

An Examination of Information Systems Development Methodologies Research in Australia

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Abstract. This paper assesses the current state of Information Systems Development Methodologies (ISDM) research in Australia, in what Avison and Fitzgerald (2003) refer to as ‘the post methodology era’. In doing so, it revisits the seminal work of Wynekoop and Russo (1997) by identifying and classifying a sample of Australian-based ISDM research, according to their research purpose and research method. It also proposes extensions to these classifications to include an examination of ontological domains and knowledge areas. This sample, drawing from a number of high-quality journals, conferences, and electronic sources, highlights a number of key issues of interest to ISDM researchers. A discussion of these issues, along with an outline for future research efforts, is provided.

Keywords: information systems development methodologies, ISDM, Australia, review

1 Introduction

Information Systems Development Methodologies (ISDMs) have been in use by practitioners and studied by researchers since the 1980s. Avison and Fitzgerald's 2003 paper in the *Communications of the ACM* (Avison and Fitzgerald 2003b) posed the question "Where now for Development Methodologies?" and discussed the possibility of a "... post-methodology era starting in the late 1990s (p. 80)". This post-methodology era is:

Characterised by a serious reappraisal by researchers and practitioners alike of the concepts and usefulness of the earlier methodologies. As a result, some organizations continue to turn to yet different (perhaps newer) methodologies and approaches, while others have abandoned methodologies altogether. (p. 80)

Recent shifts in IS development have focussed on web based IS development including portal and intranet development. Besides new methodologies, such as Multiview 2 (Avison et al. 1998), Web Information System Development Method (WISDM) (Vidgen et al. 2002), Relationship Management Methodology (RMM) (Isakowitz et al. 1995), Object Oriented Hypermedia Design Method (OOHD) (Schwabe and Rossi 1995), Howcroft-Carroll (Howcroft and Carroll 2000), Intranet Development Methodology (IDM) (Lee 1998), and Dynamic Systems Development Method (DSDM) (Stapleton 1997), other approaches based on rapid application development, such as agile system development (Cockburn 2002; Highsmith 2002) and extreme programming (Beck 2000), have become prominent.

Given the ongoing interest in studying the process of the development of information systems in practice, this paper revisits and reformulates Wynekoop and Russo's 1997 study of research assessing system development practices (Wynekoop and Russo 1997). This study was comprised of two primary dimensions. Firstly, a framework used to "... categorise and evaluate existing SDM research" (p. 48), that is, to categorise studies of SDMs by their research purpose; and secondly, a framework used to categorise "... the methods that researchers have used to study SDMs" (p. 50), that is, to categorise studies of SDMs by their research method. Wynekoop and Russo use the term System Development Methodology (SDM). In this paper we will use the term SDM when it relates directly to discussion of Wynekoop and Russo's work.

Wynekoop and Russo's study fits Avison and Fitzgerald's 'eras' as a capstone to the 'methodology era' ending in the late 1990s, in that it reviewed SDM research up until 1997. For this paper, similar questions to those posed by Wynekoop and Russo are proposed for the 'post-methodology era,' with particular application to ISD research in Australia. Based on the findings we

also propose extensions to Wynekoop and Russo's original framework including an examination of application domains within the ISDM domain based on ontological domains and knowledge areas suggested by Iivari et al. (2004).

The remainder of the paper is structured as follows; the next section provides a discussion of existing studies of information systems development methodologies. It defines an ISDM, identifies a number of existing techniques, and acknowledges various views taken by other researchers. The research approach is then outlined, and research questions for the study are provided. The paper then gives a detailed analysis of the data collected and findings. Based on these findings, a number of issues are raised in a subsequent discussion section. The paper ends with future research implications suggested, and concluding comments made.

