of research are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context" (Walsham 1993, pp 4-5).

2.4.3 Research paradigm for the current study

The current study requires a broadly interpretevist approach as it seeks to explore the full complexity of human sense making in WIS development. This decision finds

support in the work of Galliers (1992) who argues that scientific positivist approaches may not be suited to research in the socio-technical arena. Rather, as Walsham (1993) suggested, the interpretevist approach facilitates understanding of critical organisational issues in Information Systems research. Further, as Denzin and Lincoln (1994, p2) state, an interpretevist approach enables "…an interpretive, naturalistic approach…attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them." This is wholly appropriate for an exploration of possible reasons for the apparent lack of a recognised WIS methodology. Finally, it facilitates exploration of the "moral and political commitments in [the]…work" (Carey 1989, p104), which arguably are of significance to decisions around the utilisation – or not – of WIS methodologies, which seek to answer the problems and challenges of the work environment in a context of individual agency enmeshed within organisational structure. Finally, the study explores the social world of human work practice; it therefore has a strong social focus to which the interpretevist approach is wholly suited.

2.5 Research methodology

Decisions pertaining to the specific methodology to be adopted for the study were dependent upon the aims of the research since "…as a set of practices, [interpretivism] privileges no single methodology over any other, nor does it have a distinct set of methods that are entirely its own" (Denzin and Lincoln 1994, p3). Three possible approaches were considered: Case Study, Phenomenology and Grounded Theory.

2.5.1 The Case Study technique

A case study concentrates on the specific nature of a single case or multiple cases. It has a long history across many disciplines, being defined solely in terms of its concentration on the specific case(s), offering a site or sites for empirical inquiry through investigation within a real world context which are bounded by time and place (Yin, 1994). The context of the case involves situating the case within its social, cultural, historical and professional setting and exploring the issues intrinsic to it (Robson, 2002). For the current study the bounded nature of the case study approach initially appeared useful as it facilitated potential exploration of the process of web

information systems methodology development *in situ*. Hermeneutic 'interpretation' with the analysis moving back and forth between individual elements and the whole text, also seemed appropriate. The use of the case study is also well established within IS research (Galliers, 1992, Hirschheim, 1992).

However, as Benbasat, Goldstein and Mead (1987) note, the case study process implies longitudinal study of a phenomenon or situation. As such, the potential demands in terms of time and cost were deemed inappropriate to this work. Additionally, upon further reflection of the major characteristics of case study outlined by Dyer (1995, pp48-49) it was decided to reject this methodology. Specifically, case study's narrow focus, typically offering a description of a single or limited number of cases, did not enable flexibility in data gathering required to answer the research question.

2.5.2 Phenomenology:

Initially, phenomenology appeared to offer a useful approach. Bruyn (1966, p90) states that phenomenology serves as the rationale behind efforts to understand individuals by entering into their field of perception in order to see life as these individuals see it. However, phenomenology is a philosophical approach rather than a research method and as Giorgi (1997, p243) notes, modification would be needed in order that it might be used effectively. Additionally, the focus on individualism within phenomenology did not alone address the research question for the current study. By simply focussing on individual accounts and meanings without addressing the shared commonalities of these understandings and meanings and exploring from whence these meanings and understandings originated, a partial picture only would have been presented.

2.5.3 Grounded Theory:

Grounded Theory (Glaser and Strauss, 1967., Strauss and Corbin, 1990, 1998) was also investigated as a possible approach for this study. The key differences between Grounded Theory and Phenomenology lie in the theoretical background, the level of analysis, and the end product. Grounded Theory originates in Sociology and works very much to investigate social processes in order to produce a theory.

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Phenomenology and its key form of analysis currently, Interpretive Phenomenological Analysis (IPA), originate in Hermeneutics with IPA being an idiographic method. It focuses on the meanings of an individual's experience so the level of analysis is at the individual level. The outcome is to make claims about what it means to live with a particular condition or to be a member of a particular group – what it is like to live the life of that individual. The analysis may then broaden out to include other individuals' experiences, but the end point is not a theory which is a product of data saturation as it is in Grounded Theory

The use of Grounded Theory has a recognised history in IS research (eg. Miles & Huberman, 1984., Calloway & Ariav, 1991., Orlikowski, 1993., Pandit, 1996., Hansen & Kautz 2005) and the cyclical process of data collection, analysis, consultation and reanalysis appeared useful for this work. Additionally, as Payne (in Lyons & Coyle, 2007) notes Grounded Theory is useful for exploratory research which aims to develop theoretical explanations. Further, Grounded Theory facilitates "the generation of theories of process, sequence, and change pertaining to organizations, positions, and social interaction" (Glaser and Strauss 1967, p114). All these factors then, are completely relevant to this study.

Although Grounded Theory retains some sympathy for phenomenological assumptions, as noted above, researchers using Grounded Theory are less focused on individual experiences of individual actors *per se* and more on how such subjective experiences can be abstracted into causal relations between actors. In Grounded Theory interviews start with an interest in subjective understandings but the primary interest is not in the phenomenological experiences themselves. Rather, they are a means of eliciting information on the social situation under examination.

Interestingly, as noted earlier, possibly as a response to and desire to be accepted in, its origins in a world dominated by positivist inquiry, Grounded Theory contains both positivistic and interpretive elements. Its emphasis on using systematic techniques to study an external world is consistent with positivism whilst the focus on how people construct actions, meanings and intentions reflects the interpretevist tradition. Nevertheless, as Glaser and Strauss (1967) assert, the purpose of Grounded Theory is not to make claims about reality but to elicit fresh understandings about patterned relationships between social actors and how those relationships actively construct

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their existence and reality. The focus of this research was to use systematic investigation to explore web developers' choice and adoption of WIS methodologies in order to uncover those patterned relationships and their roles in the active construction of the developers' lives and work. Through both investigation of the literature and inductive exploration of WIS developers' intentions and choices, the initial aim was to construct theoretical categorisation of the process leading to a final position of developing a WIS development methodologies framework for practical use by web-developers. Therefore, Grounded Theory seemed wholly appropriate as it offers a method for developing new theory, based in inductive strategies.

A recent proponent of Grounded Theory methods, Kathy Charmaz (in Smith, 2008) notes that "Grounded Theory methods offer a flexible set of inductive strategies for collecting and analysing data. These methods emphasize building inductive theories through data analysis. Hence, you create theoretical categories that are directly 'grounded' in your data" (p82). Additionally, as web developers' intentions must respond to changing environments Grounded Theory's emphasis on process to enable the study of "…how individual and interpersonal processes develop, are maintained or change" (Charmaz in Smith, 2008, p85) also seemed apposite.

That is not to suggest a disregard for relevant theory. As noted in Chapter one, Glaser and Strauss (1967) recognise that for any researcher or practitioner in the field investigation is necessarily informed by prior knowledge, disciplinary perspectives and previous theory. Indeed, as Coase (1988) comments, a disregard of theory and what has gone before "is likely to produce a random mass of descriptive material waiting for theory or a fire" (Coase, 1988 p230).

This is further supported by Walsham (1995, p74) who comments "It is possible to access existing knowledge of theory in a particular domain without being trapped in the view that it represents the final truth in that area." This study then is informed by previous research. It also then follows the analytic procedures of Grounded Theory which are outlined below.

2.5.3.1 Process

In Grounded Theory the researcher begins by exploring some general questions about a research topic. However, unlike the hypothetico-deductive method/traditional model

of research which necessitates operationalising these previously established concepts as accurately as possible, the Grounded Theory method suggests that the concepts should become "sensitising concepts….. [which provide] "a place to start, not to end" (Charmaz in Smith 2008, p85), such that Grounded Theory researchers should remain as open as possible to new views emerging from the participants. Simultaneous involvement in data collection and analysis means that emerging analysis then shapes the data collection decisions. Indeed, as noted earlier, the dynamic interplay of data collection and data analysis is a feature which sets Grounded Theory apart from other research techniques.

The process of doing Grounded Theory research is presented in brief, below.

Typically, in all Grounded Theory research, an initial period of data collection is followed by preliminary *open coding*; that is identification and labelling of meaningful 'units' of information. Glaser (1967) advocates that this early coding should stay as close to the data as possible. Strauss and Corbin (1990, 1998) argue that these initial units should be interpreted and categorised, elucidating conceptual categorisation from an early stage. Though this has been criticised as possibly impacting the analysis by the theoretical influences of the researcher rather than staying 'true' to the data (eg Rennie, 2000) it perhaps remains an honest approach to analysis. Arguably, as Strauss and Corbin (1990, 1998) recognise, any experienced researcher is likely to be influenced by previous knowledge and research throughout the research process. Indeed, extending this point, Walsham (2005) also warns against ignoring previous theory. Moreover, even in Phenomenological work wherein bracketing – or setting to one side as far as possible, previous experiences and research – is considered fundamental to good practice (Giorgi, 1997) it is increasingly recognised that in practice, this is extremely problematic with some researchers (eg Parker, 2005) beginning to argue for the potential benefits of 'bracketing in', or including personal subjectivity, in qualitative studies. This notion is discussed more fully in Chapter 2 section 2.8.1.

In Grounded Theory, as more data are gathered examples of existing units of meaning together with new units, are coded. During this process the research focus may be refined and research questions modified which may necessitate changes to data collection protocols and sampling. Theoretical or purposive sampling is utilised; that

is, participants are selected because they are likely to illuminate - or facilitate 'testing' – of the emerging theory. Data collection continues until *saturation* is achieved; that is, no new instances of a particular category are emerging. Once the categories have been saturated, formal definitions of the properties and dimensions of each category are generated.

Once an initial set of categories is developed a single category is identified as the central phenomenon and exploration of the interrelationship of categories begins. The researcher then builds the story that connects the categories. This is called *axial coding*. The analytic work required during axial coding involves examining each category to discover links, relationships, new patterns and also, any data that does not 'fit'. Strauss and Corbin (1990, 1998) advise the use of a 'coding paradigm' to facilitate consideration of higher order features of the research such as 'process'. This also involves linking the work to existing theory in a process of theoretical integration. Yin (1989) refers to this technique as 'analytic generalization' to distinguish it from statistical generalization (which generalizes from a sample to a population). Here the generalization is of theoretical concepts and patterns. Orlikowski (1993) notes that this analytic generalization can be further extended by combining the inductive concepts generated by the inductive work with insights from existing theory**.**

Finally, the emerging theory is grounded by returning to the data such that theory is founded in the data, though as May (1986, p148) notes "In strict terms, the findings **are** the theory itself –i.e. a set of concepts & propositions which link them"

A more detailed narrative presentation of how Grounded Theory features within this research is given in Chapters 5 and 6.

2.6 Research Method/Tool

The current research was conducted in a complex domain and as such, it is sensible to note that adoption of one approach 'wholesale' may be inappropriate. Rather, as several researchers have advocated recently, (eg. Todd. *et al*., 2004) using simply one method may limit enquiry. That is not to advocate a careless and laissez-faire approach to research. Rather, it acknowledges that simplistic rigidity may omit the capacity to explore complex – and very relevant - issues in the social world. For

example, surveys have been used to elicit questions which have then been further explored in depth, through interviews to gain "thick" data (Geertz 1973, p3). That is, data which explains not just the behaviour, but its context as well, such that the behaviour becomes meaningful to an outsider (Geertz 1973, p3)**.** Similarly, in-depth interviews have been used to elicit in-depth data about a topic which has subsequently been used as a foundation for development of a large-scale survey from which generalisable results have been attained and theory proposed. Indeed, mixed methods have been noted as particularly relevant to research in IS (Banville and Landry, 1989) conditional upon the strict adherence to an audit trail (Denzin & Lincoln, 1998) in order that the study might be tracked effectively.

Such a mixed methods approach is wholly consistent with the Grounded Theory methodology (Straus & Corbin, 1990, 1998).

2.6.1 Research Methods used for this study

A number of methods were used concurrently and in combination to complete this study. These were review of relevant literature, internet survey, semi-structured interview and validation by review panel.

2.6.1.2 Literature review

 A review of relevant literature is central to any research project. It demonstrates existing theory and research and contextualises the proposed study within published and/or recognised work. A review of literature in two domains was undertaken for this study – ISD methodology and WISD methodologies. WISD methodologies are located within IS research and it became clear that in some ways WIS development is paralleling that of IS. However, in other ways it is most definitely not doing so. A review of the literature from the two domains facilitates researcher location within the field and is pertinent to contextualise this study For a full discussion of this see Chapter 3.

 2.6.1.3 Survey

Surveys usually involve gathering data from people who have an active interest in the topic being studied. A major advantage of the survey method is that a potentially large amount of data can be gathered in a relatively short time from a large sample of

participants. Participants are also able to complete the survey at a time and location convenient to themselves. A further stated advantage of survey is that no interviewer effects are present (David & Sutton, 2004). However, similarly, no researcher is available to clarify any potential misunderstandings and thus, the survey needs to be straightforward and clear. Galliers (1992) argues that surveys are inappropriate to the capture of complex data and specifically the intricacies of the relationships in the Information systems domain. Nonetheless, the advantages of being able to reach a potentially large audience in the web-systems development environment made survey an appropriate method to use in the initial stages of the research study in order to explore current practice. The more complex relationships that are inherent in WISMD might then be usefully explored using subsequent semi-structured interview, the themes of which would be derived from the review of relevant literature and also survey data.

2.6.1.3.1 Internet survey

In recent times the growth of the Internet has seen a rise in the use of Internet-based self-completion surveys. Given that this research addresses issues of WISD methodologies it seems wholly appropriate to utilise web-based survey rather than postal survey. A fuller discussion of the development of this research method is given in Chapter 5.

2.6.1.4 Interview

Interviewing is a traditional method used in interpretative research, including interpretive work in IS (Kaplan, Truex, Wastall, Wood-Harper, DeGross, 2004). The style of interviews varies from highly structured, standardised, quantitatively oriented affairs, through to unstructured, free-flowing information exchanges with all shades in between. Semi-structured interviewing (eg Myers and Newman, 2007) was adopted for the current study around a series of identified issues, arising from a review of the literature and responses to the internet survey. As there was no set response the participant was able to move around freely in his/her answer, thus facilitating the participants to tell their own story within the interaction. Rather than simply replying to a prescribed series of questions the participants were enabled to talk freely about the issues. In this way attempts were made to ensure that the resulting data were far richer.

However, it is acknowledged the process of asking questions, to some extent 'guides' the interaction and the difficulties of recording 'real' experiences and meanings are well-documented (Holstein & Gubrium, 1997). Nonetheless, for this study a semi-structured interview was considered to be the most appropriate method acknowledging as Holstein & Gubrium (1997) note, data "… are all constructed *in situ* as a product of the talk between interview participants."(p113). Further, meaning was not assumed to be simply elicited through questioning, but rather actively created in the interview encounter. Thus, the interview data were unavoidably collaborative (Holstein & Staples, 1992, Alasuutari, 1995). A fuller discussion of the interview process used in this study is presented in Chapter 6.

2.6.1.5 Validation by a review panel

Analysis of the data gathered using the Grounded Theory methodology and specifically, the review of relevant literature, the internet survey and the semi-structured interviews will facilitate development of a framework for web information systems development methodologists. In order to assess the usefulness of such a framework to WISD methodologies it is necessary to validate the framework. For this purpose two methods of validation have been reviewed.

2.6.1.5.1 Observation

One method of validation would be to use the framework and then observe its efficacy in practice. Such a process follows Action Research principles (eg. Baskerville & Myers, 2004). However, for the current study Action Research has been deemed inappropriate (see Chapter 1). As stated earlier, the focus of this work is to explore whether or not WIS development methodologists are using a recognised methodology without being aware of the fact and if they are, what that methodology is. The proposed framework is an attempt to bridge the perceived gap between practitioners and published methodologies. Due to time constraints and the fact that the different organisations involved in WIS methodology development would certainly not appreciate the intrusion of an academic into their work, it is not within the remit of this study to implement the framework and then use empirical observation to analyse its efficacy. Thus, empirical observation as a validation tool was deemed inappropriate to use.

2.6.1.5.2 Field Study

Field study might involve the use of retrospective interviews with participants involved in the process. As David & Sutton, (2004) state "…extended interviews with ..key informants ..enable the researcher to better understand the field" (p.112). Accordingly, in-depth interview with a review panel of participants from WIS methodology development will be used to validate the framework. This is discussed in detail in Chapter 8.

2.7 Sampling

Having determined the process to be used for the gathering of data issues of sampling will now be detailed. Within Grounded Theory research the notion of attaining a sample which is representative of the whole population is not normally considered relevant (Glaser& Strauss, 1967, Strauss & Corbin, 1990, 1998). Rather, the aim is to determine an in-depth understanding of the issues within a specific group. As Denzin and Lincoln (1994, p204) argue, sampling choices within and across cases are powerfully determinative of just which data will be considered and used in analysis. Choices are not necessarily driven by a concern over 'representativeness', within a quest for generalisability, but rather, an understanding of the situation and context of the case. Accordingly, the sample for this study was required to be people developing WIS. As the survey was delivered via the internet a second pre-requisite was that they had Internet access and were computer literate although it might be argued that since the individuals were employed developing WIS methodologies this latter clause was not necessary to consider.

2.7.1 Purposive or Theoretical sampling

Glaser and Strauss (1967) created the strategies of purposive or theoretical sampling. Briefly, it is in complete contrast to random sampling which seeks to include (potentially) anyone within a large population. Rather, theoretical sampling involves seeking pertinent data to develop the emerging theory. As Charmaz (2006) states, "The main purpose of theoretical sampling is to elaborate and refine the categories constituting your theory" (p96). Further, as Gordon-Finlayson (2010 p156) states, "sensitivity to theory also drives the way that data are collected".

The sample was also directed by a "general conceptual scheme" (Glaser and Strauss 1967, p59). Based on a review of the literature, and personal familiarity with the area this general conceptual scheme guided the development of the Internet survey research tool. Subsequently, the findings from this survey, together with a consideration of published literature informed the interview schedule. This then formed the foundations for determining the sample, as all areas were deemed necessary to explore. Whilst followers of Glaser would perhaps advocate not reading the literature prior to undertaking research for fear of influencing the work by previously written material, others (including Glaser and Strauss, 1967 and later Corbin and Strauss, 1990, 1998) acknowledge that "…trained researchers are theoretically sensitised" (Strauss and Corbin in Denzin and Lincoln 1998, p167). As such, researchers will utilise "…explicit theories that might be useful" (Strauss and Corbin in Denzin and Lincoln 1998, p167).

2.7.2 Sample for the current study

As stated above, the sample for the current study was a theoretical sample. Inclusion criteria for the Internet survey consisted of the following:

- Activity within WIS methodology development
- Computer literate
- Access to Internet

For the Internet survey, neither the size of the organisation, nor the length of time individuals had been employed in the area or their level of experience and/or knowledge were considered relevant inclusion or exclusion criteria. This was because the aim of the survey was to capture as much data as possible from a broad-base within the theoretical sample. Following analysis of the responses it was then aimed to focus the study and explore issues arising, in depth. The analysis of the findings from the internet survey demonstrated that participants were generally working in small/medium enterprises (SMEs) and even where perhaps the 'parent organisation' was large, which the developer her/himself was working as if in an SME; perhaps as an individual developer or as part of a small outfit.

Accordingly, inclusion criteria for the interviews consisted of the following:

- Activity within WIS methodology development

- Computer literate
- Access to Internet
- Working as part of an SME.

These inclusion criteria aimed to accrue a sample in which participants were representative of the participants who engaged with the Internet survey and who generally worked in small/medium enterprises (SMEs) since this work location seemed apposite to both the research question and to the sample .

2.7.3 Sample size

As stated above, as the survey was distributed across the Internet a specific sample size was not predetermined. It was acknowledged that surveys and questionnaires generally return a very low response rate. However, prior to distribution appropriate forums had been identified and thus, a sample size of between fifty and one hundred responses was hoped for. This would have facilitated a reasonable set of data from which to draw inferences about web developers' practice. It would also have enabled effective analysis of the data.

The sample size for the interviews adhered to Stern's (1994) proposed strategy of sampling such that sampling continues until the categories are saturated; that is, until no new data are presented by participants. Thus, as Charmaz (2006) argues, "this logic supercedes sample size" with the result that the sample "…may be very small" (p114) or very large. Accordingly, a predetermined sample size for the interviews was not identified.

2.8 Role of the researcher

The role of the researcher is dependent upon the approach adopted. If a positivist approach is utilised an objective external researcher is assumed. That is, the aim of positivist research is to remain 'outside' the research and 'measure' the variables being manipulated as far as possible without impacting the research in any subjective way.

In contrast, within the interpretive tradition, it is asserted that the researcher can never be value neutral and will always be implicated in the phenomena; total objectivity is

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neither achievable due to human nature, nor desirable – indeed subjectivity is viewed as a positive contribution to the research (Glesne & Peshkin, 1992, Parker, 2005) given that meaningful knowledge can be constructed in a way that provides room for personal and subjective ways of looking at the world. However this process does have to be acknowledged and managed within the research process. This can be achieved via a process of reflexivity (Strauss, 1987).

2.8.1 Reflexivity

Reflexivity is a term with various meanings (Dowling, 2006) but its purpose in qualitative research methods is important. Dowling (2006) suggests that reflexivity is the continuous self-critique and self-appraisal that the researcher needs to maintain in order that their own experience can be understood in relation to potential influencing of the research process. It involves being aware of what is influencing the researcher's internal and external responses to the research in hand whether this be the development of the research question or toward the information participants are disclosing. Whilst it is acknowledged that this is sometimes difficult to integrate into research activity (Ahern, 1999), reflexivity is noted to add credibility to qualitative research (Glesne & Peshkin, 1992).

Reflexivity is generally divided into two areas: personal and epistemological. Personal reflexivity is more akin to personal reflection or self-awareness (Giddens, 1976) where a person has the ability to develop an awareness of self (Wolfe, 2003) by reflecting upon the ways in which their own values, experiences, interests, beliefs, political commitments, wider aims in life and social identities have shaped the research. It has been suggested that 'self' is present in all research and has an influence on the nature of the research undertaken and the findings disseminated, even if this 'self' is not formally recognised or incorporated (Cotterill & Letherby, 1993., Ribbens, 1993, Stanley & Wise, 1993). This means therefore, that rather than bracketing out experience Glesne & Peshkin (1992) and Parker (2005) argue for bracketing *in* such experience as part of the reflexive process.

Epistemological reflexivity is concerned with the researcher having the ability to reflect upon assumptions they applied to the research which may have implicated the

research process or findings. Alvesson & Skoldberg (2009) suggest it requires us to engage in reflection on issues such as, defining the research question and possible limitations, study design and how this may have influenced the data and findings, any changes that would be made if the research were to be repeated and whether these changes would alter the understanding gained. Thus, epistemological reflexivity encourages us to reflect upon the assumptions (about world, about knowledge) that we have made in the course of the research, and it helps us to think about the implications of such assumptions for the research and its findings.

2.8.2 Role of the researcher in the current study

As stated above, a Grounded Theory methodology was utilised for the current study. This is located within an interpretevist paradigm and assumes a participatory role for the researcher; that is it assumes that both researcher and participant are fundamentally involved in shaping the form and content of the interaction being necessarily active in the research process. Whilst it is relatively straight forward to argue this position for the interview process – for example as Oleson (1992) noted it is the interaction between researcher and participant which creates the data – this position is perhaps more questionable in the survey part of the research as the researcher has no direct contact with the participant. Thus, interaction is necessarily limited to indirect interaction. Nonetheless, in accordance with Grounded Theory principles, the survey underwent change and development from its original format and all changes were based on the feedback from participants. (This is detailed in Chapter 5.) Thus, it is argued that both researcher and participants were fundamentally involved in construction of the research and acknowledges that to a greater or lesser extent, participants were always constructively part of the research process.

In this research study it is possible that there was potential for bias in interpretation of data, given personal previous research relating to Rapid Application Development, professional work roles and personal contact with web information systems developers. This was addressed through a process of continuous reflection and reflexivity and an awareness that as the researcher it was my responsibility to enforce boundaries in a professional and reflexive manner. To minimise bias in the analysing

of data all work was explored thoroughly as advised by Johnstone (2002) and Stein & Mankowski (2004). That is, all decisions regarding analysis and the process of analysing data were discussed in supervision. In this way careful analysis of the data was maintained (Cameron. *et al.,* 1992). In the writing up and discussion I ensured that equity was placed in the quoting of participants and reflected on the reason why I used each quote. This was also discussed in supervision.

2.9 Plan of the research design for the thesis

Table 2.1 below presents a plan of the research design for this thesis. It provides readers with an easy reference to the major stages of the work.

Stage	Activity	Method	Outcomes
1	Review of the domains	Literature review	Identification of existing theory and research in IS, WIS. Identification of key issues. Exploration of Structuration Theory as theoretical framework for study.
2	Exploration of WIS development methodology practice (general)	Internet survey	Evaluation of current practice in WIS development methodology
3	Exploration of WIS development methodology practice (detailed)	Interviews	In-depth analysis of current practice in WIS development methodology in a context of stages 1 and 2. Application of Structuration Theory to research findings.
4	Development of proposed framework	Analysis of Literature and findings from stages 2 and 3.	Proposed framework

5	Validation of proposed framework	Review by panel	Evaluation of proposed framework. Suggestions for future research

Table 2.1 Plan of the research design for the thesis

2.10 Summary

This chapter has provided an outline of the research design of the thesis. It begins with an exploration of the chosen research paradigm, including a reflection on the differences between positivism and interpretevism and the application of qualitative and quantitative approaches. It is noted that this study is firmly located within an interpretevist epistemology and a clear rationale is given for this. Next, a presentation of key features and procedural details of the chosen research approach - Grounded Theory – are given, together with a discussion of the role of the researcher and ethical considerations for the study, set in the context of the research. The Chapter ends with a plan of the research design for the thesis which then leads into the next Chapter which looks at the development of IS and WIS. This next Chapter thus, contextualises the current research in the relevant literature. Similarities in the two related fields are discussed together with important differences. Also discussed are the different approaches to IS development methodologies and WIS development methodologies. Parallels and differences between the two areas are explored.

Chapter Three
Information Systems Development and Web Information Systems Development

3.1 Introduction

A plan of the research design for this thesis was presented in Chapter 2. It is relevant now to review relevant literature on information systems (IS), and web based information systems (WIS); specifically IS development (ISD) and WIS development (WISD), in order to contextualise the study. Accordingly, the Chapter reviews the historical development of both ISD and WISD, noting any parallels and differences, and outlining key approaches and theorists in both areas.

ISD is a continuously evolving field central to work in IS (Avison & Fitzgerald, 2006). Additionally, computer-based systems have gradually come to be recognised as synonymous with IS and further, today, WIS are a fundamental part of effective IS for most organisations (Vidgen, 2002). That is not to suggest that WISD and ISD are synonymous. As this Chapter will clearly show, there are certainly important parallels and similar practices with many of the more traditional development values such as database-design still being retained and reused in WIS as well as IS (Vidgen 2002). However, arguably, these are being deployed in different ways within IS – where they form a clearly designated path or procedure – and WIS where they are used perhaps more intuitively to service specific user (and developer) requirements, without necessarily forming part of an established methodology. The Internet has clearly changed the way that IS are developed and whilst this has clearly impacted work in ISD it has also made for differences between the two related fields, as this Chapter will discuss.

Both IS and WIS have developed rapidly over the last few decades, though WISD is a younger discipline, and in common with many, if not most, fledgling areas there are shifting positions. These different approaches to WISD and specifically, WISD methodologies, are the focus of this dissertation. As IS has expanded and developed it has increasingly demanded the need for recognised patterns or procedures. Whilst it is clear from history that these patterns and procedures in IS have not necessarily developed in a uniform manner, it is also clear that currently, a recognised set of

systems is in place (Avison & Fitzgerald, 2006). Further, these systems did not take decades to become recognised (Avison & Fitzgerald, 2006).

In contrast, whilst sharing many of the traditional ISD values, WISD has nonetheless, apparently not always demanded formally documented patterns and procedures to be used by developers in quite the same way (Avison & Fitzgerald, 2006). Despite being a fundamental part of most effective IS for most organisations of very many differing natures and sizes, anecdotal evidence, together with personal experience and published literature (eg Lang, 2009., Harris, Webb Collins, and Hevner, 2009), suggests that many WIS developers are choosing to develop and use their own 'bespoke' methodology. Certainly a great many WISD methodologies are developed; many for doctoral research projects. Yet, many of these seem to remain in books on shelves rather than in practice in organisations. Perhaps this situation may change as WISD matures as a discipline. Or perhaps history will show that WISD is an entirely different area from ISD despite IS being essentially its parent discipline.

This review of relevant literature presented here seeks to explore the key debates within ISD including the key methodologies that have emerged and also stood the test of time and then to compare this to the patterns in WISD. In this way, the thesis might be contextualised and the aim of the research - **To identify web developers' current methodologies (both personal or published) to inform the development of a proposed framework for developing a web information systems methodology -** might be set within appropriate academic and professional discourse.

It is recognised at the outset that there is a plethora of ISD and WISD methodologies and it would be impossible to include discussion of all. Therefore, decisions pertaining to the most relevant examples to include in this thesis have necessarily been made. As stated above, the rationale behind such decisions is their relevance to the research question being explored for this thesis, together with the researcher's personal and professional experience of their pertinence to effective practice, coupled with colleague and other practitioner's expressed viewpoints.

Before embarking upon a discussion of the patterns and procedures in ISD and WISD it is relevant to define the area. Thus, a definition of IS and WIS suitable to this thesis and grounded in appropriate research is given below.

3.2 Information Systems (IS) defined

Avison and Fitzerald (2006 p3) define IS as "…[a system] in an organisation which provides [and] processes ..information useful to its members and clients." They further note that this IS "..should help it operate more effectively" (p3). This emphasis on the utility of IS for aiding the work of humans and organisations is the central focus of this study. It was something identified over twenty years ago by Buckingham *et al.,* (1987) who commented that essentially an IS is "… a human activity (social) system" (Buckingham *et al*., 1987, in Avison and Fitzgerald 2003, p19); this at a time in the 1980s, when, arguably, the technological aspects were achieving great prominence with the rapid development of computer hardware and also, later, the Internet.

Nonetheless, perhaps the chronology of the development of IS and later, WIS gives a first clue as to a possible variation between the two systems. As noted above, within IS the focus was necessarily on the technological elements and the functioning of these to aid effective opertion. The later development of the internet and web-based IS was much more firmly focused upon the human communicative features and possibilities offered by the technology.

Looking back to over fifteen years ago, Hirscheim (1995) saw IS from two perspectives, those of structure and function. In an apparently binary model he recognised the reciprocal nature and interdependence of both elements with structure incorporating individuals, data, models and processes serving an organization's purpose or function, and function being represented in the technology. He argued for an essentially social understanding of IS, including humans within his definition, such that IS should assist in the creation and communication of meaning and purpose for the individuals and the organisation. Yet, arguably, the necessity for such argument belies the underlying focus on technology prevalent at the time.

As Avison and Fitzgerald (2006) note some IS are tailored specifically to the organisation, but many more are generic. Whichever is the case all are developed and operate within an environmental and social context which is increasingly complex and dynamic as we all engage in a global economy. As a consequence, the requirements placed on IS are increasingly demanding and diverse and more recent work has included discussion of this (eg. Avison & Fitzgerald, 2006., Li, Chang, Chen & Jiang, 2010). With a focus on the social aspects of IS many models and texts have referred to the term 'user' in discussion about ISD. However, the term has been used ambiguously (Avison & Fitzgerald, 2002) to refer to anyone not part of the technical team, or an 'expert' but who is part of the system, including the client or even the organisation. It is used in this thesis to refer to anyone who uses the IS directly.

3.3 Web Information Systems (WIS) defined

WIS are a fundamental part of effective IS for most organisations (Vidgen, 2002). However, that is not to suggest that they are synonymous entities. Indeed, much debate has arisen concerning the similarities and differences between traditional IS and WIS (eg. Holck & Clemmenson, 2001, Glass, 2003, Avison & Fitzgerald, 2006) with some wishing to argue for difference and declare their personal area a speciality. To add further complications there are also different definitions of WIS. Gellerson (1999) defined them as "any software application that depends on the Web for its correct execution."(p66). While Scharl (2001) noted that they "…..represent a sub-category of mass information systems that typically support on-line information retrieval and routine tasks by way of self-service for a large number (thousands or millions) of occasional users who are spread over many locations" (p12). Moreover, both the term 'web-based systems' and also 'web-based information systems' are used by practitioners and researchers with possible differences between the two not always defined. For example, some argue that the latter denotes 'advanced' web-based systems rather than simple web-sites. Ginige and Murugesan, (2001) suggest that the distinction arises since 'web-based information systems' do not refer to small scale collections of HTML pages connected through hyperlinks, but rather, large scale systems which facilitate complex communications and information transfer, via the Web. Yet, ironically, features of web based systems that differentiate them from

traditional non web based information systems include the fact that their development often incorporates the development of web page content!

It is agreed that currently, the majority of WIS are static and document- orientated, although again the position is shifting with dynamic WIS being increasingly common and WIS have been seen to involve a mixture of print publishing and software development, somewhere between technology and art (Powell, 1998). They concentrate on visual creativity and presentation incorporating high degrees of multimedia content. Most WIS have a potential wide-ranging audience in terms of user profile, skills and technical ability, creating the need for complex and flexible human computer interface offering greater clarity of information.

3.4 Information Systems development (ISD) and Web Information Systems Development (WISD).

As stated above, computer-based systems are now recognised as synonymous with IS with WIS being a fundamental part of effective IS for most organisations (Vidgen, 2002). Indeed, Venables and Lim (2001) argue that a WIS is simply an Information System specifically aimed at development of a Web Information System, though arguably, this is a circular definition. However, mMore recent work by Ramratten, Ramratten, Patel and Hussain (2010) suggested that a fundamental difference between IS and WIS is that the revolution of Web technology meant thatinitiated small businesses and individuals werebeing able to afford to create their own computer applications, including a Website and move from being unknown companies to potentially being able to take advantage of a global market. become some of the most renowned companies in the world (eg, yahoo, google). By taking advantage of the Internet and Web technology they have driven their business so that the Web now has become a strategic part **of** the business. Further, some of the most renowned companies in the world (eg, Yahoo, Google) are entirely web-based such that the web *is* their business, not just a strategic part of it. This then, the authorsy argue, areis a major differences between ISD and WISD.

There are many formalised approaches in IS all of which use accepted tools and techniques. Indeed, it might appear that computer systems have been a fundamental

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feature in IS for many years. Yet, the use of computing technology within IS has a relatively short history and the formal processes and procedures has an even shorter one. Indeed, as late as the 1960s and 70s computer based applications were often created without the support of a formal structured development approach or methodology. Thus, the accepted patterns and procedures evident today are actually a fairly recent phenomenon. This is largely due to the fact that the demand for computer based solutions meant that developers concentrated on producing results through programming and technology application rather than documenting methodologies. Indeed, the emphasis in the early days of computers in IS was on programming techniques with few programmers following any formal methodology. Unfortunately, this also had an impact on the end user with their requirements sometimes not fully understood and with little chance of being fully met (Avison, 2003).

Demands from the industry for a more disciplined – and potentially, more effective - approach led to the creation of standards and the creation of the first ISDM based upon the systems development life cycle. This became known as the 'Waterfall approach' and it concentrated upon the identification of the order of the phases and stages that a development went through. Often there were a set of outputs identified with each stage in the development process. Whilst this is generally acknowledged as a major step forward in ISD it was also seen to be flawed as it still failed to meet "….the real needs of the business (due to concentration on technological efficiency improvements at the operational level of the organization)" (Avison 2003 p79). It soon became apparent that a focus on the technology of IS would only offer a partial answer to users' requirements. What was deemed necessary was to marry the social and technological elements together.

Unfortunately, it appears that many individuals involved in IS were technically competent but as Avison and Fitzgerald (2006) note, they were "…not necessarily good communicators" (p23). This often resulted in applications being developed which were not necessarily fit for the user's (usually the organisation or manager's) purpose. As a consequence, ISD methodologies began to be devised more centrally and then adopted by many organisations. These early methodologies have been referred to by Avison and Fitzgerald (2006) as 'Process Oriented' methodologies or

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traditional 'Structured Systems Development' methodologies. An example of this noted for its influence upon industrial computer programming was Jackson Structured Programming (JSP) (Jackson, 1975). A further influential methodology is Structured Systems Analysis and Design Methodology (SSADM) adopted and made mandatory in many projects by the United Kingdom Civil Service since 1981. These methodologies have been referred to as 'Hard' approaches (Checkland, 1981). Put simply, the 'Hard' approach is followed by developers who focus on systems with distinct boundaries as well as clear, exact goals. The world view of 'Hard' methodologies is a perception of society as predictable and constant, with reproducible situations. However, some of these methodologies have been criticised for their resultant user dissatisfaction and apparent failure to satisfy users' needs. Clearly, the strength of the rigidity of the system is paradoxically, also, its weakness as it does not allow adequate flexibility or adaptation to circumstance.

Developing at a similar time but utilising an entirely different philosophical world view were several approaches which were known as 'soft' methods. 'Soft' systems developers generally adhere to a view of society and systems development as unpredictable, constantly changing and disorganized (Checkland 1981). They also involve users in the development of the system. An early example of this approach is ETHICS (Mumford and Ward, 1968).

The idea of user involvement was not readily or rapidly adopted. Indeed, Bignell and Fortune's (1984) study into failures in IS emphasized the importance of 'human factors' in every guise from her/his use of tools through to his/her relationships and interactions, to the overall success of the IS. Critical thinkers such as Gould and Lewis, (1985) also voiced increasingly forceful arguments that problems in IS were due largely to social rather than technical elements. However, gradually, there was a growing recognition that users and the social world have an important impact upon the usability of IS. More recently, this has been echoed by authors such as Augustine (2000) and Greenbaum and Kyng (1991) who note that IS are much more than simply the flow of information represented in flowcharts.

As a response to this work and the shift from a focus on technological to human – and specifically users' – factors, some more recent methodologies have incorporated the

users and the social world at every stage of development. Important examples are the Evolutionary model and Rapid Application Development (Martin, 1991). These models represent a set of systems development activities and their relationships which also inform procedures for moving between stages and deliverables (Preece 2002). Clearly, such an approach demands effective communication skills from both parties. In a context of Avison and Fitzgerald's (2006) comments on the often limited communication skills of early developers, this is surely an approach that would not have been timely at the dawn of ISD.

3.4.1 Methodology adoption

In a retrospective study Fitzgerald (1996) formally identified a range of reasons for developers using ISD methodologies. The list included the following: help in managing complex tasks by subdividing them into smaller less intractable components; providing a directive frame work for utilising systems development techniques; facilitating the use of project management techniques; assisting in the control of uncertainty and risk; allowing specialist roles to be identified as well as allowing standards to be determined; allowing better communication and learning amongst developers and improving quality and production.

Clearly, this is a fairly comprehensive list, but the emphasis on the reciprocal demands of the human, organisation and technological elements are evident. It may be an obvious statement but in the recent global economy with increasing demands on organisations not simply to 'get ahead' but actually in many cases, to just 'survive' the need to work effectively with the optimum IS in place, is fundamental. An understanding of the different elements – human, organisational and technological - of IS is thus, necessarily important. Arguably, for the current research, this extends to WISD methodologies.

This point is illustrated well by Avison and Fitzgerald (2006 p 24) in their definition of an IS (and WIS) methodology as "A collection of procedures, techniques, tools and documentation aids which will help the system developers in their efforts to implement a new information system." They further list the components of an effective IS methodology as "…phases, themselves consisting of sub-phases, which will guide the systems developers in their choice of techniques that might be

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appropriate at each stage of the project and also help them plan, manage, control and evaluate information systems projects." The reciprocal nature of the human, organisational and technological elements of the methodology, are thus, clearly identified.

It is not known exactly how many IS methodologies are currently operational globally. Almost twenty years ago Jayaratna (1994) noted that more than *"1000 brand named methodologies are in use all over the world"* (p xvii), but evidently, since that time the number will have increased once more as different organizations have changing needs.

Looking at WISD Avison, (2003 p.20) stated that a methodology is generally based upon some 'philosophical' view. However, some WIS developers are recorded as believing that they are not following a methodology and indeed, arguably, many would resist the notion that they are following a 'philosophical approach' (Ramratten et al., 2010) Yet, whether they recognise it consciously or not, the evidence of the delivery of working IS solutions suggests that they have been using a collection of tools and techniques. Therefore, by the first part of Avison's (2003) definition of a methodology, these WIS developers have been following a methodology – a collection of tools and techniques formulated into a specific pattern - even if they were not aware that doing this denoted that they were following an identifiable philosophical approach. Arguably, many WIS developers would be unable to articulate whether or not in their practice the user, the data flow in the system or indeed the organisation, is the key element (Ramratten et al., 2010). Yet, perhaps this is actually unimportant as long as all the elements are taken account of effectively since how far uncertainty about the underlying philosophy of the approach is relevant to effective practice is contentious.

That is, it might be argued that underlying philosophy is actually of little import as long as the developers – in both IS and WIS - know **what** they are doing, and **how** and **why** they are doing it. The counter argument is of course that it **is** actually of importance to the development of IS and WIS as disciplines in a context of understanding and documenting approaches for others to (potentially) follow. Whatever the permutations of the above situation, it is clear that over time, most IS

developers have followed an approach. Even when they could not name it, the approach has consisted of a formulated and clearly designated set of patterns and procedures. Yet in WIS, the question arises as to how far the situation is paralleled. Certainly, many WISD currently do not have the same level or number of accepted (or used) approaches/methodologies and developers neither appear able to name the approach they are using nor is it necessarily a clearly formulated set of patterns and procedures. However, whether or not this means that they are not in existence or that actually, WIS developers **are** following a specified procedure is what this thesis explores.

3.5 WIS Development

It was stated at the beginning of this Chapter that WIS are a fundamental part of effective IS for most organisations (Vidgen, 2002) and parallels might be drawn between traditional ISD and the current state of WISD (Glass, 2003).

Some authors (eg. Lowe, 1999, Deshpande, 2000) argue that the development of web applications **is** following the same pattern as the development of traditional IS such that web developers are currently in the same position as IS developers who faced the software crisis of 30 years ago. Ginige (2001) talks of the complexity of web application development and the web crisis, reporting on surveys on web based project development showing that 84 % of delivered systems were judged not to have met business needs, 79% of projects were behind schedule, 63% of projects were exceeding their budget, with 53% of projects not having the required functionality

Yet, the differences are certainly focussed upon by some. For example, Murugesan (1999) and Ginige (2001) argue that WISD is very different from traditional ISD. Ginige (2001) argues for recognition of different tools and techniques, stating "Developing web-based systems is significantly different from traditional software development and poses many additional challenges. There are subtle differences in the nature and life cycle of Web-based and software systems and the way in which they're developed and maintained" (p14). He also considers there is a difference in timescale between the two areas with commercial pressures decreasing the development timescale in WISD putting increasing pressure on planning and testing phases. Accordingly, WIS are considered to evolve their functionality and content

more than encountered in traditional IS with WISD being seen as a continuous activity (Ginige, 2001).

Ramratten et al., (2010) note four major differences between ISD and WISD. Firstly, they argue that the original purpose of Web-based development wa~~i~~s to build a method that extend~~s~~ed a channel of communication to online publishing for internal and external stakeholders. ~~-~~This, they maintain, is in contrast to the focus of an ISD which tends to focus on internal business processes~~is to facilitate business transactions and successful operation of an organisation~~. However, this proposed difference between ISD and WISD is in need of further justification as arguably, the authors do not explain why being able to promote the company at home and abroad makes a clear difference between ISD and WISD.

Secondly, the development life cycle of an IS can be~~is a~~ long term (months or even years)~~cycle~~ whereas a short term life-cycle (weeks or even days) ~~of web based development~~ is quite common for many web-based projects.

Thirdly, the web is content intensive, and based on~~composed of~~ unstructured information use, whereas traditional IS focuses on structured information and its flow.

Finally, WISD tends to adopt~~is~~ a rich graphical approach, but this is less common in ~~and this may be optional to most~~ IS development projects. Thus, WISD~~the~~ methodology ~~to development,~~ needs to be discussed separately from the traditional IS development.

In summary, though WISD involves programming and software development, and adopts some of the principles of traditional IS, it is argued that WISD is different from ISD incorporating new tools and techniques and thus, for some it requires new methodologies.

3.6 Current status of WISD methodologies

The modern WIS may involve complex web pages where the information is dynamic and integrated within database driven IS that may require continuous high

performance and availability, interacting with legacy systems able to be deployed in business critical domains. As Ginige (2001) and Li et al., (2010) note, WIS have evolved from simple static informational web pages primarily presenting textual information to become complex interactive, transactional, collaborative work environments allowing workflow and online communities. Indeed, some authors distinguish between 'static' and 'dynamic' elements in their approach to WIS (Kuhnke, 2000). The dynamic element often includes the server and client-based applications centred upon a server side database. The static element is considered to be the contents of the pages including text and images. Currently, the WIS methodologies employed for such application development are frequently produced in-house (Barry, 2001., Ramratten et al., 2010) with users apparently preferring to develop specific be-spoke approaches rather than using those developed by 'experts'. Arguably, this has impacted upon both WISD as a technique and also on the IS industry.

