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IS Development Practice in New Zealand Organisations

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Abstract

A survey of New Zealand organisations with 200 or more full-time employees was undertaken in order to obtain an updated assessment of IS development practice. Over the period surveyed (2001-2003), larger organisations (500 or more FTEs) or those with larger IS functions (10 or more IS FTEs) undertook significantly more IS projects, more expensive projects, more projects in which users participated and more projects in which a standard method was used, than their smaller counterparts. In the same period, there has been a trend towards increased use of packaged software solutions and outsourced development or customisation of packaged solutions. Factors perceived as most important to facilitating or inhibiting development in actual IS projects were related to availability of resources, definition of user requirements, communication between developers and users, project management, management of IS development-related change, and developer knowledge of the IS development context.

Keywords: *IS development, IS projects, New Zealand*

1. INTRODUCTION

Surveys investigating the development of computer-based information systems (IS) throughout the world have featured in academic research for several decades, motivated by a desire to depict and improve common, if not 'best', practice (Ljung and Allwood, 1999).

In considering the need for ongoing empirical research on this topic (Barry and Lang, 2003) the following are pertinent. Most empirical studies of IS development practice focus on soliciting the views of IS professionals or managers regarding the efficacy or benefit of various factors deemed influential in IS development success. While this is of genuine interest and is addressed here, relatively few studies (also) provide information on actual IS projects. Many studies also tend to focus on the experiences of US or European organisations; close to ten years ago Rahim et al. (1998) noted that little research had been reported on development practices in countries within the Asia-Pacific region. There is no obvious evidence that this situation has altered significantly in the intervening period. Finally, many changes have occurred in the IS development environment in recent years that need to be taken into account in updating our understanding of IS development (Markus and Mao, 2004). Examples include increased devolution of IS expenditure to user groups; higher levels of packaged software acquisition and customisation; increased outsourcing of IS development; and widespread development of enterprise-wide IS and inter-organisational IS.

To address these issues, a survey was conducted of IS development practices in recent IS projects in New Zealand organisations. Surveys are a useful tool for gathering descriptive information from a large sample, providing a 'snapshot' of current practice (Fitzgerald, Philippidis and Probert, 1999; Wynekoop and Russo, 1995, 1997). This paper reports the results of that survey. Three research objectives underlie the study:

1. To obtain an updated picture of actual IS development practices in New Zealand organisations.
2. To compare IS development practices in New Zealand organisations with those reported in other national contexts.

3. To explore whether a changing IS development environment has affected IS development practices.

The remainder of the paper is structured as follows. First, we review prior empirical studies of IS development practice and examine their scope and outcomes. We then outline the development of our survey instrument and the data collection procedure used in this study. Subsequent sections present and discuss the results of the survey, before some concluding remarks are made about the findings.

2. PRIOR STUDIES OF IS DEVELOPMENT PRACTICE

Numerous academic studies have examined aspects of IS development and the influence of a variety of factors in facilitating or inhibiting development. However, many of these have been focused on one or a few specific factors, practices or methods – relatively few studies have attempted to provide a broad and comprehensive picture of IS development practice (as is the intent here). Of those studies that do, some have surveyed IS executives about the factors that affect IS development (e.g. Verkerk, Bailey, Sundakov and Duncan, 2000; Yetton, Martin, Sharma and Johnston, 2000), while others have asked various groups *associated with* IS development to give their opinion on the relative importance of such factors (e.g. Fitzgerald, 1998; Schmidt, Lyytinen, Keil and Cule, 2001). These studies and those described below therefore provide an appropriate international benchmark against which the current survey outcomes can be compared. Rather than review them here, actual practices identified in these studies are described in relation to those found in the New Zealand survey, reported in section 4 of this paper. The remainder of this section therefore addresses prior research that has sought to identify factors influencing effective IS development and their consequent impact on development outcomes.

Most of these prior studies discuss practices that are considered to influence the success (or failure) of IS development. However, "success" is a problematic concept to define and measure. For example, success may be variously defined in terms of IS development process performance, the technical quality of its product, or user satisfaction with the product (Barki, Rivard and Talbot, 2001; Markus and Mao, 2004). This lack of consensus exists not only in the academic literature, but also extends into IS practice (KPMG, 2005; Verkerk et al., 2000). For this reason, in our paper and the survey, we refer more generically to practices that "facilitate" or "inhibit" IS development. By *facilitate* we mean to make easier or less difficult; help forward; to assist the progress of; or to increase the likelihood, strength, or effectiveness of. By *inhibit* we mean to restrain, hinder, arrest, or check; to repress, discourage, obstruct; or to limit the range or extent of.

In terms of factors facilitating effective IS development practice, US IS professionals surveyed by Jiang et al. (1996) considered top management support, a competent project manager, a competent project team, sufficient resources and user consultation to be among the most important. Similarly, top management support, user participation, and experienced project management were the top three facilitative factors identified by US IS executives in the 2000 Standish Group study (Johnson, Boucher, Connors and Robinson, 2001). In ranking various factors facilitating successful IS development, Irish IS managers surveyed by Fitzgerald (1998) considered user participation to be most important, while adherence to a formal standard method and developer technical expertise were considered the least important.

In their survey of UK IS directors, Wastell and Sewards (1995) found that changing user requirements, insufficient user training and consultation, weak project management and organisational politics all had an inhibiting effect on successful IS development. By comparison, US IS executives participating in the 1994 Standish Group study considered lack of user input, incomplete or changing requirements, and lack of top management support as important inhibiting factors (Standish Group International, 1995). A more recent global survey of IS project management identified unclear or changing requirements, poor project management processes, and a lack of top management support, as the three main reasons why IS development had been inhibited (KPMG, 2005).