2 Studies of Information Systems Development Methodologies

Avison and Fitzgerald (2003a) define an information systems development methodology as:

A collection of procedures, techniques, tools, and documentation aids which will help the systems developers in their efforts to implement a new information system. A methodology will consist of phases, themselves consisting of subphases, which will guide the systems developers in their choice of the techniques that might be appropriate at each stage of the project and also help them plan, manage, control, and evaluate information systems projects. (p. 20)

Conceptual and prescriptive ISDM research has produced many ISDMs, such as Structured Systems Analysis and Design Methodology (SSADM), Jackson System Development (JSD), Information Engineering (IE), Rational Unified Process (RUP), Multiview, Object Oriented Software Engineering (OOSE), and Effective Technical and Human Implementation of Computer-based Systems (ETHICS). Since the beginning of the methodology era (mid 1980s – late 1990s (Avison and Fitzgerald 2003)), and increasingly during the post-methodology era, there have been several authors who have addressed the applicability of ISDMs in practice. This usually empirical research has focussed on the selection, adaptation and use of ISDMs in practice. These studies have produced quantitative perspectives on the frequency of use (Bansler and Bødker 1993; Chatzoglou 1997; Fitzgerald, 1997; 1998) and interpreted understandings of use in practice (Dawson and Darke 2002; Dawson and Swatman 1999; Flynn and Warhurst 1994; Kautz et al. 2004; Urquhart

1998). Some authors argue that IS development cannot be considered to be manageable, linear, repeatable or rational (Stolterman 1992; Truex et al. 2000); others argue that developers use only a subset of selected techniques and tools from any methodology (Bansler and Bodker 1993; Dawson and Darke 2002; Fitzgerald 1998; Madsen and Kautz 2002; Robey and Markus 1984); others argue that ISD should be viewed as a political process (Galal and McDonnell 1998; Robey and Markus 1984) and still others argue that there is “... no universally applicable methodology” (Kautz et al. 2004). Kiely and Fitzgerald (2005) in a recent study of the use of ISDMs in practice suggest that current practice “... reflects a much more ad-hoc development environment” and that the perception of traditional ISDMs was a negative one. Lind and Lind (2005) suggest that we need to understand the difference between ‘developer practice’ and ‘user practice’ and that the increasing complexity of methods “... has become so high that users sometimes experience increased difficulty and reduced efficiency.”

This paper explicitly examines research on the development, use, and evaluation of *methodologies*. This excludes the process of systems development itself and the general area of information systems. The subset of the information systems discipline under consideration here is characterised by the inclusion of understanding or developing a methodology for information systems development in an Australian context.

3 Research Approach

In the first dimension of their study Wynekoop and Russo examined ‘research purpose’ and proposed a set of three issues, along with example questions where “... the answers to these questions are essential for understanding system development and the role of SDMs in the development process today” (p. 48). The three research issues used by Wynekoop and Russo were SDM use, SDM selection, development and application, and SDM evaluation.

In the second dimension of their study, Wynekoop and Russo developed a two-dimensional taxonomy by adding a research method dimension for classifying SDM research. A broad set of research methods, nine in total, were identified and summarised. Wynekoop and Russo’s study was very timely, thorough and original when it was published in 1997. It specifically addressed the need to understand whether “...methodologies and improvement of the systems development process are keeping pace with technological and organisational changes” (p. 47).

This paper, classifying Australian research published in articles and papers between 1998 and 2005, builds on this existing set of issues and methods, and extends or qualifies where necessary. In particular, the three issues in Wynnekoop and Russo's study did not explicitly explore improvements and customisation of methodologies and tools in the development process. Also, it is not clear whether the categorisation of research methods by Wynnekoop and Russo was based directly on the data collected or on a pre-defined set of methods, based on earlier work (pp. 50-51).

In this paper Wynnekoop and Russo's approach is extended by adding specific research questions and extending the search criteria under research purpose to include improvements and customisation of methodologies and tools in the development process. The approach also allowed the categories of research methods to emerge from the data as it was collected (see Table 7).

To explore SDM research in Australia, Wynnekoop and Russo's original framework was adopted as a research lens. This study used the same initial categorisation, however extended it to include 'research context'. The following research questions were formulated:

1. What SDM research issue was the focus of the paper?
The study addresses Wynnekoop and Russo's three issues; use; selection, development and application; and evaluation.
2. What research method was used?
Research methods are categorised broadly as they emerged from the data, based on Wynnekoop and Russo's categories, and subsequently refined during data analysis.
3. What was the research context?

The purpose of this question was to capture the research contexts of empirical studies eg. banking, retailing, health care etc. and was refined during data analysis to provide a richer dimension for all studies, not simply empirical investigation environments.