Howcroft and Carroll, (2000) and Venable and Lim (2001) suggest that with few exceptions, traditional ISD methodologies have not successfully incorporated web-development techniques. Such exceptions include hypermedia research with hypermedia researchers (eg. Lowe, 1999: Biebe. *et al* 1997; Gomez *et al.,* 2000) generating several development approaches such as RMM, OOHDM, WebML and OO-H method, most of which attempt to combine web and hypermedia development techniques with established ISD methodologies.

It has been suggested that the evolutionary path of the Web starting with the development of network infrastructures, security and protocols was only slowly recognised by the software engineers due to their concentration on corporate not technology issues. As such some IS professionals appeared not to recognise the early web-based informational applications as part of their domain, the familiar cry being that 'HTML scripting is not programming'. This protestation is actually without foundation of course since it is indeed, IS development. Others who appeared to embrace the potential of the Web went on to create web based applications, but in actuality many replicated work in IS rather than benefiting from almost forty years of application development (Deshpande, 2000).

As Deshpande (2000) comments,

"Thus there are possibly two types of Web-based application developers: those who come from the 'traditional' applications and who need to update their technical knowledge, and the others who need to learn from the lessons of the last four decades in order to develop good methods and practices" (p4).

The need for an engineering approach to WIS development was suggested by several researchers (eg. White, 1996, Kuhnke *et al.,* 2000) with the field of 'web-engineering' proposed to maintain a structured approach in WISD. Certainly, this work led to the development of a range of structured hypermedia web methodologies together with their distinctive notation and symbols (Schwabe & de Almeida Pontes, 1998). However, as Barry and Lang (2001) note, a large number of web-developers did not and do not use these structured methodologies, preferring instead, their own experience, skills and expertise. Indeed, a survey carried out in 2005 highlighted the current situation in regard to WISD in terms of methodology adoption. (Lang & Fitzgerald, 2005). It found that 23% of web developers were following their own proprietary approach or a hybrid approach with a further 22% of web developers using traditional software development approaches. Only 8% admitted to following no development or an ad-hoc approach and only 5% adopting specialised non proprietary such as WSDM and OOHDM.

This illustrates that many developers continue to use the tools and techniques they may have acquired with traditional ISD and more may have adapted existing approaches to meet their specific requirements. However, the acknowledgement that only 5% of web developers are using specialized WISD methodologies suggests that many WISD methodologies are perhaps sitting gathering dust on the author's bookshelf. Arguably this is related to the assertion made by Howcroft and Carroll (2000) that most new WISD methodologies have concentrated on the user interface and not addressed the complete range of issues concerned with WISD. Or perhaps as Fitzgerald (1997) comments, it simply indicates that highly structured methods may not be the way forward for WISD. This position is supported in work by Harris et al., (2009) who argue that flexibility in approach is key to the success of web-based development.

Additionally, Lang and Fitzgerald (2005) warn "Already an overabundance of systems development methods exists in the academic literature, many of which are arcane, impractical, and unworkable. Academics are enthusiastically contributing to this "methodologies jungle" on an ongoing basis, and hypermedia's recent emergence has sparked talk of a pressing need for new methods and tools" (p74-75). They further advise that "Rather than writing about a largely fictitious hypermedia crisis, the academic community should ask itself whether the real crisis lies in the communication gap between academia and industry" (p74).

Lang and Fitzgerald's (2005) concerns find resonance in the focus of this research and relates to the question **How far are web developers following a recognised web information systems development methodology?** As stated earlier, there are certainly a number of WISD methodologies in evidence that have been written but little used other than for a research project, or a very limited organisational project or a lone developer's work; a point also expressed by Ramratten et al., (2010) and detailed earlier. So just how far the academic community is working in isolation from the Industry and developers' practical application of web-systems implementation is questionable and further, may be of importance if the aim to synthesise academic and practitioners' expertise to create an effective WISDM accepted by both parties, is to be realised.

3.6.1 WISD Usability

Much of the early research carried out in WISD addressed issues of technology, but users' requirements surfaced as a focus for work more recently (eg. Sachs and McClain, 2002) with Butler (2003) warning of the need to take account of social issues for successful WISD. Predominantly, social and user needs were incorporated into two approaches – the Web Site Design Method (WSDM) created by De Troyer and Leune, 2001 and Web Information System Development Methodology (WISDM) created by Vidgen *et al.,* (2002). It is relevant to outline these two approaches here, but it is also important to note that despite the apparent social and technical relevance of each, their uptake, adoption and usage has been little documented. Nevertheless, the approaches are relevant to explore in more depth and detail as they have important

implications for work later in the thesis (specifically the *Webframe* outlined in Chapter 7).

3.6.1.2 Web Site Design Method (WSDM)

WSDM (De Troyer & Leune, 2001) is a user centered web site design method, and although originally created for the development of kiosk based web sites has grown to a full semantic web development methodology. Described as an 'audience-driven' approach, WSDM is based on the users' requirements whilst acknowledging that web sites can have different types of users with differing requirements.

3.6.1.3 Web Information System Development Methodology (WISDM)

WISDM is a web based extension to the methodology known as *Multiview* which was developed by Richard Vidgen in 1985 as a response to conventional development methods which he saw as being embedded in the engineering discipline and technical rationality and failing to incorporate the social aspect of IS development.

The WISDM approach may start with an organizational analysis of the strategic direction of the host organization with its aim being to understand how value will be created. This forms part of the IS development matrix examining methods in terms of organizations and people (socio) and objects (technical) and also in terms of analysis and design. Another element of the matrix is the 'information analysis' representing the requirements specification and forming a specification of the information and process requirements of the host organization. UML (Unified Modelling Language) is the indicative approach creating both the class model and use-case diagrams and the activity diagrams of the problem being investigated. Another aspect of the WISDM matrix is work design, representing user satisfaction. This uses a Likert-type scale called *WebQual* to assess e-commerce aspects. Within the matrix the software model is represented in the technical design element where a formalized model in terms of data structures and program design is constructed. The final element represented in the matrix is HCI – Human-Computer-Interface - falling between technical design and work design elements.

WISDM has been criticized (Cybulski & Sarkar 2005) for its failure to lay any explicit recommendations for the identification and analysis of stake holders such as sponsors, customers and users, content developers and copyright consultants as well as marketing, public relations, media planners, creative directors, graphic designers and many others. Additionally, Vidgen (2002 p290) identifies a possible concern for web developers that scripting as an approach to WISD does not complement the Object Orientation approach and that UML diagrams become less appropriate as the development moves from the 'logical' to the ' physical' .

3.65.2 Rapid development

A key focus of WIS is its rapid development or "short-cycle time systems development" (Baskerville & Pries-Heje, 2004 p57). Although the phases identified in this approach are not radical or new in WISD their overlap or complete exclusion when demanded by short turn-around times are of concern to some (Savage & Savage, 2000). For example, the analysis and design phases are sometimes omitted (Savage & Savage 2000) or testing is superseded by email feedback (Van Duyne *et al.,* 2000). Such omission has been noted a not always being of benefit to the end result. An additional lack of supporting documentation has made maintenance and development of the system problematic.

3.56.3 Evolutionary approaches

Empirical studies (DIWA, 1999) have demonstrated that the waterfall model is unsuitable for web development. Yet, given that web development is evolutionary by nature, constructed in a dynamic and complex social and technological context, such an approach would seem to offer merit. Certainly, an *ad-hoc* development style

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accommodating the need for rapid development together with evolving user requirements have all contributed to making evolutionary development a useful methodological approach for WISD. Indeed, process-oriented models rather than structured engineering models seem far more apposite. Yet, there remains a serious lack of designated tools to support evolutionary methodologies. Arguably, this then has a major effect on web-developers uptake and use of such methodologies. This is related directly to the research question for this thesis, which seeks to explore whether or not web-developers are aware of and/or using published methodologies or whether they seek to develop their own approach.

3.~~5.~~6.4 Agile approaches

Over recent years a new movement has gained popularity amongst developers through a range of approaches to ISD. These are called collectively the Agile approach. The Agile approach to ISD encompasses a number of software engineering methodologies all of which claim to bring improved efficiency, excellence and an improved project success rate in IS projects. Amongst the Agile methodologies are XP (Beck, 1999), DSDM (Stapleton & Constable, 1997), SCRUM (Ramsin & Paige, 2008), as well as many others. The basis for the Agile approach to systems development is laid out in the Agile Manifesto, originated by a collection of software developers (Beck *et. al.,* 2001). This manifesto states in its introduction that,

> "We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value: Individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, responding to change over following a plan.
>
> (Beck *et al.*, 2001).

Highsmith, (2002) sees the distinction between Agile and traditional development approaches as being that whilst the traditional approach believes the user or customer is unaware of their real requirements and as such need to be guided, the Agile approach acknowledges that neither the user nor developer may have a complete understanding of the real requirements at the outset of the project. Accordingly, the Agile approach becomes more of a partnership, as the real requirements are

discovered by both parties collaboratively as the project progresses. Agile development centres on twelve key principles which can be summarized as keeping systems simple and allowing changes to be engendered through frequent contact between user and developer throughout the development process with customer satisfaction being ensured through frequent deliveries of working valuable elements of the system. The project build should then focus on motivated individuals working as part of self-organizing teams who regularly reflect on productivity and efficiency and measure their progress in terms of working software whilst always paying continuous attention to technical excellence. Lastly, the Agile approach sees that sustainable development should be promoted allowing continued development.

However, the Agile approach is not immune from the problems associated with other ISDM. As Chan and Thong (2007) note "Agile methodologies, the latest batch of SDMs that are better in dealing with volatile business requirements, are likely to face the same problems since they require developers to drastically change their work habits and acquire new skills" (p1). Such a change might certainly provoke problems. Psychologically, change is difficult and people usually prefer to rely on practices with which they are familiar and comfortable. Also, many web developers may find working collaboratively a challenge since they would possibly be expected to problem-solve *in situ* and immediately. Further, Vidgen and Wang (2009) caution against accepting the principles of Agile unquestioningly. As they argue, despite its~~the~~ increasing use ~~of Agile there remains a debate about what~~ exactly what constitutes agility and how it is achieved, continues to be debated.

Nonetheless, the idea of solving "volatile business requirements" (Chan & Thong, 2007 p1) is surely appealing and as such, is deserving of consideration. WISD is a dynamic enterprise, and arguably, requires a degree of flexibility different from traditional IS development. Potentially, Agile appears to offer one route to achieving this.

3.6.5 WISD as 'situated action'

A radical recent development to WISD has been the acknowledgement that developers are apparently working 'outside' documented methodologies (Truex, Baskerville & Travis, 2000, Lang & Fitzgerald, 2008, Lang, 2009). Certainly, it might be argued that developers have always imported tools and techniques familiar to themselves personally when developing a WIS. However, the marked shift is the **acknowledgement** of this in academic press. Of additional importance is the acknowledgement that the apparently *ad hoc* procedure employed by developers is, in reality, a creative and flexible response to project demands (Lang, 2009).

In his review of WISD Lang (2009) explores factors external to a web development project (listed as mandate by the client, organizational imperatives, locus of power, control and reward mechanisms, organizational culture and covert political roles of formalized development methods), rather than internal factors (listed as application domain, project timeframe, team characteristics and the nature of requirements). The rationale for considering external factors is that they are outside the immediate control of the web developer and yet, s/he is compelled to respond to them. Echoing research from the 1980s onwards he concludes that web development is essentially a socially negotiated process. However, in contrast to earlier work, he also notes that this process is flexible and responsive not only to user requirements but also to a range of external contextual factors. This then necessitates the use of a range of tools and techniques which might not conform to a prescribed approach/methodology.

Though this might appear chaotic and unfocussed the WISD is certainly not "amethodological behaviour" (Lang, 2009 p1). Rather, it is a definite and focused response to project needs.

With such an overt statement being made by key thinkers in the field (eg, Truex *et al*., 2000, Lang, 2009) it might be considered that the IS industry (specifically WISD) may engage with a different and new way of working such that ultimately, prescriptive, rigid methodologies become features of historical development. Certainly, such a shift in thinking is unlikely to occur overnight and it is noted that currently, it is arousing some concern and suspicion. For example, the apparent lack of structure involved has caused comment about "opportunist bricolage" (Lang, 2009 p1). However, in a context of the evidence presented above from the academic press which notes the dissatisfaction web developers apparently feel regarding published

methodologies, together with the personal anecdotal and professional evidence which initiated this research, perhaps such a change is apposite.

3.7 Summary

It is helpful at this point to summarise the literature reviewed above addressing both the possible reasons that methodologies are seen as important in the efficient and effective development of both web and traditional IS together with the counter argument that they prescriptive patterns and procedures are inappropriate to WISD. Finally, Lang's (2009) recent suggestion that a framework is most appropriate for WISD methodology is reviewed.

Looking first at the positive points for methodologies in both IS and WIS an ISD methodology can provide a useful framework for all resources involved in the development (Jayaratna, 1994). They can demystify processes and thus, make training more effective. They can also aid in the control of a development project by indicating advantageous tasks and deliverables. Additionally, an ISD methodology can allow the incorporation of appropriate techniques and hopefully improve productivity and ultimately, the quality of the final system.

However, there are also possible problems in using ISD methodologies particularly, for WISD methodologies. As discussed above many web developers seem to prefer to develop their own approach rather than using official, published methodologies. There are many reasons for this with just a few listed here. First, developers may be intimidated by the cost of adopting a particular approach, not simply in monetary terms but also in terms of human resources. As has been discussed above, WIS are often characterised by increased time pressures and these would be amplified by the introduction of a radically new development approach. There also may be cultural and organisational difficulties appearing as staff may resist changing the way they have previously worked (Jeary *et al*., 2009).

Many ISD methodologies have existed for ~~ISD for~~ over forty years and new ones are still being produced by both practitioners and researchers. The main use of these methodologies (often by teams of developers) has been

~~Prior to the revolution of Web technology, there were existing Information Systems Development methodologies which were available to practitioners for web-based development projects. Ostensibly, major use of these during that period was~~ by large enterprises ~~willing to pay for Information Systems development~~ seeking to gain competitive advantage. ~~This all changed with t~~The introduction of the web-based platform however, led to increasing numbers of individual developers many of them working for SMEs for whom traditional ISD methodologies were considered~~found~~ lacking (Ramratten et al., 2010).

~~and the beginning of the individual developer and SME involvement and it was this point that the traditional ISD methodologies were found lacking (Ramratten et al., (2010).~~

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If the arguments in favour of using ISD methodologies are accepted, it is self evident that the designing of a methodology is a step forward in achieving these advantages but if a methodology is not adopted by developers then the effort in developing the methodology is wasted. A methodology that sits gathering dust on a developer's bookshelf achieves very little. Its real value is the degree to which it is actually implemented. Thus, perhaps the recent suggestion of a framework (Lang, 2009) is worthy of exploration offering as it does, a progressive way of thinking about WISD.

3.8 Conclusion

This chapter has outlined the various definitions of systems development methodologies and identified differences and similarities between traditional ISD and WISD. It has outlined examples of both and summarized the current state of WISD methodologies. The Chapter finishes with a review of recent work by Lang (2009) which suggests that a possible way forward in WISD methodologies is a more flexible 'framework' which acknowledges contextual factors both external to the developer and also internal to her/his situation. Such flexibility he suggests, is preferable to the rigidity of previous published methodologies.

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Using this discussion of the historical background of WISD methodologies, together with an outline of the current status of the area as a foundation for the work presented in this study, it is pertinent now to outline the theoretical framework identified for the work. As detailed in Chapter one, this thesis is presented for higher level study and accordingly, a sound and apposite theoretical framework is appropriate. The identified theoretical framework is Structuration Theory (Giddens, 1984). The rationale for this choice is fully explained in the following Chapter. A brief statement here to introduce that explanation is that Structuration theory is concerned with both the individual agent and also the structure of the environment or context. As IS and WIS are focused on the interactions and communications between the individual and their context or structure, Structuration Theory seems entirely apposite as a theoretical framework.

Chapter Four
Structuration Theory

4.1 Introduction

As noted in Chapter 2 it is recognised that experienced researchers or practitioners in a field will necessarily bring epistemological and discipline-specific knowledge to their work, even when using the Grounded Theory methodology (Glaser and Strauss, 1967; Strauss and Corbin, 1990, 1998; Orlikowski, 1993; Walsham, 1995). Accordingly, following on from Chapter 3 which positioned the research in a historical and disciplinary context this chapter outlines the theoretical framework that is adopted in this research.

As reported earlier, among the IS community (wherein WISD methodologies are located) there is an increasing emphasis on social, personal and organisational issues. As long ago as 1987 Buckingham *et al*., were arguing that IS should assemble, store, process and deliver information relevant to an organisation in such a way that the information is accessible and useful to those who wish to use it. More recently, Avison and Fitzgerald (2006) were emphasising the importance of the effective combination of human and organisational aspects in the necessity to provide "…information useful to its members and clients" (p3). This emphasis on the utility of IS – and specifically web information systems - for aiding the work of humans and organisations is the central focus of this study. WISD methodologies must necessarily be fit for purpose; not only for the individual using the system but also for the organisation/system for which the methodology is intended. Therefore, in choosing a theoretical framework for the study of Web Designers' choice – or design - and use of methodologies it was pertinent to seek one which takes account not just of social system and structure, but also personal agency. For, arguably, issues of the web designer's personal knowledge, skills and experience will be impacted by the demands of the organisation/system in any decision-making and adoption of any WISD methodology.

Structuration Theory (Giddens, 1984) is the theoretical framework chosen as it offers investigation of both Structure and Agency, together with an exploration of the synthesis of the two factors.

Additionally, as noted in Chapter 2 Grounded Theory's roots within Symbolic Interactionsim (Mead, 1934) emphasises the meaning of social interactions together with personal self-awareness. It allows a focus on contextual and processual elements as well as the action of key players associated with organizational change elements that are often omitted in IS studies that rely on variance models and cross-sectional, quantitative data (Markus & Robey, 1988, Orlikowski & Baroudi, 1991). This also then finds resonance in Structuration Theory (Giddens, 1984) wherein Structure and Agency are both central. In adopting Glaser and Strauss' (1967) and Strauss and Corbin's (1990) recognition that for any researcher or practitioner in the field investigation is necessarily informed by prior knowledge, disciplinary perspectives and previous theory, the application of Structuration Theory (Giddens, 1984) as a framework in which to locate the emerging theory is appropriate.

4.1.2 Introduction to Structuration Theory

Structuration Theory is a "distinct analytical and conceptual resource" (Stones, 2005 p.1) developed by Giddens between the early 1970s and late 1980s as a response to the 'crisis' in his discipline of sociology which resulted from the split between the Structural Functionalist school (eg. Parsons, Marx, Strauss) and those concerned with Agency (eg. Hermeneutics and Phenomenology). Simplistically, this binary division can be seen in terms of 'society' and 'the individual'. That is, Structuralism focuses on social forces 'compelling' people to social action and behaviour, whereas focusing on individual Agency enables a discussion of individuality, self and consciousness, though as Stones (2005) notes, none of these concepts has yet been defined to the satisfaction of all researchers in the social sciences.

Nonetheless, as one response to the complexity and apparent confusion in the discipline Giddens, over thirty years ago, asserted that a sound understanding of the social world was not possible due to its focus on theoretical duality; not only the agency/structure dichotomy, but also the dualism involved in micro/macro and even the research division of qualitative/quantitative methodological approaches. He then claimed that his Structuration Theory would provide a new way of thinking about and applying, concepts of *Meaning, Agency, Structure* and *Power*. He further argued that

the theory presents a new interpretation of these concepts such that they might help guide the "study of social action in actual space and time" (Tucker, 1998 p.12); the fundamental premise being that the conscious actions of individuals form the sets of rules, practices and routines which, over time and space construct 'structure'. This is the process of 'structuration' and hence, 'Structuration Theory'.

More simply, Giddens was postulating that all individuals act, interact and behave in deliberate ways, with the action, interaction and behaviour then making the rules by which we all live and to which we all ascribe. Over time, these rules become part of the accepted fabric and rubric of our existence – being seen as 'received wisdom' which we accept and use to structure our ways of living. This then is the process of structuration; an active, constructive process involving individuals dynamically 'making' the world and the world 'making' them/us.

Structuration Theory is complex and diverse and accordingly, concepts relevant to the IS community have been selected and adapted for this thesis. Such selection is in accordance with Giddens' personal preference. As he complained, most researchers and authors have tended to "import his concepts *en bloc* in a way that merely served to unnecessarily burden and clutter studies with an excess of abstract concepts" (Stones, 2005 p2). Though it is aimed here not to fall into such pitfalls of abstract theorising, Structuration Theory is a complex theory and it is important to set out some key parameters and principles before applying it directly to the current study.

Giddens' Structuration Theory underwent several metamorphoses between the 1970s and the 1990s as it gradually developed in response to application, further theorising and practical application. Consequently, for clarity, it was deemed important to locate the current study within a specific frame of the theory. The most appropriate was determined as that presented by Giddens in his work *Constitution of Society* (1984) which demonstrates a thorough presentation of his theory. Building upon the division between Agency and Structure through the 1970s – key principles identified by Giddens at the outset of his work - by 1984 these features were clearly articulated and developed. Given their great importance and underpinning to the theory it is considered relevant to outline the key features of each before applying them to the current study. Thus, they are detailed below.

4. 2 Agency

Giddens asserted that human agency, which he also termed 'Transformative Capacity', is defined as the "capacity to make a difference" (Giddens 1984 p 14) – ie, the ability to effect change in some way. This, he claimed, is synonymous with power, as, in most circumstances, all agents have the capacity to make a difference to a given situation except in exceptional circumstances..Within Structuration Theory power involves the 'exploitation' of resources. Exploitation is an interesting word to use as it has overtones of negativity. However, arguably, the interpretation intended by Giddens was that people are able to USE resources to their – and others' - advantage. He defined resources as "structured properties of social systems, drawn on and reproduced by knowledgeable agents in the course of interaction" (Giddens 1984 p15); that is, rules, systems, methods, procedures, products, – in fact anything that agents might USE.

He further identified two types of resources -"authoritative resources" which derive from the coordination of the activity of human agents; arguably referring to the rules, systems, methods and procedural elements; and "allocative resources" which result from control of material products or elements of the natural world (Giddens 1984).

Deconstructing this terminology further, Giddens is arguing that our social systems are constructed through interaction between individuals – all of whom have agency. They produce the forms of knowledge and social structures we take for granted. They also control the materials and products necessary to sustain our world.

For Giddens, such control of our world happens through human agency involved in actions within daily life, wherein social interaction becomes routine encounters. These routine encounters are "formed and reformed in the *durée* of daily existence" through discourse: that is, through the meanings and values we ascribe to them. Put simply, our daily interactions are acted out within a social system which is structured and made sense of through our actions, interactions and behaviour.. As generally, most people do not question or challenge the *status quo* this daily existence then engenders an "ontological security" (Giddens, 1984 p50) for all, as the patterns of

daily life are constructed and played out. That is, we are comfortable and generally do not feel the need to question our familiar surroundings and structures within which we go about day-to-day activities.

Giddens argued that the "predictable routines" (Giddens, 1984 p50) in which we all engage are "organized in and through the intersections of practical and discursive consciousness" (Giddens, 1984 pp72-73). That is, the activities we engage in through a mixture and overlapping of patterns, behaviours and motivations the person is aware of but is unable to express, combined with those s/he is conscious of and able to express. Practical consciousness is then more like pre-reflexive knowledge. Played out in everyday life this refers to those behaviours and patterns of behaviour a person contemplates but is unable to express or action, such as dreams or fantasies, combined with those s/he engages with and discusses consciously such as plans for the future. For Giddens these two elements merge and interact within the individual and are played out (in various ways) through our interactions in social life.

4.2.1 Structure

Giddens defined structure as "rules and resources recursively implicated in social reproduction" (Giddens, 1984 p377). More simply, he is referring to the rules and resources which structure our society and our everyday living. For example, when driving we all know that we have to stop at a red light. This is a 'rule' of our society that does not need explaining at every set of traffic lights. An example of our 'recursive engagement' with resources is that we enjoy use of petrol and oil in everyday life. Interaction around the use of these resources happens daily as our existence is 'powered'. We engage in active interaction around its implications in social life every day.

Giddens departed from the conceptualization of structure as some given or external form. For Giddens, structure is what gives form and shape to social life, but it is not itself the form and shape. Rather, structure exists only **in** and **through** the activities of human agents. He suggested that while structural properties of societies and social systems are real, they have no physical existence. Instead, they depend upon

regularities of social reproduction (Giddens and Pierson 1998) that is, those practices we 'construct' through discourse, (such as rules and laws), but which, nonetheless, structure our existence. As a consequence, the basic domain of study in the social sciences consists of social practices (Giddens 1984 p.2). To return to the example given above, the rule that we should stop at a red traffic light is not a rule 'given' by some deity. Rather, it was constructed in and through the activities of human agents and is only effective to the extent that people follow it.

For Giddens, structure can be conceptualised abstractly as two features of rules – "normative elements" and "codes of signification" (Giddens 1984 pp xxx1); that is the parts of rules that regulate action – the 'normative elements', together with the meaning ascribed to such – the 'codes of signification'. The red traffic light regulates our action because of, and through, the meaning we give it. Of itself, a red light does not mean 'stop'. Rather, it is simply the signification or meaning we have ascribed to it which prompts the resulting action.

Structure then becomes a "'virtual order' of transformative relations" (Giddens, 1984 p17) such that "discernibly similar social practices ..exist across varying spans of time and space….orientating the conduct of knowledgeable human agents" (Giddens 1984 p17). Put simply, we organise our existence through social structures that have patterns across time and thus, organise our existence, behaviour and consciousness. Although we may not be consciously aware of these patterns, they nonetheless, organise the ways in which we live out our lives. For example, few of us contemplate the reasons why our political system is structured and regulated as it is. Nevertheless, the rules and patterns of political life govern the structure of our society and the way we all live.

4.2.2 Duality

For Giddens the dualism of structure and agency is best viewed as a 'duality' of two reciprocally and dynamically mutually dependent concepts which are recursively related. The focus on language in the rejection of the dualism of private, subjective experience (which is perhaps the more accepted understanding of agency within the

Phenomenological tradition), and objective culture separated from this experience, is central to Giddens' model. In this, the influence of Wittgenstein on Giddens' theorizing is clear; specifically, Wittgenstein's emphasis on the 'linguistic turn'. For Giddens, agency and "personal experience, is known to the self as a 'self' only via the pubic categories of language" (Giddens 1996, p.205). That is, without the social and public interaction, self and agency cannot be realised - ie without the social activity of language we cannot know ourselves.

This focus on language then leads to the notion that the person and society cannot be separated, but must be understood as inextricably linked with the individual's actions tying together subjective experience with larger social processes. Individuals are then constructed and constructing, reciprocally, the social world, themselves, and social processes with structuration as the process wherein the duality of structure evolves and is reproduced over time and space in a simultaneously constraining and enabling process. This finds resonance with Burkitt's (2008) thesis of the Social Self wherein he critiqued the traditional Western notion of a bounded, unique 'essentialist' self (Stevens, 1996), suggesting instead a self constructed by and reciprocally constructing, the social world and social processes. Structuration is the process wherein the duality of structure evolves and is reproduced over time and space in a simultaneously constraining and enabling process.

As noted above, such a view of self stands contrary to the accepted, largely unquestioned view of self that is currently prevalent in Western society currently. As Smail (2005) argues we generally experience life with 'self as centre' such that self is the starting point from which we make sense of the world (Pratt, 1991). As Markus and Kitayama (1991) conceptualise, this then leads to an understanding of self as "an independent, self-contained autonomous entity who (a) comprises a unique configuration of internal attributes and (b) behaves primarily as a consequence of these attributes" (p.224). As such, this 'self' assumes stability of personhood which Burr (1995) argues is an illusion, though a very necessary illusion and Gergen (1991) states, construction and maintenance of which is one of the primary tasks of an individual. Perhaps unsurprisingly as Glass (1993) and Flax (1990) assert, it is fundamental to our cultural understanding of who we are, since when faced with uncertainty in life we depend on a certain and stable 'self'.

Yet, within Structuration Theory Giddens' exposition of self as agent is set within a social context; that is, he argues that individuals have agency, but that agency is bounded within societal process and structure. In this way, he is concurring with the view of self as agent within a social system such that though we may feel and believe we have complete autonomy and choice, in actuality we are reciprocally constructed by, and constructing, the social world. Thus, agency is reciprocally bound up with structure in all that we do.

4.3 The Double Hermeneutic

A major tenet of Structuration Theory is Giddens' idea of the 'Double Hermeneutic', He defined this as the interweaving of the concepts of the social scientist and everyday life as social scientific ideas are expressed in common parlance and become part of the social world studied by the researcher (Giddens, 1984). This means in practice, that as social theory attempts to grapple with the fluidity of the social world its concepts become part of that social world and the very nature of society changes. For Giddens social theory has a fundamental impact and influence on the conceptual categories people use to understand their world and this in turn has an impact on the resulting social process and social action. As a consequence, this 'double hermeneutic of the social sciences' means that social theory is always studying a complex, changing social world and influencing its development through a dynamic dialogue between 'experts' and lay discourse.

Such a notion finds resonance in the theory of Social Representations developed originally by Moscovici (1961). Flick (1995) defined social representations as "socially shared and interactively produced process of understanding objects and processes and a way to communicate about them with others. More generally this process is part of the social process of constructing realities – through knowledge and through social practices." That is, the idea that most of what we see and hear, our beliefs about people and things are not directly factual, rather, we acquire them from other people via conversations, mass media and handing down, so their origin is interpersonal or social. Within Social Representation (SR) theory the individual is

seen as active not passive, engaged in a reciprocal, dynamic, dialogical, interactive relationship with society. The theory focuses on the ways in which meanings and understandings are circulated in society where they are constructed by discourse and in interaction.

Within SR theory (Moscovici, 1961) human understanding is understood as being developed largely from daily interactions which are constantly being changed. As with Structuration Theory's notion of double hermeneutics, SR posits the notion of 'Doppelgangers'. That is the idea that every academic science produces a doppelganger of traditional knowledge – eg. Economics produces popular economics, psychoanalysis, a psychoanalysis of the masses etc. The former produces explicit and more or less objective theories, the latter will be formed on the basis of social representations, that is legitimised by popular consensus. As Giddens argued in Structuration Theory, both develop alongside each other reciprocally.

Thus, within IS "Software technologies conditions certain social practices and through its use the meanings embodied in the technology are themselves reinforced" (Orlikowski & Roby 1991, p 155). That is, meanings and understandings that originate in the language, discourse and experiences of 'experts' gradually become part of lay discourse and are received and understood as part of everyday life. For example, the discourse around the word 'mouse' and 'gigabite' has permeated everyday interaction and understanding where once it was the province of 'computer geeks'.

4.4 Structuration Theory summarised

Clark (1990) summarises Structuration Theory into a series of statements given below:

1. Social practices reside at the core of the individual and society, where social practices constitute the actions and experiences of individual actors reciprocally interlinked with social structure.

2. Social practices are actuated by "knowledgeable human agents" who have the capacity for self-reflection and the ability (sometimes tacit) to make a difference.

3. Social practices are not random, but rather are relatively ordered and stable across time and space. In producing social practices actors draw upon 'structural properties' (rules and resources) which are themselves institutionalised features of society.

4. Structure is therefore activity dependent, relying upon the production and reproduction of activities through the 'double hermeneutic' involving both individuals and society. "We create society at the same time as we are created by it" (Giddens 1984, p14).

4.5 Structuration Theory and Information Systems

There are four major published reviews of research in IS using Structuration Theory ; these being by Walsham and Ham (1991), Jones (1997) Rose (1998) and more recently, Jones and Karsten (2008). As Jones (1997) notes, in its original formulation, Structuration Theory pays little attention to technology. However, the importance, prevalence and pervasiveness of technology in organizations' everyday operations cannot be dismissed and researchers such as Walsham (1993, 2002) and Orlikowski (1993) have extended Giddens ideas by including an explicit IS dimension in social analysis. As Rose (2001) commented the conceptualisation of theory into another field (for this study, web-design) may be used for three purposes:

1. "To theorise – to reconceptualise or theorise aspects of the new field

2. To analyse – for an analytical framework for the retrospective understanding of empirical cases or studies

3. To operationalise – to provide operational guidelines for Practitioners" (Rose, 2001 p10)

Further, in a recent review of 331 IS articles that have drawn on Giddens' work Jones and Karsten (2008) concluded that there are significant opportunities for IS researchers to pursue structurational research that "engages sympathetically, yet critically with Giddens' work" (Jones & Karsten, 2008 p127). Their review reiterates Giddens' rejection of objectivism and naturalistic approaches. It also raises concerns

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over some of the dominant interpretations and adaptations of Structuration Theory in IS research such as Adaptive Structuration Theory (DeSanctis and Poole, 1994) and the duality of technology (Orlikowski, 1992; Brooks, 1997).

Nonetheless, Jones and Karsten (2008) also emphasise that their assertions should not be proscriptive and they identify three broad strands of potential use of Structuration Theory in IS. These are first, the application of structurational concepts, then development and application of IS-specific versions of Structuration Theory and thirdly, critical engagement with Structuration Theory. The third issue relates to attempts to develop hybrid approaches such as combining Structuration Theory with other theories such as Critical Realism, Soft Systems Methodology (Rose and Lewis, 2001), Actor Network Theory (Brooks and Atkinson, 2004) and also science and technology studies (Jones and Karsten, 2008).

These hybrid approaches attempt to address some of the theoretical limitations and lack of empirical applications of Giddens' work within the field of IS. Nevertheless, other work such as that conducted by Jones and Karsten (2008) view the integration of Structuration Theory and other theory such as Actor Network Theory, to incorporate a more distinct emancipatory component as somewhat tautological. They argue that a deeper reflection of Giddens' theory would allow for emancipatory change at every point of action due to the degree of agency and choice inherent within all human actors as they all have the ability to effect change in some way.~ Yet, except in exceptional circumstances this then also allows that the potential may not be realised.

There has been a range of research applying Structuration Theory to IS led predominantly by both Walsham and, separately, Orlikowski. For example Walsham (2002) investigated cross-cultural software production and use though arguably, one of the most sustained and well articulated attempts to theorize aspects of the Information Systems field using Structuration Theory comes from Wanda Orlikowski. Indeed, she is probably best known for her work in studying the implementation and use of technologies within organisations by drawing on Giddens' Theory of Structuration. In her work with Robey (Orlikowski & Robey, 1991) she uses the fundamental elements of Structuration Theory to investigate the relationship

between IS and organisations. In her subsequent work Orlikowski applies her critique of the duality of structure to technology...

In addition to the human computer interaction aspect of Adaptive Structuration Theory, Structuration Theory has also been rearticulated as Structuration Agency Theory for modeling socio-biologically inspired structuration in security software applications (Workman, Ford and Allen, 2008). From this frame of reference, they concluded that it is not only human agents who are actors in structuration, but software agents may also "behave socially to exchange information, receive instructions, react to the effects of other agent actions, and provide responses in a cooperative fashion to fulfil individual and collective goals in an adaptable and evolutionary way" (Workman *et al*., 2008, p.269-270, Broekens *et al*., 2007).

Thus, it is clear that Structuration Theory is a widely used theory aposite to many different academic and practice situations and contexts. Structuration Theory is pertinent to the current study as it facilitates exploration of both the agency of the web-developer together with the structure of the approach and the context.

The complex inter-relationships played out in daily existence between agency and structure in the choice and development of a web system are the focus of this thesis. WIS developers clearly use tools, techniques and methods in both the research and practice cycles. However, they may be entirely unaware of the theory base behind their analysis. As demonstrated in Chapter 3 tools, techniques, frameworks, method and methodology represent familiar aids to IS development practice. However, WISD is currently at a very different stage of the action research development cycle.

4.6. Critiques of Structuration Theory

A fundamental critique of Structuration Theory is the 'conflation' of structure and agency. Conflation here refers to the "….problem of reducing structure to action (or vice-versa) and the difficulty of documenting an institution apart from action" (Barley and Tolbert, 1997). That is according to Barley and Tolbert (1997) Giddens' proposition of 'duality', the synthesis of agency and structure is actually problematic,

particularly since Giddens does not offer argument as to how it might be achieved and both elements are fundamentally different.

Archer (1996) suggests a distinction between structure and agency in the sense of tracts of time, with human actions (agency) being short term and structures being more enduring. This then allows for analytical separation and certainly, this might offer helpful solution. However, she further queries the relevance of Structuration Theory's answer to questions of historical change such as why some forms of social institution succeed and others not, and applied to IS, why some forms of IS gain prevalence and success and others do not. This is interesting in the context of the current study as it has been argued that currently, no single WIS methodology retains precedence and supremacy.

Unfortunately, Giddens has little to say on the matter of explaining historical change. The lack of concrete empirical examples in his work in combination with the theory's abstract conceptual focus, offer few clues as to how to apply the work effectively and meaningfully in practice. Further, it offers little help in accounting for problems of explaining historical change – or for offering solutions to those problems. Thus, perhaps not surprisingly, Structuration Theory has been used largely as a means of analytical comparison – and this is the case for research in IS (Rose, 2001).

However, as noted earlier, to be of any practical use Structuration theory must surely be applied to improvements in practice or as Rose (2001, p222) comments, to "…practical things in the everyday world [of IS]." Moreover, as noted at the beginning of this chapter researchers have been arguing for over thirty years (eg. Buckingham et al. 1987., Avison & Fitzgerald, 2006) for the importance of human, technological and organisational communication and co-operation to facilitate accessible and useful information "… useful to [its] members and clients" (Avison & Fitzgerald, 2006, p3).

As this emphasis on the utility of IS – and specifically web systems - for aiding the work of humans and organisations is the central focus of this study it is argued that this thesis begins to offer the practical application demanded by Rose (2001). That is, the thesis seeks the exploration and understanding of web-designers' choice and

adoption of approaches/methodologies in order then to construct a framework for web systems development. Such a framework is not intended to become simply one more new methodology left to 'gather dust upon a shelf', browsed occasionally by academics but not utilised in practice by web system designers. Rather, through the utilisation of both agency and structural elements of practice based on web system developers' views, it is aimed to produce a framework for practical use. Commencement of the discussion as to how this is achievable is given below.

4.7 Structuration Theory applied to the Current study

Firstly, it is important to set parameters of analysis and understanding before commencement of practical application of Structuration Theory to the question of choice of web-developers' approaches.

For the current study **agency** is taken to be concerned with the actions and control (perceived or actual) of the WIS developers. Their 'Transformative Capacity' - the ability to effect change in some way, or their "capacity to make a difference" (Giddens 1984 p 14) is seen as central to decisions about the system developed or used. This change occurs through the interactions of the WIS developer, the social system,and the knowledge of WISD methodologies. The developers are able to draw upon "structured properties of social systems" as they are "…reproduced by knowledgeable agents [the developers] in the course of interaction" (Giddens 1984 p 15). Such action is then mutually dependent upon the structure and agency interacting together in a process wherein the web developers facilitate and 'effect change'.

Giddens' recognition of human agency as a " transformative capacity" (Giddens 1984 p14) connected with the exploitation of significant and legitimate resources, giving the ability to make a difference, has previously not been fully recognized or acknowledged by existing specialist web development methodologies. Specifically, the mutual interdependence of the structure and agency involved has been little explored   The resources of the web developer are considered authoritative in that s/he has the knowledge of his/her abilities and skills in web development but also

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allocative resources in terms of control of the practical resources s/he is able to use. Yet all this is necessarily situated within a structural context. of the structure.

Structure is argued to be the active, developing social system within which the individual web-based system developer is working. This includes consideration of the macro social system, the organisation and also system developmentthe knowledge within which is situated the academic hierarchy of published methodologies. The rationale for inclusion of all three elements is that they provide - both separately and together - the "rules and resources recursively implicated in social reproduction" (Giddens, 1984 p377); that is they constitute rules for action and provide the associated resources necessary for such action in the WIS world., A consequence of such action and activity results in dialogical communication which then further constructs the fabric of the web system community - the activity and action of web-design within the social system – of the organisation or of the web-development world. The relationships between actors within the structure are thus organized as regular social practices; that is, web-developers construct the structure of the regular social practices of web-design within the organisation/context/wider IS community.

This process can further be conceptualised abstractly as two features of rules – "normative elements" and "codes of signification" (Giddens 1984 pp xxx1); that is the parts of rules that regulate action – the 'normative elements', together with the meaning ascribed to such – the 'codes of signification'. Structure then becomes a "'virtual order' of transformative relations" (Giddens, 1984 p17) such that "discernibly similar social practices ..exist across varying spans of time and space….orientating the conduct of knowledgeable human agents" (Giddens 1984 p17).

For the current study, it is argued that this means that the web-developers use "normative elements" (or accepted tools and techniques) of web-design which then are 'coded' and 'shrouded' in discourse relevant and meaningful to themselves (and possibly other web-developers) constructing "codes of signification" such that the resulting web-design "…orientates the conduct of knowledgeable human agents [the web-designer]". In this way, according to Giddens, structure becomes enabling as well as constraining as individuals operate within accepted parameters such that the

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Structure acquires identity and flourishes. For the current study, this means that the web-developers' choice of approach/methodology accrues identity – possibly within the wider IS community or possibly simply within his/her web information systems development community - and both the agent (the web-designer) and the approach/methodology, flourish and develop. Moreover, the structure is directly and indirectly influenced with the action, behaviour and interactions of the agents' (web developers') changing knowledge, understanding and practice. .

The Double Hermeneutic referred to by Giddens can be seen as the interweaving of the concepts of the published scientific methodologies discussed and presented in academic press, together with the everyday practice of web-systems design life as scientific, academic ideas are expressed in common parlance and become part of the practical world of web design. This means in practice that as academic theory is introduced into the fluidity of the practical applications of web-based system design methodologies its concepts become part of that world and gradually, the very nature of expectations and understandings of web information systems development changes.

As stated, for Giddens, social theory has a fundamental impact and influence on the conceptual categories people use to understand their world and this in turn has an impact on the resulting social process and social action. As a consequence, this 'double hermeneutic of the social sciences' means that social theory is always studying a complex, changing social world and influencing its development through a dynamic dialogue between 'experts' and lay discourse. Thus, our understandings of web-system design methodologies are constantly impacted by the dynamic dialogue between practitioners and social organisations.

4.8 Structuration Theory as underpinning framework for the Internet Survey

Stating once more the argument made by researchers in IS for the last thirty years that the effective synthesis of human, technological and organisational aspects is necessary for sound IS and WISD (Avison & Fitzgerald, 2006) and specifically for this thesis, that web methodologies must necessarily be fit for purpose - not only for

the individual using the system but also for the organisation/system for which the methodology is intended - this thesis necessarily investigated both agency and structure in the exploration of WIS developers' choice and development of methodologies. Accordingly, the Internet survey attempted to address both factors, together with the synthesis of the two factors.

4.8.1 Agency explored in the Internet survey

As stated above, for the current study agency is taken to be concerned with the actions and control (perceived or actual) of the web developers. It seemed appropriate then to explore how far web developers perceived themselves to have 'Transformative Capacity' - the ability to effect change – by determining their choice of Methodology/Approach. Linked into this, investigation of their "capacity to make a difference" (Giddens 1984 p 14) in a context of the WIS, was also investigated. The survey asked developers about their decision-making regarding the choice of web system by asking them to rank in importance to their choice, a series of issues and factors. These issues and factors are detailed in table 5.1.

This ability to effect change is then considered to be synonymous with agency within the relationship between the web developer and the organisation as the developer is able to draw upon "structured properties of social systems" as they are "…reproduced by knowledgeable agents [the developers] in the course of interaction" (Giddens 1984 p 15). Questions pertaining to choice of Methodology all related to this as developers actively draw upon "structured properties of social systems" (the methodologies, tools and techniques) in the course of their interactions about choice of WIS.

Questions pertaining to developers' knowledge of different methodologies and tools and techniques are linked into an exploration of agency as it was seen to be a major feature of their choice. Designers' knowledge about different methodologies, tools and techniques all contributed towards their choice – or rejection – of that approach. Such decision-making then impacted the structure and potentially, effected a change both at an organisational level and also contributing towards dialogue and debate –

both practitioner and academic. Thus, questions about web designers' knowledge of methodologies, tools and techniques were included in the Internet survey.

4.8.2 Structure explored in the Internet survey

It was argued previously that for this study, structure is seen to be two factors. First, it is perceived as the social system within which the individual WIS developer is working; which may or may not include a defined organisation, as many web-developers work free-lance rather than for a specific company. Structure was also argued to be the academic hierarchy of published methodologies.

