A critical review on the reporting of surveys in transdisciplinary research: A case study in Information Systems

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Abstract

Variability of goals and evolving research methodologies are fundamental characteristics of transdisciplinary research. This integration of research strategies from different fields complicates the evaluation of transdisciplinary research since the variability of goals drives variability of criteria and quality indicators. The aim of this research is to investigate the implications of using research methods across disciplinary boundaries by drilling down into the use of one research strategy in one research context (Information Systems) and a related sub-context (Human-Computer Interaction). Surveys with questionnaires as data-capturing tools were selected as an established research method which is widely used in transdisciplinary research. Questionnaires are one of the most established data capturing tools and yet the validity of questionnaire-based findings have often been questioned. The main problem areas have been identified as the sampling of the data, the questionnaire design and the interpretation of the results. This paper looks into questionnaire reporting practices - an essential determinant in the validity and reliability of survey-based research. The field of Information Systems and Human-Computer Interaction has been chosen as the research context. Information Systems research is by nature interdisciplinary in focusing on social and organisational issues regarding the development and use of software in organisations. Human-Computer Interaction studies address the challenges of making computers and computations useful, usable, and universally accessible to humans. Both Information Systems and Human-Computer Interaction studies address complex, heterogeneous, real-world problems, thereby meeting the first criteria to be classified as transdisciplinary research. The research design entails document analysis of papers presented at conferences in Computer Science and Information Systems over a three-year period to identify trends in the reporting of survey results, especially the questionnaire design.

Transdisciplinary research methodology facilitates the application of research methods across fields. However, if the constraints of the method are not recognised the validity of the results may be compromised in a plethora of ways. While fusion of methods are encouraged on a theoretical level in transdisciplinary research the findings of this study are a warning about the dangers of interdisciplinary application of research strategies without due diligence in observing best practices in the parent discipline. The paper aims to advance the discussion on research design and practice beyond disciplinary research and should be of interest to researchers and practitioners who deal with multidisciplinary, interdisciplinary, and transdisciplinary research.

Keywords: transdisciplinary, interdisciplinary, multidisciplinary, questionnaire design.

Disciplines: Research methodology, Information Systems, Human-Computer Interaction Studies.

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1.   Introduction

The world of working and living relies on collaboration, creativity, definition and framing of problems which require dealing with uncertainty, change, and intelligence that are distributed across cultures, disciplines and tools (Derry and Fischer 2005). Furthermore, "inventions tend to occur when unrelated areas, ideas or forms come together in unexpected ways" (De Beer 2007:233). This entails the disjunction of conventions and the use of concepts from diverse fields that enable us to relate any specific field to its world outside. The changing research landscape calls for the development and broader application of research practices that differ from the "generalising, decontextualising and reductionist" approach that has conventionally characterised disciplinary approaches to knowledge generation (Wickson, Carew and Russel 2006:1047). The need for theorised connections between the different disciplines is expressed in the emergence of the interdisciplinary, multidisciplinary and transdisciplinary research fields.

Disciplinarity, multidisciplinarity, interdisciplinarity and transdisciplinarity are like four arrows shot from a single bow: knowledge (Nicolescu 2005). These arrows fit snugly into the metaphorical bow, but what happens when they are shot into the research world and how should the methodologies be applied in interdisciplinary and transdisciplinary studies so that their inherent constraints are acknowledged?

Multidisciplinary research involves low levels of collaboration and does not challenge the structure or functioning or best practices of academic communities (Bruce, Lyall, Tait and Williams 2004). However, the evaluation of interdisciplinary and transdisciplinary research is complex as more than one discipline, profession and field are involved (Klein 2008) and this complexity may harbour unobtrusive dangers of misapplication which provides the rationale for this study.

The purpose of this paper is to investigate the implication of applying data capturing, analysis and reporting methods across disciplines for the validity of interdisciplinary and transdisciplinary research. The focus is on the use of questionnaires as one instance of applying a commonly used research instrument in interdisciplinary and transdisciplinary research, and evidence is provided to show how the practices differ between disciplines. This raises questions on how to preserve best practices across disciplines where the basic assumptions about knowledge are different. Arguably, while it is not possible to maintain the same best practices across disciplines one has to consider the implications and possible trade-offs for the validity of the methods involved. While research methods may seem transferrable on a philosophical level it requires caution to implement when observing best practices in conducting the research.