Source data for the study was defined as any published study from Australia or collaborations with Australian-affiliated researchers. Wynnekoop and Russo's search domain was:

Papers addressing SDMs in Information Systems Research, Communications of the ACM, MIS Quarterly, Data Base and Management Science ... identified as key North American journals for IS publication. ... Additionally, books, conference proceedings, trade publications, journals from outside North America and additional publications were searched to the extent possible with existing resources. (pp. 51-52)

The search domain for this study (see Table 1) is based on an extended group of international and Australian conferences and journals containing at least one author with an Australian affiliation and published between 1998 and 2005. Although it is an AIS sponsored conference, ACIS is treated separately, as it is the national conference for the IS community in Australia and is the major publishing venue for Australian IS researchers.

<i>Source Type</i>	<i>Source</i>
High ranked journals	MISQ, ISR, ISJ, EJIS
AIS sponsored conferences	ICIS, ECIS, PACIS
The Australian national IS conference	ACIS
Bibliographic Information Services	INSPEC, Compendex

Table 1: Search Domain

Manual searches of highly-ranked journals from 1998 to 2005, for Australian authored or affiliated publications were performed. These were combined with searches of major bibliographical information services (INSPEC and Compendex), for other published studies, using the criteria affiliation = “Australia”; dates = “1998-2005”; language = “English”; and keywords including “Information systems development methodology(ies)”, “Systems development methodology(ies)” and “Web systems development methodology(ies)”.

These keywords were intended to restrict the data to the development, selection, use, application and evaluation of methodologies, as scoped by the research questions.

Journal papers were sourced from the online archives of each journal. The authors’ University library subscribes to all of the identified journals in this study. Conference data was sourced from the Association for Information Systems Electronic Library (AISSeL) (<http://aisel.isworld.org/>) and CDs containing conference proceedings. A checklist of the eight identified journals and conferences was developed and the tables of contents were viewed, with the exception of publications appearing in 1998 and 1999, for ACIS, PACIS, and ECIS conferences. Limitations of the AISSeL and the availability of hardcopies, made sourcing these proceedings problematic. It was decided, in consideration for research deadlines, that the overall sample of publications obtained was representative of research focusing on ISDM in Australia. Future research addressing similar topics, would draw on a larger range of publication samples, over a wider number of publication years.

For the online database search, citation information was downloaded into an EndNote database in the first instance. Papers passing the first cull, which was based on the abstract, were then sourced as full papers from the University library or online.

The initial search produced 62 papers (see Table 2).

<i>Source Type</i>	<i>Source</i>	<i>Number of papers</i>
High ranked journals	MISQ 1998 – 2005	0
	ISR 1998 – 2005	0
	ISJ 1998 – 2005	0
	EJIS 1998 – 2005	3
AIS sponsored conferences	ICIS 1998 – 2005	3
	ECIS 2000 – 2005	11
	PACIS 2000 – 2005	10
Australian national IS conference	ACIS 2000 – 2005	22
Online databases (duplicates removed)	INSPEC, Compendex	13
Totals		62

Table 2: Initial Collection

4 Data Analysis and Findings

Information for all papers identified in the initial collection were entered into data analysis sheets (see example in Figure 1)—one analysis sheet for each conference or journal.

A first pass based on the abstract eliminated papers in non-IS areas such as geography, chemical engineering and environmental engineering which use the term system development and methodology in their own discipline-specific ways. These papers occurred in the online database searches, based on

SJIS Paper – Data Analysis Sheet **Papers <Conference Name> or <Journal Name>**

Citation	Research Issue	Research Context	Research Method

Figure 1. Data analysis sheet

keywords. This pass also eliminated any conference papers from the online database search results which were not in the group of targeted conferences for this study.

Full papers were then sourced after the first pass and a second pass was made by examining the whole paper. This pass eliminated papers in non-ISD methodology areas such as legal issues for information systems, mobile technology adoption, IS security, creative aspects of web design, project management, agile systems and extreme programming (not explicitly applied to ISDMs), open source software development, and reports of system development projects not specifically examining ISDMs. After the second pass, 44 papers remained in the data set (see Table 3).