The rationale given for inclusion of both is that each provides, separately, the "rules and resources recursively implicated in social reproduction" (Giddens, 1984 p377); that is of the activity and action of WISD within the social system – of the organisation or of the WISD world. The relationships between actors within the structure are thus organized as regular social practices; that is, web-developers construct the structure of the regular social practices of web-design within the organisation/context. Accordingly, in the Internet survey it was important to explore the rules and resources of WISD. That included both the structure of the 'organisation' together with the structure of the web methodologies.

Questions were included in the survey around the importance of the organisation; both the management of the organisation and the success of the organisation itself, to the choice of web system (see table 5.1). Also, questions about web developers' use of published methodologies were asked. In this way it was aimed to explore the "rules and resources recursively implicated in social reproduction"; that is, the Internet survey aimed to explore the processes of the choice of web system and the impact of such choice on the organisation.

4.8.3 Internet survey within Grounded Theory

Located within a Grounded Theory methodology the survey was also required to accommodate inductive reasoning and take account of observation and anecdotal

"sensitising issues" (Charmaz in Smith 2008, p87). Thus, the questions originated in personal professional and anecdotal experience and interest. As stated in Chapter 1, I had become increasingly frustrated at the apparent lack of a recognised and widely accepted web system methodology that I might teach to students. At the same time I was aware of an apparently increasing number of web system methodologies being written, but not used in practice by web developers. Anecdotal evidence had suggested a 'split' between web developers' practice and published work. I was curious to investigate the legitimacy of such anecdotal evidence and contextualise this within an exploration of exactly which – if any – recognised, published methodologies web designers were aware of. The development of the Internet survey was used as an initial exploration. The development of the Internet survey together with a discussion of the findings, are detailed in the next Chapter.

4.9 Structuration Theory applied to the interviews

Following a Grounded Theory methodology and having first undertaken the Internet survey and analysed the results I determined that in-depth interviews were a necessary additional research tool to explore in more depth and detail the notions of agency and structure among web information system developers. As with the Internet survey, both factors were investigated in the discussion of web information systems developers' choice and development of methodologies. Additionally, as in the Internet survey the interviews explored both factors, together with the synthesis of the two factors.

4.9.1 Agency explored in the Interviews

In common with the Internet survey, agency was taken to be concerned with the actions and control (perceived or actual) of the WIS developer and therefore, it seemed appropriate to explore how far web designers perceived themselves to have 'Transformative Capacity' - the ability to effect change – by determining their choice of methodology/approach. In contrast to the Internet survey, however, the interviews

facilitated a different approach to this investigation. The interviews were able to be guided by 'prompts' (detailed in Chapter 6) which enabled more in-depth exploration of the developers' personal experience, knowledge, use of tools and techniques, choice of approach/methodology, and importantly, the reasons for that choice. Questions to individual participants following these prompts were then able to be based in their specific responses, rather than a more generalised line of questions as required by the Internet survey.

This last point is especially pertinent to a discussion of agency and specifically, to investigation of their "capacity to make a difference" (Giddens 1984 p 14) to the 'organisation'. In the interview developers were asked about the rationale for their personal choice of web information system. Rather than presenting participants with a pre-set list of possible reasons the interview enabled more freedom of response. However, it is acknowledged, that just as in the Internet survey, questions pertaining to choice of methodology all related to developers' agency as they were further prompted to discuss their knowledge and use of "structured properties of social systems" (Giddens 1984 p 15), (the methodologies, tools and techniques).

4.9.2 Structure explored in the Interviews

Following on from the Internet survey, the interviews explored structure as seen in two factors - the social system within which the individual web developer was working (which may or may not be a defined organisation), and also, the academic hierarchy of published methodologies. Thus, it was important to explore the 'rules and resources' (Giddens, 1984) of choice of WIS with the developers.

Consequently, the interview asked questions about the web developers' experience and background – aiming to explore both their practical experience in web development, and also their academic and training experience (see chapter 6 for the interview schedule). Through these questions it was aimed to explore the importance of the academic background to practical application of WISD. Questions were also asked pertaining to the developers' knowledge of different approaches/methodologies and tools and techniques. Also, questions about web developers' use of published

methodologies were asked. In this way it was aimed to explore the "rules and resources recursively implicated in social reproduction"; that is, the interviews aimed to explore the processes of the choice of web system as it was then recursively implicated in perpetuating the practice (and choice of web system) for the organisation. They also aimed to provide information to further the Aim of this thesis, To identify web developers' current methodologies (both personal or published) to inform the development and validation of a framework for developing a web information systems development methodology.

4.9.3 Interviews within Grounded Theory

Located within a Grounded Theory methodology the interviews, like the Internet survey, were required to accommodate inductive reasoning and take account of observation and anecdotal "sensitising issues" (Charmaz in Smith 2008, p87). Thus, as the questions in the Internet survey, the interview questions originated in personal professional and anecdotal experience and interest as I searched for a recognised published methodology utilised by web developers.

The development of the Internet survey, together with a discussion of the findings, are detailed in the next Chapter. Details of the interview process together with the findings from the interviews are given Chapter 6.

4.10 Summary

This chapter has outlined the key features of Structuration Theory. In applying the theory to Information Systems research and then, specifically, to the current study, it has justified the adoption of Structuration Theory as a theoretical framework for the research. The key features of Structuration Theory that are used to underpin the development of the Internet-based survey and the interviews have been outlined. The development of these research tools, together with the research findings are presented in the next two Chapters.

Chapter Five
Primary Research tool: Internet survey

5.1 Introduction

Having outlined the theoretical framework used in this thesis in the last Chapter, this Chapter details the Internet research tool/method. It includes a discussion of the rationale for the tool set within the context of the overall research methodology and then proceeds to discuss the origin of the research questions and the application of the tool/method. The development of the tool is detailed with the decision-making process concerning the structure of the survey, the questions to be included and the repeated redesign issues are documented. The results of the initial study are discussed, together with the ensuing re-designed research tool. The rationale for the re-design is included. The research population is outlined and the difficulties and challenges of the research method are presented. The Chapter concludes with a discussion of the ensuing research findings and a reflection on the process.

As stated in Chapter 2 this research study follows a Grounded Theory methodology. This offers a methodology for "…allowing concepts to be generated in the course of empirical research" (David & Sutton, 2004 p 80) and through various forms of data collection. An approach that "strives to arrive at theoretical understanding of psycho-social phenomena that are grounded in the data collected from the lives and contexts of the participants" (Gordon-Finlayson, 2010). The aim is to identify patterns and then to seek to formulate concepts that capture such patterns. The patterns 'emerge' from the data through a continuous process of research reflection upon the data gathered. This often requires that initial concepts be reformulated and subsequently re-examined in a continual process of folding induction into deduction until the point of saturation – that is the point at which no new data is forthcoming. Whilst it is evident that a qualitative approach is most often employed within Grounded Theory, the methodology nonetheless, embraces a range of data collection tools leading to the collection of relevant concepts and patterns. Hence, in addition to the researcher's professional inductive experience context for the study was also provided by a review of relevant literature from the two domains of ISD methodologies and WISD

methodologies. This was presented and discussed in Chapter 3. As the researcher is from an academic background recognition of such published material is important.

The review of the literature provided context to the framing of the ensuing research. Together with personal professional inductive experience the literature was used to identify initial concepts and patterns from which the Internet survey was developed. In this way, concurrent use of inductive and deductive reasoning and material provide context to the study.

5.2 Surveys

It was decided that a sound approach to data collection in the early stages would be to gather as much data as possible from as wide-a-range of practitioners, as possible – i.e. a diverse a range of WIS developers – in order to seek to identify initial concepts or patterns. Questionnaires are better suited to gathering 'factual' data rather than subtle or complex social data. Such data was deemed necessary to review the work environment and practice of web developers. Thus, a survey was developed to gather mainly quantitative data with some limited qualitative information. The survey, also known as the self-completion survey, social survey or questionnaire survey (David & Sutton, 2004) is a traditional method of gathering quantitative data.

5.2.1 Survey Questions

Surveys require the participant to complete a series of questions designed by the researcher. Everyone in the sample is systematically asked the same questions in the same order. It has long been established that questions must be easily understandable to all participants (Payne, 1951) and that each question should mean the same to all participants. Payne and Payne (2004) also warn against using leading questions that appear to expect a certain answer, combining two or more questions or asking questions that provoke anxiety in participants such as those demanding complex knowledge or reasoning. Sapsford (1999) further reminds us that "If we ask dull questions we shall get dull answers" (p257). Clearly questionnaire design is far from a simple task!

There are two main types of questions – 'open ended' and 'closed'. Open ended questions invite the participant to respond with their own view, sometimes in detail. Consequently, space in the survey needs to be left for this. In practice, most questions are likely to be in 'closed' format offering a range of options from which the participants must choose. This includes 'attitude scale' questions which generally offer a range of five possible responses to opinion statements (Oppenheim, 1992). The advantage of closed questions is that they are easily classified. A disadvantage is that they do not generally offer the opportunity for participants to expand their answers.

The order that questions are presented is important. Generally, questions should flow into each other such that the rules of a 'normal conversation' (Payne & Payne 2004 p188) are followed. Often participants are required to answer only certain questions if they have given a particular response to a given question. This question is called a contingency or filter question. This question must be a 'closed' question. Instructions to participants then entail instructions such as 'go to question *'. Filter instructions must be absolutely clear.

The questionnaire/survey itself must be as brief as possible since most participants' attention span – and also perhaps their time - is short. However, it necessarily requires to ask sufficient pertinent questions to answer the research question.

The survey for this research was designed to answer the following research question

How far are web developers following a recognised web information system development methodology?

5.3 Advantages and Disadvantages of Surveys

There are a number of different forms of survey. Traditionally, the main form was a postal survey with the questionnaire being distributed by post with an accompanying covering letter and usually a pre-addressed postage paid envelope for the participant to return the questionnaire. Increasingly, however, new technologies have facilitated distribution via email or web pages (de Vaus, 2001). Both the postal and web-based surveys have several similar advantages. These are, first, data from a large sample

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over a wide geographical area can be gathered within a limited time. Second, researcher effects/influence is minimised as the researcher cannot use mannerisms, tone of voice or other effects (such as age or gender) to influence the results. The third advantage is that a self-completion survey can be completed in the participant's own time, at their own pace and in a place of their choosing. Additionally, any questions that might be perceived as sensitive may be more easily answered without the presence of a researcher and specifically, when a questionnaire might be returned anonymously.

An additional advantage of a web-based survey (over a postal survey) is that the questionnaire can be written so that the accidental selection of an inappropriate number of categories or a failure to respond to a question can be avoided.

The major disadvantage of both the postal and Internet survey is the traditionally low response rate. Reasons for this are varied and can include "…the subject matter of the survey, the target population under study, the recipients' perception of its value and the ease of completion of the questionnaire (Simmons, 2001 p87). Unfortunately, it is not easy to asses the reasons for people's lack of response. Another disadvantage of these surveys is that the researcher has little (if any) control over the completion of the questions. For example, participants may 'jump around' a written questionnaire or email survey (unless prevented by the format of the email/web based questionnaire). The effects of this may be that only parts of the survey are completed, or that pars of the survey which are cumulative, receive limited or inappropriate attention. Additionally, though the questionnaire will have been addressed to a 'named' participant the researcher is actually unaware of whether that person has completed it. White, (1994) suggests this was a particular issue regarding completion of research using email. Unfortunately, it is impossible to state categorically that the intended recipient completed the questionnaire. Nonetheless, all efforts possible were made to gather data from the intended sample (eg. emailing appropriate web forums). Additionally, responses indicted that the questionnaires were completed by people involved in web systems development as will be discussed later in the Chapter.

5.4 Use of the Internet

The use of the Internet within research is becoming increasingly common-place (Weiss, 2004). However, several issues have been raised as being problematic with this approach. For example, White (2004) noted ethical issues and specifically issues of privacy and confidentiality – issues noted also by Hessler, Downing, Beltz, Pelliccio, Powell, & Vale (2003) and O'Dochartaigh (2002).

In the delivery of the Internet survey additional procedures were put in place to attempt to ensure confidentiality of participants. The procedure every participant encountered is detailed below.

The first item participants viewed was an information sheet detailing the study background and objectives (Appendix 1). The risks and benefits, together with the fact that the data would be kept confidential and anonymous with the respondents having the right to request that their data should be removed from the study, were made clear. It also gave an email link enabling participants to request further information. A separate button acted as agreement that participants had read and understood the information sheet. That is they were participating in the study giving their informed consent. After this, participants were invited to complete the survey.

5.4.1 Internet questionnaires/surveys

Initially, email surveys were the predominate means of Internet surveying. As the World Wide Web (WWW) has grown in popularity, the use of Hypertext Markup Language (HTML) forms or web based surveys are becoming the dominant method of gathering survey data. As noted above internet surveys share features – both positive and negative - in common with other surveys. However, as this format for delivery has become increasingly common various researchers have investigated the use of Internet surveys specifically (eg. Crawford, Couper & Lamias, 2001, Kay & Johnson, 1999, Solomon, 2001) and it is worth reviewing briefly some of the literature here.

Currently, the biggest concern in Internet surveying is coverage bias or bias due to people sampled either not having, or choosing not to, access the Internet (Kay & Johnson, 1999, Crawford, Couper & Lamias, 2001). Although access to the internet has grown exponentially in the UK and across the West, there are still many people even here who do not have access to the Internet or choose not to use it. In lesser-developed communities this figure is much larger. It is also clear that there are wide disparities in Internet access among ethnic and socioeconomic groups. Nonetheless, though this is noted as a problem, for this research the participants will all be working within the field of web development and therefore, this issue is not considered to be a problem.

More problematic is the finding that relates to the fact that Internet surveys have significantly lower response rates than comparable mailed surveys. Several factors have been found to increase response rates including personalized email cover letters, follow-up reminders, pre-notification of the intent to survey and simpler formats (Solomon, 2001). For this research it was not possible to include a personalised cover letter as it was not known who would respond to the survey. Hence, follow-up reminders were not appropriate either. Dillman, Tortora, Conrad & Bowker (2001) found that relatively plain web-based surveys that load quickly resulted in higher response rates than "fancier" surveys that take longer to load. However, with regard to formatting generally, studies are just beginning to be carried out to learn the best ways to structure and format Internet surveys to limit biases and increase response rates. A web-based search was undertaken before commencing this study. However, currently, no definitive formats are suggested.

Nonetheless, despite the potential challenges afforded by the use of a web based survey, given the issue to be investigated in this study relates to web development it seemed apposite to utilise this research tool. Further support for the use of this tool is found in recent research undertaken by Jeary, Phalps and Vincent (2009) which aimed to further understanding of web development methods. It was undertaken using an internet survey and thus, offers a relevant precedent for this research.

5.5 Developing the Internet Survey

Based on a review of relevant literature (deductive reasoning) folded into observation and personal experience (inductive reasoning) and underpinned by the theoretical framework, a range of concepts were developed in relation to the Primary Research Question. From this, the survey questions were formed around three key concepts:

1. The web developers' experience
2. The methods used to develop WIS
3. The developers' rationale for their methodology selection.

1. The web developers' experience:

This information was deemed appropriate and necessary to ask in order to address the following issues:

1.a Length of experience of the WIS developer.
Anecdotal evidence had suggested that people 'new' to WIS development approached web methodology development differently from those who had engaged in the work for a longer period of time. In combination with the rest of the survey, this question aimed to review this.

1.b Previous experience in Information systems

The literature had suggested that WIS development is unlike any other form of IS work. For example**,** Ginige (2001) argued that WIS are significantly different from traditional IS development. Anecdotal evidence had suggested that some people had moved from ISD into WISD and the questions were aimed at discovering whether this was so. In conjunction with the rest of the survey this information might then reveal differences in adopted methodology use and knowledge about WIS methodologies.

1.c Academic background and knowledge
This question was aimed directly at ascertaining whether or not web developers were engaging with the academic or training literature or whether they were developing

systems without reference to published methodologies. This line of questioning represents the central exploration of this thesis.

2. The methods used to develop WISstems

Following on from the previous question this aimed to discover which methodologies developers were using; indeed, whether or not they recognised that the methodology they were employing was a formally documented and recognised approach. This section of questions included questions around the following issues:

2 a What methodologies developers were using

There are many web methodologies in existence. However, as stated in Chapter 1 it is difficult to locate a formally documented and recognised approach accepted by all WIS developers. Further, Gellerson (1999) and Scharl (2001) noted the plethora of approaches and the confusion that exists in attempts to identify a single approach. This question aimed to discover which methodologies developers thought they were using. It also aimed to ascertain whether or not they believed they were using a formally documented and recognised methodology.

2.b Whether the methodology adopted had been adapted.

As Ginige and Murgesan (2001) commented, "Web-based systems change and grow rapidly in their requirements, contents, and functionality during their life cycle much more than what we'd normally encounter in traditional software, information, and engineering systems. Web-based systems development is a continuous activity" (p.15). This question aims to discover whether or not web methodologists are in fact adhering to this assertion.

3. The developers' rationale for their methodology selection.

Following on from the previous set of questions this area of questions aimed to discover why developers had adopted a particular approach - if in fact they had. Whether or not their choice was based on research or whether they had 'grown' a bespoke approach to suit their organisation's needs, or whether the approach was based on the web developer's knowledge and experience. A mixture of open-ended and closed questions were devised. The survey/questionnaire consisted of three sections relating to the three key concepts being investigated.

Section 1 consisted of nine questions relating to the web developer's experience, together with personal information regarding their gender and the country in which they were working. All questions were asked to be answered in 'drop down' format; that is, participants did not need to type in an original response. Alternatives were provided for each question from which they were asked to choose.

Section 2 consisted of four questions relating to the methodologies being used by developers. These were more complicated. Two required the participant to use a *Likert*-type scale approach to rate different methodologies they knew of and/or used and two asked for other information relating to methodologies used. A *Likert* scale is an accepted and much used tool in attitudinal research. Developed by Rensis Likert in 1932 a *Likert* Scale is often used in survey design to get around the problem of obtaining meaningful quantitative answers to restricted closed questions.

Section 3 consisted of five questions relating to developers' reasons for choosing a methodology. Again, a *Likert*-type scale approach was used to ask participants to rate possible reasons for their choice. Many different possible reasons were suggested and participants were asked to rate each one.

At the end of the survey participants were thanked for their participation and invited to offer feedback on the design of the survey and to indicate whether or not they would be prepared to take part in an interview on web development methodologies – in which case they were invited to submit their email address for contact purposes. The final button invited participants then to 'submit the survey'.

The entire survey was presented on a single page in an attempt to encourage participants not to opt out of completing it. The idea was that they would be able to view the survey in its entirety and thus, they would be aware of its length and the types of questions from the outset.

Being Internet based, the survey was designed so that if a participant moved out of it after having started to answer questions they were informed that an explained non response was considered valuable research and invited to comment on their desire to not finish the survey. In addition each participant was given a unique code to identify

their data and informed that should they wish their data removed from the survey they could email the researcher the code and the data would be deleted.

5.6 Sample

The survey was posted on November 8th 2007 to the following email forums:

- Webforumz.com (web design forums)
- Sitepointforums
- Webmasterforum

These forums were identified for the following reasons.

- They were current
- There was evidence of many users interacting with the forums.
- Appropriate people were interacting with the forums (ie web developers)
- There was evidence of discussion around areas related to the research topic.
- There was evidence of much 'traffic' ie the forums were busy with contributors visiting them often.

5.7 Analysis

By the end of April 2008 a total number of one thousand and forty two people were reported by the forums as having visited the 'discussion threads' on the three forums; two hundred and eighty four from webforumz.com, five hundred and seventy three from *sitepointforum* and one hundred and eighty five from *webmasterforum*.

However, the total number of responses returned from this initial survey across all three forums was five - two from the webforumz.com forum and three from the *sitepointforum*. Three visited the questionnaire (one from *webforumz.com* and two from the other forum) but opted not to complete it. Two began the questionnaire (one from each forum) but then chose to quit before completing it. This was extremely disappointing but in keeping with the Grounded Theory methodology reflection upon the responses was undertaken in conjunction with reflection upon the research tool itself.

5.7.1 Analysis of the research results

The survey was designed to be one page long hoping that participants would see the length from the outset and then complete it. However, in practice, perhaps they were put off by the length. Unfortunately, as they did not complete it, any data they may have filled in was lost. Thus, the research data from this initial survey were nil. It is pertinent to note however, that the person who responded with constructive negative comments on the design of the questionnaire via the forum identified him/herself as a 'Community & Hosting Team Advisor', rather than as a 'web developer'.

5.7.2 Analysis of the research tool

As stated above, at the end of the survey participants were invited to comment upon its design. Given the extremely low response rate these comments are perhaps particularly pertinent to consider. However, as Hanley and West (2006) commented, this is not usual practice. They note that it is usual to represent the 'lack of data' from a study in terms of a 'pilot' from which no further work then ensues, rather than seeking to write it up honestly as a project which results in limited material. Thus, very few 'limited' projects appear in academic press and arguably, researchers assume everyone else is researching 'successfully'. Rose (1998) went some way to acknowledging problems and challenges in his study when he commented on the tensions involved in implementing a web-based learning environment which he was undertaking and then evaluating. However, such academic 'honesty' appears not to be commonplace or everyone is researching successfully from the outset. In this way, the cycle of researcher expectation of 'successful data collection' is perpetuated. Nonetheless, in keeping with the Grounded Theory methodology I feel it is relevant to present the results of my initial study as part of the whole project and to acknowledge the very limited responses obtained –but then to reflect upon this before progressing the study. These reflections are presented below.

Most participants had quit before commenting upon the survey design. However, two of the participants had commented negatively on the survey. One commented that the survey was 'boring' – though perhaps it might be argued that many, if not most, surveys/questionnaires are boring. Unfortunately, they posted this comment on the forum which arguably, may have influenced negatively the likelihood of others viewing it. The second participant had written a fuller comment, suggesting that the survey was "too long and too complex" and that it asked questions that demanded a "higher level of knowledge" than people visiting the forum possessed.

Curiously, the participant did not identify whether or not the apparent lack of knowledge referred to his/her own practice, or to that which s/he perceived others possessed. Nonetheless, this latter point is interesting and pertinent to the research question as all issues asked about were directly relevant to web development and the terminology used in the questionnaire was specific to the area. Arguably, the participant's comment relates to the fact that s/he – and perhaps other web developers in practice - do not use academic / technical terminology but rather 'get on with the job'. The other critical comments relating to the length and complexity of the questionnaire together with the comment about it being boring are perhaps because the questionnaire was too long for the target audience who maybe had limited time and did not enjoy completing graphically simple material. Further, the survey perhaps asked too many complicated questions rather than seeking quick-fire responses to simple closed questions and additionally, perhaps the participants were unconvinced that completing the survey would benefit their personal practice or knowledge. These points are particularly relevant to sections two and three.

In summary, it was decided to redesign the questionnaire asking simpler, more easily understandable questions removing much of the academic language and then to resend it to different web forums.

5.78 Redesigned Internet Survey

Taking account of participants' comments from the first survey, together with the points noted above regarding questionnaire/survey design (Payne & Payne 2004) the second survey was shorter and simpler. Clearly, there were many questions that might

have been asked. However, one of the features of a good questionnaire/survey, as noted above, is to be succinct. Thus, the redesigned tool attempted to ask only short, simple questions directly pertinent to the research question.

Reflection upon the first survey with colleagues and supervisors had suggested that perhaps the use of the word 'methodologies' might have been off-putting to potential participants who maybe were working within WIS methodology development but without using the term. Therefore, in an attempt not to make participants anxious by requesting information that appeared to demand high level knowledge and the use of apparently technical language, the term methodologies was replaced by 'approaches'.

The survey still sought to explore the same three key concepts pertinent to the research question. These were:

1. The web developers' experience

2. The methods used to develop web-based information systems

3. The developers' rationale for their methodology selection.

As before, participants were still provided with information prior to commencement of the survey and asked for their consent. However, the design of the second survey was very different from the first one. The second survey was designed in three sections. In an attempt to prevent participants from quitting without submitting **any** data, the data from each section was designed to be submitted before progressing onto the next section. At the end of each section the participant was offered a choice of two buttons. One said ' Continue' and one said 'Quit'. If participants opted to 'Continue' all data from that section of the questionnaire was submitted. If they chose the 'Quit' option then they were redirected to a screen thanking them for their participation and inviting them to explain why they were leaving the questionnaire. The redesigned survey allowed the capture from partially completed questionnaire as each section / page was stored on entry to the next section /page of the survey. Again the participants were given a code that could be emailed to the researcher to remove their data from the survey.

Section 1 *The web developer's experience*

This section asked for information about the participants and their organisations. All questions were designed with drop-down choice responses attempting to make

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completion of the survey less arduous. The format and generality of the questions in this section were designed to be comparable with other web surveys in order to put participants at their ease and encourage them to continue with the survey. Questions related to the business of their organisation, how many people were employed, the proportion of time they spent in web development, how much experience they had in web development and also in Information Systems and which country they were working in.

These questions were designed to provide context to the answers they would give in the rest of the survey but also to encourage participants to continue and complete the survey .

Section 2 *The methods used to develop web-based information systems.*
The section asked many questions relating to web development and the approaches participants were using. The questions were presented in a block grouping headed/preceded by a lead question (eg: 'how important were the following to…') Participants were then asked to indicate their responses to the ensuing statements by way of a 5 point *Likert* scale from 'Low' to 'High'. This method was an attempt to make completion of the survey more straight forward. There was some repetition of questions asked in a different way in an attempt to address the internal validity of the questionnaire. The length of this section of the questionnaire was two sides of A4 paper when printed.

Section 3 *The developers' rationale for their methodology selection*
This section asked questions relating to the reasons developers had chosen the methodology – or approach - they were using. Again, the questions were presented in a block grouping headed/preceded by a lead question (eg: 'how important were the following to…') Participants were then again asked to indicate their responses to the ensuing statements by way of a *Likert* scale form 'Low' to 'High'. The length of this section of the questionnaire was two sides of A4 when printed.

At the end of the questionnaire participants were once more, thanked for their participation and invited to offer feedback on the design of the survey and to indicate whether or not they would be prepared to take part in an interview on web

development methodologies – in which case they were invited to submit their email address for contact purposes. The final button invited participants then to 'submit the survey'.

Before the survey went live it was piloted amongst colleagues at Staffordshire University and amended according to their feedback. Generally, their advice was to ensure the survey was short with few, simple questions.

5.9 Sample

This time a different approach to gathering data from participants was employed. In addition to a greater number of web forums being targeted the survey was sent to fifty individual London-based web development organisations identified within the Thomson Business Directory. Also, ten individual web developers located via *Facebook* were sent an email requesting them to look at the survey at my website.

The following web forums were targeted
- Talkwebdev
- Daniweb IT discussion community
- Dev shedforums
- Web design forum
- Microsoft
- talkwebdev

The questionnaire was posted on July 10th 2008.

It was decided to check responses to this survey after five weeks. The reason for allocating this length of time was in order to maintain a realistic schedule for the research. Also, after five weeks the survey would have been superseded by other, more recent on-line surveys such that my work was relatively 'old' and arguably, anyone who was likely to answer it would have done so.

5.10 Results

On August 17th twenty seven people had clicked through to the actual survey having gone through the consent sheet agreeing they had given informed consent. This represents a much larger response rate than the original version. Of the twenty seven, three participants (14%) immediately left the survey without entering any data and without giving details for their non response. This could indicate that the formal presentation of the requirement to read the information sheet prior to participating was a deterrent. A further seven clicked through to the first page of the survey but did not enter any data or comment on their non response. Seventeen completed the personal details section (Section 1 of the survey). Participants were from eleven different countries. Five stated they were from the United States of America, two from the United Kingdom and others from Canada, Australia, South Africa, Kenya, India, Poland, Portugal, Germany and France.

The participants ranged in experience from less than 1 year to over 10 years experience in developing WIS. This is shown in fig 5.1 below.

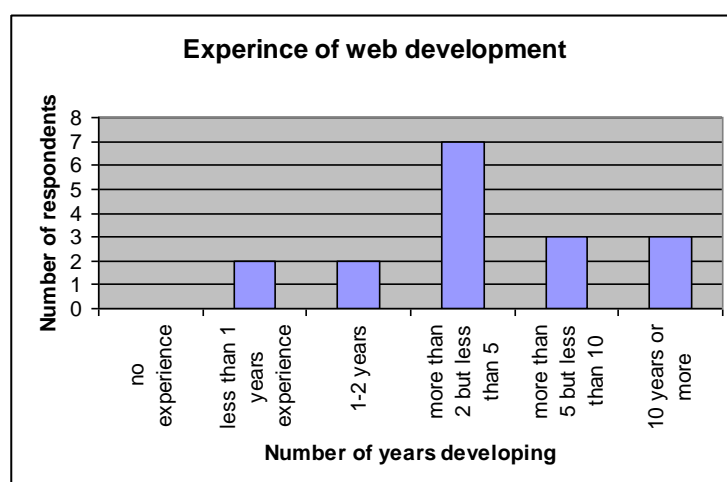**Experince of web development**

Fig 5.1 Participants' experience in web development.

The length of experience in WISD stated by participants is interesting as almost 25% had under two years experience. The majority (seven respondents) had more than two but less than five. Only three respondents stated they had more than ten years

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experience. Clearly, this suggests that web developers with a range of experience were answering the survey.

Of the seventeen participants who completed the section on personal details nine quit after looking at section 2. This was despite having already submitted their personal details. One politely recorded the comment "Sorry I am giving up…". This left eight active participants at section 2 (a clear indication that although they were willing to take part perhaps more than one page is a deterrent).

Section 2 asked questions relating to the approaches (methodologies) participants were using.

- Two indicated that they had not heard of any approaches.
- Five stated they were aware of only one of the development approaches
- One participant indicated that they had heard of all suggested and used many but did not choose any one as the main approach they were using.

Perhaps at this point some participants began to feel that their lack of knowledge of approaches was demeaning to them and they left as the survey was challenging them in a negative way. Unfortunately, this is something that can only be conjecture as no feedback suggesting this was forwarded.

The participants' responses to the question relating to their knowledge of methodologies/approaches is shown in fig 5.2 below
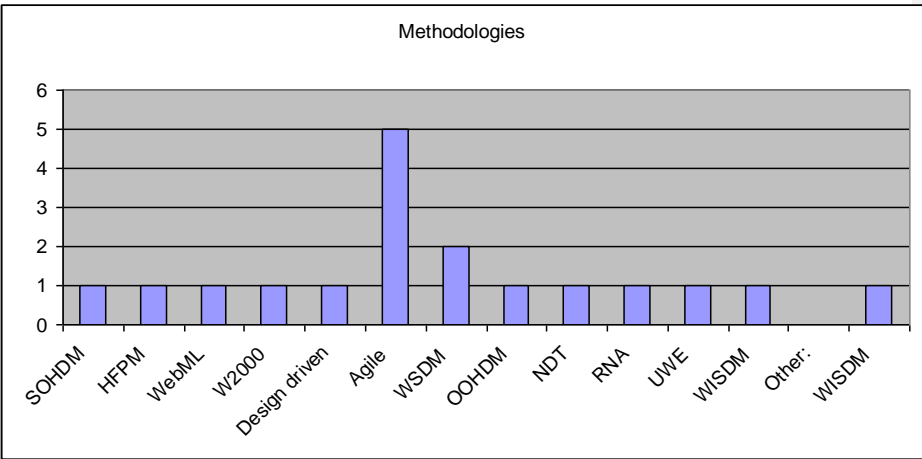
Fig 5.2 Methodologies awareness

The approach most commonly noted as being known was the *Agile* approach; this being known by five participants. Participants were asked to indicate on a scale of 0 – 5 how familiar they were with the approach with 0 representing no knowledge and 5 indicating that they used the approach as their main approach. The Agile approach was identified as having a total experience quotient of 13 from a max of 35. This illustrates that most approaches for web development were not known about by a range of experienced web developers. Only one participant – who was based in the USA and had 10 years of web development experience - had knowledge of all of the methodologies. However, when asked to name others he knew of that were not listed, he claimed to know no others, which might suggest that in fact he had simply clicked on all approaches, rather than actually having knowledge of all.

The results also suggest that largely, web developers have limited or little knowledge of published approaches to web system development.
Participants stated familiarity with the methodologies is shown in fig 5.3 below.

Degree known
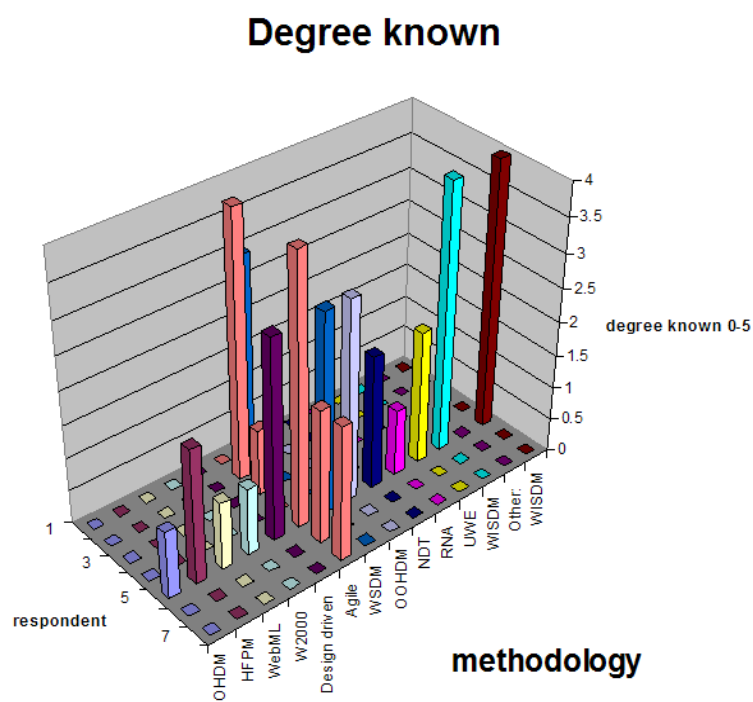
Fig 5.3 the extent to which participants were familiar with the methodologies

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When participants were asked about tools and techniques within WISD that they used (having been offered a list of possibilities) a wide variety of tools and techniques were stated as being known. The most 'popular' techniques in terms of it being known about weighted by degree of use are as follows:

- Prototyping and Brainstorming are the most popular in terms of weighted degree of use and number of participants using the tool/technique.
- Scenarios reviews, templates, ER modelling, sketching/story boarding and use case are also seen as popular tools and techniques.
- Normalisation and questionnaires are used but not as extensively as the above techniques.
- ELH and ECD are techniques from SSAD a Traditional ISD approach and were used sparingly.

Only one 'Additional' or 'Other' tool technique was identified as being used. This was "Psychic powers". Whilst this might initially be dismissed as humour, nevertheless, the participant continued on to acknowledge that his manager actually promoted this as an appropriate tool and technique to be used in web development!

Participants' responses are shown in fig 5.4 below

Fig 5.4 Tools and techniques known

Although the responses to the survey are few, they do acknowledge that as experienced web developers participants both have knowledgeable of, and utilise, a wide range of relevant web development tools and techniques.
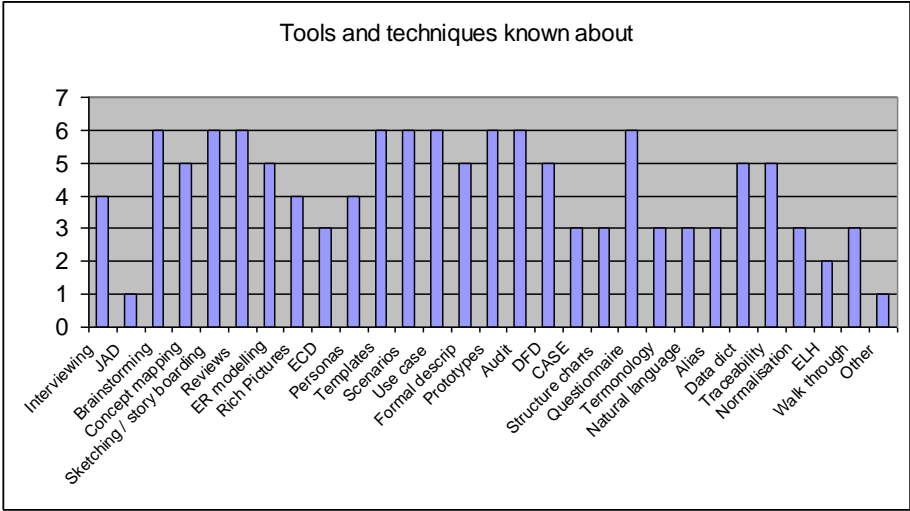
Section 3 asked participants about the reasons for their choice of approach (methodology). Unfortunately, by section 3 only three participants were continuing to complete the survey. The first question asked participants to indicate on a scale of 0-5 the importance of four possible reasons for their choice of approach. The most important reason given was the developer's personal knowledge. This was followed by the degree of success of their organisation. Perhaps these two responses might be linked as the web-systems developer's knowledge and skills may contribute actively to the success of the organisation. Similarly, if the organisation is successful, the developer may feel confident to try out his own personal knowledge and skills rather than resort to 'tried and tested' techniques.

One interesting and very honest comment was included in this section:
"'Here's the thing. We were all ex-MSFT [Microsoft] guys who hated all the process at MSFT. We were really good engineers and there were only a few of us. So we just made it up as we went along. I mean, it's just ASP. It's not like_ it's hard."
Again, arguably, this reflects not only the confidence of the developer to develop systems in response to organisational needs, but also perhaps suggests a 'maverick' side to the person him/herself that /she did not respond well to process, preferring to be creative and innovative.

Within a context of Structuration Theory the response detailed above can be seen to be the designer's Agency, concerned as it is with his/her actions and control (perceived or actual). Their 'Transformative Capacity' - the ability to effect change in some way, or their "capacity to make a difference" (Giddens 1984 p 14) is seen as central to decisions about the system developed or used.

Participants' responses to the question about choice of methodology are given in fig 5.5 overleaf.
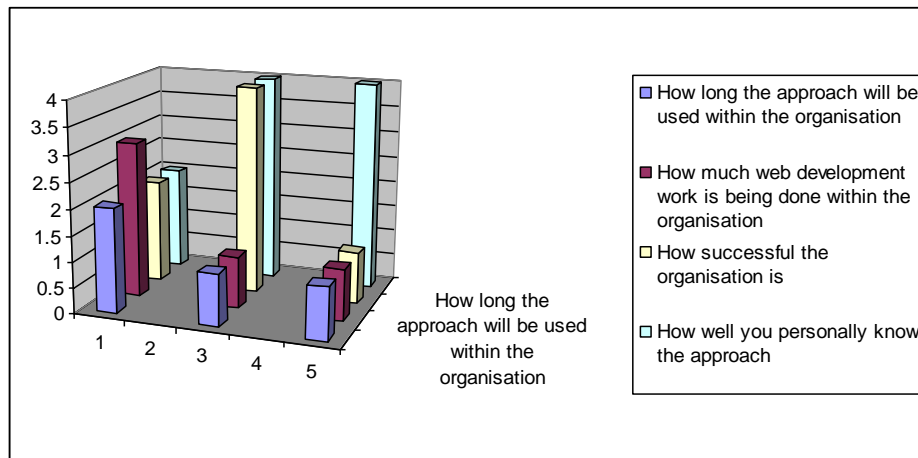
Fig 5.5 Reasons for the choice of methodology

On the same page was the lead question asking participants to state how important a list of possible reasons were to the choice of approach for developing WIS and then to rank the importance.

Their responses are given below.

Question	Participants	Weighted response	Ranking importance
I was able to learn the approach as we went along	3	11	1
People involved in the project wanted to use this approach	3	11	1
I was able to use technology/tools to support this approach	3	11	1
The approach fitted my way of doing things	3	10	2
Top management were very keen on this way of developing systems	3	10	2
I personally could see advantages in following this approach	3	10	2
Others in the organisation really wanted us to use this approach	3	9	3
I already had a lot of knowledge of this approach	3	9	3
The organisation has strict In-house standards for this sort of thing	3	9	3
I thought this approach would work well within the organisation	2	8	4
The organisation had prior experience of this approach	3	8	4
My past experience of using this approach	2	7	5
The technology is getting very complex and the organisation needed a defined approach	3	7	5
The organisation likes traditional approaches in developing web systems	3	6	6
My past experience of using this approach	3	6	6
The organisation did not have an agreed approach to developing web systems	3	6	6
The organisation gained lots of advantages in following this approach	3	5	7
The organisation is getting very large and needed this approach	3	4	8
The organisation has established formal procedures for web systems development	3	4	8
The organisation has to follow the Industry standards	3	4	8

Table 5.1 Reasons for choice of approach/methodology

The most important reasons stated were the ability to learn the approach 'On the job', that individuals involved 'wanted the approach' and also, that there were technology

and tools to support the approach. Arguably, all these responses reflect the individual web designers' personal motivations rather than an 'organisational' response – that is it suited the web designers' chosen way of operating; to learn as they were going along using an approach they had chosen, which was supported by technology and tools. Addressing the final point it can perhaps be seen that the choice of approach was a considered response by the web information systems developers, rather than a 'laissez-faire' attitude wherein any approach was deemed satisfactory.

The next most important factors were seen as the fact that the approach fitted the individuals 'way of doing things', and that the developer could 'personally see advantages to the approach'. Again, this seems to reinforce the points made above However, 'the support of top management for the approach' also featured within this band of important factors, which perhaps suggests that although web-system designers may want to consider themselves independent agents, the reality is that the support (or not) of management is fundamentally important – and is recognised as such.

Third in ranking in terms of weighted importance were:
- 'others in the organisation really wanted us to use this approach',
- 'I already had a lot of knowledge of this approach',
- 'The organisation has strict in-house standards for this sort of thing'

Clearly, here, the organisation is noted as the dominating factor. Yet, still personal knowledge weighed heavily.

'I thought this approach would work well within the organisation' and that 'the organisation had prior experience of this approach' were given equal fourth ranking showing an acknowledgement of the duality of structure and agency by the individual respondents. This is also reflected in the comments that 'My past experience of using this approach', 'the technology is getting very complex' and 'the organisation needed a defined approach' acknowledges the duality of structure and agency in the choice of methodology. Indeed, arguably, this duality is reflected throughout participants' responses to the on-line survey.

Finally, 'industry standards' and 'having established procedures' came last on the ranking of weighted importance just lower than the organisation 'seeing advantages' and that 'the organisation did not already have an established approach'. This is interesting as it seems to suggest that straight-forward, obvious organisational benefits and procedures are not ranked very highly by the web-system developers who responded to this on-line survey. Perhaps such responses would be very different if the questions were asked of a profession such as the police, which raises questions about the characters of web-system developers. Though these are clearly beyond the remit of this thesis, it is nonetheless a pertinent question to bear in mind when training/teaching web-system developers employed in different contexts and professions.

All the responses presented above can be situated within a context of Structuration Theory. The designers' 'Transformative Capacity' - the ability to effect change in some way, or their "capacity to make a difference" (Giddens 1984 p 14) is seen as central to decisions about the system developed or used. This, then might be considered to be synonymous with power within the relationship between the individual web-systems developer and the organisation, as the developer is able to draw upon "structured properties of social systems" as they are "…reproduced by knowledgeable agents [the developers] in the course of interaction" (Giddens 1984 p 15). As noted in their responses, some designers focussed on agency whilst others acknowledged the production of the forms of knowledge and social structures necessary for the 'profit' of the organisation (Structure).

The final question on the questionnaire again related to the choice of methodology. All remaining three participants completed this question. Their responses are given overleaf.

Question	No respondents	Weighted response	Ranking
The approach determined all the tools and procedures	3	11	1
The approach let the organisation continue to use existing tools	3	10	2
The approach allowed me to select tools and procedures that I felt appropriate for developing web systems	3	10	2

The approach allowed the organisation to use our existing way of developing web systems	3	9	3
The approach fits well with the organisations way of doing things	3	9	3
I personally wanted to adopt this approach to developing web systems	3	7	4
I felt the need to change the organisations way of developing web systems	3	6	5
The organisation was able to gradually introduce the approach	3	5	6
The organisation is doing a lot more web development work and needed another approach	3	4	7

Table 5.2 Choice of Methodology

The weighted response revealed that the most significant reason for choosing a particular approach was that the tools and procedures were determined by the web-designers' chosen approach rather than as might be expected, that the known tools would determine the chosen approach, or that the organisation's management determined the approach. Arguably, this demonstrates again, the designers' agency in their choice of approach. Perhaps in contrast, the second most significant reason was that the organisation could continue to use the existing tools. Arguably, this contradicts the agency reflected in previous responses, but perhaps illustrates the duality of the practicalities of working within an organisation. It also perhaps reflects the fact that the chosen approach allowed the respondent to select tools and procedures that they felt appropriate for developing web systems.