The unit of analysis is the reporting on questionnaire-driven surveys in Information Systems and Human-Computer Interaction research. The data was captured through a document analysis on the proceedings of a leading, annual South African conference in Computer Science and Information Systems research, namely the conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT). The scope was limited to evaluating the reporting on questionnaire-based findings in Information Systems and Human-Computer Interaction articles from 2008 to 2010.

The rest of the paper is organised as follows: In Section 2 a brief literature review of the basic differences between the disciplines of multidisciplinarity, interdisciplinarity, and transdisciplinarity is provided with more detail on the characteristics and challenges of

transdisciplinary research. In Section 3 the questionnaire as data-capturing tool is discussed, as well as the context of the study, namely the fields of Information Systems and Human-Computer Interaction research. In Section 4 the research design is explicated and results from the document analysis are presented. The findings are discussed in Section 5. Section 6 concludes with overall findings and the implications for transdisciplinary research.

2.   Review of transdisciplinary research

The definitions of the different approaches, namely multidisciplinary, interdisciplinary and transdisciplinary research are now discussed to clarify the theoretical assumptions underlying this study and explicate the definitions as a point of conceptual departure.

- Multidisciplinary research approaches a research topic from several disciplines at the same time (Bruce et al. 2004; Nicolescu 2005). For example, a painting by Leonardo da Vinci can be studied from the context of art, the context of art history and the context of religion at the same time. The perspectives of several disciplines may be used to enrich the study in service of the home (central) discipline but the goal remains limited to the framework of disciplinary research epistemology. Multidisciplinary research tends to retain disciplinary autonomy and is characterised by the unintegrated application of more than one disciplinary methodology (Wickson et al. 2006). This self-contained manner allows little cross-fertilisation among disciplines or synergy in the outcomes (Bruce et al. 2004).
- Interdisciplinary research similarly approaches the issue from a range of disciplines but allows the transfer of methods from one discipline to another. The contributions from the various disciplines are integrated to provide a holistic outcome (Bruce et al. 2004). Nicolescu (2005) distinguishes three degrees of interdisciplinarity, namely:
    - degree of application where the methods of one discipline are transferred to another for example using chemistry to develop new medicines;
    - epistemological degree where the methods of one discipline are transferred to another on the ontological level, for example the use of formal logic in the area of general law;
    - degree of the generation of new disciplines where the methods from one discipline are transferred to another to create new theories that transcend the parent disciplines. For example, transferring mathematical methods to meteorological phenomena to generate chaos theory.
- Transdisciplinary research defines a new mode of science different form multi- or interdisciplinary research (Walter, Wiek & Scholtz 2007) that focuses on the organisation of knowledge around complex, heterogeneous domains rather than disciplines and subjects (Bruce et al. 2004). Transdisciplinary research transcends separate disciplinary perspectives towards the epistemological goal of the production of new, broad *in vivo* knowledge of a particular phenomenon (Nicolescu 2005; Klein 2008).

Towards a better understanding of the concept of *in vivo* knowledge, Nicolescu compares it with disciplinary *in vitro* knowledge as depicted in Table 1.

Table 1. Comparison between disciplinary knowledge and transdisciplinary knowledge (Nicolescu 2005)	
disciplinary knowledge (*in vitro*)	transdisciplinary knowledge (*in vivo*)
external world-object	correspondence between external world (object) and internal world (subject)
knowledge	understanding
analytic intelligence	new type of intelligence - harmony between mind, feelings and body
oriented towards power and possession	oriented towards astonishment and sharing
binary logic	middle logic included
exclusion of values	inclusion of values

Gorman proposed a four-level knowledge classification framework, consisting of declarative knowledge (what), procedural knowledge (how), judgement knowledge (when) and wisdom (why). Relating this to *in vivo* knowledge, it seems that *in vivo* knowledge includes all four levels with the added dimension of values. This is in agreement with Nicolescu (2005) who argues that transdisciplinary research is distinct from disciplinary research, while being complementary in the sense that transdisciplinary knowledge concerns the correspondence between the external world of the object and the internal world of the subject.