<i>Source</i>	<i>Number of Papers</i>	<i>Percentage</i>
<i>Highly-ranked Journals</i>		
MISQ (1998-2005)	0	0%
ISR (1998-2005)	0	0%
ISJ (1998-2005)	0	0%
EJIS (1998-2005)	2	4.55%
<i>AIS Sponsored Conferences</i>		
ICIS (1998-2005)	2	4.44%
ECIS (2000-2005)	10	22.73%
PACIS (2000-2005)	4	9.09%
<i>Australian National IS Conference</i>		
ACIS (2000-2005)	20	44.45%
<i>Online Databases (duplicates removed)</i>		
INSPEC, Compendex (1998-2005)	6	13.64%
Totals	44	100%

Table 3: Final data set

Every effort has been made to keep the data collection process, and the subsequent categorisation, as consistent as possible. This research did not seek to review the papers contained in the final sample, nor did it intend to make value judgements on the research in those papers. Rather, the research focused on patterns and aggregations within a body of research. A full reference list of the sample is available from the authors on request.

The preferred publication venue for Australian ISDM research is conferences. Figure 2 illustrates a clear predominance of research appearing in conference proceedings, 89% in total. Table 4, showing a higher level of detail, identifies publication sources and year of appearance.

<i>Source</i>	<i>Number of Articles per Year</i>								
<i>Journals</i>	1998	1999	2000	2001	2002	2003	2004	2005	Total
MISQ	0	0	0	0	0	0	0	0	0
ISR	0	0	0	0	0	0	0	0	0
ISJ	0	0	0	0	0	0	0	0	0
EJIS	0	0	0	0	1	0	1	0	2
Other	0	0	0	0	2	0	0	3	5
<i>Conferences</i>									
ICIS	1	1	0	0	0	0	0	0	2
ECIS	NA	NA	1	3	1	2	1	3	11
PACIS	NA	NA	0	0	1	1	1	1	4
<i>Australian National IS Conference</i>									
ACIS	NA	NA	5	3	2	3	5	2	20
Total	1	1	6	6	7	6	8	9	44

Table 4: Selected articles by source of publication and year

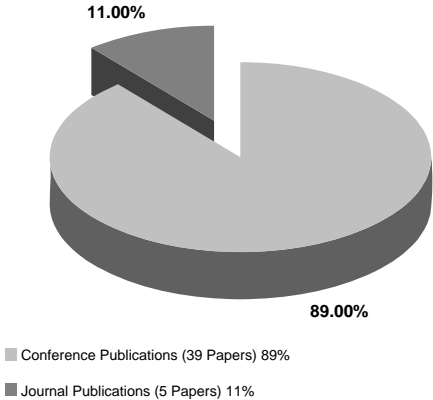


Figure 2. Conference versus journal publications

In Table 4, the row labelled “Other” contains totals of papers that were found in online databases but were published in a journal other than MISQ, ISR, ISJ or EJIS.

4.1 The Research Issue Category

During data analysis the research issue category was modified as different research purposes were identified in the data. Research issues included ISDM use, ISDM Development which comprised improvement and customisation, Software (SW) Development Methodologies (SWDM) as distinct from Information Systems Development Methodologies and ISDM evaluation. Table 5 contains the initial categories and the primary research questions posed in each category.

<i>Research Issue</i>	<i>Example questions</i>
ISDM use	Are ISDMs used in practice? How are ISDMs used in practice? If an ISDM is not used, why not and what is?
ISDM development	How are ISDMs developed or adapted in practice? Can new and better ISDMs be developed? Can tools be developed to improve ISDMs? How can ISDMs be improved? How are ISDMs customised in practice?
Software Development Methodologies (SWDM)	Can methodologies be developed to improve the software developed for ISD?
ISDM evaluation	Does the use of a specific ISDM improve IS quality? Does the use of a specific ISDM improve developer productivity? In what context(s) are specific ISDMs successful?

Table 5: Modified research issue categories

4.2 The Research Method Category

During data analysis, Wynkoop and Russo’s (1997) original research method classification was consolidated to four. This new classification scheme evolved as ISDM publications were analysed, and is more representative of the ways in which research methods were identified in the sample of ISDM

papers. The final research method classification included case study, experiment, survey, and conceptual study (see Table 6).

<i>Research Method</i>	<i>Description</i>
Case Study	Included specific industry case studies, teaching cases, “minor” case studies used as illustrative examples, online case studies, focus groups
Experiment	Investigations set up in controlled environments
Survey	In-situ and online surveys and questionnaires
Conceptual Study	Theoretical or literature based non-empirical study

Table 6: Research methods

As for the results, Table 7 shows the number of studies in each research method category, and what research issues were addressed for each of the sampled papers. Case studies of ISDM use and conceptual studies of ISDM development are the dominant categories. These findings will be discussed in more detail later.