'The approach allowed the organisation to use our existing way of developing web systems' and 'The approach fits well with the organisations way of doing things' given as responses to the question about choice of methodology seemed to suggest that possible cultural changes in the web-system world generally, were not being influential in the choice of methodology/approach determined by the web developer.

It was noted that apparently of lesser importance the individuals' perspectives were as follows: 'I felt the need to change the organisation's way of developing web systems' and 'I personally wanted to adopt this approach to developing web systems' ranked less in importance. However, when considered against the responses given above, such individual responses perhaps should be reconsidered. Maybe, the web developers did not consider it appropriate to state that they were individually responsible for implementing/changing procedures within the organisation. Or perhaps they did not consciously recognise that they had in fact done so.

Nonetheless, when considered against responses outlined above it is clear that web developers did in fact influence decisions about the approach used.

The least significant factors were seen as: 'The organisation was able to gradually introduce the approach' and 'The organisation is doing a lot more web development work and needed another approach.' Again, such responses suggest a focus on structure rather than agency. Nonetheless, when measured against the responses discussed above, given that these responses were ranked 'last', the message to managers and web-designers generally from respondents to the Internet survey is that the needs of an organisation are given the lowest ranking by WIS developers.

The participants were automatically taken to the last page and at this stage only one continued. Although all were taken to a screen asking for reasons for not continuing only one decided to give a reason despite having stayed with the survey so long.

The last page of the survey now reverted to the original academic language of the first version that of questioning knowledge of web development methodologies with open ended questions on web methodologies being used and where they learned about them. These questions elicited no response at all even from the last participant who had dedicated so much personal time to the survey. Although the exit screen asked for reasons for not continuing, only one participant responded leaving a feeling of extreme frustration as so many other questions immediately sprang to mind such as 'Did the participant feel intimated by the language?' Unfortunately, no respondent was able to give answers to such questions. This presents clear practical difficulties with a survey (either online or postal) as clearly, the questions were not available as 'real-time' responses to the participants' responses.

The single participant who stayed to the end - although not completing any questions referring to methodologies- gave the following grades to their view of the survey.

The scale of invited responses was as follows:

There were too many questions asked	Agreed
The questions were not very clear	Agreed

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There were not enough response options to the questions	Disagree
The response options could have been clearer	Disagree
The design of the questionnaire could be improved	Neutral

Table 5.3 Reasons for non-completion

The participant agreed there were too many questions, and also agreed that the questions were not clear but disagreed that there were not enough response options and indicated that the responses to the questions were clear. S/he was 'neutral about' whether the questionnaire could be improved. However, given that only one participant stayed the course I feel s/he was correct in stating that there were too many questions and this concurred with responses to the first version of the questionnaire that was greeted with the comment that not many people would respond!

The participant who continued to the end of the survey stated that s/he was working in On-line Social Network / Shareware marketing. With 50% of his/her time spent on web development, and that she had been working in the area for 2 years.

5.10.1 Analysis

Clearly, the number of responses to the second survey was greatly improved on the first questionnaire. Although limited, the data collected was nonetheless, constructive and informative. Generally, it suggested that most people answering the survey were developers with few years experience who were unaware of academic terminology and who sought to undertake their roles from a 'hands on' perspective, seeking to use 'what works' rather than seeking to validate their approach via academic means. This is completely supportive of the researcher's inductive experience. It is also central to answering the research question for this thesis and moreover, it is reminiscent of the 'early days of computing'.

It was also clear from responses – and the lack of responses - to the survey that its design still needed consideration if it was to gather relevant data. The limited number

(and quality) of responses to this second survey/questionnaire, though an improvement on the first, was still disappointing.

5.11 Lessons learned.

In keeping with Grounded Theory methodology reflection upon both the results and the design of the research tool are important. Therefore, having presented the findings of the second questionnaire, reflection upon its design led to the third internet survey. Learning lessons from what happened before, this third survey was much shorter and much simpler. It folded the consent form and information sheet into the initial mail contact, assuming that 'opting in' asserted consent with the proviso still in place that each potential submission had its own unique identifying code which if forwarded to the researcher would ensure that all data pertaining to that individual would be deleted. However, dispensing with the 'stand alone' consent form and progressing straight to the questionnaire seemed useful in light of the fact that participants had commented negatively on the length of the previous two survey. Additionally, as noted earlier, many potential participants never progressed past the consent form, possibly feeling intimidated by the formal nature of the information sheet and consent form.

The third survey still asked the three fundamental questions relating to the web developer's experience, the web methodologies/approaches s/he was using and the reason for that choice. However, many of the questions asked in the previous two surveys were dispensed with and a much shorter survey/questionnaire based around six fundamental questions was designed.

5.12 Design of the third Internet survey

As stated above, the third survey/questionnaire was designed to be considerably shorter. This was not without problems as it limited severely, the number of questions able to be asked. However, as those who had commented on the previous surveys had all noted 'length' as a problem it was concluded that this was a necessary amendment. Additionally, part of the redesign process had involved comment from supervisors

and interested colleagues and their advice concurring with that above, was also to make the survey more succinct and use more simple language.

The survey still sought to explore the same three key concepts pertinent to the research question. As stated earlier, these were:

1. The web developers' experience

2. The methods used to develop web-based information systems

3. The developers' rationale for their methodology selection.

However, the format of the survey was much altered; being much more succinct and much more simple.

After much consideration it was decided to retain the opening section –albeit with redesigned brevity – which asked for limited demographic and personal details about the developer's personal experience; their business area and their job role. This section was retained because this opening to a survey was comparable with others participants would have encountered and thus, it would be familiar and not threatening. It was also hoped that by encouraging participants to give some personal data it may encourage commitment to continue (consciously or unconsciously).

The first major question relating to the research question asked participants which methodologies/approaches they had heard of. Originally, participants were presented with many options. However, for simplicity it was decided to just ask participants to list what they knew. This was risky since if they did not know any they may feel threatened and leave the questionnaire at this point. Nonetheless, it was decided that this risk was worth taking as it did not then present a 'busy' screen at the outset.

The next question followed from the first question and asked participants to rate the importance of management to the decision –making process regarding choice of methodology. This was followed by a question about the web developers' personal choice of methodology including the tools and techniques they used. Then, a question about the tools and techniques developers had heard of. Finally, participants were invited to add any additional comments they considered useful or relevant.

Details of the results of this survey are given below.

5.13 Sample

The survey was posted in August 2008 to a variety of web developers' internet forums.

These forums were identified for the following reasons.

- They were current
- There was evidence of many users interacting with the forums.
- Appropriate people were interacting with the forums (ie web developers)
- There was evidence of discussion around areas related to the research topic.
- There was evidence of much 'traffic' ie the forums were busy with contributors visiting them often.
- They were different forums from those used before

Once again, it was decided to check responses to this survey after five weeks; the time period determined as long enough to enable people to respond, but not so long that it became completely dormant. Additionally, it enabled a realistic schedule for the research to be maintained.

5.14 Results

Results indicate that a better response rate was generated and also, a broader range of development experience was also gathered. 47 people looked at the web survey, but only 36 attempted to enter any data. This is a markedly better response rate than last time where only 27 looked at the survey with just 17 entering any meaningful data and this number gradually diminishing to just 3 participants.

As before, the survey system invited those people who 'looked but did not participate' to explain their reasoning. Of this population, 76% of those who 'looked' completed the survey, with only 24% looking but not entering data. On one level this might be argued to be a 76% response rate! However, the figure does not include those that saw the forum log inviting them to do the survey but decided to go no further.

It would certainly have been very informative to discuss rationales for their decisions with both the group that 'looked but did not participate' and those that actually clicked through to the survey but went no further and then compare this with participants who completed the survey. However, no responses were forth coming as to why people decided to not continue. Clearly, as this was a web survey, the opportunity for 'face-to-face' questioning was unavailable. Nonetheless, it is interesting to note just how far into the survey people progressed. Of the non-completers, 10 chose to go no further than the first section of the web site. No-one entered any reasons for none-continuation. This left 26 participants answering the survey/questionnaire. Using the base of the number of people that clicked through to the survey this gives a response rate of 55% which is definitely an improvement upon early versions of the survey, arguably indicating that the design of the survey is central to the response rate, with simplicity apparently scoring over complexity.

The results were analysed as previously and revealed the following:
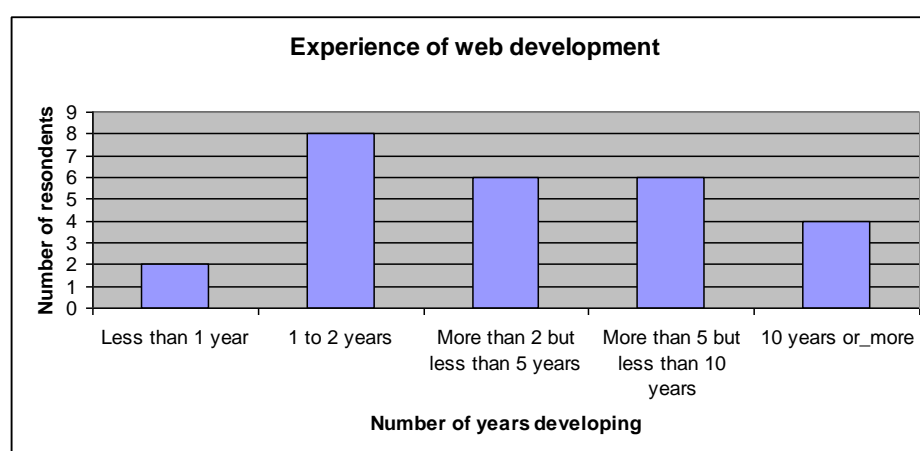

Fig 5.9 Experience of web development

Survey Version 3 (V 3) revealed that 38% of the participants had under two years experience. This would suggest that the age profile of respondents was younger, though, having removed demographic details in order to aid survey simplicity and brevity, this can only be a supposition. An associated possible reason for the

difference between these results and the previous survey could be that the format of the earlier surveys was less acceptable to the younger age profile. However this also means that the majority of the participants had more than 2 years experience of developing web systems and so should have been in a good position to give informed data.

The next table presents findings from the question relating to the areas of work in which participants were employed.
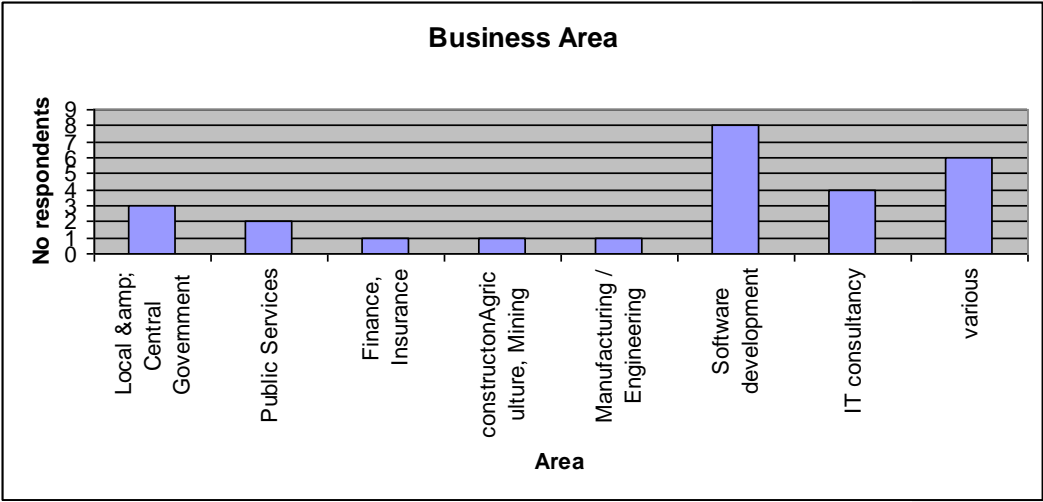
Fig 5.10 Participants' areas of work

The participants described themselves as working in a wide range of business areas but the vast majority classified their business area as Software Development or IT Consultancy, which included marketing through to Executive Online Recruitment. The next major area was Government and Public Services. Arguably this demonstrates a good representative sample with an expected bias of most web developers considering them selves to be working in the area of software development.
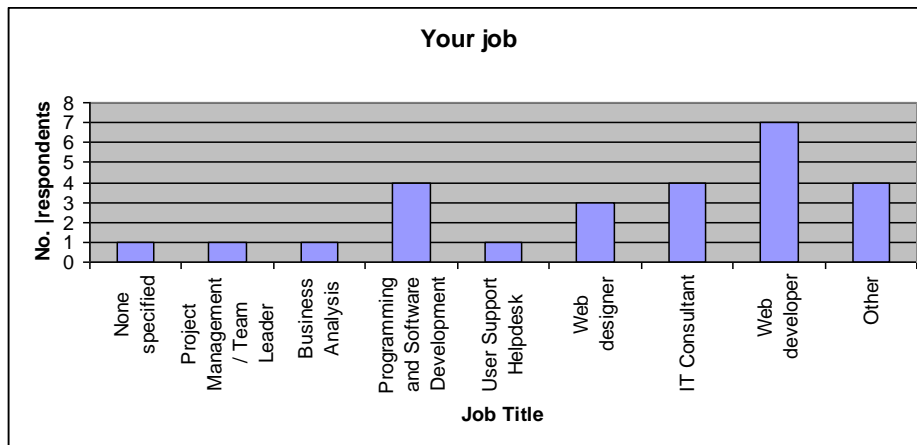
Fig 5.11 Participants' employment

When asked about their own personal role the results show a wide range of job titles specified by the participants but 70% indicating that Programming or Consultancy Web design and development was their work. This shows that the survey was aimed at appropriate forums with a relevant sample participating. The participants choosing the category 'other' specified themselves as Business Owners and students.
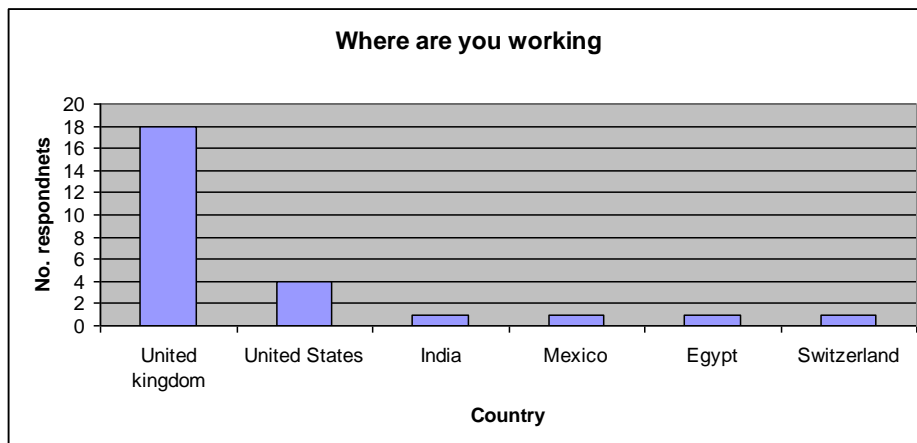
Fig 5.12 Participants' country of employment

The vast majority of participants stated they were working within the United Kingdom. This is in contrast to the previous survey where participants from many more countries engaged – even if most did not complete the survey.

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The next section of questions asked participants about the tools and techniques they were using. The chart below represents the full findings of this section of the survey/questionnaire.
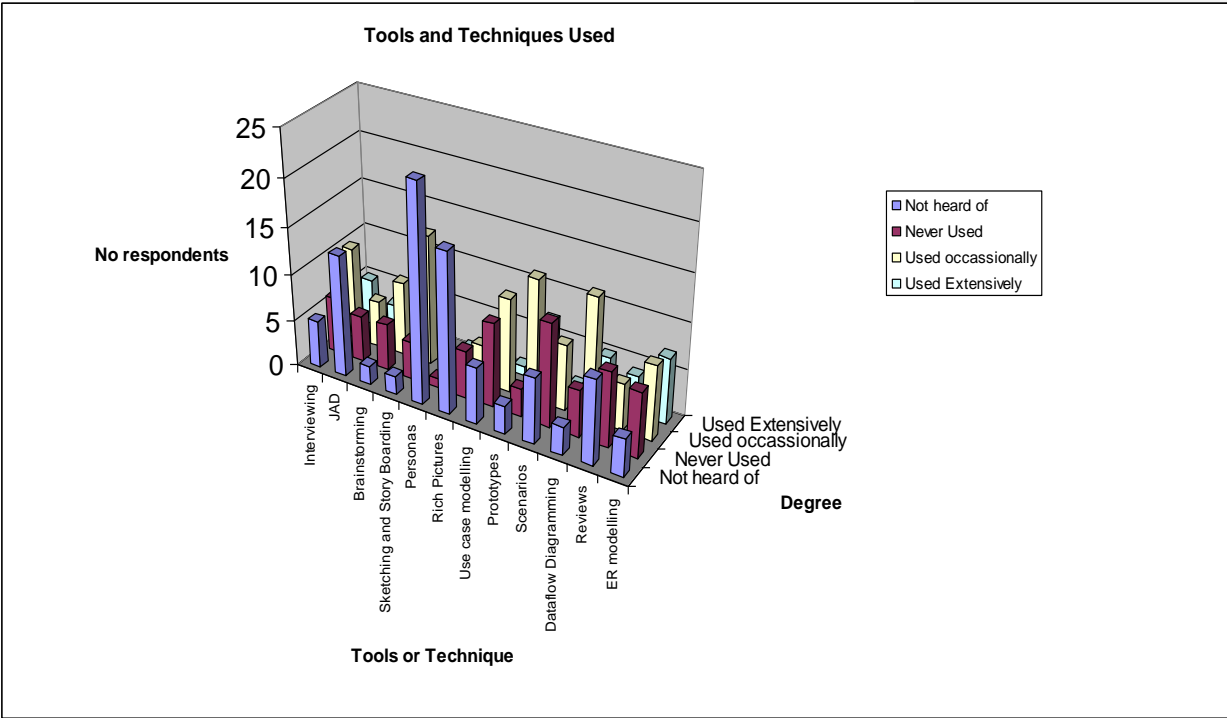
Fig 5.13 Tools and techniques used

It was realized from the previous surveys that it was necessary to discriminate between the degree to which web developers may be using a particular tool or technique. However, earlier attempts gained a poor response probably due to the complicated nature of the question so this version simplified the question to request the user to express their degree of knowledge of the tool or techniques over the range as described below**:**

Please rate each as follows: 0: not heard of ; 1: never used; 2: used occasionally; 3: used extensively

The main techniques that were indicated as being used by web developers in the previous attempts at the survey deployment were detailed as options. However there was also the category 'other' that allowed respondents to indicate other tools and techniques they used in their development of web-based systems. Three of these listed by participants were *Software, Framework* and J*ackson* diagramming. *Jackson* was noted by one participant as being used extensively. Participants were then offered a list of possible techniques and asked to indicate which they used –following the key listed above (ie 0: not heard of, through to 3: used extensively). The techniques listed were as follows:

- Interviewing;
- Personas;
- Scenarios
- Joint Application Development;
- Rich pictures;
- Dataflow diagramming
- Brainstorming;
- Use Case modeling;
- Reviews
- Sketching/ and story boarding;
- Prototypes;
- ER modeling

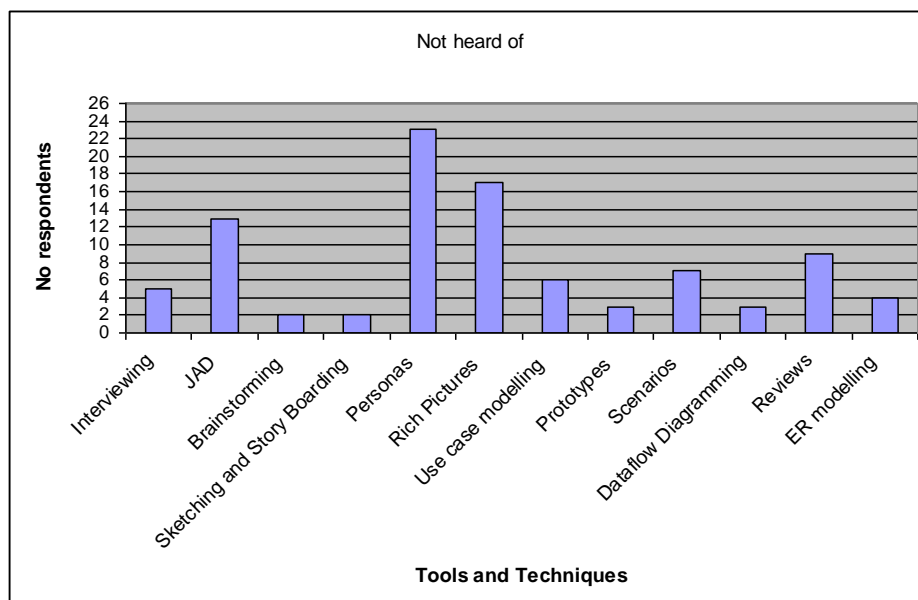The graphs below shows responses to this question beginning with responses to 'not heard of'

Fig 5.14 Levels of awareness of Tools and techniques

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When looking at participants' responses to 'least heard of' *Personas* and *Rich Pictures* were the techniques noted, which is perhaps unsurprising as these techniques are not common. However it is odd to think that 18% of developers have never heard of the *Interview Technique* as this is much more commonplace. It should be noted that the 'not heard of techniques' are spread amongst the participants rather than being indicated by one or two participants unfamiliar with the tools and techniques of web development. This suggests that many web developers are not familiar with the wide range of tools and techniques being used with the field of web development. However, it may be that developers may be familiar with, and perhaps may even be using, these techniques but know them by another name. Additionally, not all web developers will be interacting with clients and developing bespoke systems.
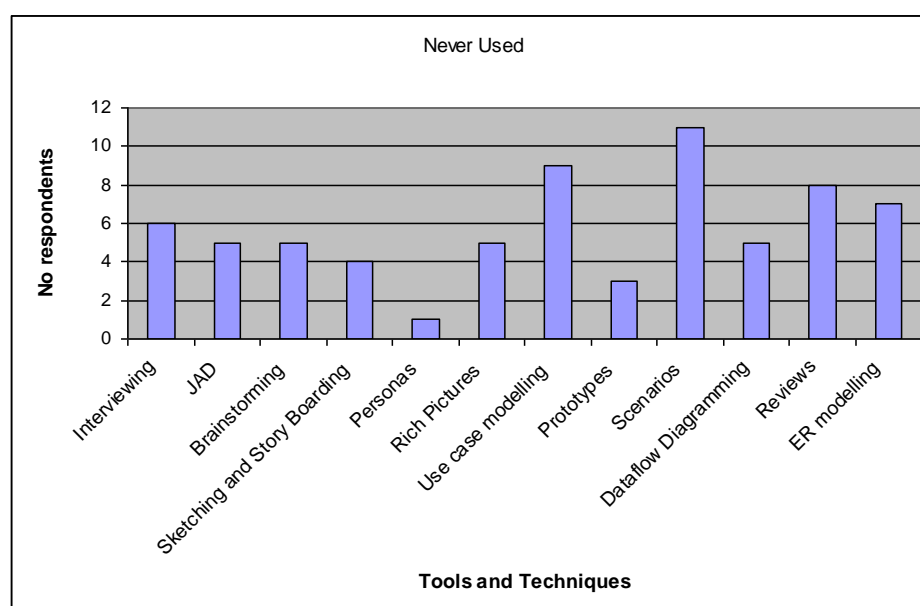
Fig 5.15 Tool and techniques never used

These results above show participants' responses to tools and techniques they 'never use'. Perhaps unsurprisingly, the use of *Scenarios* as a development technique is 'heard of' but 'not used' by 42% of participants but possibly more surprising is that 35% of web developers that responded had heard of *Use Case Modelling* but were choosing not to use the approach. Perhaps this is a sign that the OO approach to systems development has not fully penetrated web development.

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Used Occassionally
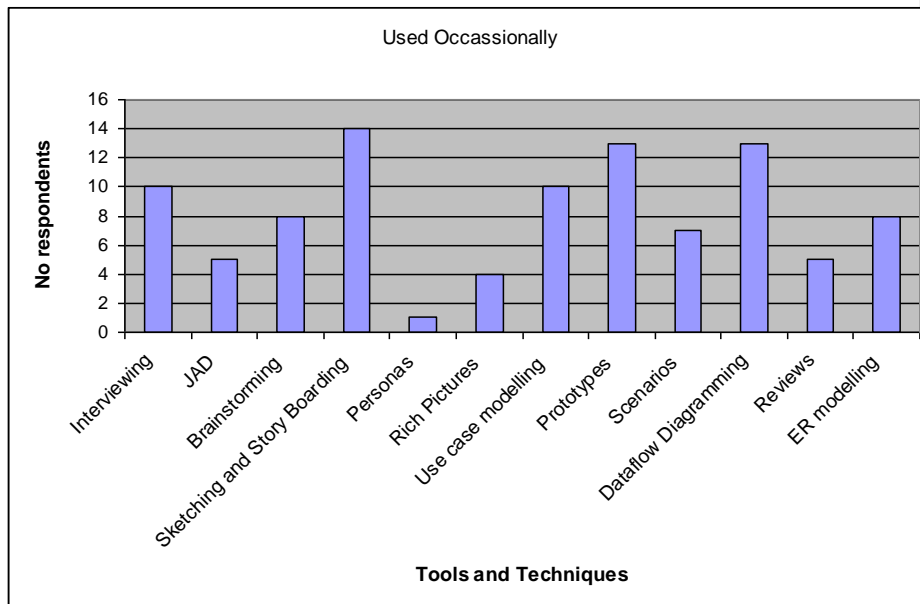
Fig 5.16 Tools and techniques used occasionally

Tools and techniques indicated by participants as being 'used occasionally' showed that *Personas* appears to be the least popular web development tool or technique with only 1 participant using it 'occasionally'. *Sketching* and *Story Boarding* along with *Prototyping, Dataflow diagramming* are used by 50% of the participants on an 'occasional' basis with *Brainstorming* and *ER Modelling* being used by approximately a third of the web developers. This shows that web developers have a wide range of tools on which to call but they are used selectively presumably depending on the individual project or client.

The next question asked participants bout tools and techniques they used extensively. Results (Shown overleaf) show that a wide range of techniques are in use by web developers on a regular basis and in terms of those 'used extensively' the most popular were *brain storming prototyping* and *ER modelling*. *Dataflow diagrams* and *interviewing* were also popular. JAD (Joint Application Development) showed 11% of participants regularly using this technique but *Personas, Use case modelling* and *Scenarios* were only used by 1 of the 26 participants. *Rich Pictures* was the only technique that no one used regularly.

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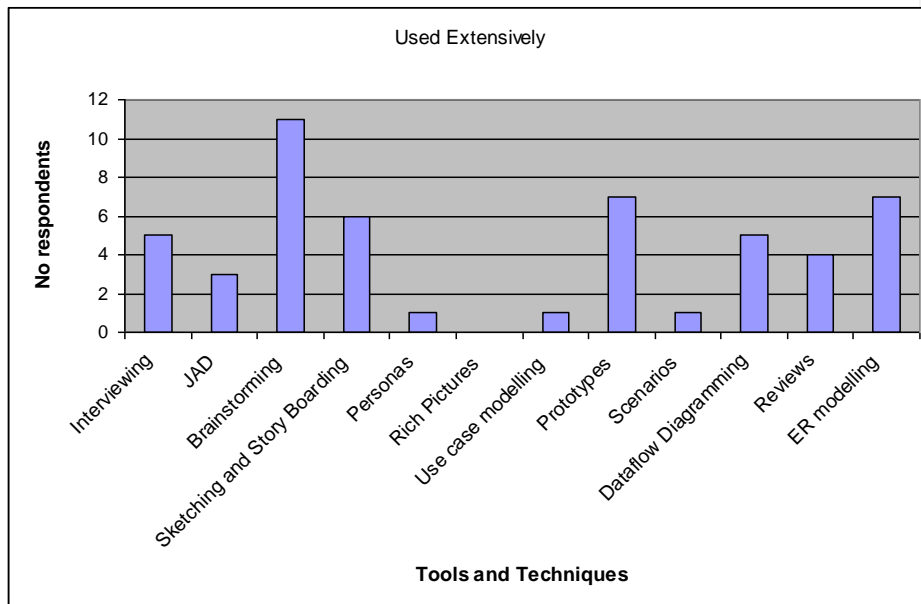
Fig 5.17 Tools and techniques used extensively

The diagram above is interesting as the tools and techniques indicated as being used most extensively are included in those that offer the most flexibility to web-developers. Thus is then important factor to consider when developing any new framework for web-system methodology development.

Question 3 on the survey concerned the developmental approaches the developer had heard of. It was an open text box allowing the participant to indicate any of their experience. The chart below indicates responses
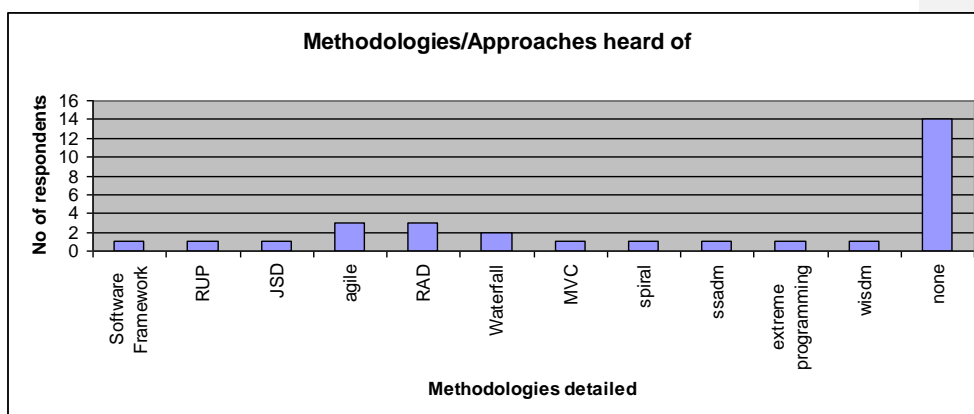
Fig 5.18 Participants' awareness of Methodologies/Approaches

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The main feature is the number of participants that could not detail a single methodology that they had heard of. Of those they were aware of, only *RAD* and *Agile* received more than two votes. This suggests that methodologies/structured approaches are not part of the participants' tool kit when developing WIS. This links back to one of the questions for this research **How far are web developers following a formally documented and recognised web information system development methodology?** It suggests that perhaps they are not following a formally documented and recognised approach. It also links to one of the objectives set for the study **To explore the current status of web information systems development based on data collected from web developers.**

It should be noted that no individual participant chose to name more than one methodology. However, the following approaches/methodologies were stated as being used by participants:

Coldfusion Framework
RUP
Protoyping
Agile
CMS
Interview with the client
Spiral
LAMP /MVC
RAD
Prototyping
Rad
Agile

Table 5.4 methodologies/approaches stated to be used

54% of the participants stated that they were not following a formally documented methodology or structured approach when developing web based systems – again linking to the research question for this thesis noted above. Of those stating they used an Approach/Methodology *RAD* and *Agile* proved to be the most popular. Of the participants who indicated they did follow a methodology one simply listed 'Interviewing clients' which cannot be counted as a methodology. Similarly, of other Approaches/Methodologies listed by participants, *Lamp* is a solution stack of free software development components such as *Linux, Apache, Mysql, Php* and as such

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does not represent a methodology and CMS refers to Content Management System and again this is not a methodology. This leaves the following methodologies or approaches being used by the 26 participants.

Methodology/ Approach	Users
Coldfusion Framework	1
RUP	1
Protoyping	2
Agile	2
Spiral	1
RAD	2
None	17

Table 5.5 methodologies/approaches actually used

Interestingly, only the *cold fusion* approach could be judged to be a methodology specifically designed for web developers. *RUP* (Wolfgang 2005) and *Agile* (Pikaraien et al., 2008) represent the most modern approaches to systems development and *RAD* (Martin 1991), *Spiral (*Boehm, 1988) and *prototyping* (Alavi, 1984) represent earlier (although still used) approaches used in systems development. It could be interpreted that 65% of participants do not follow a recognised Approach/Methodology when developing their web based systems, with a specific web methodology being used by just 4 % of participants and 31% of the participants following methodologies that were not specifically created for web based information systems.

Some participants indicated that they follow Rapid Application Development approach/methodology (RAD) (Martin 1991), which is a proprietary methodology and requires the payment of a fee and the use of specialised CASE tools that are not web specific. However, arguably, the developers may be following a RAD approach based upon James Martin's RAD methodology but not requiring a licence fee or use of specialist CASE tools, with possibly no case tool at all. Certainly, many Information Systems developers do this. As outlined in chapter 3, RAD is an approach that attempts to deliver a finished application in a shorter timescale thereby reducing the costs of the development. It is an approach that incorporates the accelerated use of structured techniques deploying them interactively with the users and using rapid prototyping as a technique that allows users to refine their requirements and incorporate changes. RAD defines the quality of the finished

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system not in terms of adherence to a predefined specification but in terms of the degree to which the solution meets the users' requirements at the time of handover.

In 1991 James Martin saw RAD as a subset of his larger development methodology Information Engineering explaining that RAD begins with high level user requirements which are refined the evolution of successive prototypes it utilizes the techniques of time-boxes where by the system is sub divided into elements that are individually developed. In RAD time and resources are generally considered as fixed and unmovable and functionality is flexible a complete contrast to early approaches to systems development. RAD aims to make frequent deliveries of the most important components of the proposed system in an attempt to engender confidence and commitment in the end user to the continued system development.

RAD includes a high level of user participation throughout the development cycle it makes particular use of Joint Application Development sessions which are meetings arranged without disturbances that are challenged to resolve development issues in a short time period.

This again illustrates the shortcomings of the survey approach as the data shows that the RAD methodology is the most popular yet, arguably, the developers are highly unlikely to be following the RAD methodology due to its unsuitability for web development – even though they state that they are in fact so doing. It is however, possible that they are following a methodology or approach based upon RAD but likely, not RAD *per se* but rather, something of their own interpretations based upon the RAD principles of evolutionary development – that is, users being involved throughout the development together with high speed, low cost and quality being determined by how satisfied the customer is with the end product. This, they then identify as RAD, though in reality, it probably is not James Martin's model. The second most popular Approach/Methodology noted by participants was *Agile* yet this itself is not a methodology but a group of methodologies all sharing certain principles but themselves quite different.

So, to summarise, the survey approach has gathered the hard data yet left the research with many unanswered questions pertaining to the exact methodology the participant is following and the degree to which they are adhering to it.

The next question explored the importance of 'management' to the decision-making process concerning the Approach/Methodology adopted. Participants were asked to rate the importance of Management to the decision-making process using a scale of 1-5 with 5 being High. Results are shown in the graph below. It appears to indicate two extreme views on the importance of management being on board with the method or approach chosen for developing web systems.
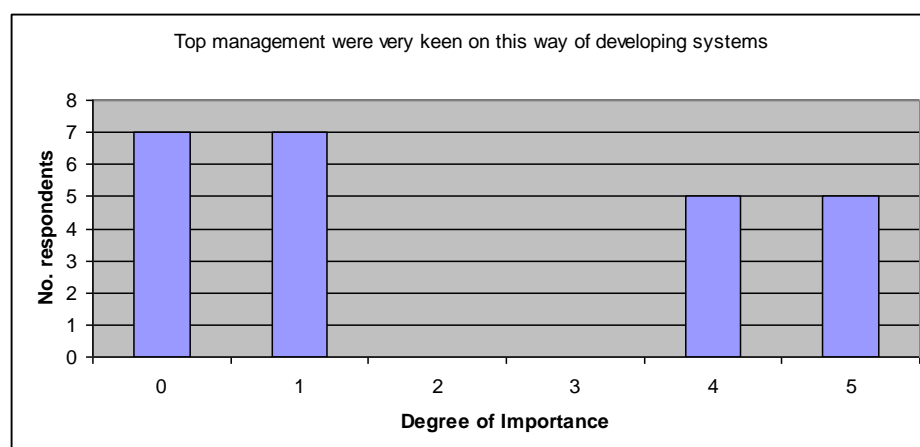
Fig 5.18 Importance of Management to choice of web development

The next option offered to participant was that **they** thought the Approach/Methodology would work well in the organisation. Again, they were asked to rank the importance of this using 1 as low and 5 as high. Results for this are more ambivalent with participants generally staying 'safely' in the middle ground of 2 and 3. However, results also seem to indicate the individual has some input on the choice of methodology as the scores for 1 and 2 were lower than the upper ends of this scale. Arguably, higher scores at 1 and 2 would have indicated that web-designers felt they had little say in understanding the needs of the organisation.

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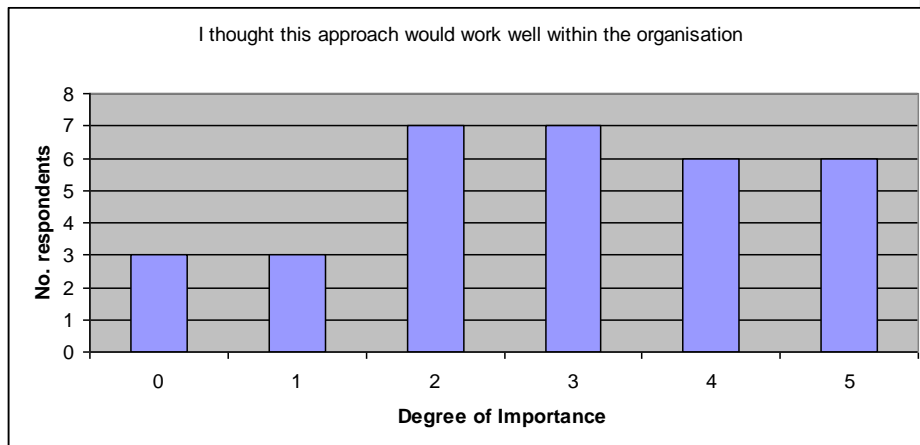
Fig 5.19 Importance of web-developers' choice of system

Similarly, answers to the following question about how far the participants felt the choice of Approach/Methodology facilitated advantage to the organisation perhaps alluded to the previous question concerning the developers' own beliefs about the Approach/methodology. Surely they would not have been keen to implement a system in which they saw little or no advantage to the organisation - and indirectly to themselves - or which might inadvertently lead to their personal redundncy
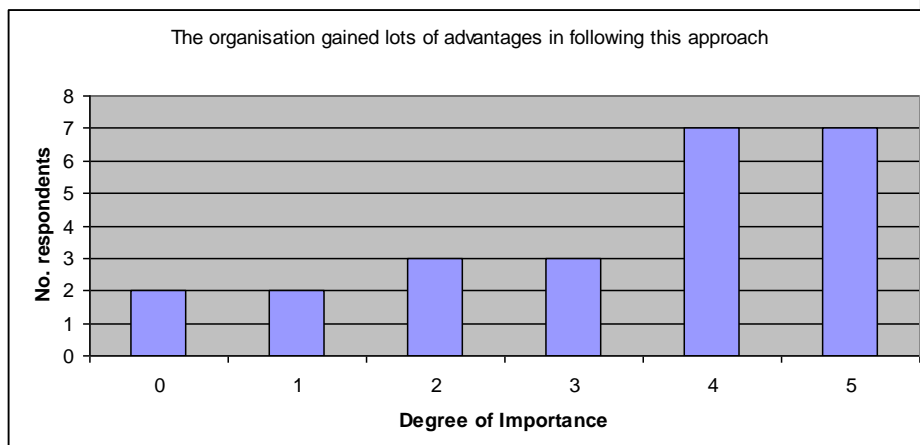
Fig 5.20 Importance of organisational advantage to choice of web system

This also indicates that the choice of methodology is seen by the developers as important to the organisation's success and development. This again links into

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Giddens' (1984) theory of the web developers' agency. The designers' 'Transformative Capacity' - the ability to effect change in some way, or their "capacity to make a difference" (Giddens 1984 p 14) is seen as central to decisions about the system developed or used. The developer is able to draw upon "structured properties of social systems" as they are "…reproduced by knowledgeable agents [the developers] in the course of interaction" (Giddens 1984 p 15).

The next two questions on the survey asked participants about the importance of familiarity of tools and techniques to their chosen Approach/Methodology. These questions link to the research question **How far are web developers following a formally documented, recognised web information system development methodology? a**nd also to the fourth research objective **To determine whether or not web information systems developers who claim not to be following a methodology are actually doing so without being cognisant of the fact.**

The two charts below illustrate participants' responses to this question and also to the question about how important past experience was in determining their choice of Approach/Methodology. The results show the majority of web developers felt these points were very important to their choice of methodology.
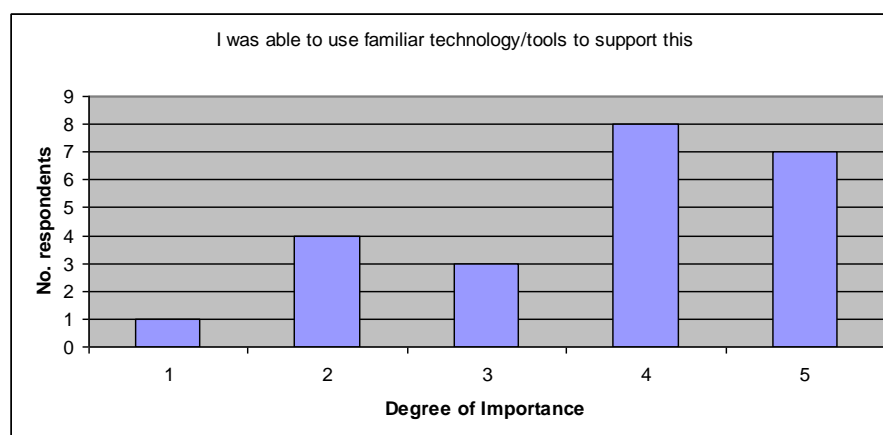
Fig 5.21 Importance of web-developers' familiarity with tools to choice of web system

My past experience of using this approach

Degree of Importance
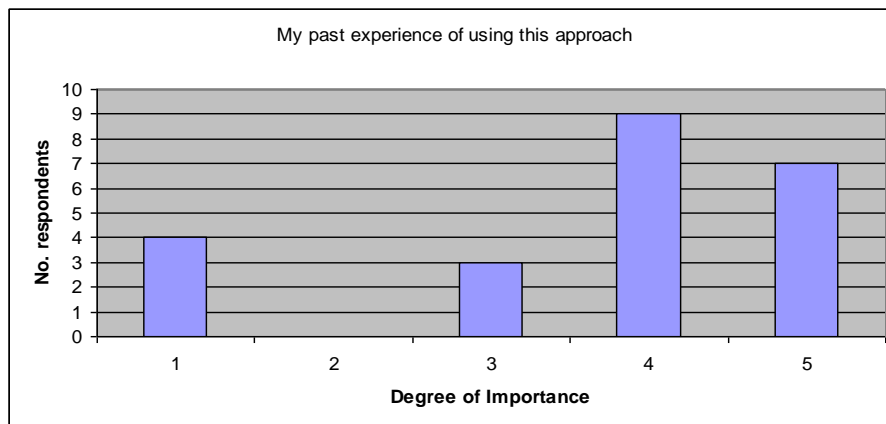
Fig 5.22 Importance of web developers' past experience to choice of web system

This is interesting as it can be argued that most of us seek stability within 'known' and familiar techniques and tools throughout life. In the area of web information systems development in which arguably, complexity and dynamism is fundamental in response to a changing environment, such familiarity is important to note. Most participants found it important to build their approach/methodology on the 'known' rather than the unknown. This is then central to consider for any new or proposed approach/methodology.

Following on from the questioning around the familiarity of tools and techniques used by developers the next question asked about the importance of prescriptive tools and techniques. The chart below shows participants' responses. It shows that 30 % of the participants felt that the ability to use prescribed tools and techniques was of low importance whist 26% felt this was of some importance the remainder showing no particular feelings one way or the other. This suggests that most participants did not particularly want the methodology to determine the tools and procedures that must be followed suggesting instead, that the majority have a desire for independence in this matter. Again, in a context of any proposed 'new' approach/methodology this is important to consider.