Wickson et al. (2006) argue for the theorisation of transdisciplinarity towards defining and recognising the approach as distinct from the more accustomed cross-disciplinary approaches of multi-disciplinarity and interdisciplinarity. Furthermore, it provides the opportunity to discuss processes and outcomes unique to this approach and identifies barriers to the diffusion of transdisciplinary research. Focusing on the characteristics of transdisciplinary research, Wickson (2006) proposes problem focus, evolving methodology and collaboration as essential to the definition of transdisciplinary research. Each of these will now be considered in more detail:

- Problem focus: Transdisciplinary research is performed with the explicit intent to engage and solve complex, multidimensional problems that manifest in the real world and are not confined by the boundaries of a single disciplinary framework (Wickson et al. 2006; Walter et al. 2007). While TD research does not deny or avoid the conceptual, philosophical and theoretical dimensions of the problems researched the starting point is the actual real-world problem.
- Evolving methodology: There is broad agreement in the literature that there can be no single prescribed methodology for TD research (Bruce et al. 2004). Transdisciplinarity is characterised by an interpenetration of epistemologies in the development of methodology, thus the dissolution of disciplinary boundaries is a precondition for the construction of novel methodologies tailored to the problem and its context (Wickson et al. 2006).
- Collaboration: Accepting the previous two characteristics, namely that transdisciplinary research is focused on complex, heterogeneous and multidimensional real-world problems and involves the development of a shared and evolving methodology that has fused different disciplinary approaches, collaboration becomes inevitable.

Klein (2008) proposes a set of seven criteria for the evaluation of transdisciplinary research. These criteria reflect the characteristics concerning the goal, the methodology, collaboration and integration as explicated, but expand on these from an evaluation perspective to include variability of criteria and indicators, leveraging of integration, iteration, effectiveness and impact. Variability of goals drives variability of criteria and indicators of quality information (Creswell 2009), therefore the variability of criteria and indicators common to transdiscilpinary research (Klein 2008) has the potential to create tensions between disciplines, as practices for ensuring validity and reliability are dependent on these criteria.

In summary, it can be said that there is agreement on the goals of transdisciplinary research and on the need for collaboration in reaching these goals. The evolving methodological has been addressed on a theoretical level (Wickson et al. 2006) but how methodological construction plays out on the implementation level and what the challenges are, has not been discussed and explained to the same degree. This is necessary and important as disparity in best practices may affect the rigour of the research findings. The next section overviews fundamental constructs in the conduction of the study, namely the questionnaire as data-capturing tool and Information Systems and Human-Computer Interaction as the field of research.

3. Research context explained

The focus of this study is to investigate the transdisciplinary application of research methods by considering the use of questionnaires as research instruments in the field of Information Systems and Human-Computer Interaction. The questionnaire as data-capturing tool is now discussed. The survey as research strategy with the questionnaire as data-capturing instrument (or tool) is one of the most established and widely used research strategies across disciplines. Questionnaires are not required when measuring non-human characteristics (Olivier 2004) but given the importance of the societal context in both IS and HCI, this study focuses on questionnaire-driven surveys. This familiarity with the use of questionnaires may create complacency not conducive to rigour. Therefore it is necessary to review questionnaires as data-capturing tool (Section 3.1) before we can investigate how they are applied in IS and HCI research (Section 4). In section 3.2 the context of the research, namely the field of Information Systems and Human-Computer Interaction research, is discussed to justify the selection of the research context.

3.1 Questionnaires as data-capturing tool

Surveys are one of the most commonly used research methods across all fields of research (Lazar and Feng 2010). Survey research provides a quantitative description of trends, attitudes and opinions of a population by studying a sample of that population (Creswell 2009). The terms 'surveys' and 'questionnaires' are sometimes used interchangeably, but to be more concise the term *survey* refers to the technique or method used (Creswell 2009) whereas the term *questionnaire* relates to the actual list of questions (Oates 2006). A questionnaire is a purposely defined, structured and well-written set of questions to which an individual is asked to respond.

Surveys using questionnaires as data-capturing instruments may look easy, but inferior data, erroneous conclusions and costly mistakes are the results of underestimating the complexity of surveys (Mouton 2001; Wilson 2007). Olivier (2004) identifies three aspects of surveys

that often contain pitfalls: sampling the data, designing the questionnaire and applying the results.