<i>Research Method</i>	<i>Research Issue</i>				Totals
	ISDM Use	ISDM Development	SWDM Development	ISDM Evaluation	
Conceptual	0	12	5	1	18
Survey	1	1	0	1	3
Case Study	12	0	0	7	19
Multiple Method (Case Study)	2	1	0	0	3
Multiple Method (Other)	0	1	0	0	1
Totals	15	15	5	9	44

Table 7: Number of studies in each category

4.3 The Research Context Category

Originally the research context category was intended to simply identify the industry or organisational environment in which an empirical study was carried out, such as banking, retail or education. As the data was collected and analysed it became apparent that this category could be used to indicate the broader contexts within ISDM research. For example, areas such as requirements engineering, soft systems methodology, ISD across cultural groups, structuration theory, etc were identified. This research context category now

provides a richer description of the studies and refines analysis and understanding of the types of research undertaken by Australian researchers since 1998.

The final use of the research context category is influenced by Iivari et al.’s (2004) body of knowledge (BoK)—a concept for informally describing the areas of knowledge held by IS experts. This concept was developed from an analysis of ISD process knowledge based on two IS journals, ISJ and MISQ. The concept suggests 5 knowledge areas, based on 5 ontological domains (see Table 8). The first three knowledge areas are adapted from Freeman (1987), the fourth from Jones and Walsham (1992), and the fifth added by Iivari et al. (2004).

The knowledge areas are described as:

- Technology knowledge: knowledge of types of hardware, software and their application.
- Application domain knowledge: knowledge about the application domain for which an information system is being built, eg accounting concepts and principles for an accounting IS.
- Systems Development process knowledge: tools, techniques, methods, approaches and principles used in systems development.
- Organisational knowledge: knowledge “about the social and economic processes in the organisational contexts in which the IS is to be developed and used” Jones and Walsham (1992).
- IS application knowledge: typical IT applications, their structure, functionality, behaviour and use, in a given application domain.

<i>Ontological Domain</i>	<i>Knowledge Area</i>
Domain of Intra- and Inter-organizational Context	Organisational Knowledge
Domain of IS Development Processes	ISD Process Knowledge
Technology Domain	Technology Knowledge
Domain of IS Applications	IS Application Knowledge
Application Domain	Application Domain Knowledge

Table 8: Iivari et al.’s (2004) 5 ontological domains and knowledge areas

Categorising the research contexts for the papers in the data set against Iivari et al.’s (2004) five knowledge areas is shown in Table 9. Most papers contributed to more than one knowledge area. The number of papers for any knowledge area is noted in parentheses.

The 'Application Knowledge' research contexts here were broad covering several application domains and industry sectors, both public and private, large and small.

The 'SD Process Knowledge' research contexts in this study, as stated above, emphasised requirements engineering and theoretical development. This included a theoretical method evaluation model for ISDM, the application of situational theories of action, structuration theory, actor network theory, and a discursive framework for examining ISD. Some alternative perspectives (teleology, evolution and dialectic) to the lifecycle view and an approach based on a metamodel for assessable software development methodologies were also presented.

The 'IS Application knowledge' research contexts had some focus on web development tools, Soft Systems Methodologies and object-oriented approaches to ISDM (and in particular RE) including reuse.

The 'Technological Knowledge' research contexts focussed on programming and software development as the technological underpinnings of ISDMs and were mostly visible in the research conducted by computer scientists, rather than information systems researchers.

Many of the 'Organisational Context Knowledge' research contexts focussed on requirements engineering and its application in practice. From an organisational perspective three different groups of researchers looked at the relationships and interactions between developers, managers and users developing requirements together; another researcher studied politically cultural issues influencing SDM in banking. Geographical specific areas included one group of researchers investigating the requirements engineering process and distributed virtual teams in systems development across Australia, New Zealand, the United Kingdom and Thailand. Another researcher looked at user influence in decision support in systems development in Australian agriculture.

5 Discussion

Major findings of this study include the identification of characteristics and trends in the post-methodology era for Australian SDM research, as discussed below.