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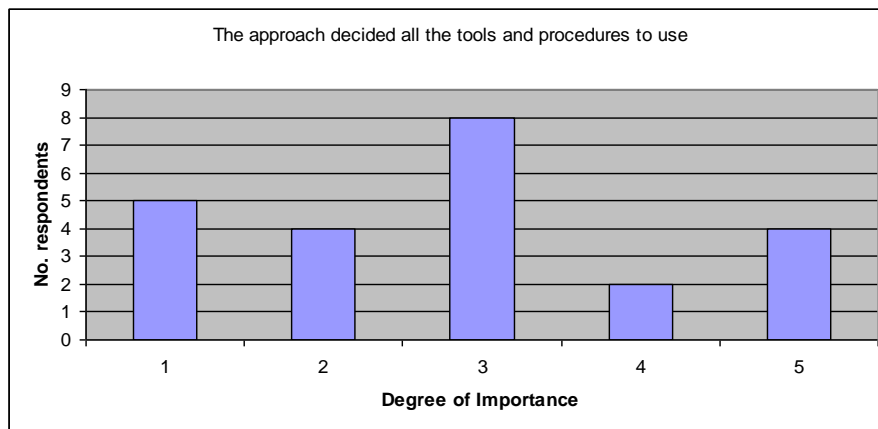
Fig 5.23 Importance of choice of approach/methodology to choice of tools

The end of the survey/questionnaire asked participants where they learned or acquired their knowledge and skills in WISD from. This question links directly to the research question Responses showed that 50% of the web developers responding to this section indicated that University was where they learned their current approach to developing WIS but some of these indicated their experiences of work also influenced their knowledge base. The next main method of learning their chosen approach was "on the job" the remainder specified self learning or the Internet. None specified academic journals as being their source for knowledge on WIS. Given earlier responses this is probably expected as arguably, most people base their practice on skills learned through training of different kinds. Probably very few people base their practical work on~~use~~ academic journals ~~on which to base their practical work~~. This chart might also usefully illustrate the developers' perceived understanding of the different approaches rather than simply indicating~~reflect~~ their preferences~~desires~~. Again, unfortunately, no qualitative data wereas gathered to explore the designers' motivations for their responses so this argument must remain conjecture.

Finally, the survey/questionnaire invited participants to expand on their reasons for choosing and using an approach/methodology. All seemed to follow a similar theme of client need. Perhaps the most illuminating response was the following comment,

> "'The client!! Their needs and specifications should always be listened to first
> to determine the most effective methodology for the project. This can help

keep the client happy and also protect the company from the client making additional, often costly, changes towards the end of the project life cycle."

Another participant stressed:

"The ability to communicate with the client clearly and as frequently as required."

And yet further participants commented:

- "easy to use and customer rich experience" ;
- "Mainly the speed, we develop smaller web application, clients want products quickly."
- "Depends very much on what the customer needs" "What the client needs in terms of features and future features."

All these comments then suggest the need for an easy to use, fast and flexible approach interpreting the client's requirements. This will be returned to later in the proposed framework for developers outlined in Chapter 7.

5.165 Reflection on the process

The Internet survey initially appeared to be a very useful tool for collecting a breadth of data about WIS developers' choice of methodology and their knowledge about different methodologies. Logically, WIS developers would be very familiar with web-based tools and ostensibly, the use of the Internet seemed appropriate and useful in order to reach a wide relevant audience quickly and to communicate with them in a manner with which they were familiar. It was sent out to apparently appropriate forums which were well-used by WIS developers. However, the original survey was very poorly received and the completion-rate was extremely low.

In keeping with a Grounded Theory methodology the survey was redesigned, piloted and re-sent to further forums. Following a similarly limited response it was decided to redesign for a second time – building on the results and feedback from the second survey/questionnaire - and post a third survey. The response-rate improved, and the results of the survey have been presented in this Chapter. Of the responses submitted

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some interesting findings emerged, primarily around the issues of web-developers' knowledge and reasons for the choice of methodology. The major reason given for the choice of methodology in both the second and third survey was the designers' personal choice rather than the perceived benefit to the organisation ~~— though this must be set in a context of the probability that the~~ though it may be expected that the designers choices are likely to be fairly well-aligned with those of the organisation if s/he seeks to retain his/her job.

The needs of the designer are congruent with those of the organisation as s/he seeks to retain their job. Statements about the web-developers' knowledge seemed to suggest that they were apparently unaware of published methodologies, preferring instead to create their own to fulfil perceived needs and organisational demands. This latter response links to the duality of agency and structure inherent in Structuration Theory, where the reciprocity of the two elements of the theory interact almost symbiotically.

It is well-recognised in questionnaire and survey research generally that response rate is likely to be low and certainly, this survey (in all three manifestations) concurred with this assertion. On reflection, perhaps a major problem with the initial survey was that it was far too complicated and used language common to academics rather than the average lay person. Whilst questions around developers' experience and exploration of this experience pertaining to academic literature was an aim of this research (Chapter One) it was probably not appropriate to use academic language in the questions. Nonetheless, in-keeping with Grounded Theory methodology this approach was rectified in the subsequent surveys.

In summary, the use of an Internet survey was potentially a very useful research tool, particularly for a survey pertaining to WIS development. However, the facility to explore issues further with participants or to explain if they did not understand a specific question completely, or even just to urge participants to continue completing the survey, is not available to a researcher using this tool. For this research, arguably, this was then a limitation. Consequently, a more in-depth interview with WIS developers was deemed appropriate for the next stage of the research in order that

issues might be more fully and holistically investigated. This is reported in the next Chapter.

5.1~~7~~6 Summary

This Chapter has discussed the development of the Internet questionnaire/survey research tool. It has provided a clear rationale for choice, set within a context of the overall research methodology. Discussion of the challenges and problems inherent within the tool, an outline of the problems and challenges identified in the initial application together with the rationale for and details of, its two redesigns are provided. The Chapter concludes with a final presentation of the research findings, a reflection on the process and a rationale for the interviews to be detailed in the next Chapter.

The findings from the Internet survey were clearly not as rich in data as had been hoped. Nonetheless, they provided sufficient information from which to develop an interview schedule from which to gather thick data (Geertz, 1973) on WIS developers' experiences and choices of methodologies. Details of the interview process and findings are given in the next Chapter.

Chapter Six
Primary Research tool: Interviews

6.1 Introduction

Details of the three Internet surveys, together with the research findings were given in Chapter 5. Using the information gained in this phase of the research, participants were sought to take part in an in-depth interview about their practice and choice of approach/methodology. This Chapter outlines this use of interviews as a research method for the study. It commences with a discussion of the rationale for use of interviews, setting interviews in the context of Grounded Theory methodology. The interview schedule is detailed, its development and the rationale for and context of the questions. This is followed by a detailing of the research sample. The data collection process is presented followed by a discussion of the findings. Analysis of data is undertaken using the Grounded Theory coding and process. Findings from the interviews are then presented and analysed in the context of Structuration Theory.

6.2 Research tool: Interviews

There are several research instruments used traditionally within interpretive research and Grounded theory specifically. It was noted in Chapter 3 that qualitative interviews are particularly appropriate to Grounded Theory. An additional tool considered was observation, though observation was not deemed appropriate within the operation of a busy web development operation. Thus, interview and field notes were utilised.

The style of interviews varies from highly structured, standardised, quantitatively oriented questionnaire-style interviews, through to unstructured, free-flowing informational exchanges with all shades in between. In more positivist research it is generally the objective to standardise the stimulus and thus, the data required from the interviewee. However, implicit in this reasoning is the assumption that all respondents share a common vocabulary with every word carrying the same meaning for each person (Denzin, 1989). In contrast, within the premise that all research participants are meaning–making, it is asserted that they may not hear the question

through the same meaning-frame as the interviewer or other interviewees and that they are invested in particular positions in multiple discourses as they interact within any specific one (Burr and Butt 2000, p197).

In appreciation of this position, semi-structured interviewing was adopted for the current study around a series of identified issues, arising from a review of the literature. As there was no set response the participant was able to move around freely in his/her answer, thus facilitating the participants to tell their own story within the interaction. Rather than simply replying to a prescribed series of questions the participants were enabled to talk freely about the issues. However, it is acknowledged that as the interviewer posed the questions there was necessarily an element of 'guiding' the interaction. Nonetheless, as Holstein and Gubrium (1997, p113) noted, data "… are all constructed *in situ* as a product of the talk between interview participants." Therefore, it has to be asserted that the participants' responses were part of that product and certainly, through using a semi-structured interview, attempts were made to ensure that the resulting data were rich, though the difficulties of recording 'real' experiences and meanings are well-documented (Holstein and Gubrium, 1997).

The research position within the current study supported the perspective that suggests that both interviewer and participant are fundamentally involved in shaping the form and content of the interaction being necessarily active in the research process. Oleson (1992) noted that it is the interaction between researcher and participant that creates the data. This acknowledges that to a greater or lesser extent, participants are always part of the research process. Meaning was not assumed to be simply elicited through questioning, but rather actively created in the interview encounter. Thus, the interview data were unavoidably collaborative (Holstein & Staples, 1992, Alasuutari, 1995).

6.3 Analysis of subjectivity: Sensitivity to participants' needs

The area being researched is potentially emotive as there may be concerns regarding issues of 'professionalism' for workers. As Oleson (1998) noted, in order for full

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discussions to take place, a positive relationship between interviewer and participant is necessary. Further, Griffin and Phoenix (1994) commented that when researching emotive issues it is important for the researcher to initiate a 'shift' in power within the interaction such that the participant is able to dictate the pace of the interaction, feeling comfortable with the responses and contributions proffered by the researcher. In this way a relaxed and supportive atmosphere might be cultivated in which it is more likely that full informative discussion concerning the issues raised, can ensue. Semi-structured interviews were used for the study, endemic in which is a lack of enforced standardisation. However, in order to ensure consistency across the interviews the following procedures were followed.

- Introduction and confidentiality sheets were discussed with each participant, prior to the interview.
- Permission was sought to tape the interview, with each participant prior to the interview commencing.
- Field notes were taken during and after each interview.
- Interviews were all conducted in surroundings that were familiar to the participants.
- The researcher wore the same suit for each of the interview sessions.
- Each participant was thanked and briefly de-briefed following the interview.
- Uniformity of interview prompts, designed to pursue the aims of the study, in a context of the issues arising from the literature review, used as an aide to both researcher and participant, to guide the interaction.

In the context of the current study the researcher, whilst clearly not a web developer, nonetheless actively presented as being neither firmly entrenched in mainstream dominant discourse pertaining to WISD nor too far on the margins of IS culture. The researcher was introduced to the participants as having a research interest in the area under investigation, but acknowledged from the outset the participants 'expertise' and experience in the practicalities of working in WISD.

The existence of social differences between the interviewer and interviewees did not mean that the interviews were devoid of information. They provided opportunities for individuals to articulate their feelings about their life experiences from an 'expert'

standpoint. The participant was able to recognise him/herself as an expert on a topic of interest to the researcher. Rapport building is a key to the success of this enterprise. The need to establish trust and familiarity; showing genuine interest, assuring confidentiality and not being judgmental are some important elements in establishing rapport, (Glassner & Loughlin 1987, p35). All these techniques were employed by the researcher in this study.

6.4 Developing a research schedule

The semi-structured approach to interviewing was adopted in order to ensure a high degree of flexibility which was deemed essential in order to explore issues raised. Nonetheless, a minimal structure was required in order that the encounter did not become simply a directionless 'chat'. Therefore, it was considered necessary to formulate 'prompts' which could be utilised to guide the interview encounter. These related to the original conceptual issues of the research and also to the stated aims of the research given in Chapter one and stated below.

The interviews aimed to explore and to seek evidence for aims 2 and 4 of the thesis, given below:

Aim:

Aim 2 : *To explore the current status of WISD based on data collected from web developers.*

Aim 4: *To determine whether or not WIS developers who claim to be following 'no methodology' are actually following a methodology without being aware of this.*

In summary, the interview prompts were designed to pursue the aims of the study, in a context of the issues arising from the literature review and also from anecdotal evidence collected. The prompts were originally formatted in a logical order, though this order was not pre-determined for the interview. Rather they were intended as an aide to both researcher and participant to guide the interaction.

6.5 Development of the research schedule

The major questions are given below. Additional prompts were given to participants as required in individual interviews to ensure free-flowing, clear elucidation of the issues. That is, if participants did not understand the initial line of questioning additional information/alternative phrasing of questions were offered. In this way complete understanding of the prompts was facilitated to the participants.   .

<u>Questions:</u>

1. To set the scene to begin I would like to know about your current job and a little bit about the main business of your organisation.

2. Now something about web development in the organisation

3. Now some information about your personal experience in web development (WD).

4. I'd like to talk to you about different approaches/methodologies in WD

5. Now some information about your choice of web methodologies (WM)

6. Thinking about the tools and techniques of WM

7. Some questions about where you learned about WM

8. Finally, some questions about how you think web developers learn their work

6.6 Research Sample

Six web-developers from a range of different backgrounds working either for themselves or for a small unit within an organisation, each varying in size and purpose, were interviewed. All the developers had in common the fact that they were directly responsible for the choice of the WIS methodology adopted and utilised. The participants all responded to an emailed invitation to participate in this study. in this way they were a purposive, self-selecting sample.

Participant 1 was a middle-aged male web-developer working as a lone web developer but based in a large organisation. He was a graduate with ten years experience of web-development, all within the same organisation.

Participant 2. was a thirty year old male web-developer working in independent practice. He was a graduate with nine years experience of web-development gained from working for different employers and organisations of varying sizes.

Participant 3 was a middle-aged female web-developer working within a small IT unit within an organisation employing approximately 100 people. She was a graduate with seven years experience of web-development

Participant 4 was a thirty-five year old male web-developer working in independent practice. He was a graduate with ten years of experience in web-development.

Participant 5 was a twenty one year old male web-developer again working in independent practice. He had just three years experience.

Participant 6 was a twenty eight year old male developer with six years of experience in web development. He was a graduate now working for himself.

6.7 Reflexivity and reflexive practice

Reflexivity about possible researcher bias and preconceptions prior to commencing this study was undertaken. This was repeated at the following points during the research: prior to and during the interviews and before and after data analysis. The aim was to ensure as far as possible that interviews were participant led and that analysis was data, rather than researcher driven. Prior to commencing the study the researcher identified both professional and personal perspectives and experiences of the research area. This was detailed in Chapter 1.

The researcher's personal experience of struggling to find a published methodology that is relevant to all web developers prompted the initial interest in the issues. Frustration at the apparent lack of available material also influenced the early work. However, academic pursuit of the area led to appreciation of a completely different view. This view acknowledged both the frustration and innovation of people working in the area. Subsequent encounters with professionals involved much re-evaluation of the issues. All the information was recorded formally in a research diary with

additional reflection being added as appropriate throughout the research process. Issues were also discussed at the research supervision meetings.

6.8 Reliability, validity and generalisability – or Trustworthiness of qualitative data

The current study utilises a qualitative approach, seeking to explore meaning within an in-depth study of specific phenomena (Guba & Lincoln, 1994). Consequently, the traditional issues of generalisability, validity and reliability are inappropriate and instead, this study utilised Guba & Lincoln's (1994 p114) preferred terminology of trustworthiness and authenticity. These two key concepts each consist of four sub-categories.

6.8.1 Trustworthiness
- Credibility (parallels internal validity)
- Transferability (parallels external validity)
- Dependability (parallels reliability)
- Confirmability (parallels objectivity)

6.8.2 Authenticity
- Criteria of fairness
- Ontological authenticity (enlarges personal constructions)
- Educative authenticity (leads to improved understanding of constructions of others)
- Catalytic authenticity (stimulates to action)
- Tactical authenticity (empowers action)

Guba and Lincoln (1994) suggested that **Trustworthiness** is perhaps more immediately understandable, with **Authenticity** requiring evaluation after completion of the study and dissemination of its findings. As a consequence, these factors of authenticity will not be reviewed here.

Addressing the issues of Trustworthiness within this study, the notion of Credibility considers how well the subject of the research is identified and described. Transferability refers to the facility of transfer from one theory to another, rather than from sample to sample. This idea relates to the idea of external validity/generalisability in quantitative research. Generalisability is not always

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appropriate to qualitative research. Transferability of one theory to another offers a possible alternative, as for example in the current research some elements of theory can be considered within other areas of web development.

The third element suggested by Guba and Lincoln (1994) is dependability which parallels reliability. This has a central role in positivist research being a useful indicator that researchers are able to operate definitions in similar ways, creating the same meaning within the data. In the context of qualitative research, reliability has been referred to as the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions (Hammersley, 1992 p67). However, such a definition suggests at least a partial adherence to the notion of a fixed 'reality' and it has been argued (eg. Marshall and Rossman, 1989) that since social reality is always in a state of flux the concept of accurate research instruments, is irrelevant. As they noted "This assumption of an unchanging social world is in direct contrast to the qualitative/interpretative assumption that the social world is always changing and the concept of replication is itself problematic" (Marshall & Rossman, 1989 p147).

Further, as Yardley (1997 p35) noted "In quantitative research, reliability is too often achieved by treating important inconsistencies and idiosyncrasies as 'error' and that objective validity is a mistaken ideal, since all views of reality are associated with a particular perspective." Post positivist researchers believe that all research is influenced by the researcher: that the data collected in both quantitative and qualitative research is not neutral, since the researcher frames the question, chooses the participants, interacts with them to produce the research data and then selects and interprets the analysis. The researcher decides which data to include and which to omit and which unexpected, inconsistent or ambiguous findings to profile.

The fourth issue is Confirmability of the research. They introduced this notion as a parallel to the quantitative idea of objectivity, but stressed that the focus should be on whether or not the research process is rigorous and appropriate and that there is transparency through which it can be judged. Morse (1994 p230) suggested that rather than addressing issues of reliability and validity within a positivistic understanding, more appropriate measures of 'objectivity' in qualitative research

would be to focus on issues of the Criteria of Adequacy and Appropriateness of Data; The audit trail; Verification of the study with Secondary Informants; and Multiple Raters. In this way, using one of, or a mixture of, these designated methods a qualitative researcher might usefully document and validate their research process such that anyone looking at their work might follow exactly their research processes and decision-making and comprehend precisely how they reached the decisions they did regarding the data. Consequently, though positivist issues of reliability and validity would not be addressed or adhered to, nonetheless, the research process, data analysis and data findings might be supported.

In the context of this study the criteria of adequacy was utilised. This refers not to the numbers of participants but rather that adequacy is achieved when sufficient data have been collected that saturation occurs and variation is accounted for and understood. This process is relevant to an interpretevist approach and specifically, to Grounded Theory. Details of decisions pertaining to saturation of data are given later. Some element of the verification process wherein the model and/or data is taken back to the participants for verification could have been applied. However, this would only have enabled a review of part of the research out of context of the whole. Additionally, within a research framework in which an important part of the work is the interactive action of the researcher and the participant in the research situation, an attempt to 're-visit' or recreate this context was not relevant since this would support the notion of an exploration of 'objective truth'.

The use of multiple raters was similarly inappropriate as action between participants and researchers is created between the parties concerned through a flexible subjective narrative of lived experience. Therefore, different researchers and participants would have created different action and different narratives. Possibly the most useful of Morse's measures for the current study was the audit trail; whereby clear documentation of the research process and implementation could be undertaken. The audit trail was able to provide evidence of consistency and research rigour. In this study each stage of the research was documented clearly and accurately. Attention was given to the decisions made with these decisions placed in methodological, epistemological and ontological context.

In conclusion, though all descriptions are bound within a particular perspective representing the world rather than reproducing it (Hammersley, 1992), it is possible to describe social interaction in ways that can be subject to investigation. In research practice enhancing trustworthiness is a very concrete activity. It involves efforts to ensure the accuracy and inclusiveness of the data on which the research is based, in addition to efforts to monitor the truthfulness of the analytic claims being made about the data.

6.9 Interview data

As noted above, all interviews were undertaken following, as far as possible, the same procedure and process. Subsequently, they were all transcribed verbatim as soon after the interview as possible. All 'erms' and pauses were included in the transcript. Additionally, field notes were taken before and after the interview to note any further information which might be relevant. For example note was taken of the manner of the participant – such as whether or not they appeared nervous or relaxed as this may have impacted upon the interview. Following transcription of the interview analysis of the data using Grounded Theory coding, was undertaken. The interviews were analysed sequentially with information from each informing the next. Thus, although the interview schedule was followed for each interview, as noted above, extra prompts were included where necessary.

By interview six no new data significant to this research inquiry was emerging and it was therefore, concluded that 'saturation' had been reached. Dey (1999) suggests the term "theoretical sufficiency" (p257) in preference to that of saturation. He argues that saturation is an imprecise term that relies on the researcher's conjecture and may foreclose analytic possibilities since data collection and analysis ceases when the researcher decides 'saturation' of categories has occurred. In contrast, the term "theoretical sufficiency" denotes more honestly the fact that the researcher has decided that sufficient data has been collected to facilitate development of the theory.

For the current study, it is acknowledged that the decision to cease data collection and analysis was made by the researcher when no new data significant to the inquiry was

evident. Certainly, if tens of interviews were to have been conducted then some new data may well have emerged. Additionally, if the interviews had been conducted with web-developers from organisations of many varied sizes and descriptions, then additional data would possibly have emerged. However, given the confines of this study such interviewing would have been impossible to undertake. Additionally, this research aimed to investigate web-development practice by developers working either alone, or in small groups –even if this was within a larger organisation. Thus, the research was more narrowly focussed and as Morse (2000) commented, "…if the topic being studied is obvious and clear….fewer participants are needed than if the topic is below the surface and intriguing but difficult to grasp" (p3-4). Therefore, given the clear topic being studied and the fact that no new data significant to the research question was emerging, a decision was made to stop interviewing.

6.10 Data Analysis

Using Grounded Theory coding the first stage of analysis involved preliminary *open coding*; that is identification and labelling of meaningful 'units' of information. As Glaser and Strauss (1967) advocated, this early coding stayed as close to the data as possible. The preliminary open coding identified the initial units. This is detailed in Appendix 2. The units of meaning are listed below. Evidence from the transcripts is given in Appendix 2.

Units of meaning:
Personal Motivation
Knowledge of tools & techniques
Knowledge of Approaches
Experience
Documentation of Approach
Structure of Personal Approach
Personal Approach
Need for flexibility
Agency
Academia & Training.
Information Systems development

Power & Control

As discussed in Chapter two this research has followed Strauss and Corbin's (1990., 1998) procedures and process for Grounded Theory. Accordingly, these initial units were interpreted and categorised, elucidating conceptual categorisation from this early stage. From the initial units (listed above) the following categories were identified:

Categories:

Personal Approach

Background Learning

Agency

The rationale for the categories was that some units seemed to link naturally together to form a more comprehensive category within the overall 'story' of the interviews which told of the participants' approach to WISD, together with their rationale for its adoption. A discussion of each category is presented below with quotes from the participants to support the analysis.

6.10.1 Category one: Personal Approach

First, the following units of meaning were clustered together under the Category *Personal Approach:*

Documentation of Approach, Structure of Personal Approach, Personal Approach and *Need for flexibility*

This category thus, necessarily included all elements of the Personal Approach participants reported in the interview.

First, a major feature of the Personal Approach indicated by participants was that it was not a recognised Methodology/Approach, but rather as Participant 1 stated

 "Its just my amalgamation of techniques" (P1.Pg9,L 200).

Certainly, all the participants recognised the terminology of 'methodology' except Participant 5, who supposed he did use them – but was not certain what they were. In response to the question about use of Methodologies he stated, *" Yes … probably… if I knew what they were [laugh"] (P5.Pg6, L136-9).* A more common response was

given by Participant 2 who stated that though 'experts' use the term methodology, in practice this is "… *from my experience it is a set of processes that you have to follow,"(P2.Pg4, L63-5)* suggesting that he felt that perhaps the use of the word methodology was not accessible to clients and perhaps it presented a certain 'mystique' which in practice really just reduced down to a set of processes.

Similarly, Participant 3 stated an emphatic *" No No.." (P3.Pg4, L77)* when asked about her use and knowledge of approaches, though it was clear that she was amalgamating a series of approaches in her personal bespoke approach.

This is perhaps a theme taken up by Participant 2 when he says *"The approach I always take - .. I try to simplify the web tools or web package that I build to be most useable" (P2. Pg2, L26-7).* That is, he uses procedures, tools and techniques from different approaches/methodologies, but then adapts these and 'simplifies' them into a useable format. Similarly, this useable approach was noted as being necessarily a response to the development needs at the time. This was a point made by several participants. For example, Participant 4 stated, *"but in the end it was what we needed at the time. Each project was so different from the previous that we were developing approaches that suited the project… no **one** suited us." (P4.Pg2,L40-2).* Participant 5 also commented *"every one was different each company wanted different things." (P5.Pg1, L23).* Participan*t* 3 also commented that *"I came up with my own (P3.Pg8 L186)* That is, no single approach/methodology was suited to every project engaged with. Therefore, the developers adopted and adapted tools and techniques as appropriate into a 'bespoke' approach/methodology that was without identifying name.

When discussing the structure of their personal approach, including formal documentation of the approach it was clear – if perhaps surprising – that only one participant seemed to feel the need to document formally what they were doing so that others might follow their way of working. That participant was a female working for a large educational organisation. She commented *"All of that is documented the procedures, everything. Lots of flow diagrams showing the processes I want to do that, then I do that and that and then that" (P3.Pg7, L159-60).* She noted later in the interview that she was working with a range of individuals who wanted to input into

their own web-pages and as the web-master it was important to her to formalise procedures in order to take control. As she stated *"they sort of start off in the year with it being the most important thing but then teaching takes over" (P3.Pg7, L146).* This also linked into her personal motivation for developing the systems to *"..show progress" (P3. Pg7 L144).* For this participant control in the situation was to have a recognised set of clearly defined procedures others might follow – should they wish to. This also then showed her expertise.

For others, maybe, the reason they were not documenting their approach/methodology, was in order that others were unable to 'copy' them. As Participant 1 commented, *"the documentation is non-existent other than in the code itself and in my head" (P1.Pg9,L184)* and Participant 2 said, *" I have created my own documentation for myself. Never passed it onto someone else and asked them to work by following that process" (P2.Pg5, L90-1).* Participant 4 commented, *"the documentation was minimal" (P4.Pg5,L69-70).* Possibly because as Participant 2 stated, *" they would not have to be written down because they would be in your memory" (P2.Pg5 L84-5).*He continued by noting, *"I have never worked in an organisation that has a formalised process or even had an informal process to be quite honest" (P2.Pg5, L92-3).* This suggests that recording and documenting web-process is not usual – in marked contrast to traditional IS.

Nonetheless, that does not indicate that there is a total lack of structure to the approach/methodology taken by the developers. Indeed, as Participant 1commented,
"I tend to take a structured approach even though it may appear ad-hoc my Approach is still very structured and well organised" (P1.Pg8,L160-1). And as Participant 4 stated, *"Look we were not making it up as we went along but neither were we following any one identifiable approach. Or rather over time we found what suited... what worked for us and, and simply refined our approach but that did not mean we were tied to any one way of doing things"(P4.Pg2, L42-45).* Additionally, as noted above Participant 3 was choosing to document her approach.

Possibly the major feature of importance to WIS developers was the need for flexibility in their approach. All participants emphasised this requirement several times and in several different ways through the interviews. For example, as

Participant 1 commented *"I use the design Approach I have in mind…then test it, get feedback on it & then do the next bit" (P1.Pg5,L100)*. He went on later in the interview to say, *"..depending on the development project you will have different needs for development tools"(P1.Pg10, L215-6)*. And the approach/methodology needs to accommodate to this.

Often the client does not know exactly what s/he needs from a project. Thus, the WIS has to evolve and adapt to the client's demands as the project develops. This can make choosing an approach/methodology before embarking upon the project, very difficult. As Participant 2 commented *"I have looked at creating a project plan before I have even started the web development process, not only so I can follow it but so the customer can follow it,..but they say 'yes I understand now why you cannot build it because I have not given you this information yet'"(P2.Pg14, L 251-4)*. Also, Participant 4 noted *" some clients had no idea what they wanted and we had to use new techniques… some clients only had the vaguest idea who would be using their systems and so we had to design the system blind" (P4.Pg3, L47-53)*. And as Participant 5 commented *"every customer wants something different" (P5.Pg3, L81)*. Participant 3 also commented upon the need for flexibility despite noting that she documented procedures. She stated *"I also basically think that when you take down a procedure it has to be fluid" (P3.Pg9, L186-7)*.

Without the lack of adherence to rigid rules and procedures inherent in what they feel to be their own 'bespoke' approach/methodology such flexibility – they feel –would not be available to them. As Participant 4 continued later, *"we change our approach depending on the particular project and the work pressures at the time…" (P4.Pg4, L66)7)*. *"It is changeable, in that each project is different and so we bring on board the tools and techniques we need when we need them" (P4.Pg4, L83-4)*. And finally, *"each project… would need to be…. … a flexible approach". (P4.Pg6, L129)*. Above all, as Participant 4 stated succinctly *"what I do know is that the way we work … works for us" (P4.Pg4, L76)*.

6.10.2 Category two: Background Learning

The second Category identified was _Background Learning_. The following units of meaning were clustered within this Category:

Academia and training, Information Systems development, Knowledge of Approaches and _Experience._ Fundamentally, this Category encompasses all issues raised by participants that referred to their background learning. This included both academic and training experiences, and also professional experience (eg in IS).

All the developers interviewed were working either independently or as a small-scale operation within a larger organisation. This is important to the analysis of their data and to the subsequent design of _Webframe_; designed as it is, for this audience rather than for a large-scale operation.

All the participants interviewed had been in WISD for a different number of years and their backgrounds were all different. What was common to all participants was their complete lack of formal training in WISD. As Participant 1 stated about his experience, "_Nothing in web development" (P1.Pg12L251)._

When asked where and how they learned their skills, again the answers were fairly similar. As Participant 4 stated "_[I learn from]_ "_...the web, from my studies, from competitors…… from what clients have come across from the computing press……"_ _(P4.Pg6, L143-4)._ Participant 5 stated that he had not learned from academia or official training but "_From time to time when things are quiet I look around the web but…… ... I have heard of these Agile approaches but it all seems like heavy going or common sense" (P5.Pg3, L89-94)._ No participant commented that s/he had learned from 'official' sources. Even Participant 3 whose responses might be argued to be the most dissimilar to the others – particularly regarding her motivation to document her approach – noted that she learned from "…_the internet and I started off reviewing other sites and try to bring the best out of each. I also did a lot of research on our competitors"(P3.Pg8, L177-8)._

Participant 5 explained why he was not learning from 'official' sources, "_I am either too busy knocking out a system or I am too bored to investigate… besides ..... I find that I find what I need when I need it. Like the data base side I went ages before I needed to understand that and I am sure I only know a bit but I know what I need to_

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know… if that makes sense" (P5.Pg3, L). Participant 2 commented *"There is a conflict in being taught a methodology and then going out into the real world not using any methodology and not seeing anyone who does use a methodology and thinking, well not what is the point of it because I know the point of it, but although I refer to it as different process its a layer of processes that you follow; they just don't seem to follow them" (P2.Pg13, L225-9).* This is an interesting comment that has immense implications for this research. Linking back to one of the research questions which sought to explore if WIS developers were following published sources and, by implication, learning from such sources, the participants' responses suggest that they are not.

That is not to suggest that their approaches/methodologies are completely without foundation. Indeed, as Participant 1 stated, *"The whole software engineering ethos is pretty well engrained in ..all that I do" (P1.Pg7,L159-60).* And this 'ethos' together with its procedures, was evident in all participants' work when asked about their knowledge and use of tools and techniques. Participant 2 noted *" The main systems or the platform I use is PHP, MYSQL. My development environment or preferred development environment would be ADOBE Dream Weaver Fireworks I have not used too much of Photoshop but I am quite confident with the Adobe Macromedia package" (P2.Pg1, L16-19).* He continued later in the interview to add *"I use Macromedia Dream Weaver or which is now Adobe Dream Weaver" (P2.Pg8, L139-40).* Participant 4 said he used *"...such things as Personas and Story Boards…. we also used more traditional techniques such as Entity Relationship modelling" (P4.Pg3, L53-9).*

In terms of approaches/methodologies Participant 2 commented that he used *"I've started with asp [err] which was using a Microsoft Access data base then I moved onto using a well I touched on Dot Net using Sql database but my preferred one at the moment is a Php platform using Mysql database. And really I don't think its, err... too important what, what, what platform, whether it is...ASP or Dot Net and Sql when you are structuring your database if the data base is structured properly you should be able to hand that over and some one should be able to build it in what ever platform they have chosen, and it does tend to work like that" (P2.Pg9 L143-9).*

Participant 4 said he used *"PHP and Apache based systems as required"* (P4.Pg1,L16).

Just because they did not use the approaches/methodologies it did not necessarily mean the participants had not heard of them. When asked the question about which approaches/methodologies they had heard of Participant 2 stated *"SSADM is all I can remember... I cannot recall exactly what it is apart from that it is very structured erm really and l linear in its approach so that you do the first thing first and the second. And then RAD rapid application development which I feel is more suited to real world application development"* (P2.Pg3, L44-7). SSADM appeared popular as Participant 4 also stated this as an approach/methodology he had heard of *"SSADM and RAD"* though interestingly, he also stated that he *" took elements from each"* (P4.Pg2 L40).

Participant 1 noted *"I've heard of Wisdom…"* and more interestingly to this research, he added *"… I've heard of one that a colleague of mine developed.."* (P1.Pg4, L74-5). This comment is interesting because it relates to an assertion made at the outset of this study, that it is NOT the aim to simply create yet another approach/methodology which is apparently little used. Rather, it is the aim of this project to seek to determine an approach/methodology **To identify web developers' current methodologies (both personal or published) to inform the development and validation of a framework for developing a web information systems development methodology.**

6.10.~~43~~ Category three: Agency

The third Category identified was *Agency.* The following units of meaning were clustered within this Category:
Personal Motivation, Control and *Power.* This Category included all issues relating to participants' accounts of their reasons for adopting an approach/methodology, including the power and control their choice of approach gave.

Looking first at issues around Personal Motivation of the developers for working as they did, it was clear that all participants were keenly motivated to work in web-

systems development and indeed, to develop the systems they did. However, the personal motivation appeared different for each participant. This is very important to this research and specifically, to the development of the proposed framework.

Participant 1 commented *"…[it] was motivated by erm..the desire for me to…support my own activities" (P1.Pg3, L46)*. This might be seen as a very abstract reason as 'my own activities' might be asserted to be fairly nebulous and without delineation. However, more generally, it could be seen to be a rationale common to all the participants, even if the detail of the 'activities' varied. And this factor is of vital importance to the development of *Webframe* as illustrated later in this thesis.

Participant 2 commented *" I felt web development offered an exciting future for web development but from a business perspective"(P3.Pg2, L23-4). H*e later explained, *"It is to help the business" (P2. Pg 18, L329),* though clearly, as he also explained, helping the business validated his role *"if the business succeeds then my work is seen as important in it" (P2.Pg18, L251)*.

For Participant 3 the major motivating factor seemed to be "*to show progress*" (P3.Pg7, L144) to her employer. This participant was employed rather than self-employed and this might account for her personal motivation. Nonetheless, Participant 1 was also employed and he seemed keen to retain complete control over his approach.

What is clear is that no single factor motivated web developers. This is a very important factor to consider when developing the *WebFrame* if it is to be accepted by active web developers in practice. If they can see no use for it then clearly they are not going to use it.

Whilst participants recognised and acknowledged the need for client involvement in developing the approach/methodology, interestingly, they also felt the need to be in control of the project. As Participant 2 commented *" If I allow them to be leading me , I know from previous experience, and this is again where it differs from academia, its like you're evolving your processes from experiences- usually bad ones- and then if you refer to that process and say 'no if I allow that customer to take me down that*

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route at this point then I know I am going to encounter this problem'. I need them to follow me, I need then to follow this process"(P2.Pg4 ,L75-9). This suggests that whilst acknowledging the importance of listening to the client and taking account of his/her needs, this participant nonetheless, felt it important to retain agency.

This sense of control and agency was also evident in the participants' comments about documenting the approach/methodology. As Participant 1 commented *"..the code itself is in my head so in that sense it leaves them [management] vulnerable" (P1.Pg9,L185).* This sense of 'power' was something he seemed to appreciate continuing later in the interview to state ironically and with a wry smile*, "In a sense of..safe-guarding my ownership of the software I have neglected to document it as I ought" (P1.Pg7,L147-8).*

Similarly, Participant 2 noted *"I have created my own documentation for myself. Never passed it onto someone else" (P2.Pg L90-1).* This undoubtedly give him a sense of power and control over his situation as the client could not simply replace him and his services easily with another web-developer brought in to follow what he had been doing. Additionally, there remained an air of mystique around his web-development activities. In this way, his work was made more secure and he himself was arguably, made to feel more validated. As he noted, - *" I think what happens there is the customer then is taken aback when I say this is how it will be done. A lot of my process started really from let's say, payment, and how do you gain trust first of all because of people scamming customers. How do I gain trust? I will prove to you... this is what we are going to do. First of all, I will prove to you that I can set up a domain. I will set up your web site so that basically I say this is what I am going to do... That will prove to you that I can do what I say I can do. That I am capable of doing it"(P2.Pg6 L97).* Clearly, this participant felt the need to prove his worth to his client and his interview makes clear that money (payment) was a motivating factor for his work. Agency and control for him was concerned with being paid for work he had done. Participant 3 also stated the need to prove her worth, though such a demonstration of worth in her case, led perhaps more indirectly to payment. Both these motivations are in marked contrast to Participants 1 and 4 and denotes once again, the need for *Webframe* to accommodate to varying and different personal motivations of WISD.

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All three categories discussed above were present in all interviews though the emphases/frequency of stating, were different in different participants' accounts.

6.11 Central category

Once this initial set of categories was developed, in keeping with Strauss and Corbin's (1998) process instructions, a single category was identified as the central phenomenon. For this research that was 'agency'. Although, more quotations from the transcripts might be attributed to other identified units of meaning, nonetheless, it is argued that all units related to decisions and choices made by the web-developer. Certainly, these were constrained in part by the demands of the organisation(s). However, in every case it was the agency of the developer that determined the approach. S/he chose which tools and techniques to use, whether or not to seek knowledge of, or utilise, different approaches, whether or not to develop a personal approach, how to ascertain the applicability of the approach etc. Indeed, the agency (perceived or actual) of the web-developer was the key to the approach being used by each developer. Linked into this implicitly, was that each developer had both a creative and arguably, a 'maverick' streak. They were all confident and innovative enough to step outside accepted, documented approaches and decide exactly what and how their personal approach would work. None chose to follow an accepted approach, preferring instead, to create their own, and having the confidence – and knowledge and skills – so to do.

This is in marked contrast to IS development; even the IS work undertaken by the participants. They all commented that they followed accepted, documented approaches to IS – perhaps implying a lack of agency. Yet, they chose not to in WISD. It is postulated here that this fact is highly significant. Certainly, in a context of work in IS the choice of agency as a central category might be questioned. However, arguably, since this research explores WIS development it is within this context that the choice of central category is identified. It is asserted that within this context the notion of agency is highly significant. All the developers commented in many different ways about their experienced need for control within their web

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development. This then necessarily involved them utilising tools and techniques they deemed appropriate to the job in hand, rather than them simply following the accepted rules and procedures of a specific approach/methodology.

Indeed, it might have been both interesting and illuminating to ask the developers if one of their reasons for moving out of ISD and into WISD was the greater facility for personal agency afforded by WISD in contrast to the more structured approach of ISD. Sadly, this possibility only occurred to the researcher when writing up the data, so it is a question that must remain unanswered. It is nonetheless, a noted limitation to the current study.

6.12 Axial Coding

Following this identification exploration of the interrelationship of categories began and the story that connects the categories was gradually built through *axial coding*. The analytic work required during axial coding involved examining each category to discover links, relationships, new patterns and also, any data that did not 'fit'. This also involves linking the work to existing theory in a process of theoretical integration or 'analytic generalization' (Yin, 1989); so named in order to distinguish it from statistical generalization. In keeping with Orlikowski's (1993) work this theoretical integration or analytic generalization was further extended by combining the inductive concepts generated with insights from existing theory.

6.13 Integration of inductive Data and Structuration Theory

As stated earlier in this thesis the theoretical framework for this study is Structuration Theory; chosen as it facilitates exploration and synthesis of both the human agency aspects of WISD together with the structural features – where structure includes both the organisation and the approach to WISD (This understanding of structure was argued in Chapter 4). It is relevant here to integrate Structuration Theory into the inductive data collected in the interviews.

6.13.1 Agency

Agency was identified as the Central Category in analysis of the interview data. Broadly then, this links into Giddens' notion of agency as described in Structuration Theory and discussed in this thesis in Chapter 4. For Giddens, agency is the ability to effect change in some way; the "capacity to make a difference" (Giddens 1984, p14). This understanding of agency is in contrast to the perhaps more widely held western, phenomenological understanding of agency which is concerned with personal subjective experience and essentialist notions of a unique, boundaried existentialist notion of self (Stevens, 1996, Burkitt, 2008). That is, the notion that we are all unique with our own personal experiences and personality and thoughts.

Giddens' designation of agency is clearly seen in both the participants' responses in the online survey and also in the participants' responses in the interviews. They all commented upon their ability to effect change; that they had the power so to do, through the web-system since they chose which approach/methodology to use and through the "exploitation of resources" (Giddens, 1984, p14) they exerted power and control over the situation. The WIS may have been developed using a recognised approach/methodology or more usually, a system the developers themselves had designed and implemented both to meet client need but also, to utilise their expertise and experience.

Considering first the responses given by developers in the Internet survey, a major factor listed for the choice of approach/methodology adopted was that they 'wanted the approach'. Arguably this suggests the importance of individual web developers' personal motivations and agency rather than an 'organisational' response. This is supported in the next most frequently reported important factors being that it suited the web designers' 'way of doing things' and that they could 'personally see advantages to the approach' (see table 5.1).

Reflecting upon the application of Structuration theory to these responses it can be argued that web designers view their agency – "capacity to make a difference" (Giddens, 1984 p14) as fundamental to their work; that is, they stated that they actively seek out approaches/methodologies they wanted to use rather than adhering

to approaches/methodologies chosen for them by others. Yet, that is not to assert that the web designers ignore completely the wishes of others and specifically, management. Indeed, a further reason given by the web developers for choice of approach/methodology was that it was supported by top management. This may be viewed as pragmatism on the part of the developers in that they recognised that though they may 'feel' they have choice, in practice, if top management (who have power & control over their wages and employment) do not agree with their decisions they are not likely to prosper! Certainly, the practical amount of power and control exerted by web developers may be more limited than their ego and personal perception may suggest. Yet, the perception of control is relevant and indeed, this factor of possible difference between perceived agency and capacity to make a difference and agency in practice was not addressed or explored by Giddens because for Giddens agency only exists in practice – that is when capabilities are realised.

It is interesting and relevant to compare responses from the online survey with responses given by participants in the interviews. All interview participants were working either independently or for small units within larger organisations, but all, nevertheless, arguably, had a degree of autonomy from the outset. Certainly, all the participants interviewed indicated that they decided upon which approach/methodology to implement. For example as Participant 1 commented *"I use the design Approach I have in mind…then test it, get feedback on it & then do the next bit" (P1.Pg5,L100).* It could be argued that the client in this situation would still be able to dictate the choice of approach/methodology since if s/he did not approve or agree then the web developer would perhaps be compelled to amend or alter his chosen path. Nonetheless, since the WIS developer is the person with the knowledge and skills employed to implement the WIS, it can be asserted that his/her decision would – or should – be taken account of. In this way then, s/he would have agency.

Continuing analysis within Structuration Theory, as noted in Chapter 4 Giddens defined resources as "structured properties of social systems, drawn on and reproduced by knowledgeable agents in the course of interaction" (Giddens 1984, p15). For this thesis that is the structure of organisations and society, including social systems within organisations and society that are interacted with and used by the web developers.

Giddens (1984) further identified two types of resources: "authoritative resources" which derive from the coordination of the activity of human agents and "allocative resources" which result from control of material products or elements of the natural world. Thus, in a context of the participants' responses, interaction between the web-developers who have agency, and others in the social world produces the forms of knowledge and social structures (WIS contextualised within IS more generally) we take for granted. However, as was evident in the participants' responses, they also control the materials and products necessary to sustain the WIS.

Participants in both the Internet survey and the interviews indicated that they believe that they determine the approach/methodology adopted (authoritative resources) and utilise relevant tools and techniques of which they have knowledge (allocative resources). Arguably, they utilise other tools and techniques of which they are unaware. However, this research did not explore this.

6.13.2 Structure

It was argued in Chapter 4 that for this study structure is conceptualised as both the social system within which the individual WIS developer is working and that which structures that social system . That includes whatever is applicable to the individual web-developer. It ranges from an organisation or part of an organisation, to the industry at large for these working for themselves outside a designated organisational structure. Structure was also argued to be the academic hierarchy of published methodologies as this provides a context against which the web-developer is working. Both provide, separately, the "rules and resources recursively implicated in social reproduction" (Giddens 1984, p377) of the activity of the social system – ie Information Systems and the organisations.

The individual organisation or industry at large both provide context to the activity of the web systems development since without either there would be no purpose to the web system; that is there would be no purpose to operation in a vacuum. Similarly, the academic hierarchy of published methodologies provides a context against which

the web system might be identified and developed. The relationships and interactions between actors from all these arenas are then organized into regular social practices and accepted social interactions such that all know their social scripts and understand their roles in the structure.

The Double Hermeneutic referred to by Giddens, (1984) is seen as the interweaving of the concepts of the published WIS methodologies discussed and presented in the academic press, together with the everyday practice of WIS development within the organisation, as scientific, academic ideas are expressed in common parlance and become part of the practical world of organisational process and procedure. The WIS developers are aware and take account of, the published methodologies, but then – according to the interviews – discard them as inappropriate to their practice. Nonetheless, elements of the discourse and knowledge surrounding the published work, necessarily permeates down into everyday interaction. This can be seen reflected in the interview responses of the participants.