Oates (2006) supports the importance of questionnaire design by stating that the quality of the information obtained by a questionnaire is directly proportional to the quality of the questionnaire design. Various guidelines for questionnaire design are available and can be consulted for regulating content, organisation, clarity, conciseness and style (Mouton 2001). An in-depth discussion of questionnaire design guidelines is beyond the scope of this study. However, a brief reflection on questionnaire design and selection is required to provide evidence that questionnaire design, selection and evaluation are not trivial and should be given due consideration in assessing the validity and reliability of research results.

3.1.1. Questionnaire Design
Questionnaire design is influenced by the issues of question order, content and format. Each of these constructs is explained in more detail below.

Question order refers to the effect prior questions can have on responses. Note the following regarding question order (Mouton 2001; Brace 2004; Olivier 2004; Willis 2005):

- Start with general questions relating to the topic and progress to the more specific or detailed subject matter.
- Behavioural questions should be asked before attitudinal questions on the same subject.
- Avoid prompting for information or priming. The consistency effect is a particular type of priming which occurs because respondents are led along a particular route of responses to a conclusion that they can answer in only one way if they are to appear consistent.
- Funnelling sequences can be used to take respondents from general questions through to more specific questions on a topic, without allowing earlier questions to condition or bias the responses to the later ones.
- When given a list of alternatives, the order of the items may have an effect on their selection. Respondents tend to give more weight to the first-mentioned aspect (primacy effect) or the last- mentioned aspect (recentness effect) than those in the middle. Rotating or randomising the questions is a way of spreading bias across the statements more evenly although it is not completely eliminated.

Question content refers to the question and the language used to phrase the question. The guidelines below need to be considered when designing questionnaire items (Mouton 2001; Oates 2006; Lazar and Feng 2010):

- The wording has to be brief, unambiguous, unbiased, specific and objective.
- Double-barrelled questions that combine two or more questions in one statement should be decomposed into separate questions.
- Avoid double negatives when asking people to agree or disagree with a statement.
- Avoid sensitive or potentially threatening questions that could conflict with accepted ethical research practices.

Question response formats refer to the structure of the response. Questionnaire responses can be structured as a series of choices or the opportunity to create a new response. Questions are divided into open-ended (open response) and closed-ended (fixed response) response formats.

The response format of survey questions depends on the information required (Lazar and Feng 2010). Open-response items are used to capture new information and gain insight whereas appropriately structured fixed-response format responses are required for statistical analysis. Both formats have their advantages and limitations (Mouton 2001; Lazar and Feng 2010).

Apart from item order, content and format it is also necessary to consider the number of items in the questionnaire. In general, small samples are inadequate for statistical methods because results from small samples tend to be statistically unstable due to sampling error (Field and Hoyle 2005). There should be at least one subject (user) for each item on a questionnaire (Kline, Seffah, Javahery, Donayee, Rilling 2002). For example, if a questionnaire has 30 items, a sample of at least 30 subjects is needed in order to place confidence in the stability of the results. Obviously the questionnaire is necessary to judge the item order, content, format and the correspondence between the number of participants and the questionnaire design. It is common best practice to state the number of participants and thus the same diligence would be expected in stating the questionnaire design.

3.1.2 Implications for research design

In the selection of research instruments or tools, the criteria of reliability, relevance and validity have to be considered. These criteria can be described as follows (Mouton 2001; Field 2003; Field and Hoyle 2005):

- Reliability is described as the ability of the method to produce the same results under the same conditions.
- Relevance refers to the need to ensure that the instrument can be applied in the intended context of use.
- Validity is the ability of the research method to measure what it is designed to measure and this can be differentiated into content validity and criterion validity:
  - Content validity: does the questionnaire relate to the construct being measured?
  - Criterion validity: does the questionnaire measure what it is supposed to measure when compared with real-life observations?

Reliability and validity, jointly called the 'psychometric properties' of measurement scales, are the yardsticks against which the adequacy and accuracy of our measurement procedures are evaluated in scientific research (Bhattacherjee 2011). Having established that questionnaire design is not trivial and unquestionably important in judging the validity of the information obtained in a survey it follows that the questionnaire should be presented in a verifiable way as a fundamental part of the evidence.