Based on the literature from the post-methodology era presented earlier in this paper it can be argued that any research paper about Information Systems Development (ISD) might encompass any one or more of Iivari et al's (2004) knowledge areas in its research context since:

<i>Knowledge Area</i>	<i>Research Contexts</i>
Application knowledge (specific application domains or industry environments)	Government and public sector (4) Health care (3) Banking (3) Commercial software houses (3) IT Suppliers (2) ERP (1) Agriculture (1) Transport (1) SMEs (1) Insurance (1) Retail (1)
SD process knowledge (including theoretical development, methodology development, requirements engineering)	Requirements engineering (11) Theory, theoretical models and frameworks (9) Web methodologies (5) Tools and techniques (4) New methodologies: Prescriptive Simplified Methodology (PSM), RARE IDIOM, Internet Commerce Development Methodology (ICDM) (3)
IS Application knowledge (the application of existing IS frameworks to ISDMs)	Web development tools (3) Object-oriented approaches (3) Soft Systems Methodology (3) Reuse (2) Decision Support (1) Geographical IS (1) Portal technologies (1) Project management (1)
Technological knowledge (software development focus)	Agile software development (2) Extreme programming (2)
Organisational knowledge (organisational relationships and interactions, actors and roles)	Cultural contexts: organisational and geographic (10) Attitudes: managers, developers, clients (5) User influence (2) Organisational politics (1) Incentive contracts (1) Creativity (1) Contingency factors (1)

Table 9: Identified research contexts (based on Iivari et al.'s (2004) five knowledge areas)

- SD is a social process which operates in an organisational context

- ISD is carried out using some approach that could be classified as an Information Systems Development Methodology (ISDM) even if that approach is not based on a specific methodology
- ISD applies to some application domain
- ISD applies within an IS application domain
- ISD is implemented within some hardware and software infrastructure or technological domain

All of these characteristics were evident to some degree in the collection of papers examined in this study. The most common research contexts for Australian ISDM research were:

- Requirements engineering (11)
- Cultural contexts: organisational and geographic (10)
- Theory, theoretical models and frameworks (9)

These research contexts indicate a focus on understanding the theoretical underpinnings, social context and early stages of the systems development process, rather than the development of new tools and techniques or building new methodologies.

Table 7 shows that by far the most common research methods used for Australian ISDM research, were conceptual and case study methods. This included case studies as a component of a multiple method approach. Case study research methods varied from full empirical studies including several data collection methods such as structured interviews, focus groups, to minor case studies based on small illustrative examples or questionnaires with small groups or students. It is not clear whether the popularity of case study methods is a specifically Australian characteristic, whether it is a natural method for ISDM research or if it is because case study is a prevalent method in IS research in general at this time.

Although the case study approach proved popular, particularly in the study of ISDM use and evaluation, a number of the papers sampled were unclear as to the extent that the case research played in the overall research attempt. A number of papers used case studies as a means of describing, or validating the method in question, but lacked depth in the case description, and how data for the case studies were collected. Yin (1994, p 32) suggests that one of the key criteria for judging the quality of case study research is 'external validity'. Although the majority of case studies identified in the sample were single cases, they were often unclear in establishing the domain in which the case findings may be generalised. This made it challenging to assess the rigorousness of the data collection process where case studies were concerned. There was also little discussion of tools such as case study protocols, which would

make the repeatability of the case research difficult, and raised questions on the 'reliability' (Yin 1994, p 36) of the cases. This is not to suggest that the case research identified in the sample was of poor quality, but to present that it was regularly unclear in articulating the case research strategy.

Many of the conceptual studies involved theory development, the development of a new methodology or extension of an existing methodology without an empirical component. This type of research was described by Wynekoop and Russo as 'normative' writings and described as:

Concept development not based on empiricism or theoretical grounding, but on the authors speculations or opinion. Descriptions include no interpretation, but are presented as factual or objective accounts. (p. 51)

So whilst conceptual research is important, there was little evidence that these theories were being empirically validated over time.

In this study several papers referred to an SDM as a software development methodology rather than a system development methodology. The five papers in this study which were classified as Software Development Methodology (SWDM), were all conceptual. That is, the paper was either the development of a new methodology for software development within the ISD process, or a tool or improvement to an existing methodology. Two papers referred to the software development lifecycle but also to the role of methodologies in the development of systems within organizations. One paper dealt with specification and validation for dynamic life-cycle models, and another reuse in the ISD process. Another presented a process-oriented approach to requirements engineering. Authors were from Schools of Computer Science, Information Technologies or Software Engineering, rather than Schools of Information Systems or Business. Whilst the language and terms used in these papers overlapped with IS perspectives of SDMs, the focus was clearly on the software development component of ISD. Given this lack of clarity in the common use of the term SDM, it may be suggested that software development methodologies are subsets of systems development methodologies and that researchers should be aware of the differences, along with the confusion that may arise with the use of certain vocabularies and constructs. Therefore, researchers should clarify their terminology in their writings for publication depending on context and target audience.