For example, five participants (Participant 1, Participant 2, Participant 3, Participant 4, and Participant 6) had been educated to undergraduate level, with Participant 5 completing a degree at the time of the interview. Although the participants' academic and undergraduate backgrounds were all different, all bar Participant 5 made reference to tools and techniques they had been either taught, or been introduced to, through training. Participant 5 asserted that he had taught himself the tools and techniques finding new ones as appropriate to complete a task/job. He showed little knowledge of web terminology but it was clear that he understood the applications of the approaches/methodologies, tools and techniques.

Of the graduate participants Participant 1 graduated twenty years ago in 'Computing'. His personal choice of WIS development utilised elements of tools and techniques he had been taught, but also then, elements of his learning of new tools and techniques since that time, together with his practice experience. All were then synthesised into his own approach – which was not formally documented, but which resided "in [his] head".

Participant 2 graduated in IS nine years ago. He was familiar with IS terminology and his personal approach used elements of published work. He used IS terminology to describe his personal approach. Part of his undergraduate course had been in WIS and he recognised and incorporated elements of this in his personal approach. Once again, however, this approach was not a documented approach available in the academic or practice literature. Rather, his approach was his own, for his own practice but "*not for others"*

Participant 3 gradated in IS ten years ago. She acknowledged this fact, but stated that her motivation for acknowledging published, recognised work was to give her own work credibility and respect. Nonetheless, she adapted this recognised system as appropriate to the task.

Participant 4 graduated in IS ten years ago. He was familiar with IS terminology and web approaches, but like the other participants he used his own approach. He acknowledged that this was influenced by his academic background and knowledge, but noted that it was the demands of his practice that motivated development of the approach rather than academic or documented work.

Participant 5 was still completing his undergraduate studies but having discovered and apparently, demonstrated, skills in WIS development he had been employed by several different small organisations to design WIS. Again, like the other participants Participant 5 used his own approach. He did not appear to recognise or know the names of accepted tools or techniques. However, when these were explained to him he appeared to acknowledge them within his work, despite the fact that he did not identify them as published, accepted systems/tools/techniques.

Participant 6 graduated in IS six years ago. He was running his own business. He was familiar with different methodologies, but like the other participants preferred to create his own approach to suit the demands of the task.

Thus, it can be argued from the responses of these developers that academic theory is set against the fluidity of the practical applications of web-based system design methodologies by designers such that its concepts become part of that world.

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Additionally, gradually, the very nature of the organisational expectations and understandings of web-based system design – for that organisation and for the individual– will develop and change as developers use and discuss their approach.

As stated, for Giddens social theory has a fundamental impact and influence on the conceptual categories people use to understand their world and this in turn has an impact on the resulting social process and social action. As a consequence, this 'double hermeneutic of the social sciences' means that social theory is always studying a complex, changing social world and influencing its development through a dynamic dialogue between 'experts' and lay discourse. Thus, to apply this notion to the current study our understandings of WISD methodologies are constantly impacted by the dynamic dialogue between practitioners ('experts' who have agency), organisations (who engage in lay discourse within their structure) and lay understandings in society at large.

6.13.3 Duality

For Giddens the double-sidedness of structure and agency is best viewed as a 'duality' of two reciprocally and dynamically mutually dependent concepts which continuously impact each other. That is both are continuously active and acting, each upon the other. Neither is able to exist and function alone without the other. There is a focus on language and a rejection of the split between private, subjective experience and objective culture separated from this experience. For Giddens, agency is not perceived as a private, phenomenological experience that is self-contained and isolated. Rather, as Giddens stated, "personal experience is known to the self as a 'self' only via the pubic categories of language" (Giddens 1996, p205). That is, we cannot know either ourselves or the society in which we live other than through our language – which we have created and which is socially situated. The focus on language then leads to the notion that the person and society cannot be separated, but must be understood as inextricably linked with the individual's actions tying together subjective experience with larger social processes. We only know and understand ourselves through our actions and experiences in the social world and we can only understand these experiences through our interactions with the social world and with

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others. Structuration is then the process wherein the duality of structure and agency evolves and is reproduced over time and space in a simultaneously constraining and enabling process.

6.14 A return to the Data

The final stage of Grounded Theory analysis is to return to the data to ensure that any theory is founded therein, though as May (1986 p148) noted "In strict terms, the findings are the theory itself ie a set of concepts & propositions which link them". Nonetheless, it has been argued throughout this thesis that honest analysis of data will necessarily involve integration of existing theory; particularly given the fact that the researcher is employed as an Academic and this thesis is to be presented for a higher degree. Accordingly, the thematic analysis has been contextualised within a framework of Structuration Theory (Giddens, 1984).

6.15 Key Organising principle of proposed framework for web development

As stated above, agency was identified as the Central Category in analysis of the interview data. Acknowledging the reciprocal nature of agency and structure within Structuration theory the concept was linked into Giddens' notion of agency as described in Structuration Theory as the ability to effect change in some way; the "capacity to make a difference" (Giddens 1984, p14). Giddens' understanding of agency was illustrated clearly in both the online survey and also in the interviews. Moreover, it was the notion of agency as seen in the developers' need for autonomy and control that became very clear in both the survey and the interviews. Accordingly, the fundamental concept and key organising principle of the proposed framework for web development had necessarily to accommodate and make central, this notion.

As noted above, the practical amount of power and control exerted by web developers may be more limited than their ego and personal perception may suggest. Yet, the perception of control was arguably, of paramount importance and indeed, such a

concept, together with the flexibility it afforded, was fundamental to web developers' work.

Thus, a central organising concept for any proposed methodology development had necessarily to be agency. In accordance with Giddens' notion of agency this was not determined to be a western, phenomenological view of agency which assumes an essentialist, notion of 'self as centre' (Smail, 2005) such that self and agency is the starting point from which we make sense of the world and which emphasises stability of personhood (Burr 1995) . Rather, within Structuration Theory Giddens' exposition of self as agent is set within a social context; that is, he argues that individuals have agency, but that agency is bounded within societal process and structure. In this way, he is concurring with the view of self as agent within a social system such that though we may feel and believe we have complete autonomy and choice, in actuality we are reciprocally constructed by, and constructing, the social world. Thus, agency is reciprocally bound up with structure in all that we do.

This is the view of agency identified for this thesis. Certainly, individual WIS developers presented a convincing view of their own importance, control, power and dominance in their web system design work. Nonetheless, arguably, such work was inextricably bound up with the demands of the structure (ie the demands of the organisation, the wider IS community and society). Yet, given the emphasis placed upon the need for agency (possibly perceived rather than actual) made by the WIS developers this concept was determined as central to the resultant development of *Webframe*.

6.16 Summary

This chapter has detailed the development and use of interviews in this research. A clear rationale for the questions has been provided with information about the research sample. The findings have been analysed using Grounded Theory methodology coding and contextualised within a theoretical framework of Structuration Theory. Agency has been identified as the central organising category within the interview data as it was noted that all WIS developers commented on the

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need for control over their work and the power of their skills to facilitate this. Accordingly, it was determined that the proposed framework for WIS development should necessarily focus on this as a central requirement if the framework is to be effective and useful to practice. Additionally, data from both the Internet survey and the interviews suggested that web developers valued principles of flexibility and eclectivity in their practice. That is, they actively chose the tools and techniques they used which originated in an array of different approaches. They then structured these tools and techniques into a 'bespoke approach' according to the requirements of the work they were undertaking, or the demands of the client, which ideally, were one and the same thing.

The final part of this Chapter discusses the notion of the central category identified using Grounded Theory coding; agency. This concept is contextualised within a discussion of agency within Structuration Theory rather than agency assumed more generally in a western phenomenological view. Within Structuration Theory Giddens' exposition of self as agent is set within a social context such that individuals have agency, but that agency is bounded within societal process and structure.

The background to the development of *Webframe* together with the rationale for its principles, are detailed in the next Chapter.

Chapter Seven
Proposal for Web Information Systems Development

7.1 Introduction

The previous two Chapters presented details of the empirical work undertaken for this study. An Internet survey provided initial responses to a range of questions about developers' knowledge, skills and practice. The information gained from this survey, together with material from published research was then used to develop an interview schedule, from which six in-depth interviews were carried out with a range of web developers all working either for themselves, or for a SME. The Grounded Theory methodology was utilised with data analysis following the procedures outlined for this approach.

From the initial twelve units of meaning identified in the data three categories were determined. These were as follows:
Personal Approach
Background Learning
Agency
From these categories the central category was identified as agency. A rationale for this decision was detailed. This central category links with Giddens' (1984) notion of agency within Structuration Theory and a discussion of this was presented.

From the analysis of data a proposed framework for developing WIS was devised. Details of this are given in this Chapter. The Chapter presents the proposed framework for WIS Development commencing with a reflection on current practice and then proceeding to detail the concepts and ideas behind the proposed framework. Based in a context of the analysis from Chapters 4, 5 and 6 a clear rationale for its content is provided. Details are also given of the method of validation of the framework.

7.2 Reflection on current practice

The current state of WISD is complex. As noted in Chapter 3 evidence from the literature shows that web developers use a wide range of approaches/methodologies, tools and techniques in developing WISD with apparently only a few using a specific structured format, most preferring instead, their own experience, skills and expertise together with an amalgamation of tools and techniques (Curtis *et al.,* 1988; Barry & Lang, 2001, 2005; Jeary *et al.*, 2009; Lang 2009).

Lang (2009) even went so far as to suggest that developers' work might be "….characterised as "situated action" typified by improvisation, opportunistic "bricolage" and even apparently "amethodological behaviour" " (p 45). That is, they respond to the context and task demands using their skills and knowledge, rather than a specific, documented methodology. As such, this might appear contrary to process and procedures of any given methodology and hence "amethodological", whereas in practice, the behaviour is appropriate to the situation and thus, almost paradoxically, there is a 'methodology of sorts' being implemented.

In their study of 23 small web development projects, Jeary *et al.,* (2009) found only one case where the developer continued to use an academic WISD methodology throughout the lifecycle. They suggested a fundamental reason for this was that for many, the perceived benefits may be outweighed by the difficulty or effort required to learn the method. Difficulty in understanding a method and/or its techniques was repeatedly cited as the reason for its abandonment. Specifically, they found a number of key areas where existing methods may be failing their intended users. These related to terminology, completeness, and guidance. Jeary *et al.*, (2009) concluded that despite developers recognising the potential of variety of methods, method choice can be bewildering, particularly since many methods are perceived as incomplete in some way.

Findings from the current study support both Barry and Lang's (2001, 2005) work and also Curtis *et al's* (1988) assertion with results from both the web-survey and the interviews suggesting that few web-developers are adopting the specialised WISD methodology that are published in academic journals or taught in Universities or other

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training environments. However, they did not concur with Jeary *et al's.,* (2009) suggestion that developers perceived the effort required to learn the method as a barrier to methodology adoption. Rather, results from the survey discussed in Chapter 5 suggest that web developers might actually be unaware of specialist WISD methodologies. Accordingly, the level of perceived effort involved in adopting a methodology does not present as plausible evidence for barriers to adoption as the developers appeared not to be aware of the methodologies at all. Or, perhaps their lack of knowledge might indicate a choice not to explore specialist methodologies. In which case the perceived effort required, reported by Jeary *et al.,* (2009) might be cited as a possible reason why.

The findings from both the Internet survey and the interviews support the assertion by Lang (2009) that WISD might be seen as being typified by improvisation which might then appear to be "amethodological" (p 45).The interviews detailed in Chapter 6 indicated that not one developer interviewed reported that they followed web specific methodologies, yet all were successfully developing WIS. Although clearly the sample for these interviews was small and no generalisation can be made from the findings, nonetheless, they are again in concordance with the literature in which Lang and Fitzgerald, (2005) note that 22% of their sample were following traditional software approaches, 23% of web developers following their own proprietary approach or a hybrid approach and 8% admitted to following no development methodology, or an ad-hoc approach. Only 5% of Lang and Fitzgerald's sample stated that they were adopting specialised WISD methodologies.

Supporting this assertion, the results from the current study further suggest that web developers are successfully developing WIS by implementing a range of tools and techniques based upon their own personal choice, skills experience and knowledge. They are following a lifecycle that they deem apposite and documenting it as they see appropriate. In some instances they claim to be applying traditional IS methodologies to the domain of WIS. However, in all cases they appear to be making the decisions pertaining to the approach/methodology adopted.

This latter point links well into Structuration Theory and specifically, Giddens' (1984) notion of agency. That is, as one of the completers of the Internet survey

commented, "*We were all ex-MSFT [Microsoft]guys who hated all the process at MSFT. … So we just made it up as we went along.*" Although clearly, none would state their position in terms of Structuration Theory, nonetheless, agency as reported by Giddens (1984) seems relevant here. All WIS methodologists were designing systems based on their own knowledge and skills and their "transformative capacities" (Giddens, 1984, p14) were clearly important to them.

In addition to supplying further support for Lang and Fitzgerald's (2005) work and Lang's (2009) recent paper, this current study has also investigated possible reasons why most preferred their own experience, skills and expertise together with an amalgamation of tools and techniques, to the use of recognised approaches/methodologies. This then goes further than Jeary *et al's*., (2009) study which explored the reasons developers were not using recognised methodologies but did not investigate possible reasons for their preference for a personal approach. Additionally, the current study frames the work within Structuration Theory (Giddens, 1984) since it has been argued throughout the thesis that the reciprocal, dynamic relationship between structure and agency is fundamental to understanding web development. This assertion finds resonance with Lang's (2009) paper which states that "..design methods must always be uniquely interpreted within the distinct context of the situation and consider the people involved" (p45), though as discussed below, Lang's emphasis seems to be towards the situational or socio-technical features of WISD.

It is relevant at this point to introduce the framework for developing WISD methodologies proposed in this thesis. It is identified and named here as *Webframe*. The name *Webframe* is founded in the context of the work – *WEB*- IS methodologies, together with the idea that this work does not seek to develop yet another methodology, but rather, aims to suggest a *FRAME*work for WIS methodologists to work within. Interestingly, Lang's (2009) paper also argues for the idea of a framework for web development, rather than a prescriptive set of procedures or definite model. Given the recency of Lang's paper, the eminence of the author and the potential similarities of the work to this study it is important to consider Lang's framework in this chapter. First, however, it is relevant to present details of *Webframe*.

7.3 Introduction to *Webframe*

As stated above, a Grounded Theory methodology involving an Internet survey together with semi-structured interviews has been used to facilitate the development of a framework for WISD. Based in a theoretical context of Structuration Theory (Giddens, 1984) *Webframe* is based on a set of key principles which acknowledge the reciprocal nature of the personhood of the web developer with the socio-technical environment. This is in concordance with work spanning over three decades (eg. Buckingham *et al.,* 1987, Avison & Fitzgerald, 2003, 2006) which note the importance of marrying the social, environmental and technological elements of WISD together.

The principles of web development within *Webframe* are not argued to be prescriptive or form a set of procedures or a model for web development methodology. Indeed, it has been argued that such specificity and prescription is actually perceived as detrimental and obstructive by many web developers in practice (eg Barry & Lang, 2001., 2005, Ramratten et al, 2010)). Rather, the principles are aimed to guide and support web developers as they make decisions concerning the optimum route, tools and techniques to use. Having asserted the importance of Structuration Theory to the general principles of WISD, *Webframe* forms a set of guiding principles that recognises the agency of the web developer, the structure of the WISD methodology and in line with Structuration Theory, acknowledges the duality of these two elements together with the reciprocal nature of both.

It is evident from the published research that is reviewed in Chapter 3 together with the findings of the Internet survey and the interviews, that WISD methodologies are actuated by knowledgeable web developers. Further, as evidenced in both the Internet survey and the interviews, WISD methodologists seem to be aware of the approach they are taking. Whilst they are not necessarily able to give a recognised 'name' to this approach, nonetheless, they acknowledge that oft-times this incorporates elements of published tools and techniques and involves their prior learning and training. For example, as Participant 2 said in the interviews, *"I use Macromedia Dream Weaver or which is now Adobe Dream Weaver." (P2.Pg8, L139-40)* and P4 noted that he used *"PHP and Apache based systems as required" (P4.Pg1,L16).*

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Though, as he further commented, *"I don't think its, err... too important what, what, what platform, whether it is...asp or Dot Net and SQL when you are structuring your database if the data base is structured properly"(P2.Pg9 L143-4)* and as Participant 5 stated honestly [when you build databases do you draw entity relationship models?] *" Yes ... probably... if I knew what they were [laugh"]* (P5.Pg6, L136-9).

All these facets are completely in line with the principles of Structuration Theory, asserting as it does, the importance not only of structure and agency as elements of everyday life, but also, of the synthesis of the two as fundamental to existence. That is, WISD methodologists are utilising both their own agency and incorporating the structure of the web-system design world, their organisation and the published work in IS with some work in web methodologies, to develop their approach.

Further, it is asserted that development in WIS is not random, but rather is relatively ordered – either through accepted stable documentation of process, or within individual web-developers' practice across time and space. That is, whether or not web developers document their processes and procedures, nonetheless, these practices and procedures are not random acts. Rather they are clearly designated and considered. Sometimes they may include stable documentation and sometimes they may reside in the web developer's head or portfolio of skills which s/he utilises in different contexts and situations across time and space. Evidence for this was provided in the interviews discussed in Chapter 6. In producing WIS it is clear that web developers draw upon 'structural properties' (rules and resources) which are themselves institutionalised features of structured approaches to developing systems. Whilst they may not use them wholesale, nonetheless, it became clear through the interviews that web developers were adopting and adapting parts of recognised systems to suit the project they were involved in.

Webframe attempts to accommodate this duality of agency and structure by featuring the agency of the developer as central to the framework. Arguably, this focus gives greater prominence to the notion than that offered by other published methodologies and frame works for developing WIS. It is in direct response to the findings from the Internet survey and the interviews and aims to apply these findings to WISD. It also links with the point made by Rose (2001) regarding the applied nature of the IS

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domain. Rose (2001) stated "In an applied field, it should be taken as axiomatic that useful theory should lead to improvements in the capacity for effective action" (p217). Accordingly, *Webframe* was constructed through a Grounded Theory analysis of web developers' views of their practice contextualized in a theoretical framework of Structuration Theory.

Interestingly, as stated earlier, Lang's (2009) study with web developers in Ireland also emphasizes the need for an acknowledgement of the reciprocity of developers' personal characteristics and the socio-technical environment. Additionally, as discussed in Chapter 3, he too, suggests a need for a framework for WISD based on elements he calls "external contextual factors" (p 45). To recap, Lang lists these as "mandate by the client, organizational imperatives, the locus of power, control and reward mechanisms, organizational culture, and covert political roles of formalized development methods" (p 46). Although Lang states the need to consider the relationship between personal features of the web developer and the socio-technical environment it might be argued that his emphasis veers more towards socio-technical factors. This contrasts with the principles of *Webframe* (presented later in this chapter) which are contextualized firmly within the dual notions of structure and agency exemplified in Structuration Theory (Giddens, 1984) but which emphasizes the agency of the web developers.

The concept of agency within Structuration Theory as applied to this research has been discussed in Chapters 4, 5 and 6. It is further argued here that agency is fundamental to web designers' practice, yet currently, it is not being recognised fully within published web specialist methodologies. Rather, a prescriptive approach to WIS development is proffered by most WIS methodologies such that the creativity and ingenuity of developers is left seeking voice and thus, perhaps, web developers leave published methodologies alone. That is not to assert that the prescriptive nature of methodologies is the sole reason developers are not using them. However, the lack of consideration of developers' agency **is** argued to be of importance here. This will be further discussed below.

7.3.1 Agency within *Webframe*

It is important to note at the outset that the agency of the web-developers is not a homogenous entity. Rather, it is argued that the agency of the web developers encompasses different features and facets of and for, developers. Adopting Giddens' (1984) view of agency wherein the concept is taken to be concerned with the actions and control (perceived or actual) of the web developers, together with their 'Transformative Capacity' - the ability to effect change in some way, or their "capacity to make a difference" (Giddens 1984 p 14). In a reciprocal relationship with structure of the web development arena, agency is seen as central to decisions about the WIS that is developed or used. Clearly, such decisions will be impacted by the motivations behind the WIS for the developer, which again, will be influenced by the structure of web development and the wider social world.

Thus, for example, for Participant 2 the motivating factor was financial reward, whereas for Participant 3 the motivating factor was to appear skilled and knowledgeable to her employers such that she almost engendered an air of mystique that no-one else was able to emulate. This agency might then be considered synonymous with power within the relationship between the individual web-systems developer and the 'organisation' as the developer is able to draw upon "structured properties of social systems" as they are "…reproduced by knowledgeable agents [the developers] in the course of interaction" (Giddens 1984 p 15). That is, it is argued that the individual web developers have agency and the ability to effect change, as they produce the forms of knowledge and social structures necessary for the 'profit' and effectiveness of their part of the organisation (that which is directly impacted by the web system). They determine which approach/methodology to adopt, which tools and techniques to use, how to combine these and how best to implement the system. Certainly, these choices may be impacted upon by organisational and external factors. Yet, given the nature of the web system role such impact may be diminished. Though integral to the success of the organisation conceivably, this work might perhaps also paradoxically 'stand alone'.

Nonetheless, it is argued here that simply attempting to focus the notion of developers' agency into a specific unitary model would be misguided and limit its

relevance. Certainly, the lack of singularity makes the notion problematic to encapsulate. However, clearly as agency is pivotal then failure to address it and further, to capture its essence within the proposed framework for developing WIS would arguably, dilute its structure detrimentally. It is further argued here that the limited attention paid to the notion of agency has had a detrimental effect on the design of WISD methodologies with the end result that web developers working alone or within SMEs seem to feel that published methodologies are neither of use, nor worthy of account. As Participant 1 noted, he had *"Nothing[experience] in web development" (P1.Pg12L251)*. Also, as Participant 2 commented, *"There is a conflict in being taught a methodology and then going out into the real world not using any methodology and not seeing anyone who does use a methodology and thinking, well not what is the point of it because I know the point of it, but although I refer to it as different process its a layer of processes that you follow; they just don't seem to follow them" (P2.Pg13, L225-9).*

Even Participant 3 who was possibly the least entrepreneurial or 'maverick' of all the designers interviewed, commented that she *" basically went on the internet and I started off reviewing other sites and try to bring the best out of each. I also did a lot of research on our competitors"(P3.Pg8, L177-8).*

Participant 4 stated that his approach came not from published methodologies or training but from *"...the web, from my studies, from competitors…… from what clients have come across from the computing press……" (P4.Pg6, L143-4*) and P5 commented *"From time to time when things are quiet I look around the web but…… … I have heard of these Agile approaches but it all seems like heavy going or common sense" (P5.Pg3, L89-94*). Similarly, Participant 6 commented that he didn't *"… tend to erm follow any kind of methodology. I just go in erm with the guns blazing approach and take on a brief understanding of what the client wants...... with no documentation and produces something that I believe the client is what the client is after instead of producing any kind of documentation"(P6.Pg L45-8).*

Finally, Participant 5 commented *"I am either too busy knocking out a system or I am too bored to investigate…"*Perhaps this is a euphemism for 'lazy' and certainly, this was the youngest web developer to be interviewed, with the least experience.

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Nevertheless, he continued confidently " *besides ..... I find that I find what I need when I need it. Like the data base side I went ages before I needed to understand that and I am sure I only know a bit, but I know what I need to know… if that makes sense.*"(P5.Pg3, L15-20).

Thus, it is argued here that any successful WIS must necessarily take account of the methodologists' perceived 'transformative capacity' – in all its facets, and that currently, this factor is largely overlooked in published methodologies. Possibly the only published WIS methodology asserted to account for designers' specific needs and individual skills, experiences and motivations, is WISDM. Details of this methodology were given in Chapter 3. Whilst it is not appropriate to repeat this material, it is relevant to note here the asserted differences between WISDM and *Webframe*. Primarily, for this research this is centred around the notion of agency.

7.3.1.1 Agency within WISDM

As noted in Chapter 3 WISDM is a web based extension to the methodology known as Multiview which was developed by Richard Vidgen in 1985 as a response to conventional development methods which he saw as being embedded in engineering discipline and technical rationality and failing to incorporate the social aspect of IS development. It can be argued that Multiview can be used in specific situations by individuals to create a WISDM instance of a Multiview approach within a specific focus and context. As such, Multiview can be seen to offer a high degree of agency in developing the web development approach centered on the WISDM. However, it does recommend an indicative approach in terms of Unified Modelling Language (UML) and the use of *WebQual* as part of its development matrix and as such can be seen to be more prescriptive than the *Webframe* principles suggest is appropriate as detailed within this thesis.

The WISDM approach may start with an organizational analysis of the strategic direction of proprietary or initiating host organization with its aim being to understand how value will be created. This forms part of the IS development matrix examining methods in terms of organizations, people (socio) and objects (technical) and also in terms of analysis and design. Another element of the matrix is the

information analysis representing the requirements specification forming details of the information and process requirements of the host organization. UML is the indicative approach creating both the class model and use-case diagrams and the activity diagrams of the problem being investigated. Another aspect of the WISDM matrix is work design representing user satisfaction - the approach uses an instrument based on a *Likert*-type scale, called *WebQual* to assess e-commerce aspects. Within the matrix the software model is represented in the technical design element where a formalized model in terms of data structures and program design is constructed. The final element represented in the matrix is HCI – Human-Computer-Interface - falling between technical design and work design elements.

Importantly for this thesis, WISDM has been criticized (Cybulski and Sarkar 2005) for reasons given in Chapter 3 and whilst it can be seen that WISDM does indeed offer a higher degree of agency than many more prescriptive approaches to developing WIS this is still far more prescriptive itself than the *Webframe* approach suggested in this thesis as appropriate to web developers' work.

The other recent approach which might arguably be of relevance here is Agile. Again, this was reviewed in Chapter 3 and though it is not appropriate here to repeat the information detailed, it is nonetheless, relevant to present key features of Agile for discussion in a context of the proposed framework, *Webframe*.

7.3.2. Agile approaches

Agile methodologies (eg. XP (Beck, 1999), DSDM (Stapleton & Constable, 1997), SCRUM (Ramsin & Paige, 2008) encompass a number of software engineering methodologies all of which claim to bring improved efficiency, excellence and an improved project success rate in IS projects. On first sight these qualities might appear relevant and similar to the proposed *Webframe* particularly since the key features of Agile methodologies are collaborative working, using individuals and interactions over documentation (Beck *et al.*, 2001).

However, as reported in Chapter 3 the Agile approach is not immune from the problems associated with other WISD methodologies. As Chan and Thong (2007) note *"Agile methodologies …require developers to drastically change their work habits and acquire new skills"* (p1). This then might well be considered inappropriate to web developers who stated in the Internet survey and interviews, that one of the major reasons for their choice of approach was that it enabled them to use tools and techniques with which they were familiar. Additionally, as Jeary *et al.*, (2009) note in their survey, developers were resistant to learning new methodologies, preferring to base their work on skills they already had.

Webframe allows developers to utilise tools and techniques with which they are familiar. It does not require them to drastically change their work habits and acquire new skills. Rather, it gives credence to the agency of the developer to achieve their goals.

7.3.3 Structure within *Webframe*

Contextualised within Structuration Theory and of importance to *Webframe* is the notion of structure which has been argued to be the social systems and social structures within which the WIS developer is working. This includes the academic hierarchy of published methodologies together with a dialogical communication between parties which then further constructs the fabric of the WIS community – ie, the activity and action of WIS within the social system, of the organisation or of the WIS development world. The relationships between actors within the structure are thus organized as regular social practices; that is, web-developers construct the structure of the regular social practices of WIS within the organisation/context/wider IS community. In this way the community develops. This is not necessarily through the growth and development of published and subsequently utilised methodologies. Rather, as has been argued both by Lang and Fitzgerald (2005) and through this study, WIS developers are frequently developing their own approaches to suit the 'problem/task' they encounter.

Therefore, just as the agency of the web developers is not a homogenous entity, similarly, the structure of the WIS world is not fixed and unitary. Certainly, there are

identifiable features which might usefully be taken account of for *Webframe* including the social system within which the WIS developers work (which may or may not be a defined organisation, as many WIS developers work free-lance rather than for a specific company) and the academic hierarchy of published methodologies (with which the developer may or may not engage). The rationale for inclusion of both the organisation and the hierarchy of published methodologies as features of structure given earlier, is that both provide the "rules and resources recursively implicated in social reproduction" (Giddens, 1984 p377). That is, both constitute rules for action and both provide the associated resources necessary for such action within WISD. It was argued that the rules for each are different and similarly, the resources for each are different.

Yet, a consequence of such action and activity results in dialogical communication which then further constructs the fabric of the WIS community. The relationships between actors are thus organized as regular social practices; that is, web-developers construct the structure of the regular social practices of WIS development within the organisation/context/wider IS community.

Contextualising this further within Structuration Theory where, as stated in Chapter 3, structure is then conceptualised abstractly as two features of rules – "normative elements" and "codes of signification" (Giddens 1984 pp xxx1); that is the parts of rules that regulate action – the 'normative elements', together with the meaning ascribed to such – the 'codes of signification', structure then becomes a "'virtual order' of transformative relations" (Giddens, 1984 p17). This, Giddens stated, then results in "discernibly similar social practices ..exist[ing] across varying spans of time and space….orientating the conduct of knowledgeable human agents" (Giddens 1984 p17). For this research that is held to mean that the web-developers use "normative elements" (or accepted tools and techniques) of WIS which then are 'coded' within discourse relevant and meaningful to themselves (and possibly other web-developers). As they construct the "codes of signification" the resulting web-design "…orientates the conduct of knowledgeable human agents [the web-developer]". That is, the discourse, tools, techniques and resulting WIS practice guides ("orientates") subsequent discourse, tools, techniques and practice. The cycle is reciprocally constructive.

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Thus, in a context of *Webframe* the structure is important to the rules (tools and techniques used by designers) and discourse central to web design. However, just as agency for the web developers is not a single homogenous entity, it is argued here that simply focussing *Webframe* into a specific unitary model would again, be misguided and limit its use. Similarly, all the reasons given above for including the varied and flexible nature of agency are relevant also to structure.

7.3.~~3~~4 Agency and Structure in W*ebframe*: Summary

Certainly, the lack of singularity makes the notions of agency and structure problematic to encapsulate. However, it is also asserted that if both are such key concepts, dismissing them will result in the frameworks being poorly-used - which is indeed what appears to have been happening thus far. Support for the inclusion of both is found in Lang's (2009) paper in which he states that "there is a growing body of literature illustrating the point that web development is essentially a socially negotiated process" (p 45). That is, he argues that account must necessarily be taken of the both structure and agency of WISD if progress in the area is to take place.

It is argued in this thesis that the resolution of this fundamental problem is to produce a framework which will support and encourage the inclusion of both structure and agency of the web developer to be recognised and utilised within WIS development. Further, to enable and encourage these web developers to view their approach as an appropriate methodology which they might then 'own'. In this way they might recognise its uniqueness and structural properties whilst at the same time it may introduce them to the concept of methodologies *per se* if they are able to locate their own approach within published work. It might also simultaneously invite continual review and improvement of their personal chosen approach together with reciprocal engagement with and development of, WISD methodologies generally.

Thus, in summary, as demonstrated in the Internet survey and the interviews all the WIS developers had individual, specific motivations for their choice of approach/methodology. Additionally, none were apparently following a recognized approach, or even, necessarily, a specific set of tools techniques. As a consequence,

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simply writing a single approach/methodology for use by all would perhaps meet with limited success, if not abject failure and dismissal. Indeed, it is argued here that a framework consisting of a specific set of principles would be more appropriate and effective. Again, this concurs with the recent work tabled by Lang (2009).

As Rose (2001, p217) states succinctly concerning the applied nature of the Information Systems domain, "In an applied field, it should be taken as axiomatic that useful theory should lead to improvements in the capacity for effective action." That is, he is arguing that theory is useful in terms of its successful application and it could therefore, be argued that the basic domain of study in the field of WIS methodologies should consist of the actual WIS practices. In this way,, structure within the field of WIS development exists in and through the activities of web developers. The structural properties of WIS development are indeed real, although they have no physical existence but rather, depend upon what web developers regularly practice as they develop their WIS.

As such, it could be considered that a web developer who is not aware of WISD methodologies (and therefore, does not engage with them) will have no influence upon their development. As a consequence of this lack of engagement WIS methodologies will continue to have no influence on them. However, it might then be argued that by enabling the web developer to structure his/her existing approach in a framework that identifies it as a 'web information systems methodology', the developer might be encouraged to engage further with other methodologies. Then, possibly over time and space, such engagement might reciprocally influence the world of the web developer and that also, of WIS methodologies.

7.4 Rationale for design of *Webframe*

The research findings together with the academic literature and theoretical framework have been synthesised and refined to be represented by 5 key principles that it is argued that any framework for WISD methodology needs to incorporate in order to be acceptable to individual web developers. This framework does not encompass a complete specified methodology with accompanying full documentation and strict

guidelines. Rather, in a context of the evidence cited in this thesis that such methodologies are little used by experienced web-developers, *Webframe* offers **principles** of design but leaves the practical implementation to the developer. The aim is to support developers without restricting them to a specific route or implementation. This is in direct response to the findings from the interviews (detailed in Chapter 6) wherein the participants emphasised their requirements for a flexible framework that they could direct and within which they could use a variety of principles (tools and techniques) as they deemed appropriate. Accordingly, it is argued that providing such a framework will improve web development practice. It will offer the flexibility demanded by developers whilst also providing a set of identifiable designated principles for constructing an approach that might be utilised by many.

As noted throughout this thesis, however, it is important to reiterate that the framework is intended only to apply to web developers who are experienced in developing WIS successfully. Additionally, the framework principles are applicable to developers working in isolation or very small teams. It has not been explored with uninitiated developers or developers working in large teams or organisations. It is recognised that their needs may be entirely different.

As noted in Chapter 1 the aim of this study was stated as: **To identify web developers' current methodologies (both personal or published) to inform the development and validation of a framework for developing a web information systems development methodology.**

Thus, the necessity to produce a framework that is effective and useful in practice is of fundamental importance to this study. It has been argued throughout the thesis that Giddens' (1984) Structuration Theory provides an apposite theoretical framework offering as it does, a link between agency and structure; both of which have been argued to be central to web development.

The key principles of *Webframe* are given next.

7.4.1 Key principles of *Webframe*

The key principles are as follows:

- Flexibility
- Eclecticism
- Evolution
- Personal Incentive
- Ease of use.

These are all discussed below:

7.4.1.1 Flexibility

This principle recognises that each individual web developer has specific experience, skills and knowledge. It also acknowledges that both the individual project and the client's requirements both have the potential to be unique. This means that it is unlikely that any one particular approach will satisfy all web developers, all projects or all clients. This means that a web developer's chosen approach should be capable of being varied and flexible to accommodate the specific requirements of the individual project and client's needs.

Many methodologies promote one lifecycle as being more appropriate than all others. *Webframe* recognises that the developer should be able to follow the lifecycle they choose as being most appropriate to the individual client or project. For example a client that is articulate and knowledgeable may be able to very precisely pre-specify their requirements for their particular project and the developer may choose to follow a development lifecycle styled upon the traditional waterfall approach with structured stages that run concurrently. As a result this may deliver an appropriate solution within a specified budget and timeframe. In another situation the same developer may be faced with a client that is unable to describe their requirements in any meaningful detail and the developer may choose to follow a prototyping approach perhaps evolving the system in conjunction with the client until it meets their requirements. Again the same developer may have a client with a project which s/he perceives the most appropriate development lifecycle to be one of gradual staged roll-out following an incremental basis.

This flexibility of *Webframe* facilitates the appropriate lifecycle model to be determined by the web developer who is aware of the individuality of the project and the client's needs rather than being compelled to follow prescriptively the published web approach/methodology. As Orlikowski and Robey (1991) note "Tools, languages and methodologies constrain the design process" (p 160), though as Curtis *et al.*, (1988) caution, a methodology actually fails to constrain to any extent, the design process as it is almost never followed! In any event, *Webframe* aims to be flexible and facilitate the developer to use his/her own skills as appropriate rather than follow prescriptively, a specified approach/methodology.

The next key principle identified by this research is Eclecticism:

7.4.1.2 Eclecticism

This principle recognises that there are a wide range of tools and techniques with the domain of ISD and that this has been extended with the arrival of WIS. It further recognises that the choice of tool and techniques is best determined by the web developer, who is aware of his or her own skills and knowledge of web development tools and techniques but is also aware of their applicability and relevance to the project and client concerned.

It is also recognised that most participants stated that they found it important to build their approach/methodology on the 'known' rather than the unknown. That is they were actively building their approach on their acquired skills and knowledge or skills and knowledge they perceived they might develop. This is then central to consider for any new or proposed approach/methodology.

Webframe facilitates the recognition that web developers will have certain skills and techniques that they prefer to use, based upon their experience of developing web projects. In turn they may have a wide range of tools and techniques at their disposal but they will have ideas about which of those are most appropriate to an individual project's needs. This might be based on previous experience or learned skills or perhaps on a 'best estimate' as to what is relevant to the project. They should not then be deterred from using these tools and techniques and coerced into using a limited range that may be prescribed by a specific WIS methodology. For example, a particular specialist WIS methodology may require the use of personas or story

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boards yet an individual developer may feel that one or both of these is inappropriate to a particular project. Arguably, for the success of the project such a decision must rest in the hands of the individual developer not the methodology.

Webframe allows developers to be eclectic in their choice of tools and techniques. For example a particular web application may require the development of a complex database structure and thus Entity Relationship (ER) Modelling and Normalisation are seen as appropriate techniques. In contrast, the same developer working with another project may deem it unnecessary and possibly 'over kill' to use ER modelling and simply adopt a standard format for any database. Such decision-making needs to be determined by the developer rather than the methodology. Hence, eclecticism is vital.

The third key principle of *Webframe* identified within this research is evolution:

7.4.1.3 Evolution

This principle recognises the changing, evolving nature of the individual web developer; that they will likely grow and develop over time depending on their individual experiences and learning and it is entirely appropriate that their approach to WISD should also change and develop. Some developers may be 'early adopters' and may want to learn new tools and techniques as they are made aware of them. If these new tools or techniques are successful then a developer may wish to incorporate these in future projects such that a methodology that specifies the tools and techniques would at this point prove redundant. If the developer sees that the advantages of this evolution are substantiated across an increasingly wide range of web projects then they may become a permanent feature of his /her approach.

The Evolutionary approach to WISD has long been recognised within some WIS methodologies such as RAD and DSDM; both of which have seen them as core tenets of their approach. However, *Webframe* is different. Evolutionary approaches such as RAD and DSDM discuss evolution in terms of the system being developed. *Webframe* refers to the evolution of the **methodology** that is being used to develop the systems. That is, this core principle of *Webframe* recognises that the world of WIS development is fast changing and as such WISD approaches must change, or evolve.

Again the agency of the developer is fundamental as it is s/he that determines in what way or manner his or her WISD approach should change and evolve.

A fourth principle identified within *Webframe* is Personal Incentive

7.4.1.4 Personal Incentive

This principle is based upon acknowledging that many web developers are successfully meeting their clients' needs in developing relevant web based solutions. It acknowledges that the developer often possesses a wide range of skills and techniques involved in WISD, however it goes further and recognises that the individual web developer is aware of which approaches, tools and techniques are effective for them as a web developer. Therefore, rather than using a specific specialist WIS methodology they will create one to suit the task and client. Further, they have the incentive to do that in order to make the system necessarily effective and importantly, to satisfy their agency.

Data from the interviews revealed that individual web developers had a personal incentive or motive for their work which impacted upon their choice to follow a particular approach to developing WIS. The *Webframe* approach allows web developers to incorporate their personal incentive to the degree that they deem appropriate. For example one web developer expressed not only the need for his methodology to enable the client to be made aware of the progress of the project but specifically to be aware of the occurrence of a payment stage based upon a mutual awareness of the lifecycle of the project. Another web developer participating within this research identified the need for a strict limit on the documentation of the project based on the need to ensure the security of the system being developed. Many of the individuals involved with this research identified very individual and personal incentives for the manner in which they developed WIS. No one specific WIS methodology could accommodate such individual web developer's needs but *Webframe* facilitates recognition that these may exist and allows the web developer to incorporate them as they deem appropriate.

The fifth principle of web frame is Ease of Use

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7.4.1.5 Ease of Use

This key principle of *Webframe* is based upon the preceding four principles and recognises that an individual developer's main concern is developing the project at hand. Web projects have been identified as having very tight timescales and as such a developer is unlikely to adopt a new framework or approach unless they find it easy to understand and easy to implement or use, or unless there is a compelling reason to do so.

For example many proponents of methodologies extol the advantages of UML and the importance of incorporating this technique within their prescriptive methodology as for example WebML (Moreno *et al.,* 2007; Kateros *et al.*, 2008). Yet, very few of the developers responding to the Internet survey acknowledged UML either in terms of being aware of its existence or stating that they use it. As such any approach/methodology prescribing UML might be seen as complex and difficult by these developers unfamiliar with using UML. Linking back to Jeary *et al's.,* (2009) work this might then be considered a valid reason for not using it. Certainly, the perception of whether an individual WIS methodology is easy to use is likely to be linked to the individual web developer's skills. However, *Webframe* as a framework for developing WIS does not aim to offer a prescriptive model for implementation. Rather, it aims to set out a set of key principles within which WISD might flourish.

Taking account of the previous four principles, first, *Webframe* attempts to embrace the agency of the individual web developer and rather than attempt to force change upon the developer it aims to recognise the individual skills and knowledge of the developer, to acknowledge that each project is unique and only the developer will be aware of the degree of the individuality of a project; it aims to recognise that within a project each user or client is individual and that particular techniques or tools may need to be applied with a specific client or user. *Webframe* aims to recognise that a web developer will develop and change over time and that the chosen approach should also change and evolve. ~~In this way the structure and agency duality may be synthesised in the developing project~~. Lastly, *Webframe* aims to recognise that individual developers may have individual reasons or personal incentives for following a particular approach.

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These then are the five key principles of *Webframe*. Fundamentally, it is argued here that recognising the **agency** of an individual web developer in **flexibly** choosing the most appropriate lifecycle for each circumstance combined with their individual **eclectic** choice of tools and techniques to suit each individual project and client along side the ability to change or **evolve** the methodology over time and circumstance, will result in an **easy to use bespoke** methodology meeting the **needs of the individual developer** and thus result in better WIS being developed.

7.4.1.6 Summary of *Webframe* principles

The framework is intended not to be another methodology that is produced and not applied. Indeed it is not a WISD methodology at all. Rather, it is a set of guiding principles that might be applied by web developers in devising their own approach to developing WIS. It could be used by WISD methodology authors to devise a new methodology but that is not the purpose of this thesis. Structuration Theory recognises the duality of agency and structure, together with the synthesis of the two elements. However, most WISD methodologies could be said to represent the structure side of this duality with very few methodologies, with the possible exceptions of WISDM and Agile, acknowledging the agency of the web developer. Additionally, it has been argued in this thesis that even WISDM and Agile do not go as far as *Webframe* in recognising the nature and importance of the knowledge, skills and *agency* of the developer in developing WIS.

It is further argued that no other WISD approach goes as far as *Webframe* in recognising that each project and client is unique and that the web developer in consultation with the client is possibly in the best position to decide the appropriate approach, tools and techniques that should be applied to the project at hand. By utilising the principles of *Webframe* as a support and guide to the process the developer is facilitated to structure their approach to WISD. Importantly, s/he is also encouraged to review the individual project success and reflect upon the part played by his/her chosen approach – which might or might not include already published methodologies, tools and techniques; whether or not the developer is consciously aware of these. That is, the developer develops his/her approach – which might or might not incorporate elements of published methodologies – using *Webframe*

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principles, but all the time reflecting upon the unique requirements of the project and acting upon these appropriately.