In both IS and HCI research, methods from more mature fields like psychology are adopted and adapted in some cases. Wenger and Spyrdakis (1989) warn against a tendency in Information Systems (and by inference HCI) to adopt methods for descriptive and experimental work from social sciences without due consideration of the constraints of the methods. The adoption of questionnaire-driven surveys from psychology without due diligence regarding the selection of questionnaires and transparency regarding questionnaire-related information may be one of these examples. Non-reporting of questionnaire design makes it impossible to validate the instrument upon which the findings are based. The questionnaire information can be made accessible by providing the actual questionnaire, a link to the questionnaire or the name of the questionnaire in the case of standardised

questionnaires. The argument may arise that providing the questionnaire is less important in qualitative research, and this argument will be addressed in more detail in Section 5, but the fact that it could support the validity of the research is difficult to dispute. The investigation in the next section looks into questionnaire reporting in the field of Computer Science, Information Systems and Human-Computer Interaction towards understanding the paradigms underlying the research approaches and showing that most studies in those fields can be classified as transdisciplinary research.

3.2. Information Systems and Human-Computer Interaction

Computer Science and Information Systems are classified under the umbrella definition of *Computing* where *Computing* refers to any goal-oriented activity requiring, benefiting from, or creating computers (ACM/IEEE 2005). Computer science is the study of the theoretical foundations of information and computation and of practical techniques for their implementation and application in computer systems (Denning & Comer 1989). Computer Scientists invent algorithmic processes that create, describe, and transform information and formulate suitable abstractions to design and model complex systems. Information Systems developed out of the need to bridge the gap between business management and Computer Science towards an evolving new scientific area of study (Hoganson 2001).

Information systems are implemented within an organization for the purpose of improving the effectiveness and efficiency of that organization (Silver and Markus 1995). The capabilities of the information system and characteristics of the organization, the work systems, people, and development and implementation methodologies together determine the extent to which that purpose will be achieved. On a theoretical level, the discipline of Information Systems (IS) is seen as an interdisciplinary science (Kroeze 2009) that focuses mainly on social and managerial aspects regarding the development and use of software in organisations (Oates 2006).

By the end of the 1990s, computers became integral parts of the work environment and are used by people at all levels of the organization (ACM/IEEE 2005). The expanded role of computers made more information available to organizations, the problems of managing information became extremely complex and the challenges of making proper use of information and technology to support organizational efficiency and effectiveness became crucial issues. The challenges faced by information systems specialists grew in size, complexity and importance and forced a rethink of the boundaries and methodologies used in Information Systems, i.e. interdisciplinary and transdisciplinary research became relevant (Mingers 2001; Porto de Albuquerque & Simon 2007; Porto de Albuquerque, Simon Wahoff & Rolf 2009). IS research concerns the interplay between information and communication technologies and the organisational and societal contexts in which these technologies are used (Porto de Albuquerque et al. 2009). The research philosophies in IS include the positivist, interpretive and critical (Olivier 2004).

The other field of interest here is Human-Computer Interaction (HCI) which falls under both Computer Science and Information Systems or one of the two disciplines, depending on the research problem. HCI focuses on the challenges in making computers and computations useful, usable, and universally accessible to humans (ACM/HCI 2009). HCI can be defined as the study of people, computer technology, and the ways these influence each other,

subsequently HCI involves the design, implementation and evaluation of interactive systems in the context of the user's task and work (Dix & Finlay 2004).

The field of HCI is multidisciplinary since it has emerged from an interaction between Computer Science, the behavioural sciences and design science (Plimmer 2005). Given the focus on user needs, initially on the individual user and later on the needs of societies of users, HCI research now stretches beyond the boundaries of Computer Science and IS disciplines to include issues from psychology, sociology and marketing research. Table 2 depicts a comparison of IS and HCI research against the main transdisciplinary research criteria.

Table 2: Evaluating IS and HCI against the criteria for transdisciplinary research		
Transdisciplinary research	IS research	HCI research
Problem focus		
Complex, multidimensional problems that manifest in the real world and are not confined by the boundaries of a single disciplinary framework (Wickson et al. 2006; Walter et al. 2007).	Proper use of information and technology to support organizational effectiveness and efficiency (Mingers 2001; Oates 2006; Porto de Albuquerque et al. 2009).	Initially focused on the optimisation of systems but evolved to include the various HCI factors involved and prioritise the factors for different user groups to make informed trade-offs (Dix and Finlay 2004; Lazar and Feng 2010).
Methodology		
Evolving methodology: No single prescribed methodology for TD research (Bruce et al. 2004).	Qualitative, Quantitative, and Mixed Methods Approaches (Oates 2006).	Qualitative, Quantitative, and Mixed Methods Approaches (Lazar and Feng 2010).
Collaboration		
Collaboration between stakeholders and disciplinary approaches.	Dependent on the collaboration of users, system administrators and management.	Trade-offs between multiple stakeholders (Lazar and Feng 2010) like users, usability practitioners, system designers and administrators.