Trends in Post-Methodology Era Australian ISDM Research

Table 4 details the source and the year of publication of the 44 articles selected for analysis. One area of interest, triggered by the sample, is the increasing number of papers being published in the area of SDM research. Excluding publications from 2005, of which much of the data remained unavailable at the

time of submission, almost 50% of the sample came from articles published in the past 3 years, representing a steady expansion of the body of SDM knowledge. As expected, the number of papers published in ACIS was high (20 in total). More interesting, however, was the high number of SDM papers appearing in ECIS proceedings since Australia would not normally be considered to be a typical catchment area for ECIS submissions, as it is not a European country. These figures confirm the observations of Galliers and Whitley (2002), in that Australian researchers represent almost 10% of the most frequent representation by country for the conference, with participation continuing to increase.

Although participation in European conferences by Australian researchers is high, the number of published ISDM articles in high-quality journals is remains low. Figure 2 suggests that an overwhelming majority of Australian ISDM research is being targeted at conference publication outlets, instead of journals. Whether this should be a phenomenon of concern remains to be seen, however, recent changes to the way publicly-funded Australian research is assessed is dramatically influencing the publishing behaviour of Australian researchers. An increasing push for high quality, high impact research, through the federal government-sponsored Research Quality Framework (RQF), may shift this focus from conference to journal publications.

Not surprisingly where new development methodologies have been proposed in the post-methodology era they have tended to be web-based. In one case a specific portal development methodology and in another case a specific requirements analysis method-tool framework was proposed. This mirrors similar trends in the international ISDM research community (Howcroft and Carroll 2000; Vidgen et al. 2002) indicating that this area of ISDM research reflects international trends.

6 Implications and Future Research

This study provides a picture of Australian ISDM research since 1998 which indicates the characteristics and trends discussed above. However, in order to fully understand the direction ISDM research is taking, in the post-methodology era, further research into emerging trends across the broader IS spectrum is required. This might include an ongoing longitudinal study of Australian ISDM research and studies of ISDM research across more than one country. A larger study of international post-methodology ISDM research would provide useful contexts in which to understand current trends, in both Australian and Scandinavian ISDM research.

Facilitating North-South collaborations in SDM research would be assisted by a similar study to this one for Scandinavian publications. Together with an understanding of the focus of Australian SDM research collaborations between Australian and Scandinavian researchers could be based on both research with commonality where North-South researchers are focussing on similar issues within their own communities as well as collaborative projects based on complementary strengths and designs where each group of researchers brings its own special set of talents and experience.

Extending this study to studies of Australian and Scandinavian IS research in general would also provide broader contexts for research, and open paths for further collaboration. In other recent studies of IS research Arnott and Pervan (2005) explored decision support systems research and Scornavacca et al. (2005) have looked at mobile business research. Adding to these studies would provide the IS community with useful reference points for emerging ISDM research areas and assist in facilitating pro-active collaborations.

7 Concluding Comments

This paper has presented a study of ISDM research in Australia in the post-methodology era (1998-2005). This contributes to the wider discussion of ISDM research in general. The Wynekoop and Russo (1997) framework provided a useful lens which incorporated both research issue and research method perspectives. Because of these dual perspectives this framework would be useful for examining other areas of research besides information systems development methodologies.

The extensions to the framework as described in this paper add richness by including an explicit investigation of research contexts based on Iivari et al's (2004) ontological domains and knowledge areas. The extensions also adopted an approach where the domains of research issues, research methods and the research contexts emerged from the data as it was collected rather than presumptive definitions. This version of the framework could be further extended to explore research methods in greater detail and could be applied to other areas of IS research as suggested in the previous section.

The findings provide evidence of healthy and increasing research activity in ISDM for Australian researchers. This activity is evident particularly in the theoretical underpinnings of the early stages of the ISD process, and the use of ISDMs in practice. This growing interest provides a strong foundation for further collaborative research and cross-cultural studies with colleagues in other

parts of the world, especially in Scandinavia where there is a rich tradition of ISDM research.

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