7.5 Webframe presented as a diagram

In order to better understand the elements of *Webframe* and how they all work together in a process of web ISD *Webframe* is presented as a diagram below.
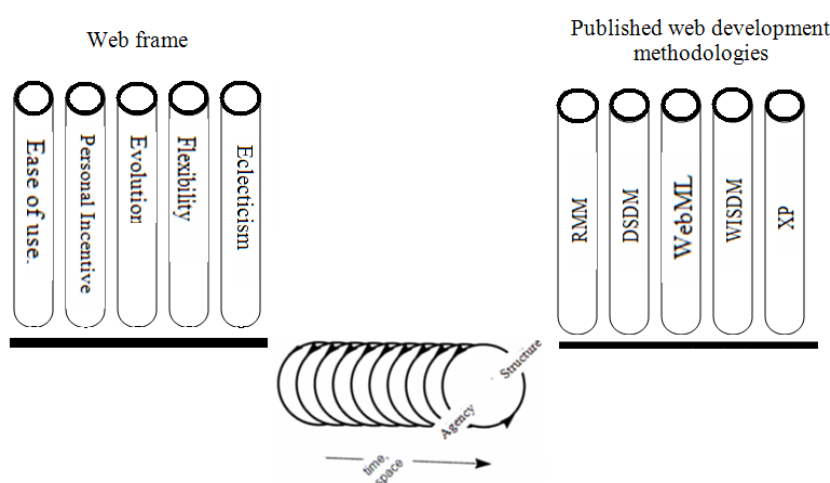

Fig 7.1 Diagrammatic representation of *Webframe*

Webframe is presented above as a bridge between published web methodologies and web developers' daily practice. The key principles identified through this research to constitute the framework are presented on the left hand side of the diagram. It is suggested by this thesis that as these principles are used by web developers to guide their WIS, the development of their WIS proceeds through a series of iterations in 'time and space' (Giddens, 1984). Based on the results of the survey and the findings from the interviews it is argued here that web developers tend to follow~~will use~~ the~~se~~ principles; not necessarily in a specific order or indeed, necessarily all of them every time. Further, the number of these iterations will be dependent upon the size and nature of the WIS being developed. Additionally, the order and number of times these iterations will be encountered will also depend upon the project being undertaken and the developer undertaking it. There is no single path or order through these iterations, not any restriction on the number of times they may be undertaken. It is recognised that such fluidity in process may be seen as problematic by some methodologists.

However, it has been argued throughout this thesis that rigidity and the necessity to adhere strictly to a formulaic approach has been encountered by many web developers as inappropriate. The consequence being that they choose not to utilise the methodology devised for them, preferring instead to construct their own to suit their purpose. Thus, *Webframe* sets out the principles deemed necessary for useful WISD, but does not dictate order or frequency of use. Rather, this is left to the agency of the developer. It is argued here that this flexibility is a major strength of *Webframe*. Using the principles of webframe as a guide, the web developer is enabled to develop and progress his/her own approach which is contextualised in a flexible, but recognisable framework .

On the opposite side of the diagram the current crop of published methodologies is presented. As part of the process of WISD and encompassing both the structure of the situation, organisation or society, together with the key element of the agency of the web developer, the web developer 'hits' published methodologies (having encountered them in their education/training or development in WIS). S/he subsequently proceeds to engage with these as appropriate to include relevant elements in her/his approach. In this way, web developers are growing and developing as individual agents whilst simultaneously (perhaps without cognitive awareness) engaging with published WISD methodologies. In this way it is argued that ultimately, WIS developers might finally influence - and be influenced by - published methodologies.

The idea behind the diagram is that if developers include the key principles in their web development practice they will be enabled to create a 'semi-structured' methodology suited to their needs and requirements. Lang (2009) talked of development being apparently "amethodological". It is argued here that far from the process being amethodological, WIS developers and WIS development are **in actuality** conforming to a methodology; it is just (as Rampatten et al 2010 note) that this methodology is not a methodology that is recognised as such. Consequently, if WIS developers can be encouraged to engage with *Webframe* as a methodology and further, to **see it** as a methodology, perhaps they might also begin to engage with academic and training material about WISD and WISD methodologies in practice. Then, subsequently, they might also begin to influence WISD in the future.

7.6 Reflection on *Webframe* as a diagram.

Exploratory work in IS almost seems to expect the findings to be presented in a visual format. Accordingly, *Webframe* is presented as a diagram above. Yet, it has been argued throughout this thesis that simple presentation of modular process and procedure has been unsuccessful in the field of WIS methodology development in the sense of encouraging developers to adopt the methodologies. Accordingly, the documentation of *Webframe* as an apparent 'model' for practice has problems and limitations it is important to document.

Firstly, it has been argued throughout this thesis that *Webframe* offers a set of guiding **principles** for developers. It does not offer a set of procedures or tools. It is in no way aimed to be prescriptive. Rather, a major aim of *Webframe* is to ensure flexibility and facilitate developers to develop their own systems. It also aims to celebrate the agency of the developers, rather than attempting to confine them to a strict regime of process and documentation. Consequently, presenting the framework as a visual representation seems contradictory. Nonetheless if the web developer is to be encouraged to recognise her/his own approach as a methodology based on and supported by these very elements then he/she might benefit from seeing *Webframe* presented visually, for in this way perhaps it will appear more user-friendly and practical.

Webframe is also presented visually above as representing the requirement for a bridge to be established between SMEs and the published web development methodologies. The recognition by web developers of the validity of their own approach (as they are actually building WIS) as a methodology will, as outlined in Structuration Theory (Giddens, 1984), allow their actions to become modified over time and space influenced by the structure and rules embedded within published methodologies. However, this reflexive monitoring of action can only begin if the web developers see the relevance of methodologies to their approach to developing

web systems. Recognising their approach in terms of it being a methodology is one possible route to beginning to establish this process.

7.7 *Webframe* in practice

As stated throughout this thesis *Webframe* is relevant to SMEs. It is not seen as appropriate for large scale businesses and organisations as these have different, often corporate identities and procedures clearly delineated. It is however, seen as pertinent to the work of individual WIS developers as they generally work more autonomously. Very often they work free-lance and perhaps rely on personal skills, knowledge and resources to a greater extent than WIS developers in large companies. This might then suggest to those observing from outside, that the individual developer is using "amethodological behaviour" (Lang, 2009 p245). Whereas, in reality the developer is applying a personal 'bespoke' solution and approach based on her/his knowledge, skills and resources. Possibly without her/his awareness s/he is actually following (and possibly creating) a methodology.

It is further suggested in this thesis that there are several key principles that developers work to when developing WIS. These have been formulated as *Webframe* – a guide to WIS - and it is suggested that if developers can be encouraged to see that they already work using these principles they may then begin to perceive WISD methodologies in a different way. Further, if this work can be disseminated in training ofand web developers' for a then potentially, in time, the developers may begin to engage with the methodologies and tofurther, actively contribute actively to future development in the area as they see itthe area as relevant and pertinent to themselves and their work.

7.7.1 Stages of *Webframe* in practice

In order to understand *Webframe* more clearly a potential scenario for its use is related below. Although this scenario is presented here it is important to note at the

outset that it is not being proposed as *the* model for its application, since throughout the study it has argued that a single specified methodology model of WIS development is inappropriate to all practice.

It is argued therefore, that the developer will use *Webframe* as a permitting, authorising or justifying framework to allow the casting of their approach to WIS development. The developer's subjectivity is recognised as an integral part of a holistic - rather than reductionist - approach which includes recognition that the developer is part of the development process. S/he will use *Webframe* to recognise the individual context within which each project is situated and then to facilitate the use, of their choice of tools and techniques.

1. The first step in a WIS development project would be for the developer to begin to explore general questions about the project or problem presenting itself. S/he would consider the need of the client, the project demands (including time and resource demands) and also her/his personal skills, experience and personal incentives. This allows the developer to be open to new views emerging from the user and permits, if desired, the concurrency of data gathering and data analysis allowing the analysis to shape the path of the projects development. Accordingly, the *Webframe* principle of **evolution** is employed; not only **evolution** of approach but also, **evolution** of the project as well.

2. An initial period of data collection will be followed by the identification of the key elements in the project. The web developer will work closely with the user to interpret and categorise using prior knowledge as appropriate. This will also continue throughout the life-cycle of the development process. As more facts or requirements are acquired ~~it is asserted that~~ a better understanding of the project may emerge~~will be ascertained~~ and this clearer understanding may necessitate changes to the development approach and choice of tools and techniques. The *Webframe* principle of **flexibility** is key to this. Systems development is a creative problem solving activity with best use of available resources, tools and techniques to get the job done.

3. The data collection may continue until no new requirements or facts emerge. Once a set of requirements is arrived at a single one may be seen as central and then an examination of each requirement to discern relationship patterns or processes may begin. This will involve linking the work to existing projects, tools and techniques in an integrating process as established in the **eclectivity** principle of *Webframe*. Such linking work could range from a complete adoption of a published WISD methodology to a more *ad hoc* use of tools and techniques or possibly an initial approach based upon previous experience increasingly morphing into a new approach which is in fact, the developers own methodology. Importantly, throughout the project development should be constantly held up to examination and evaluation by the users. Clearly, as with any project this assumption can only be made in a context of an assumption of the professionalism of the web developer and the client. As it is not the purpose of webframe to instigate 'checks' such good practice and professionalism must be assumed. (As noted above and denoted diagrammatically in the visual presentation of *Webframe* the developers use of *Webframe* to cast his or her approach does not suggest that previous theory regarding WISD should be disregarded. A web developer will necessarily be informed to varying degrees, by prior knowledge and web development theories but will incorporate existing knowledge of web development with out becoming trapped in the view that it represents the final truth in web development.)

4. The application of *Webframe* places the developer at the centre of the process of web methodology development recognising the unique qualities in any project represented within the developers experience and skills, the users' requirements and the problem domain of the project in hand. In this way it also facilitates the principle of **personal incentive** as the individual developer is able to see his/her way through the project to gaining personal reward in the work.

5. If the example of a user that has fully documented their requirements perhaps in the form of a tender document is considered – s/he will require a different set of tools and techniques from the user who is only partially able to express

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their requirements. The latter may benefit from a prototyping approach with a high level of user input facilitated by appropriate tools and techniques whereas the former may require more formal specified techniques such as extensive documentation of process flow diagrams in part to confirm the developer's understanding of their requirements and demonstrate progress. The tools and techniques chosen by the developer based on their skill set as represented by the *Webframe* principle **ease of use** and also on the requirements of the project process may change or develop as the complexity of the project becomes apparent.

It is argued that just as each project is unique being determined by the problem, the domain, the user and the developer, each development approach chosen will require to be **flexible , eclective, evolutionary** and if it is to be followed through to successful completion it will need to be perceived as **easy to use** and to meet the **personal incentives** of the 'actor' that is central to the development approach selected – the developer.

Webframe provides a set of principles for web development and thus facilitates the developer to choose an approach; it introduces the IS' theoretical concepts of methodologies and serves to bridge the gap between practitioners and authors of web methodologies. Thus, *Webframe* facilitates developers in recognising and developing their own approach to web development as a methodology as expressed by Avison and Fitzgerald (2006 p 24) in their definition of an IS (and WIS) methodology - "A collection of procedures, techniques, tools and documentation aids which will help the system developers in their efforts to implement a new information system."
Then through gradual but consistent exposure to the published web methodologies, such that they become simply another feature and part of their work, ~~it is postulated that~~ the developer may be encouraged~~will~~ to engage with the published methodologies and begin to both use them and influence their progress.

Once a developer recognises their own approach to developing web based systems as a methodology, they may be more likely to engage with the shaping of ways to make ~~Structuration Theory postulates that web developers will act, interact and behave in deliberate ways to make the~~ rules for their work (in the world of WISD

methodologies). Over time, these rules become part of the accepted fabric and rubric of the web developers' existence – being seen as 'received wisdom' which the developer accepts and uses to structure their approach to web development. This then is the process of structuration; an active, constructive process involving individual web developers dynamically 'making' the world and the world 'making' them.

For the double hermeneutic effect as identified by Giddens (1984) (in his Structuration Theory) to occur, the professional or academic creating web methodologies needs to nurture the development of the *doppleganger* of their domain. That is, the theories of their approach need to be legitimised by web developers' consensus and that can only occur if the gap between web developers' practice and web methodologies theory is bridged. *Webframe* is presented as one way in which it is possible to bridge the gap since it encourages developers to engage with their approaches as recognised ways of working .

7.8 Method of validation of proposed Method/Model/Framework

Whilst it has not been seen to be appropriate to 'test' *Webframe* in practice for the reasons given in Chapter 2, nonetheless, it is apposite to seek to evaluate and validate it. The procedures for this are outlined in the next Chapter. First, however, it is relevant to reiterate briefly the rationale for the chosen method of validation of *Webframe*, together with reasons for not testing the framework *in situ*. This latter method of validation would be to use the framework and then observe its efficacy in practice. Such a process follows Action Research principles (eg. Baskerville & Myers, 2004). However, for the current study Action Research was deemed inappropriate (see Chapter 1). Due to time constraints and the fact that the different organisations involved in WIS methodology development would certainly not appreciate the intrusion of an academic into their work, it was not within the remit of this study to implement the framework and then use empirical observation to analyse its efficacy. Thus, empirical observation as a validation tool was deemed inappropriate to use.

The use of retrospective interviews with participants involved in the process was decided as a suitable method for evaluation of *Webframe*. As David and Sutton,

(2004) state "…extended interviews with ..key informants ..enable the researcher to better understand the field" (p.112). Accordingly, in-depth interviews with a review panel of participants from WIS methodology development was used to evaluate and validate the framework. This is discussed in detail in the following Chapter.

7.9 Summary

This Chapter has presented the proposed framework for WIS methodology development - *Webframe*. It has been contextualised within Structuration Theory. The process of developing *Webframe* has been outlined with a clear rationale for its content and structure. Following presentation of *Webframe* as a visual diagram, an idea of its use in practice has been given. The Chapter concludes with details of the method of validating the framework. This leads into the next Chapter which will present details of the evaluation and validation of the framework by a review panel.

Chapter 8
Validation of the framework

8.1 Introduction

Chapter 7 presented details of *Webframe*, a proposed framework for developing web systems. It outlined the five key principles and discussed the rationale for their inclusion, basing this in the findings from the Internet survey and the interviews. The material was also contextualised in a theoretical framework of Structuration Theory (Giddens, 1984).

This Chapter outlines the evaluation and validation of the framework. It gives detail of the panel of reviewers, together with the rationale for this. The construction of the interview schedule is provided with rationale for the questions. Following a presentation of the process of the validation the findings are discussed and analysed. The Chapter ends with a reflection on the use of the review panel as a means of validating the framework.

8.2 The Panel of reviewers

As stated, it was decided to conduct extended interviews with those working in the field to evaluate and validate the proposed framework The choice of the sample population for this panel was of fundamental importance to the validation of the proposed framework. Firstly, the appropriate number of reviewers was a necessary consideration. Clearly there are no hard and fast rules about what constitutes an appropriate number and it is important to be mindful that whilst too few might compromise Trustworthiness too many might hinder depth of analysis. Eisenhardt (1989) suggests that fewer than four views may render the evaluation and validation unconvincing, though greater than ten might engender too much complex material to draw effective conclusion. Consequently, it was decided to interview five reviewers.

The second consideration regarding the sample was the type of sampling to employ. Within Grounded Theory methodology a purposive sample is appropriate. Similarly, when utilising small data sets this method of sampling is also considered appropriate

(Pettigrew, 1990). Further, Marshall and Rossman (1995) offer suggested criteria for the selection of small samples. Of relevance to the current study are the two detailed below.

First, participants must be accessible to the researcher for the appropriate amount of time necessary for completion of data collection. Second, the participants must have the necessary depth of knowledge and experience to be able to answer the research questions effectively. Accordingly, in order to satisfy all the above demands, the five experienced web developers who had already been interviewed as part of this research were approached and invited to participate in the interviews about the efficacy of *Webframe.* All consented to take part.

As stated, the five had previously all been interviewed for the earlier stages of the research. Thus, it might be suggested that the participants may have a potential bias when reviewing a framework to which their data had contributed. However, clearly at the point of the initial interview they had all given their own personal perspective on and experience of web systems development. Subsequently, the key principles constituting *Webframe* were developed from a Grounded Theory analysis of **all** the interviews contextualised in a theoretical framework of Structuration Theory. Thus, it is argued that any potential bias was countered and that the participants' views on the proposed framework were valid and useful.

The five web-developers contributing to the review panel came from a range of different backgrounds and worked either for themselves or for a small unit within an organisation, varying in size and purpose. All developers were directly responsible for the choice of web-methodology adopted and utilised and therefore, all were eminently suited to the evaluation and validation of *Webframe*. Of the initial interviewees Participant 3 (a female web developer) was not involved in the evaluation and validation of the framework as she had left her place of employment to take maternity leave and it was deemed inappropriate to ask her to participate.

8.3 The interview process

As the researcher had previously engaged with the participants in this research the process of interviewing for a second time was possibly more comfortable to undertake as all parties knew each other a little. As with the initial interviews the researcher was introduced to the participants as having a research interest in the area under investigation, but acknowledged from the outset the participants' expertise and experience in the practicalities of working in web development.

Once again, in order to ensure consistency across the interviews the procedures followed for the initial interviews (detailed in Chapter 6) were adhered to. Similarly, once again, the semi-structured approach to interviewing was adopted in order to ensure a high degree of flexibility but retain a minimal structure. Eisenhardt (1989) notes the necessity for a set of research questions to guide the researcher and facilitate comparability across interviews yet, also for the facility for flexibility. As the researcher was mindful of the fact that all participants were expert in their field with much practical experience of developing and implementing WIS it was deemed important to leave sufficient 'space' for them to develop answers as they wished. However, as the aim of the interviews was to validate the proposed framework consistency across the interviews and a focus on the structure of *Webframe* was also necessary.

The interviews aimed to explore and seek evidence for aims 8 and 9 of the thesis, given below:

Aim: 8: *To design a framework based in research findings and framed within Structuration Theory, to inform the choice of web development methodology*

Aim 9: *To validate the framework.*

8.4 Development of the research schedule

The aim of the interview was to evaluate and validate *Webframe*. Therefore, the interview schedule was formulated around the five key principles of the proposed

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framework. The interviews focused on one central issue – the relevance and usefulness of the five principles. The three major questions are given below. Additional prompts were given to participants as required in individual interviews.

1. In this proposed framework for developing web systems how far do you think the following issues are important?

- *Flexibility*
- *Eclecticism*
- *Evolution*
- *Personal Incentive*
- *Ease of use.*

2. How far do you consider the proposed framework to be useful for web system development practice?

3. How far can you see the framework being useful to your web system development?

Finally, participants were asked if there were any other principles they felt would be important to include.

It was recognised that participants would only be able to offer a subjective evaluation of the second and third question and that a true reflection on the potential usefulness and effectiveness to web system development practice would only be apposite upon actioning the principles. Nonetheless, it was considered important to seek the views of the participants as they are experts in their field and engaged in web systems development in practice on a daily basis. It is beyond the remit of the current research to implement the framework and monitor its usage and effectiveness. Rather, this study has sought only to propose a framework based on the academic literature and the views of practitioners in the field. Additionally, as has been stated throughout the work this proposed framework is relevant to the work of experienced web system developers working either alone or within a small organisation. It has not sought to generalise to a wider population.

Nevertheless, questions two and three in the interviews relate to the issue of Authenticity raised by Guba and Lincoln (1994, p114) and as such this provides further support for their inclusion in the interview schedule. Discussion of this is detailed in 8.5. below.

8.5 Reliability, Validity and Generalisability – or Trustworthiness of Qualitative data

Once again, issues of Trustworthiness, Authenticity, Dependability and Confirmability of the data were taken account of. All these issues were discussed and detailed in chapter 6 so it was not thought necessary to repeat the material here. However, of additional relevance to note at this point is the issue of **Authenticity** since although in full, the concept can only be reviewed after completion of the study and dissemination of the findings, nonetheless, it relates in part to the findings from the initial interviews from which the principles of *Webframe* were formulated.

8.5.1 Authenticity

- Criterion of fairness
- Ontological authenticity (enlarges personal constructions)
- Educative authenticity (leads to improved understanding of constructions of others)
- Catalytic authenticity (stimulates to action)
- Tactical authenticity (empowers action)

Of particular importance at this stage of the research were the first three categories. It is argued that categories four and five which demand action, can only be fully realised upon completion of the study and implementation of the framework.

First, the 'Criterion of Fairness'. All participants' views and perspectives were taken account of in the formulation and construction of the proposed framework. It is argued that returning then to the same participants for their evaluation of the framework – which included not only their views, but also those of all the participants- facilitated this category. All views were taken account of equally and the resulting framework was a fair representation presented back to the participants.

The 'Criterion of Fairness' links to the second category 'Ontological Authenticity' as according to Guba and Lincoln this then enlarges personal constructions. That is, for this research the principles of *Webframe* identified and related back to participants were evaluated and validated in a context of their potential utility in practice; their personal constructions. Thus, through questioning the participants about how far they perceived the framework to be useful in practice the research invited them to apply the principles to their own work and position themselves in their own future world. This then offers ontological authenticity to the framework as it places it in the real world of web system development practice rather than leaving it in an academic or theoretical vacuum.

Further, this second category then links to the third category of 'Educative Authenticity' which Guba and Lincoln state leads to improved understanding of constructions of others. For in addition to evaluating and validating the framework for personal practice the developers were also asked to consider its potential use for others. In so doing they would then automatically be considering others' constructions of web development.

8.6 Interview data

As noted above, all interviews were undertaken following as far as possible, the same procedure and process. As with the initial interviews, they were all transcribed verbatim as soon after the interview as possible. All 'erms' and pauses were included in the transcript as clues to the development of Participants' thought processes may be garnered from these. Again, field notes were taken before and after the interview to note any further information which might be relevant. Following transcription of the interview analysis of the data using Grounded Theory coding, was undertaken.

8.7 Data Analysis

Full details of the process of data analysis using Grounded Theory principles was outlined in Chapter 6. This same process was followed with the interview data from the review panel to evaluate and validate the proposed framework. It is relevant here

to present the findings. The analysis was based on the exploration of the proposed framework – *Webframe* – and its potential efficacy for use and practice in the views of the review panel. The views of the panel are given below with quotes from their interview to support the discussion.

First it is important to note that several of the developers commented that the framework would be suitable and relevant only to experienced developers. As Participant 1 commented *it does not really give sufficient guidance as to what is needed For a professional that's fine, for a novice that would perhaps be rather confusing.........not suitable for a novice developer.*
Interviewer: Your caution is against using the frame work for people who are learning web development.
Respondent: yes inexperienced developers.

Further Participant 4 noted *it only really works if you know what you are doing.*

These comments were perhaps to be expected. Certainly, the framework had not been developed with novice developers in mind. Rather, the aim of *Webframe* was to provide experienced developers with key principles for developing their own systems

When asked questions about the key principles of the proposed framework the participants were generally supportive of the ideas. A representative selection of the review panel's comments on the five key principles of *Webframe* are given below:
Clearly, some principles appeared more important than others to different participants. However, generally, all participants seemed supportive of the principles.

8.7.1 Flexibility

As stated in Chapter 7, based on the findings of the Internet survey, the interviews and the literature reviewed, the principle of **flexibility** in web development practice seemed very important. Thus, although it has been suggested earlier that none of the principle should be seen as numerically ordered in web development practice, nonetheless, its perceived importance meant that it was proffered as the first principle

for consideration by the review panel. All participants commented upon this principle favourably. Given below are succinct and representative comments

P1 I would think it is probably one of the highest priorities of any methodology that it needs to ... it has to be suitable to the job in hand and it also needs, especially today, to be easily assimilated by people who are new to the method
There are methodologies that talk about flexibility but I am not sure that they actually achieve it

P2 Oh yes –anything that's going to be workable MUST be flexible.

P5 each project I work on is different .... so my approach has to change to suit. Sometime the system is very small and I can just blast through it. Other times the system is larger and it takes some planning and preparing. I have yet to be given a pre.... What do you call it..... tender... But sometimes I have to work closely with the contact in order to understand just what they want. Yes any approach has to be flexible.

8.7.2 Eclecticism

The principle of Eclecticism stemmed from the notion that 'one size does not fit all' and that developers were using many different tools and techniques to construct a system appropriate to the clients' needs. As Howcroft and Carroll (2000) noted, possibly one of the reasons for the poor uptake and utilisation of published methodologies is their prescriptive nature. Further, Jeary *et al*., (2009) commented that developers deviate in various ways deliberately from the designated route stipulated in the published methodologies, leading them to argue that perhaps these methodologies were TOO prescriptive and did not leave space for developers to be **Eclective** in their design. Being coerced into using simply a few stipulated tools and techniques was, arguably, not the approach most developers desired. Thus, the second key principle of *Webframe* was Eclectivity – to allow developers to use which ever tools and techniques they deemed fit. This notion appeared to be supported by the review panel with comments such as those detailed below.

P3 I want to do the project the way I want to do it. Use the tools that I feel are the best ones

P4 *The only way to go…… if you try a technique and it does not get the result, you need to try another way but I have a lot of experience and so I usually, probably always, make the right choice of tool and technique.*

P4 It depends upon the project. Some times the client hands us a complete spec and we build to that. And some times … more often… we build what they want even when they have trouble expressing it.

P5 Is there any other way to do it? . Just like a carpenter would have had a wide range of planes each suited for a particular woodworking job, I have to use the best tool for the job. It might mean building a prototype system or drafting a story board what ever needs to be done.

The third key principle aimed to give attention to the development of the system. Clearly, the projects were evolving entities. No WIS finished as it started, as demands – economic, resource, human etc – all changed over the life-cycle of a project. Thus, for any framework to be useful, account must necessarily be paid to the evolutionary nature of the system. Comments from the review panel were mixed regarding this principle. Participant 3 seemed to interpret the principle as a 'total change' which he felt was not appropriate to his practice. Conversely, Participant 5 agreed that for any system to be effective and useful, **evolution** was important

8.7.3. Evolution

P3 Not so important for me as I the way I do things doesn't seem to be changing very much?
Of course we would modify rather than change every thing

P5 as a web developer you need to adapt to take on new technologies and new methods because at the end of the day the web is not going to stay as text, images and videos it's going to evolve beyond that. I mean you can't really say oh yeh its always going to be this way because that approach may be totally irrelevant in ten years time.

P4 We don't have time to change the whole approach and   er… besides the way we do things works for us but …..it doesn't stop us trying new things and if they work sticking with them.

P5 this area moves so fast or is it that I have so much to learn?. Whatever, the thought of deciding how to develop web systems and doing it that way for the rest of my career frightens me.   You have to continually change and improve, there is always someone out there doing something clever than you and you have to keep up. That's how I started, being able to develop front ends quicker than no…. not quicker better than most others… also cheaper because I hit on the right tool. Now there are other tools and I have to stay on top of them. Yes I have to change the way I develop systems and will continue doing that.

The next principle discussed was **Personal Incentive**. This stemmed directly from issues raised by the interview participants when they all commented that they were motivated to develop web information systems – but by very different things. The principle ties into the idea of the developers' Agency discussed earlier in this thesis. Indeed, Agency was noted as the key element emanating from the interviews with the developers (Chapter 6). All the developers were motivated by different things but they all needed to feel power and control and 'transformative capacity' (Giddens, 1984). Thus, this principle was included in the proposed framework as it was considered that to omit it would mean the framework would not be effective – or utilised. Nonetheless, as discussed earlier, the fact that the Agency and Personal Incentive was not a homogenous entity rendered it a problematic concept to include. As can be seen in the responses from the participants, some failed to understand completely what was being suggested.

8.7.4 Personal Incentive

P1 I think that all designers have different motivations for doing what they do.

P4 Yes but more than that building the business.. profit yes but also reputation .. client base. Personal motivation is linked to the success of the business.

P3 a chance to hopefully celebrate but also reflect on what has and hasn't worked for us seems like a good idea. That way we can build on what works and change what has not.

P5 Personal motivation? Yeh erm definitely yes that's the way I develop ... the costs and meeting the clients needs without overspending on software erm development time which is obviously critical and just being able to keep the client satisfied and be able to produce it as cheaply as possible but without skimping on quality.

P5 Money obviously but perhaps more.... It feeds my ego being good at this game. I like solving problems , I like the smug feeling I get when people see what I can do for them. It must remain interesting to me , I donot want to get bored.... If I get bored I will stop doing them. Is that my personal motivation uh?.

The fifth principle identified was e**ase of use**. As stated in Chapter 7 it was decided that for any framework to be useful it must necessarily be easy to use. Anything requiring lengthy training or study would likely be relegated to a shelf –or worse!

Hence, ease of use became the fifth key principle of *Webframe*. Comments on this from the review panel are given below.

8.7.5 Ease of use

P3 *Any approach we follow must be easy to use and I cannot imagine any thing more easy than one that we devise ourselves based in the first instance on the way we actually do things*

P6 *you have to flexible to meet the clients needs erm. I think also you cannot be too flexible*

P4 : *Strikes me as common sense... it's the way I have always done it…… starting from my first business and really…… whenever I have worked for myself. I choose the approach that works best for the client…to get the project completed.*

P5 *Yes it should be easy to use. It seems to be largely the way I work now but more... Sort of recognising the way I do things . Also sort of giving me permission. I don't know what I want to say really. I like the flexibility, no one telling me the way I have to work, I like the ability to choose the tools I see best*

8.7.6 Validity of the comments of the panel of reviewers

From these comments it was ascertained that the key principles proposed were acceptable to the panel. All were commented upon favourably and the criteria of Authenticity (Guba and Lincoln 1994) discussed earlier were accommodated. Other criteriaon may also wellhave been relevant, but none were suggested by reviewers when invited to suggest additional criteria.
the interview asked the question of reviewers as to whether or not they felt anything else would be useful as principles of WISDM and none replied with any further additional criterion.

First, the criterion of Fairness was accommodated as all views of the review panel were taken account of equally. The other criterion Ontological Authenticity, Educative Authenticity, Catalytic Authenticity (stimulating action) and Tactical Authenticity were addressed through the question *How far can you see the framework being useful to your web system development?* A range of comments

were forthcoming from the reviewers. A representative sample is given here: *P1 well I'd have to try it out, obviously, but it seems to capture what I actually DO...so (laughs) yeah, looks ok.*
P4 I think the part about flexibility is key. And yes, I can see me using it in practice. See how it goes!! (laughs)
P3 As long as it lets me do what I want when I want I'll give it a go.

All these factors then linked together to answer the aim of this study **To inform the development of a proposed framework for developing a web information systems methodology.**

A stated aim of Grounded Theory methodology is to develop a theory and certainly, it has been argued in this thesis that a theory of web development based in Structuration Theory has been presented. It has been argued that web developers are not generally using the published web methodologies, preferring instead to construct their own using a range of tools and techniques to suit the task and their skills and expertise. Findings from the internet survey and the interviews provided support for this assertion and a framework for web development practice based on the requirements stated by participants was constructed.

At this point it is relevant to examine the validity of the proposed framework, *Webframe* in the views of the panel of reviewers. The table below summarises the views of the review panel as to the importance of each principle to web system development. The participants are listed across the top of the table (P1 – 5). The principle of *Webframe* they were asked to comment upon is listed on the left hand side of the table. If a * is presented under a participant and against a principle, it indicates that the participant stated that they thought this principle was relevant and important to the framework.

Principle	P1	P2	P3	P4	P5
Flexibility	*	*	*	*	*
Eclectivity	*	*	*	*	*

Evolution		*		*	*
Personal Incentive	*	*	*	*	*
Ease of use		*	*	*	*

As can be seen all participants viewed most principles as important. However, not all participants viewed all principles as important. The key principles regarded as important by all reviewers were **Flexibility** and **Eclectivity** and **Personal Incentive**. This is interesting and in addition to perhaps showing the expected finding of the initial interviews, that **Ease of Use** and **Flexibility** are seen as key it also supports the findings from the initial interviews which noted as the key category, developers' Agency.

Based on the findings of the initial interviews and then the findings from the interviews with the panel of reviewers the major theoretical proposition resulting from this study is that the principle of web developers' agency/personal incentive is the key to successful web systems development. All other principles stem from this if it is accommodated effectively. This is extemporised further below. However, first it is relevant to detail how this understanding of Agency, together with the principles of Flexibility, Ease of Use and Eclecticism, are different from published methodologies.

8.~~7~~8 Differences between *Webframe* and published methodologies

Webframe is proposed here as a response to the study's research findings which indicate that individual developers working in small to medium sized web development organisations (SME) are developing their own web based applications rather than using previously published work. As stated above, the key principles of *Webframe* are **Flexibility, Ease of Use, Eclecticism** and **Agency/Personal Incentive**. Currently, no single published methodology has been identified which addresses all of these issues and thus, it is argued, this is a primary reason that web developers are constructing their own.

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Another distinctive feature of the *Webframe* approach to developing WIS is that whilst earlier methodologies were considered to be data driven or process driven (eg. SSADM) or organisation oriented (eg. Softsystems (Checkland 2001)) *Webframe* is centred firmly on the individual developer. Certainly, it could be argued that Martin's (1990) approach, Rapid Application Development (RAD) is user centred and evolutionary. However, based in a theoretical context of Giddens' (1984) Structuration Theory, *Webframe* encompasses both the agency of the individual developer and the structure of web methodologies. It recognises that the web developer is best placed to determine the best tools and techniques for a particular project balanced against the skills and knowledge of the development team, the demands of the client and the socio-technical context. Further, the user centred, evolutionary focus of RAD is also incorporated within *Webframe* since its emphasis on flexibility facilitates recognition of the developer's accommodation of user need. The developer is in the prime position from which to judge the degree of coverage of the development lifecycle that is necessary and within that the appropriate phases, tasks and deliverables that are required. Nonetheless, this acknowledgement of the importance of user requirement and evolution emphasised in RAD is incorporated within the primary thrust of *Webframe*, that is the personal agency of the developer. It is argued then that this principle of agency guides all other factors.

8.9 Development of theory

One purpose of a theory is to enable the testing of an idea such that generalisable findings may be forthcoming. Certainly, such testing may be facilitated by future research built upon this study. However, the purpose of this work is exploratory with the aim of building rather than testing theory Future studies may then build upon this work and action the theory.

The theory was formulated as a response to the research questions posed at the outset of this research; those being reported in Chapter 1 as follows:

1. How far are web developers following a recognised web information system development methodology?

2. How far is it possible to develop a framework to assist web-designers' adoption of appropriate web information systems development methodologies?

3. How far might this be acceptable to web information systems methodologists in practice?

The theory was also a response to the overall aim of this research given in Chapter 1 and stated below:

To identify web developers' current methodologies (both personal or published) to inform the development of a proposed framework for developing a web information systems methodology.

The theory was contextualised within Structuration Theory (detailed in Chapter 4) and thus, was also a response to Objective 5 given below:

To design a framework based in research findings and framed within Structuration Theory, to inform the choice of web development methodology

Thus, in summary, using a methodology of Grounded Theory the theory was grounded in the findings of the online survey/questionnaire and the findings from the interviews and contextualised in a framework of Structuration Theory.

8.9.1 Statement of theory

The theory for this thesis is as follows:

Experienced Web developers are formulating their own approaches based on their personal skills, knowledge and experience. Any acceptable approach must be formulated which enables Ease of use, Flexibility, Evolution and Eclectivity and also accounts for developers' Personal Agency.

This theory resulted from an analysis of the findings of the online survey/questionnaire and interviews in the first instance which together formed the platform for development of the proposed framework *Webframe* which was outlined and discussed in Chapter 7 and evaluated and validated by the Panel of reviewers– the findings of which are presented in this Chapter.

8.10 Reflection upon the use of the Panel of reviewers as a method of evaluating and validating the proposed framework

As discussed earlier in this thesis it was deemed appropriate to use a panel of reviewers to evaluate and validate the proposed framework. The reasons stated were time constraints of the thesis; that a longitudinal study was inappropriate to the demands of PhD study completion time. Additionally, an awareness of the fact that the different organisations involved in web system methodology development would certainly not appreciate the intrusion of an academic into their work. Thus, it was not considered possible or appropriate within the remit of this study to implement the framework and then use empirical observation to analyse its efficacy and therefore, empirical observation as a validation tool was deemed inappropriate to use.

However, it is noted that the use of a panel of reviewers to evaluate and validate the framework may limit the asserted efficacy of the framework since it has not yet been evaluated in action. Rather, as noted above, participants were commenting subjectively on possibilities of implementation. Hence, arguably, the final criteria noted by Guba and Lincoln concerning (1994) Authenticity discussed above, might only be realized fully later, when the framework as been actioned.

Nonetheless, within the constraints of the demands of this thesis, validation by an review panel the likes of whom this framework was developed, seems appropriate.

8.11 Summary

This chapter has presented details of the validation of the framework. Information concerning the constitution of the panel, together with the research validation questions pursued are given. Discussion of the findings of the panel are reflected upon. So too is the process of using an review panel for validating the framework. The next chapter will summarise the thesis and present conclusions of the study. It will also provide reflection on the research and the research process and suggest potential further research which might result from this work.

Chapter 9
Summary, Conclusions, Reflections and Suggestions for Further Research

9.1 Introduction

As this is the final chapter of the thesis it presents a summary of the study, detailing briefly the process and reflections upon each stage. It also presents the conclusions of the study together with suggestions for further research. The chapter begins by reiterating the Aim and Objectives of the research in order to provide context to the summary. It then proceeds to detail the methodological and theoretical framework and then summarises the academic literature in web systems methodology development. Findings of the internet survey together with those from the interviews are presented next, followed by details of *Webframe,* the proposed framework for web systems methodology development. A discussion around the views of the review panel is presented followed by the conclusions of the research. Finally, reflections on the overall process of this study together with suggestions for future research are given.

9.1.1 Aims and objectives of the study
To commence, it is relevant to re-state the overall Aim of the work, as this has given the research direction and structure.

<u>**Aim:**</u> **To identify web developers' current methodologies (both personal and published) to inform the development and validation of a framework for developing a web information systems development methodology.**

In order to achieve this aim seven objectives were identified as follows:

- To investigate the status of web information systems development methodologies evidenced in the academic literature.
- To explore the current status of web information systems development based on data collected from web developers.
- To compare and contrast the literature on web based and traditional information systems (IS) in order to determine the differences between

methods, tools and techniques used in the development of each type of system

- To determine whether or not web information systems developers who claim not to be following a methodology are actually doing so without being cognoscente of the fact.

- To design a framework based in research findings and framed within Structuration Theory, to inform the choice of web development methodology

- To validate the framework.

- To evaluate the research project

These objectives have been answered as follows:

- To investigate the status of web information systems development methodologies evidenced in the academic literature.

A review of the literature on web information systems development methodologies was presented and critiqued in Chapter 3.

- To compare and contrast the literature on web based and traditional information systems (IS) in order to determine the differences between methods, tools and techniques used in the development of each type of system

Research on Information systems development methodologies (ISDM) was detailed, addressing both its historical background and also its current status. This was followed by a review of the literature on web systems information systems development methodologies. The two were then compared and contrasted. It was determined that web information systems development methodologies had not followed the same developmental path as ISDM. Rather, web developers seemed apparently to be choosing not to follow prescribed and documented methodologies, preferring instead to construct their own 'bespoke' approaches to accommodate each new project, or to be following methodologies without being aware that they were so doing. A review of the different approaches used in web information systems

development methodologies was presented with details of the similarities and differences in each approach given.

It was noted in Chapter1 that a major impetus for this study was the lack of guidance available for developing web based information systems in a structured organised way together with an anecdotal awareness of the lack of published web methodologies being utilised in practice by web developers. In order to explore both sides of this concern an empirical study was designed but initially, an academic literature review was undertaken to ascertain the published view of the current status of web systems methodologies. This was presented in Chapter 3. A brief review of that literature is given below in a context of its contribution to the debate in this thesis.

9.1.2 Review and summary of academic literature on web systems methodologies

A review of the literature demonstrated that WIS developers have their own specific methodologies. However, interestingly, WISD has apparently not demanded formally documented patterns and procedures to be **used** by developers. Additionally, many of the more traditional development values such as database-design are still being retained and reused (Vidgen 2002).

Of specific interest to this thesis is the contrast in developmental paths taken by ISDM and WISD methodologies in terms of the demand for recognised patterns or procedures. Certainly, the latter is a much younger discipline, and in common with many if not most, fledgling areas there are shifting positions. Despite being a fundamental part of most effective IS for most organisations of very many differing natures and sizes, it appears that many developers are choosing to develop and use their own 'bespoke' methodology. Indeed, although a great many web-system methodologies are developed they seem to remain in books on shelves rather than practical application in organisations.

Ironically, this is not to suggest that the literature review did not assert the value of methodologies to the efficient and effective development of both web and traditional

information systems. The prevailing view in both teaching and research focuses on the need for structured development methodologies. However, in practice, the literature suggests that specialized structured web methodologies have a poor uptake in the world of web developers (Barry & Lang 2001.,Ramratten *et al.,* 2010),

So, in summary, the current status of WISD methodologies presented in the literature would seem to be that there is a recognised demand for documented methodologies, but that in practice many web developers are developing their own. Of interest for this thesis was then the question, WHY? And this question evident from the literature review then led directly into the empirical research for the study.

Accordingly, the next objectives explored were as follows:
- To explore the current status of web information systems development based on data collected from web developers.

- To determine whether or not web information systems developers who claim not to be following a methodology are actually doing so without being cognisantoscente of the fact.

In order to conduct an empirical investigation a suitable methodological framework had to be decided upon. Although it was clear that an interpretevist epistemology was appropriate as this study was exploring understanding and meaning, the methodology needed further consideration. After much thought a Grounded Theory methodology was decided upon. The rationale for this was given in chapter 2. From this basis a mixed method involving an internet survey and in-depth interviews was identified as appropriate.

9.1.23 Methods: Internet survey and Interviews

The Internet survey was considered useful to facilitate the gathering of as much data as possible from as wide-a-range of practitioners, as possible – i.e. a diverse a range of web-developers in order to identify initial concepts or patterns. The decision to post an internet survey rather than use a more traditional postal approach was in

accordance with the research area for this study, being based as it is, around issues of the internet. Email and internet surveys are also becoming increasingly common-place, (Weiss, 2004). The major disadvantage of both the postal and email survey is the traditionally low response rate. Reasons for this are varied and can include "…the subject matter of the survey, the target population under study, the recipients' perception of its value and the ease of completion of the questionnaire (Simmons, 2001 p87).

Despite best efforts, the response-rate was limited and this possibly is where I hit my first 'brick wall' of the study. Receiving few responses with one response also being very insulting, was extremely demoralising! However, following Grounded Theory methodological principles, I analysed the data that was returned, re-wrote the survey and tried again. Whilst it cannot be argued that a massive response was forthcoming, nonetheless, useful data was received and this is presented in Chapter 5.

Following on from the survey a more interactive approach to data collection was taken through interviewing six web developers in practice. All were experienced practitioners and their contributions were fundamental to the development of the proposed framework for web development which is the focus of this thesis.

Whilst there is some disagreement in the literature about the used of mixed methods (eg. Myers, 1997) for this thesis the two methods used were useful. An initial broad generalised glance at the area via the on-line survey set the scene for in-depth interviews to facilitate exploration of 'why' choices were being made regarding WISD methodologies.

9.1.24 Methodological framework: Grounded Theory

As stated above, it was determined to use Grounded Theory Methodology for this research. As noted in Chapter 2 the use of Grounded Theory has a recognised history in IS research (eg. Miles & Huberman, 1984, Calloway & Ariav, 1991, Orlikowski, 1993, Pandit, 1996, Hansen & Kautz 2005) and the cyclical process of data collection, analysis, consultation and reanalysis was useful for this work. Additionally, as Payne (in Lyons & Coyle, 2007) notes that Grounded Theory is

useful for exploratory research, which aims to develop theoretical explanations. Again, this was appropriate for this study. Further, Grounded Theory facilitates "the generation of theories of process, sequence, and change pertaining to organizations, positions, and social interaction" (Glaser and Strauss 1967, p114). All these factors then, seemed completely relevant to this study.

On reflection, the choice of the Grounded Theory methodology was indeed, appropriate. However, the time taken to utilise it effectively was immense. The cyclical nature of Grounded Theory meant that analysis was a constant, continuous and cumulative process. There never seemed a time when the research or analysis was truly 'complete'. Certainly, the formal decision that saturation had been reached was made when no new data was forthcoming. However, always there remained the nagging feeling of doubt that a fourth internet survey and/or a further ten interviews may well elicit further categories and an increased knowledge base from which to build the framework. Yet, this is surely a conundrum faced by many researchers employing a Grounded theory methodology and ultimately, a decision to cease collecting data had to be made. Thus, based on the rationale given by Reason and Rowan (1981) almost thirty years ago, when the data for the current study appeared 'good enough', the next stage of research was undertaken. Somehow, being able to ground such a decision in recognised, published research seemed apposite and comforting!

9.1.~~3~~5 Summary of Research findings

The Internet survey presented in Chapter 5 confirmed earlier anecdotal 'best guesses' that many web developers do not use the specialised web methodologies that have been developed and published. Additionally, the survey findings also demonstrated – perhaps worryingly- that many developers were not actually aware of many methodologies. However, they did appear to be utilising different tools and techniques to *construct* their own way of doing things. Many of these tools and techniques originated in traditional IS. This finding then supported the work reviewed earlier (Vigden, 2002) and it raised the same question about the future developmental path likely for WISD. That is, if web developers are importing tried and tested tools

and techniques from the parent discipline of IS but then developing their own 'bespoke' approaches, what potential is there for methodology development in practice?