Based on the comparison of the goals, methods and stakeholder involvement depicted in Table 2 it is concluded that both IS and HCI research have the general characteristics of transdisciplinary research. This does not mean that pure disciplinary research is not conducted in these disciplines but justifies the decision to consider research studies from these two fields when investigating transdisciplinary research.

4.   Research design

The investigation now looks at questionnaire design reporting in the field of IS and HCI. The conference proceedings of the South African Institute for Computer Scientists and Information Technologists (SAICSIT) was chosen for the document analysis as it is a well-known, reputable conference that attracts a wide audience of Computer Scientists and Information Technologists from across South Africa. The conference is held annually and the 2008, 2009 and 2010 proceedings were analysed. The papers were reviewed by an average of three reviewers each and the acceptance rate diminished from 41% in 2009 to 37% in 2010 which attests to the popularity and high standard of the conference. The research

philosophies include positivist, interpretive and critical approaches, using quantitative, qualitative and mixed methods research with the associated range of data-collection methods. The data-capturing methods include observation, recordings, interviews, surveys and the use of secondary data.

The following universities and institutions were represented in the 2008, 2009 and 2010 SAICSIT proceedings: Council for Scientific and Industrial Research; Nelson Mandela Metropolitan University; University of Cape Town; University of the Western Cape; Rhodes University; University of Fort Hare; University of the Witwatersrand; Tshwane University of Technology; University of South Africa; North-West University and the University of Pretoria. The wide coverage of South African research institutions bears evidence that SAICSIT is a representative conference of the South African research landscape in Computer Science and Information Systems research. Section 4.1 explains the document analysis procedure followed while the results and findings are presented in section 4.2.

4.1 Document analysis

To investigate the reporting of questionnaire-related information, document analysis was done on the SAICSIT proceedings of 2008, 2009 and 2010. The proceedings were analysed by searching for the words 'survey' and 'questionnaire' in the peer-reviewed, full research papers, and, where found, the papers were further analysed to see if the study was in IS or HCI and furthermore if a questionnaire was used in the data-capturing. Obviously a paper could include the term 'questionnaire' without involving questionnaires as a data-capturing tool. The studies where questionnaires were used were then reviewed for providing information that made it possible to evaluate the questionnaire. This meant providing the actual questionnaire, an electronic link to the questionnaire or the name of the questionnaire in the case of standardised questionnaires. To preserve anonymity the actual titles of the articles cannot be published but most studies involve the testing of an information system in a specific context with a specific user group. A possible limitation is that different kinds of questionnaires were involved, comprehensive questionnaires that formed the basis of the study, post-test questionnaires administered after usability testing in HCI and one case of a questionnaire used in an interview. As the questionnaire was used as data-capturing tool there is no reason why it should not comply with the requirements for questionnaire design and be seen to apply with the requirements. The results are presented and discussed in Section 4.2.

4.2 Results

Table 3 depicts findings on the reporting of questionnaire-related information. From observation of the document analysis findings in Table 3 it is clear that overall 68% of the surveys omitted questionnaire-related information. The questionnaire reporting seemed to improve in 2010 but the sample is too small to make any predictions or generalisations. This leads to the conclusion that questionnaire design information was not reported adequately to allow assessment of the validity of the findings based on that questionnaire. Therefore the issue warrants further investigation and discussion.

Table 3: Questionnaire reporting in SAICST proceedings 2008-2010				
Year	Number of papers	Number of papers using surveys	Number of papers including the questionnaire or questionnaire-related information	Papers omitting questionnaire-related information
2008	33	13	4	69%
2009	23	4	1	75%
2010	37	15	6	60%
Overall	93	32	12	68%

In all the questionnaire related literature there is no argument to be found against the importance of questionnaire design. However, the findings show that the reporting of questionnaire design has not received the same prominence in all the papers and that could influence the validity of the survey findings.