In the Internet survey questions were also asked about the developers' experiences and knowledge of published approaches/methodologies. Additionally, questions about the use of tools and techniques were also raised. As with responses to the internet survey the interviews with web developers revealed that they had some awareness of published methodologies, but that they imported tools and techniques familiar to them in order to construct and develop their own personal approach. The interview process then facilitated the opportunity to discuss in more detail, possible reasons for so doing. This was extremely useful.

Using the Grounded Theory methodology the central theme identified from the interviews was the developers' sense of agency. The interviews also suggested that the web system developers are deliberately not interacting with the published web methodologies. This finding concurred with research detailed earlier (eg Barry & Lang, 2001; 2005) which suggested that non-utilisation, or partial use, of published methodologies was a deliberate tactic used by web information systems development methodologists. It also fitted well with the theoretical framework –Structuration Theory (Giddens, 1984) – chosen for this thesis. Giddens argues that agency and structure are reciprocally interacting in the construction of our world. The evidence from the empirical work resented here would suggest that this theoretical framework is useful then for exploring this.

Thus, it links effectively to the fifth objective identified for this research:

- To design a framework based in research findings and framed within Structuration Theory, to inform the choice of web development methodology

9.1.46 Theoretical framework: Structuration Theory

As Rose (2001) commented the conceptualisation of theory into another field (IS – and specifically, for this study, web-design- research) may be used for three purposes:

1. "To theorise – to reconceptualise or theorise aspects of the new field

2. To analyse – for an analytical framework for the retrospective understanding of empirical cases or studies

3. To operationalise – to provide operational guidelines for Practitioners" (Rose, 2001 p10)

Indeed, there has been a range of research applying Structuration Theory to information systems led predominantly by both Walsham (1995) and, separately, Orlikowski (1992).

These were detailed in Chapter 4. Of importance to note here at the end of the study is that purposes 1 and 3 were seen as relevant to this work. Accordingly, Structuration Theory has been used as theoretical context for the study. It has also provided a backdrop to review the notion of agency which became so clearly related to developers' practice as expounded in the interviews

To situate the decision-making for adoption of Structuration Theory as an effective framework it is relevant to reiterate the process. In an attempt to provide theoretical context to these assertions of the possible reasons for the poor uptake of published web system methodologies by developers, relevant social theory was sought. Given that increasingly, work in IS and WIS has been located in a context of social theory with the assertion made for the last twenty years (eg. Buckingham. *et al.,*1987, Avison and Fitzgerald 2006) that it is both the human and organisational aspects of IS that are important and to focus simply on the technology is a grave mistake, it was deemed important to contextualise the current research in the field of social theory. Yet, it was also considered important to acknowledge the Structural elements of the WIS. Accordingly, Giddens Structuration theory (1984) was identified as appropriate. In this way, both the technological and human elements of WIS development might be realised and explored.

The key elements of Structuration Theory were expounded concerning the recursive relationship between Agency and Structure repeating and evolving over time and space. Structuration theory has been widely applied within the domain of IS research (eg Orlikowski 1992, Walsham 1995, Rose 2001) for empirically based research and theory within which web development methodologies are located.

Linking back to the points made by Rose (2001) above, the use of Structuration Theory as a theoretical framework within which to contextualise the research was effective. The reciprocal dynamic interaction between the developers' agency and the structure of the published methodologies and the organizational demands was important to consider. Stating once more the argument made by researchers in IS for the last thirty years that the effective synthesis of human, technological and organisational aspects is necessary for sound IS and WIS development (Avison & Fitzgerald, 2006) and specifically for this thesis, that web methodologies must necessarily be fit for purpose - not only for the individual using the system but also for the organisation/system for which the Methodology is intended - this thesis necessarily investigated both agency and structure in the exploration of WIS developers' choice and development of methodologies. Thus, Structuration Theory provided an apposite contextual theoretical framework.

9.1.~~5~~7 Validation of the proposed framework

The penultimate research objective was

- To validate the framework.

This was undertaken via a panel of reviewers details of which were given in Chapter 8. It is summarised below.

The following key principles were proposed as a working framework for WISD.

- Flexibility
- Eclecticism
- Evolution
- Personal Incentive
- Ease of use.

The Panel supported the inclusion of all the principles.

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The key principle forming the basis of the theory from this research is then that in order for a web system to be effective developers' agency/personal incentive needs to be taken account of.

The final research objective answered was

- To evaluate the research project

This evaluation is evident throughout this final chapter which seeks not only to reflect upon the research findings but also to consider the research process, its strengths and limitations. All these factors are presented here. First however, as this thesis is to be submitted for a PhD it is relevant to consider the study's contribution to research, practice and to knowledge.

9.2 Contribution of the current study to research and practice.

The essential assertion of this research is that social aspects are of significance to web based information systems development and they are not adequately stressed in web based information system development practice. Applying Structuration Theory brings to the fore-front the notion that web systems development is a method of practice representing a form of a social system that incorporates computer based technologies and human communication and interaction. .

This can be considered empowering for the experienced web developer as they have the freedom to look at the best methods of developing web based systems but it also can be viewed as frustrating as an inexperienced developer is left with out detailed guidance. This is resolved by limiting the appropriateness of the audience for using *Webframe* and specifying that it is suited for experienced web developers working within SMEs or in isolation within larger organizations but it is not suitable as an introduction to web development as it does not offer the detailed guidance required by inexperienced web developers. *Webframe* is not intended as a training or instruction method. Rather, it is intended as a guide to the principles necessary for effective WISD to take place with experienced developers from SMEs.

In summary of this section it is argued that this research has claimed the following contributions to knowledge:

The first and main contribution to knowledge that this research offers is in offering a range of alternative guidelines in understanding the rationale of experienced SME web developers in their approach to developing web based information systems. The research expounds the belief that existing web methodologies fail to recognize the individual agency of web developers operating in SMEs. The *Webframe* approach offers experienced web developers the agency not currently embedded within web development methodologies and validates their current successful approach to web systems development by providing a set of guiding principles from which to develop their own bespoke web based methodology - based upon their assessment of the project and client at hand.

As an outcome of this research project this has been named as "Contingency".

This legitimizing of their current approach as a methodology culminates in an approach that is not only easy to use but also encourages the web developers to review and reflect on their chosen approach at the end of each project in such a way that as described in Giddens' Structuration Theory the web developers interact with the domain of web development methodologies reciprocally and recursively in turn being influenced by web methodologies and influencing web methodologies over time and space.

As an outcome of this research project this has been named as "legitimization".

The development of Webframe as a proposed structure for web information systems development is the first and major contribution to knowledge claimed.

Linked contributions that are claimed are as follows:

First, the study utilises a Grounded Theory methodology to explore the research question. Though utilised in previous IS research this methodology no research has been identified to date which has been employed to date, to investigate choices and adoption of web information systems methodology.

This is claimed as a methodological contribution to knowledge.

Secondly, no research has been located which considers the question concerning whether or not web information systems development methodologists are following a designated model or framework in practice but without necessarily recognising this. Thus, this study is the first to explore the question.

This is the third contribution to knowledge claimed.

Third the study evaluates the research findings in a context of Structuration Theory in order to investigate personal tensions between human agency and structure. No research has been identified to date which explores web information systems methodology adoption using a theoretical framework of Structuration Theory.

This is the fourth contribution to knowledge claimed.

Finally, the research proposes a framework for practice relevant to web information systems development. The framework has been outlined and discussed in previous Chapters and evaluated by a panel of reviewers (Chapter 8). The framework is a radical departure from the more common published methodology models. Evidence has been provided that WIS developers prefer to produce their own personal bespoke approaches to suit the project they are working on. *Webframe* offers a set of guiding principles upon which any approach can be modelled. These principles have been validated as appropriate by a panel of reviewers. This is in complete contrast to existing, published work. Clearly the next step for research here would be to 'test' the principles in WISD practice.

Comment [A1]:

The proposed principles are the fifth contribution to knowledge claimed

This Chapter will now present the conclusions and recommendations of the study.

9.3 Conclusions of the research

1. The first conclusion is that web information systems developers are currently not choosing to use published methodologies in their work.

Evidence for this has been cited from the published literature (presented in chapter 3) and also more specifically from the empirical work engaged in for this study together with evidence from the current study..

2. The second conclusion is that the developers are choosing to utilize tools and techniques with which they are familiar and in which they have skills and experience.

There may be many reasons for this; some of which have been suggested by literature reviewed in this thesis. The research from this study also supported this assertion with developers stating that they used the tools and techniques with which they were familiar and that they deemed most appropriate to the completion of the job. No participant stated that they chose to learn new skills for task completion. These statements then also link to the third conclusion given below.

3. The third conclusion is that developers are developing their own 'bespoke' approaches/methodologies to suit the needs of the specific project they are involved with.

4. The fourth conclusion is that individuals who enter into work in web information systems development may have an acute sense of agency such that it is important to them that they have 'transformative capacity' (Giddens,1984).

As such, they do not appear to desire to use recognized and accepted approaches/methodologies. This is then in stark contrast to the more accepted ways of working involved in traditional ISDM Arguably, the reasons for this may be that as the work is more time urgent and possibly demands different levels of creativity from traditional ISDM the field of web information systems development methodologies attracts a 'different' kind of developer. Certainly, to test such a suggestion was beyond the remit of this study and would require personality and other psychological testing. Nevertheless, it is potentially a fascinating area of work to consider.

When put altogether, these four conclusions set the scene for the development of *Webframe* which sought to address the needs of the developers by constituting a

set of key principles for practice. This then was the ultimate focus of this research.

9.4 Suggestions for further research

As this study has provided an exploratory proposed framework for web development practice suggestions for further research include following web developers as they attempt to develop their own personalized web methodology based on the principles outlined in *Webframe*. This could be achieved via an action research approach. Also, potentially, a longitudinal study to assess the efficacy of *Webframe* over time would be useful as would an assessment of the application of *Webframe* for different businesses/organisations. This research might then also be useful in revealing other factors that impact upon web information systems development. All these studies were beyond the scope of the current study but all would potentially add to the body of knowledge in web information systems development.

9.5 Final reflections on the research process.

Overall the research process has been an interesting experience. I now understand completely why people undertake just one PhD in a life-time. Not only is it time-consuming and all-encompassing but it completely dominates one's life for a lengthy period of time. Having said that it is a useful learning experience and it has benefited my teaching and hence, my students' experience as I have engaged with many new ideas and materials. Certainly, they – and I – will benefit from the increased amount of reading and exploration of ideas necessary to write this thesis. This has not simply involved engaging with research on information systems and web information systems, but also exploration of research paradigms and tools of research. I now feel more equipped both to undertake future research and to supervise others. Of specific interest and frustration was the fact that practical research in the real world does not fit neatly into the 'boxes' of published work and decisions pertaining to 'best fit' must be made – and then justified!

Necessarily, this involved me in some decisions which perhaps, in retrospect might have been reconsidered. Thus, when reflecting upon the research it is important to consider the limitations of this research in order that my research practice may be enhanced and developed in the future. These are documented below.

9.5.1 Limitations of the research

A major limitation of the research is the small amount of empirical work undertaken. One small project is clearly not enough evidence to support the claim that the approach is useful in any meaningful sense or demonstrates any merit generalisable to web information systems developers in other situations. Further research is needed for this. The design of the research incorporates learning from empirical situations informed by theory into the design of new forms of web information systems development. Devising a project which is informed both by previous projects and by theory is the usual way of proceeding. However, it is difficult to define what constitutes practical or research success. Perhaps a more important criterion than success, is that the research influence events, or precipitates change in some observable way, mainly in practice. This then would concur with Guba and Lincoln's (1994) claim for Authenticity discussed earlier.

However, the purpose of this research requires the newly devised *Webframe* simply to be evaluated and validated. Little effective practical application is incorporated. Arguably, a better design would incorporate the projects into a programme of similar projects to allow sensible developments to evolve naturally, though this demands resources beyond those available to this research

The survey sought to outline the existing situation in relation to web developers and their experience of web development but the researcher did not anticipate the degree to which the web developer community had become desensitized to the web based survey process and their unwillingness to answer the first two versions of the questionnaire. This lack of response delayed the progress of the research.

None of this is to say there were not positives to be gained from the research. The main positive was the insights into the web developers thinking resulting from the

interviews and the Grounded Theory process of coding and developing themes. The emergence of a theory that could be looked at through the lens of Giddens' Structuration theory was also illuminating.

9.5.2 Personal reflections

From a personal perspective, as the researcher I have been concerned over the length of time it took me to complete this study. Always there were pressing issues and tasks I felt I had to undertake and this research got put to one side increasingly until it became like the 'elephant in the room' – ever present but not discussed and consequently, not completed. The lack of interest in the Internet survey was very depressing. This stalled the research for a time whilst I considered what best to do in the light of such complete apathy and not a little hostility. Having 'recovered' motivation and progressed the survey to a more simple format the responses were more helpful, though still not as plentiful as I had hoped for. Yet, apparently, these were completely inline with expected responses to such a method.

The interviews progressed more satisfactorily. Perhaps it is something to do with the fact that the interaction is 'in person' and having consented to engage with you the interviewee feels a sense of responsibility. Anyway, the interviews were much more helpful in eliciting useful material from which to build the proposed framework.

Interestingly, the time taken to collect the data overall was in comparison much shorter than the time taken to write it into a sensible narrative. However with the benefit of hindsight I can now see that the time it took me to complete the draft ready for submission was an essential requirement. I would highlight this as an important reflection to fellow researchers embarking on similar qualitative research projects. Do not underestimate the time required to document, reflect upon and analyse the information given by participants. A great deal of time is needed to fully unpack the themes in order to reach a point where one understands the emerging concepts enough to commit translation of their views into the proposed framework, with confidence.

In some respects I was unsuccessful in doing this; I often found myself saying *"I cannot do this"* - a statement backed up with any number of valid excuses for not facing my research. However progress was made following junctures at which I pushed myself to work. I finally decided to immerse myself fully in the work instead of teetering on the edges hoping that it would somehow write itself! I felt able to take control at this point and finally get the writing started in earnest. Once I reached this point the writing progressed. I completed the draft for submission over the following few months albeit with an enforced break due to life-threatening illness. This also demonstrated the need to ensure time is set aside for thinking, rest and subsequently, writing. The image of a coffee percolator is relevant here as a good strong, flavour-full pot of coffee demands time. Similarly, a good strong thesis also demands time for thought and reflection. A thesis is not written overnight. Indeed, writing is in itself is a circular process – writing encourages thought and thought encourages writing.

9.6 Conclusion

In conclusion the study has provided a unique view into the thoughts and needs of WIS developers. Analysis has been conducted within a framework that explains the Agency and Structure of the developers. The requirement to ensure that students are encouraged to think about the requirements of a useful WISD methodology is progressed by this research which perhaps will be developed further by future application to practice.

Finally, reflective practice is always to be promoted and commended. It is through consideration of current and previous practice and research together with an analysis of their synthesis, that lessons might be learned for the future.

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Appendix 1 Grounded Theory coding

Unit of meaning	Evidence from transcripts
Personal Motivation	P1.Pg3, L46 "...[it] was motivated by erm..the desire for me to...support my own activities" P2.Pg2, L23-4 " I felt web development offered an exciting future for web development but from a business perspective" P2. Pg 1,8 L329 "It is to help the business" P5.Pg3,L105-6 "I like change and perhaps I am only selecting new and different projects?" P5.Pg6, L130 "…if the contract was worth it I would" P5.Pg7, L It has to be easy to understand and do and give me something back... It has to make sense... to me." P3.Pg7, L144 "I have to sort of show progress"
Knowledge of tools & techniques	P2.Pg1, L16-19 " The main systems or the platform I use is PHP, MYSQL. My development environment or preferred development environment would be ADOBE dream weaver fireworks I have not used too much of Photoshop but I am quite confident with the adobe macromedia package." P2.Pg8, L139-40 "I use macromedia dream weaver or which is now adobe dream weaver." P2.Pg9 L143-9 "I've started with asp [err] which was using a Microsoft access data base then I moved onto using a well I touched on dot net using sql database but my preferred one at the moment is a php platform using mysql database. And really I don't think its, err... too important what, what, what platform, whether it is...asp or .dot net and sql when you are structuring your database if the data base is structured properly you should be able to hand that over and some on should be able to build it in what ever platform they have chosen, and it does tend to work like that." P4.Pg1,L16 " PHP and apache based systems as required" P4.Pg3, L53-9 "used such things as personas and story boards…. we also used more traditional techniques such as entity relationship modelling." P5.Pg6, L136-9 [when you build databases do you draw entity relationship models?] " Yes … probably… if I knew what they were [laugh]" P6.Pg5, L99-103 "the most important tool I use is communication with the client, talking to the client because they are one that are asking for the product in the end. As regards to technical methods I am a line by line coder so I do not rely upon software. As regards to database I usually us normalisation based methods which aren't as and erm...structured ".
Knowledge of Approaches	P1.Pg4, L74-5 "I've heard of wisdom…I've heard of one that a colleague of mine developed. P2.Pg3, L44-7 "SSADM is all I can remember... I cannot

	recall exactly what it is apart from that it is very structured erm really and linear in its approach so that you do the first thing first and the second. And then RAD rapid application development which I feel is more suited to real world application development" *P4.Pg2 L40 "SSADM and RAD and we took elements form each"* *P5.Pg2, L41-2 "I started using HTML and the real break through was getting to know flash so that I could build intros to existing web sites"* *P3.Pg4, L77 " No No.."[knowledge of approaches]* *P6.Pg4, L63-65 "wisdm which is web based completely for web development I know of scrum which is also for software development as well I believe erm which is ideal for client based meetings erm there is RAD, the waterfall cycle"* *P6.Pg4 L72-3 "I use probably elements of them but never a strict regime or a strict methodology."*
Experience	*P1. Pg2,L30 "I would say about 10 years"* *P1.Pg7,L158 "Before I started to develop web systems I had 15 years of traditional structured programming.".* *P2.Pg2, L38 "Probably since 2000"* *P4.Pg1,L5 " I started in web-development around 10 years ago"* *P5.Pg1, L8-9 "[It's] all I have ever done … there is no 'before that' other than school but even then I dabbled and built systems for people."* *P3.Pg2, L53-5 "Well sort of my background is systems and web development just sort of fell under my umbrella as my predecessor was the web master and so I became the web master"*
Documentation of Approach	*P1.Pg9,L184 "the documentation is non-existent other than in the code itself and in my head"* *P2.Pg5, L90-3 " I have created my own documentation for myself. Never passed it onto someone else and asked them to work by following that process. I have never worked in an organisation that has a formalised process or even had an informal process to quite honest."* *P2.Pg 14, L241-2 "… sort of, well they don't follow this methodology at all but they might have a process of how they do things or what they do.* *P2.Pg5 L84-5 "Obviously from experience, they would not have to be written down and because they would be in your memory."* *P4.Pg5,L69-70 "the documentation was minimal."* *P3.Pg7, L159-60 "All of that is documented the procedures, everything. Lots of flow diagrams showing the processes I want to do that, then I do that and that and then that"*
Structure of Personal	*P1.Pg8,L160-1 "I tend to take a structured approach even though it may appear ad-hoc my Approach is still very*

Approach	*structured and well organised"* *P2.Pg11, L198 " But they are not formalised it's a very informal way of development"* *P4.Pg2, L42-45 "Look we were not making it up as we went along but neither were we following any one identifiable approach. Or rather over time we found what suited... what worked for us and, and simply refined our approach but that did not mean we were tied to any one way of doing things"* *P5.Pg7, L148-9 "I talk to the customer and he shows me examples of what he already got or what others have built it and show it and then I move on from there."* *P3. Pg3 , L61-3 "I went about it from the users perspective, in other words what is it they want to see, what is the most logical way for them to come in, how can they find what they need to find easily without getting lost"* *P6.Pg6, L45-8 don't tend to erm follow any kind of methodology. goes in erm with the guns blazing approach and takes on a brief understanding of what the client wants...... with no documentation and produces something that I believe the client is what the client is after instead of producing any kind of documentation."*
Personal Approach	*P1.Pg9,L 200 "its just my amalgamation of techniques"* *P2. Pg2, L26-7 "The approach I always take - so I try to simplify the web tools or web package that I build to be most useable."* *P2.Pg4, L63-5 " So where as we refer to this process as a. methodology, from my experience it is a set of processes that you have to follow."* *P4.Pg2,L40-2 "but in the end it was what we needed at the time. Each project was so different form the previous that we were developing approaches that suited the project... no suited us."* *P1.Pg5,L100 "I [use] the design Approach I have in mind...then test it, get feedback on it & then do the next bit"* *P5.Pg2, L27-8 "Well its not exactly hard ... is it? I just read about it and started to develop my own way of doing things"* *P5.Pg3, L52-3 " often I simply took what they already had and did it properly."* *P5.Pg3, L66-7 " many of my systems are built from scratch with out previous systems to build on."* *P5.Pg3, L every customer wants something different and each time I learn something new.* *P5.Pg7, L181-3 "it depends on the problem I am trying to solve. I will use the way I know...... unless there is a problem I cannot solve and then I may try new ways of doing it"* *P3.Pg5, 1 106-8 "because our main purpose of our web site is marketing so I sat down and they said what they were looking for 'blah blah blah' what do you think we need to have, that was my starting point"*

	P3.Pg5, L115-118" I thought what do I think people need on the web site and then there was a lot of talk about navigation and you know making very sort of erm consistent throughout the website, they all wanted different things" *P3.Pg7 L165 [bespoke?] "Yes... yes"* *P3.Pg8 L186 "I came up with my own.".* *P6.Pg4, L72-77 "Well actually I create my own every time I speak to a client."* *P6.Pg6, L154-9 "Number one. The client satisfaction, always, because if they are paying for it they want to be able to use it, they must be happy with what they are paying for. Erm as regards to business approach I want to make sure that it was done time effectively and that the price is kept relatively low because we have spent less time doing it, while you want to make sure the quality is there because that potentially a portfolio piece that you want to show potential clients in the future".*
Agency	*P1Pg5,L105 "I have an Approach"* *P2.Pg4 ,L75-9 " if I allow them to be leading me , I know from previous experience, and this is again where it differs from academia, its like you're evolving your processes from experiences- usually bad ones- and then if you refer to that process and say 'no if I allow that customer to take me down that route at this point then I know I am going to encounter this problem'. I need them to follow me, I need then to follow this process."* *P4.Pg4, L76 "what I do know is that the way we work ... works for us"*
Need for flexibility	*P1.Pg10, L215-6 "..depending on the development project you will have different needs for development tools".* *P2.Pg14, L 251-4 "I have looked at creating a project plan before I have even started the web development process, not only so I can follow it but so the customer can follow it,..but they say 'yes I understand now why you cannot build it because I have not given you this information yet'"* *P2.Pg15, L 258-60 "If it was able to be customised so lets say this isn't exactly how you have to use it but we will enable you to pull elements of this methodology out which might be suited to how you want to work"* *P4.Pg3, L47-53 " some clients had no idea what they wanted and we had to use new techniques... some clients only had the vaguest idea who would be using their systems and so we had to design the system blind"* *P4.Pg4, L66-7 "we change our approach depending on the particular project and the work pressures at the time...."* *P4.Pg4, L83-4 "it is changeable, in that each project is different and so we bring on board the tools and techniques we need when we need them."* *P4.Pg6, L129 "each project... would need to be....* *... a flexible approach".* *P5.Pg1, L23 "every one was different each company wanted different things."*

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	P5.Pg3, L80-1 *"every customer wants something different and each time I learn something new."* P5.Pg7, L165-7 *" it all seems to change so fast the latest thing I am looking at is something called AJAX and I am not sure what it will do for me but if I can master it I will use it where I need to"* P3.Pg9, L186-7 *"I also basically think that when you take down a procedure it has to be fluid"*
Academia & Training.	P1.Pg12L251 *"Nothing in web development"* P2.Pg13, L225-9 *"There is a conflict in being taught a methodology and then going out into the real world not using any methodology and not seeing anyone who does use a methodology and thinking, well not what is the point of it because I know the point of it, but although I refer to it as different process its a layer of processes that you follow; they just don't seem to follow them"* P2.Pg 16, L288 *" things evolve whilst I am building it"* P4.Pg6, L143-4 [learn from] *"...the web, from my studies, from competitors…… from what clients have come across from the computing press……"* P5.Pg3, L89-94 *"From time to time when things are quiet I look around the web but…… ... I have heard of these agile approaches but it all seems like heavy going or common sense."* P5.Pg3, L *"I am either too busy knocking out a system or I am too bored t o investigate… besides ..... I find that I find what I need when I need it. Like the data base side I went ages before I needed to understand that and I am sure I only know a bit but I know what I need to know… if that makes sense."* P3.Pg4, L86-7 *"When I studied with the OU I touched in on the web side but I taught my self html"* P3.Pg8, L177-8 *"I basically went on the internet and I started off reviewing other sites and try to bring the best out of each. I also did a lot of research on our competitors".* P6.pg2, L26-32 *" I did a home study course when I was fifteen alongside my gcse's covering basic html and then I did an apprenticeship with a college during which I had experience with a web development company after finishing a course at college I did two years web development as a junior developer erm which consisted of mainly in-house web development projects. After that I did a university degree including one years work placement with a local web development company"*
Information Systems development	P1.Pg7,L159-60 *"The whole software engineering ethos is pretty well engrained in ..all that I do"*
Power & Control	P1.Pg9,L185 *"..the code itself is in my head so in that sense it leaves them [management] vulnerable"* P1.Pg7,L147-8 *"In a sense of..safe-guarding my ownership of the software I have neglected to document it as I ought"* P2.Pg L90-1 *"I have created my own documentation for myself. Never passed it onto someone else"* P2.Pg6 L97- *" I think what happens there is the customer*

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	then is taken aback when I say this is how it will be done. A lot of my process started really from let's say, payment, and how do you gain trust first of all because of people scamming customers. How do I gain trust? I will prove to you… this is what we are going to do. First of all, I will prove to you that I can set up a domain. I will set up your web site so that basically I say this is what I am going to do… That will prove to you that I can do what I say I can do. That I am capable of doing it."

Key:

P = Participant, Pg = Page, L = Line

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Appendix : 2 Internet surveys

<u>Version 1: of internet survey</u>
<u>Introductory screen:</u>

Title of Project: **Web development methodologies**

Name of Researcher: **R.M.Kinmond**

Researcher contact Details: **Email: R.M.Kinmond@staffs.ac.uk**

Tel: 00 44 (0) 1785 841203

Consent form:

Pressing the 'I agree' button will take you to the questionnaire and serve to confirm that you have read and understood the information sheet for the above study and have had the opportunity to ask questions. Also that you understand that your participation is voluntary and that you are free to withdraw at anytime without giving a reason without your legal rights being affected. Further that you understand that your data will be securely stored and where published will be unidentifiable with you as an individual. In addition your personal data will be destroyed should you choose to withdraw from the study.

I agree

Information sheet:

Study Title: Web Development

Thankyou for taking the time to look at this survey, below are a few details explaining what it is about and what Study background:

Structured approaches help to guide web developers in the process of constructing web systems. Little is known of the process by which web developers choose appropriate approaches, it is anticipated that the data gathered as part of this study will inform the web development community and serve to improve actual practise.

What is involved in the study?

You are requested to answer a series of web based questions regarding your background as a web developer and the methods that you currently use to develop web based information systems / applications. You are then invited to select from options those that best represent your reason for following your main methodology. The questionnaire should take about 15 minutes to complete

The study aims to gather data in order to understand the rationale behind web developers choice of approach for their development of web systems. It is anticipated that a framework will be be developed to assist web developers in choosing appropriate methodologies for their particular project.

What are the risks?

The data gathering procedure contain no known risks to participants

What are the benefits?

It is hoped to gain a greater understanding of selection procedures for web development methodologies. It is anticipated that publications resulting from this research will increase knowledge within the domain and promote further research and discussion

Will my personal data be kept confidential?

Names and addresses of participants will be kept confidential. The information we gather from this study will not be identifiable with an individual.

Can I change my mind and withdraw?

You may withdraw at anytime and request that your data be removed from the study

Objectives of the research:
1. To compare and contrast the literature on web based and traditional information systems (IS) in order to determine the differences between methods, tools and techniques used in the development of each type of system.
2. To contextualise the current status of web development based on data collected from a survey of web developers in a context of information from objective 1. These web developers being from appropriate web developers' forums.
3. To determine, using analysis of the data from the survey and supported by case study data, incorporating organisation data selected from suitable agreeing respondents to the initial survey, if web developers who claim to be following 'no methodology' are actually following a methodology without being aware of this.
4. To construct an analysis of the adoption of web methodology in a context of structuration theory (Giddens, 1984) in order to assess the integration of human agency and social structure in an evaluation of the social action behind web development
5. To design a framework in the context of objectives 1,2,3,4 to inform/guide the choice of web development methodology
6. To conduct a workshop evaluation of the framework involving a panel of experts, selected on a basis of expertise, impartiality and willingness to participate from the respondents agreeing to act as case studies and supplemented where appropriate with other respondents to the initial survey, reflecting on the impact the framework would have had on recent-past system developments.

If you have any questions about this study you can contact the researcher as detailed below:

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Version 1 Internet survey

Web Information Systems Development (WISD)

This survey is designed for web developers of all levels of experience/expertise.
The survey attempts to gather information to understand the following:

- **experience** levels of web developers maintaining and developing real web based systems;
- **methods** used to develop web based information systems;
- **rationale for selection of method**, as well as techniques and tools used

The responses from the survey will remain completely anonymous and the data will be used for academic research purposes. Once the study is completed, a report of the survey will be made public.

note: The term "methodology" or "method" is used interchangeably to define a systematic way of doing something. They reflect ways of working and controlling (such as processes) or ways of modelling (such as notation conventions or documentation) (Olle 1988)

Your level of experience:

Q1: What is the MAIN business of your organisation:

[Please Select ▾] ; [If other please specify]

Q2: How many people are employed in web development within your organisation?

[Please Select ▾]

Q3: How many employees are there within your organisation?

[Please Select ▾]

Q4: Which of the following best describes your main job function?

[Please Select ▾] ; [If other please specify here:]

Q5: What proportion (%) of your work is spent in Web based Information Systems (WIS) Development ?

[Select an option ▾]

Q6: How many years experience do you personally have in information systems development?

[Please select an option ▾]

Q7: How many years experience do you personally have in WEB based information systems development?

[Please select an option ▾]

Q8: Which one of the following best describes your assessment of your web development skills?

Please select an option ▾ If other please specify here:

Q9: Which one of the following best describes your education attainment level?

Please select an option ▾ If other please specify here:

Methodologies used for web development:

Q10: To what degree are you familiar with each of the following Web based Information Systems Development Methodologies ?
Please rate each as follows:
0: not heard of; 1: heard of; 2: familiar with; 3: used occasionally; 4: used extensively ; 5: use as main methodology.

0 ▾ SOHDM: Scenario-based Object-Oriented Hypermedia Design Methodology	0 ▾ WSDM : Web Site Design Method	
0 ▾ HFPM:Hypermedia Flexible Process Modeling	0 ▾ OOHDM: Object Oriented Hypermedia Design Model	
0 ▾ WebML:Web Modeling Language	0 ▾ NDT:Navigational Design Techniques	
0 ▾ W2000	0 ▾ RNA: Relationship- Navigational Analysis	
0 ▾ Design-driven Requirements Elicitation	0 ▾ UWE: UML-based Web Engineering	
0 ▾ Agile development		

Other: (please detail any other WISD methodologies you are familiar with followed by the level of familiarity 0-5)

Q11: How many Web-based Information Systems Development (WISD) methodologies
do you use in your work?   Please enter a number:

Q12: Which is the MAIN methodology that you use for WISD in your current organisation?

Select an option ▾

If Other please specify

Q13: Estimate to what degree you conform to the published recommended phases, tools and techniques for your main methodology

Select an option ▾

Q14: To what degree do you use each of the following web development tools and techniques in your
MAIN WISD methodology?   Please rate each as follows:
0: not heard of ; 1: not used; 2: tried to use; 3: used occasionally; 4: used extensively ; 5: always used

0 ▾ Interviewing	0 ▾ Templates	0 ▾ Questionnaire and check list
0 ▾ JAD : Joint Application Development	0 ▾ Scenarios	0 ▾ Terminology comparison
0 ▾ Brainstorming	0 ▾ Use Case modelling	0 ▾ Natural Language
0 ▾ Concept mapping	0 ▾ Formal description	0 ▾ Alias Glossary
0 ▾ Sketching and story boarding	0 ▾ Prototypes	0 ▾ Data dictionary
0 ▾ Reviews	0 ▾ Audit: results check	0 ▾ Traceability matrix
0 ▾ ER modelling	0 ▾ Dataflow diagramming	0 ▾ Normalisation
0 ▾ Rich pictures	0 ▾ CASE	0 ▾ Entity Life Histories
0 ▾ Effect correspondence diagrams	0 ▾ Structure charts	0 ▾ Walk through
0 ▾ Personas	Other please enter below	

Please detail here other tools and techniques you use in your main WISD, folowed by the degree of use:0-5).

Reasons for choosing main methodology:

Q15: How much impact do you feel each of the following has in your organisation's decision to implement a WISD methodology?

Sustainability of the method	Low	○	○	○	○	○	High
Scale of activity of the organisation in the area	Low	○	○	○	○	○	High
Cost base based on size of organisation	Low	○	○	○	○	○	High
Knowledge of organisation of method	Low	○	○	○	○	○	High
Organisations diversity of technical knowledge	Low	○	○	○	○	○	High
Diversity of organisations activity	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High

Q16: Reasons for choosing main methodology:

How important are each of the following in determining a choice of methodology within your organisation?

Presence of a product champion	Low	○	○	○	○	○	High
Strong top management support	Low	○	○	○	○	○	High
Level of personal IT expertise	Low	○	○	○	○	○	High
Perceived advantage	Low	○	○	○	○	○	High
Personal years within organisation	Low	○	○	○	○	○	High
Complexity of organisation	Low	○	○	○	○	○	High
Not currently having a methodology	Low	○	○	○	○	○	High
Optimism of fitting methodology to organisation	Low	○	○	○	○	○	High
A highly centralised organisation	Low	○	○	○	○	○	High
A highly formalised organisation	Low	○	○	○	○	○	High
Past experience	Low	○	○	○	○	○	High
Own trials	Low	○	○	○	○	○	High
Ease of use	Low	○	○	○	○	○	High
Learning by doing	Low	○	○	○	○	○	High
In-house standards	Low	○	○	○	○	○	High

In-house standards	Low	○	○	○	○	○	High
Industry standards	Low	○	○	○	○	○	High
Support from stake holders	Low	○	○	○	○	○	High
Technology advantage gained	Low	○	○	○	○	○	High
Prior experience	Low	○	○	○	○	○	High
Complexity of technology	Low	○	○	○	○	○	High
Level of compatibility	Low	○	○	○	○	○	High
Traditional approach	Low	○	○	○	○	○	High

Please detail below other factors and the degree of importance (1 low-5 high)

Q17: How important are each of the following in deciding on a WISD methodology?

Past experience	Low	○	○	○	○	○	High
Own trials	Low	○	○	○	○	○	High
Ease of use	Low	○	○	○	○	○	High
Learning by doing	Low	○	○	○	○	○	High
In-house standards	Low	○	○	○	○	○	High
Industry standards	Low	○	○	○	○	○	High
Support from stake holders	Low	○	○	○	○	○	High
Technology advantage gained	Low	○	○	○	○	○	High
Prior experience	Low	○	○	○	○	○	High
Complexity of technology	Low	○	○	○	○	○	High
Level of compatibility	Low	○	○	○	○	○	High
Traditional approach	Low	○	○	○	○	○	High
Degree of relevance	Low	○	○	○	○	○	High
Addresses a practical need	Low	○	○	○	○	○	High
Degree of usefulness	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High

Q18: How much influence were each of the following in bringing the methodology in to practise?

Percentage of web development work being done	Low	○	○	○	○	○	High
Your role in the development of web systems	Low	○	○	○	○	○	High
Your Age	Low	○	○	○	○	○	High
Years of experience	Low	○	○	○	○	○	High
Methods currently used	Low	○	○	○	○	○	High
Tools currently used	Low	○	○	○	○	○	High
Philosophy behind the methodology	Low	○	○	○	○	○	High
Methodology can be gradually introduced	Low	○	○	○	○	○	High
Approach is eclectic	Low	○	○	○	○	○	High
Approach is prescriptive	Low	○	○	○	○	○	High
Conforms with orgs current way of doing things	Low	○	○	○	○	○	High
Acts as an agent of change	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High
if other please specify:	Low	○	○	○	○	○	High

Q19: How strongly do you agree with the following statements?

	Very strongly agree	Agree	Neutral	Disagree	Very strongly disagree
Tools and techniques currently used for web development should determine the methodology chosen.	○	○	○	○	○
The methodology should determine the choice of tools and techniques used	○	○	○	○	○
The methodology should force conformity, everyone should be doing the same approach	○	○	○	○	○
The methodology should allow practices to evolve over time	○	○	○	○	○
The methodology should be in the form of an enabling framework and not too prescriptive	○	○	○	○	○

Please feel free to coment on the above statements.

Survey feedback

What is (are) the bad thing(s) about this survey?

☐ Too many questions
☐ Questions not clear
☐ Insufficient response options
☐ Multiple responses match asked questions
☐ Questionnaire design is poor

Any other comments that may improve the questionnaire design for others are most welcome:

If you are prepared to take part in a short interview concerning you approach to

web development methodologies please tick the appropriate box below and enter your contact email:

○ Yes, I am willing to take part in a short interview concerning my use of web development methods
  and I have entered my email address below.
○ No, I am not able to take part in a short interview concerning my use of web development methods.

Email address:

Thank you very much for taking part in this survey!

Submit the survey

References:

Olle, T.W. ,Hagelstein, J., Macdonald, I.G., Rolland, C., Sol, H.G, Van Assche, F.J.M. and Verrijn-Stuart, A.A. *Information Systems Methodologies: A frame work for understanding* , Addison-Wesley, Wokingham England, 1988

code generation to allow anonymous storage yet removal of data on request of respondent:

Thank you:

Many thanks for taking the time to answer the questionnaire.*

I would appreciate you mailing any web developer contacts you may have and asking them to also complete the questionnaire.

The code below may be emailed to myself requesting removal of your data from the study.

To assist you in this I suggest you save this webpage or take a note of this code:.
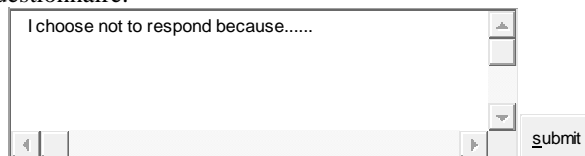
code:

Once again many thanks:

R.M.Kinmond:

email contact: **R.M.Kinmond@staffs.ac.uk**

* If you gave up on the questionnaire and chose not to submit your data this is considered a 'non-response'.
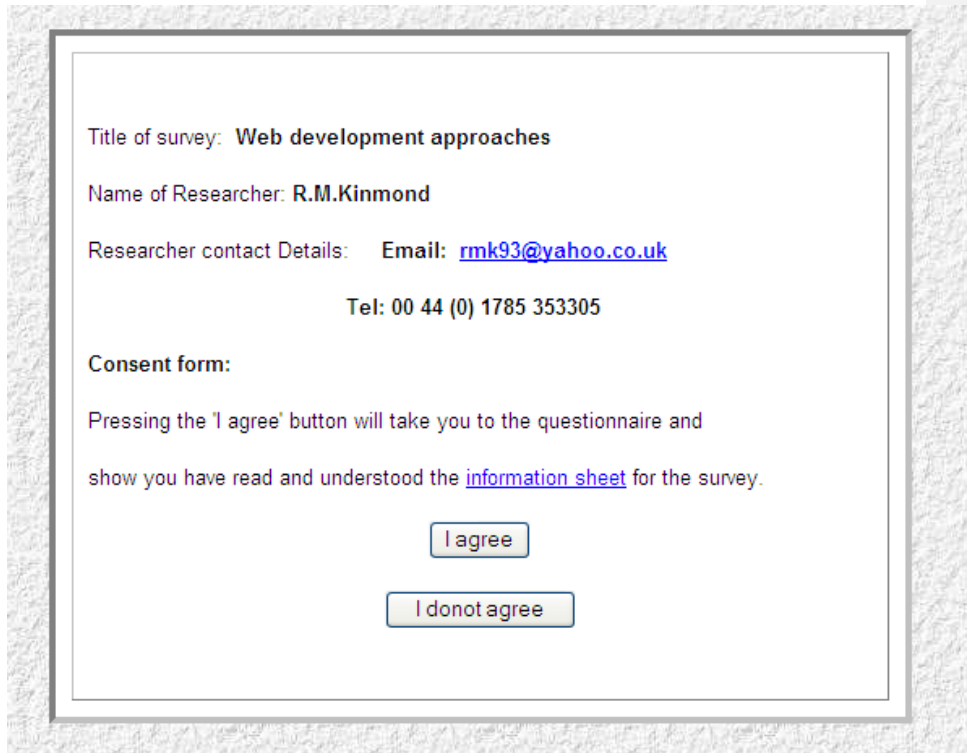 However, 'non-responses' can be very valuable to researchers in improving their research,
 would you be prepared to explain below why you choose to not submit not complete the questionnaire.

```
I choose not to respond because......
```
submit

Version 3: Introductory Sheet:

Title of survey: **Web development approaches**

Name of Researcher: **R.M.Kinmond**

Researcher contact Details: **Email: rmk93@yahoo.co.uk**

Tel: 00 44 (0) 1785 353305

Consent form:

Pressing the 'I agree' button will take you to the questionnaire and

show you have read and understood the information sheet for the survey.

I agree

I donot agree

Version 3: Information Sheet:

Information sheet: **Study Title: Web Development Approaches**

This survey is intended for all web developers whether you are a lone developer with little experience or a developer working at microsoft/google, your views are all important

There are no right answers just what you think. The survey is not a commercial enterprise, just simple research to gain a greater understanding of approaches to developing web systems.

All data will be kept anonymous, secure and confidential

You may withdraw at anytime and request that your data be removed from the study

> Goto the questionnaire.

If you have any questions about this study you can contact me at:

rmk93@yahoo.co.uk

Version 3: Questionnaire: Page 1

Web Development

First I need to know a little about your experiences of web systems development.

   Q1: What is your personal experience in web development ?

Your business area	Please select	If other please specify here
How web developers employed where you work	Please select an option	
Your job	Please Select	If other please specify here:
How many years have you been a web developer?	Please select an option	
Where are you working?	Select Country	If other please specify here:

> Continue

> Quit

Version 3: Questionnaire: Page 2

Web Development   screen 2 of 3

Q2: Do you use any of the following web development tools and techniques in your MAIN web development approach?

Please rate each as follows: 0: not heard of ; 1: never used; 2: used occasionally; 3: used extensively

[0 ▼] Interviewing   [0 ▼] Personas   [0 ▼] Scenarios

[0 ▼] Joint Application Development   [0 ▼] Rich pictures   [0 ▼] Dataflow diagramming

[0 ▼] Brainstorming   [0 ▼] Use Case modelling   [0 ▼] Reviews

[0 ▼] Sketching/ and story boarding   [0 ▼] Prototypes   [0 ▼] ER modelling

Please detail here other tools and techniques you use in your main web development approach, followed by the degree of use:(0-3).

[   ]

Q3:   Please list any web development approaches / methodologies you have heard of. (eg WISDM)

[   ]

[   ]

[   ]

[   ]

Which is the MAIN web development approach / methodology you use?

[   ]

[Continue]

\>

[Quit]

Version 3: Internet survey: Page 3

Web Development   screen 3 of 3

Q5: How important were the following to the choice of approach for developing web systems ?

	Low						High
Top management were very keen on this way of developing systems	Low	○	○	○	○	○	High
I thought this approach would work well within the organisation	Low	○	○	○	○	○	High
The organisation gained lots of advantages in following this approach	Low	○	○	○	○	○	High
I was able to use familiar technology/tools to support this	Low	○	○	○	○	○	High
The organisation has established formal procedures for web systems development	Low	○	○	○	○	○	High
My past experience of using this approach	Low	○	○	○	○	○	High
The organisation has to follow the Industry standards	Low	○	○	○	○	○	High
The approach decided all the tools and procedures to use	Low	○	○	○	○	○	High
The approach should allow me to choose my own tools and procedures	Low	○	○	○	○	○	High

What other factors do you consider important in choosing your approach to developing web systems?

Q6. Where did you learn of the web development approach you follow?

Finish

Version 3: internet survey: Page 4

Thank you:

Many thanks for looking at this questionnaire.*

I would appreciate you mailing any web developer contacts you may have and asking them to also complete the questionnaire.

The code below may be emailed to myself requesting removal of your data from the study.

code:

Once again many thanks:

rmk

email contact: rmk93@yahoo.co.uk

>
* If you gave up on the questionnaire and chose not to submit your data this is considered a 'non-response'.
However, 'non-responses' can be very valuable to researchers in improving their research.
would you be prepared to explain below why you choose to not submit not complete the questionnaire.

```
I choose not to respond because......
```

Finish