5.   Discussion

Towards contextualising these findings in transdisciplinary research it can be argued that the questionnaire design may have less significance in qualitative research where the researcher's interpretation and selection of the significant results for reporting play a bigger role (Creswell 2009). In mixed methods research there are often elements of the constructivist paradigm associated with qualitative research approaches where understanding or meaning of phenomena is constructed through interactive participation of subjects giving their personal thoughts, feelings, experiences and their subjective views (Creswell and Plano Clark 2011). Walsham (1993) supports the argument by stating that interpretive methods of research start from the position that our knowledge of reality, including the domain of human action, is a social construction by human actors, therefore, the knower and the known are interactive and inseparable. In contrast to the assumptions of positivist science there is thus no objective reality which can be discovered by researchers and replicated by other researchers. Surveys are mostly associated with the philosophical paradigm of positivism but can also be used with interpretive and critical research (Creswell 2009) and this allows us to consider best practices concerning the use of the same data-capturing tool in different paradigms.

There is less focus on explicating the research instrument in other qualitative methods such as interviews and focus groups and it could be argued that the researcher should be trusted on using the questionnaire as well. Recognising the researcher's subjective involvement may mitigate the necessity of reporting the questionnaire design to some extent but omitting the questionnaire design disallows the opportunity for scrutiny that can add validity to the findings. Applied to the instance under investigation, this argument may motivate more freedom for the researcher to deviate from the structured questionnaire. It is important to distinguish if the non-reporting of questionnaire design points to the interpenetration of epistemologies in the development of a transdisciplinary methodology or simply a practice.

Although repeatability is mostly not feasible when using human subjects the availability of the questionnaire is an important resource for other researchers. Furthermore, omitting questionnaire-related information does not add to the usefulness, relevance, reliability or validity of the research in any way. Given the limits on word count, it may be necessary to put the questionnaire on a website and provide only the link in the article. This additional effort is surely warranted in supporting the validity of the paper and the publication.

Given the absence of arguments against providing the questionnaire design, the identified trend of non-reporting it seems more like a matter of changing practice. The tendency warrants further information as it resonates with an earlier warning that researchers tend to adopt methods from social sciences without due consideration of the constraints of the methods (Wegner and Spyridakis 1989).

6.   Conclusion

Questionnaire-driven surveys are used in disciplinary, interdisciplinary and transdisciplinary research involving both quantitative and qualitative approaches. Asking useful questions to get usable responses is an integral part of evaluation in Information Systems (IS) and Human-Computer Interaction (HCI) research but the complexity of questionnaire design is often underestimated (Wilson 2007). This study investigated questionnaire design and reporting in the field of IS and HCI. A document analysis of the SAICSIT papers from 2008 to 2010 showed that on average 68% of the studies using a survey omitted the questionnaire design information. This finding indicates variability on the issue of reporting questionnaire design information. The fact that this analysis was done at a prestigious conference with double blind peer-review points to a trend in research practices rather than the omission of a few authors or the oversight of a few reviewers. The validity of a survey is influenced by the design of the questionnaire including the questionnaire items, the formulation, structuring and presentation of the items. Therefore the questionnaire is required to ascertain the validity of the survey and essentially the validity of the findings of the research. This can be accomplished by providing the actual questionnaire, a link to the questionnaire or the name of the questionnaire in the case of standardised questionnaires.

The main research question concerned the application of methodologies in interdisciplinary and transdisciplinary studies to allow the dissolution of disciplinary boundaries while adhering to the method's inherent constraints. The findings indicate that certain practices, for example questionnaire reporting, may vary between different fields and even within the same field. However, transdisciplinary application of methodologies should be done mindful of the constraints defined in the discipline of origin as those constraints ensure the rigour of the method. The diffusion of paradigms and methods should not be allowed to influence best practices especially when there is no epistemological rationale for changing the practice. The findings cannot be generalised beyond the field of Information Systems and Human-Computer Interaction and more research is needed to investigate the practice of reporting questionnaire-related information. Surveys are a basic research strategy in transdisciplinary research; understanding best practices in questionnaire design, selection and reporting is essential to serve the transdisciplinary goal of understanding and applying science beyond the confines of single disciplines.

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