Although they did not exactly address the same IS development practice issues as covered here, two additional prior surveys are relevant to the work undertaken in the current study as they were conducted (at least in part) in New Zealand. In 1999, Verkerk et al. surveyed New Zealand IS and other executives, in order to compare IS project outcomes in the public and private sectors (Verkerk et al., 2000). They found that there was a high level of commonality across the sectors in terms of the top six factors affecting project success, project failure and problematic outcomes. For

example, professional project management and top management support were the highest ranked success factors, while incomplete or changing requirements and insufficient resources were the highest ranked problematic factors. Verkerk et al. suggest that, as elsewhere in the world, there is still room for improvement in IS project outcomes in New Zealand. In another study involving new Zealand IS managers (along with others in the UK), Yetton et al. (2000) found that project characteristics (e.g. size, newness and strategic nature) were regarded as important factors influencing IS project performance.

In summary, a relatively small selection of factors has appeared to dominate those considered influential in prior studies. However, the breadth of factors considered in each study was not extensive; most of the studies were reported in or before 2001, meaning that the influence of more contemporary factors or a more contemporary development context could not be reflected in the outcomes; and those prior studies undertaken in New Zealand did not address actual IS development practice to the extent considered useful here.

3. RESEARCH APPROACH

In light of the dated and comparatively narrow scope of most prior research, the aim of this study was to provide a comprehensive and up-to-date assessment of IS development practice in actual IS projects in New Zealand organisations. The results could then be compared to IS development practices reported in other countries and an assessment made of any impact of a changing IS development environment. The survey instrument used in this study was a multi-page Web-based design. Dillman's (2000) principles for constructing Web surveys were followed in order minimise the effects of measurement, non-response, coverage and sampling errors. The major part of the survey was a questionnaire that solicited information about aspects of IS development practice in New Zealand organisations, including factors influencing the IS development process.

The questionnaire comprised a number of sub-sections. Target respondents were first asked to estimate the total number of IS projects that had been undertaken and completed by their organisation during the preceding three-year period. Respondents were asked to categorise these IS projects in terms of the size of the project, different types of IS development and acquisition, different levels of standard method use in the development process, and different levels of user participation in the development process. For those projects where no standard method was used or where users did not participate, respondents were asked to identify the reasons for this.

Respondents were then asked to rate the relative importance of a number of factors that might be influential in "facilitating" or "inhibiting" IS development. As noted earlier, given the lack of an agreed understanding of the meaning of IS development success, we preferred to use these generic terms on the basis that they were less likely to be associated with participants' preconceived notions of success or failure, and were more inclusive of practices that may have influenced the development *process*, irrespective of the eventual perceived project outcome. Respondents were not given definitions of "facilitating" and "inhibiting" as we wanted them to consider these terms in a general sense (as described in section 2) and without undue influence or constraint from us. The factors used in this part of the survey were drawn from the prior studies reviewed above and are summarised in Table 1. In rating each item, respondents were asked to select a number from a five-point anchored rating scale of 1 ("Not important") to 5 ("Very important"), or alternatively a "Don't know or Not applicable" option.

Respondents were also asked to identify any anticipated changes in IS development practice in their organisation in the subsequent three years. Finally, respondents were asked to describe their official position and to classify their organisation in terms of business sector, organisational size, and the size and location of its IS function.

The survey was pilot tested to 20 organisations in March 2004, resulting in some minor modifications to question wording. The main survey was undertaken during April and May 2004. The target population was those organisations large enough to require IS beyond that which could be achieved by standard desktop applications, to have an inherent need for systematisation and computerised integration of business functions, and be more likely to utilise up-to-date software innovations and development practices.

Altogether, the survey was administered to 460 New Zealand public and private sector organisations with 200 or more FTEs. The manager responsible for IS project work within the organisation (typically an IS/IT Manager or CIO) was targeted as the respondent in order to provide both an organisational view and one

informed by knowledge of the organisation's IS development practice. Although single-respondent managerial surveys have their limitations with respect to distance from actual development work (Wynekoop and Russo, 1997), managerial level respondents are more likely to be knowledgeable about organisation-wide issues (Doherty and King, 2001). In order to ensure currency of the results and to ensure more accurate recall by survey respondents, the survey focused on IS projects undertaken and completed (or substantially completed) in the three calendar years 2001 to 2003.

Facilitating IS development	Inhibiting IS development	Source
Adequate resources or time	Resource or time constraints	(Barry and Lang, 2003; Fitzgerald, 1998; Jiang and Klein, 2000; Jiang et al., 1996; Rainer and Watson, 1995; Schmidt et al., 2001; Standish Group International, 1995; Verkerk et al., 2000; Wastell and Sewards, 1995; Wixom and Watson, 2001; Yetton et al., 2000)
Adequate developer knowledge of the system context	Inadequate developer knowledge of the system context	(Fitzgerald, 1998; Jiang and Klein, 2000; Schmidt et al., 2001)
Effective communication between developers and users	Ineffective communication between developers and users	(Jiang et al., 1996)
Effective management of changes resulting from system implementation	Ineffective management of changes resulting from system implementation	(Jiang and Klein, 2000; Rainer and Watson, 1995; Schmidt et al., 2001; Wixom and Watson, 2001)
Effective project management	Ineffective project management	(Jiang et al., 1996; Johnson et al., 2001; KPMG, 2005; Schmidt et al., 2001; Verkerk et al., 2000; Wastell and Sewards, 1995)
Effective functioning of the project team	Ineffective functioning of the project team	(Jiang and Klein, 2000; Jiang et al., 1996; Wixom and Watson, 2001; Yetton et al., 2000)
Effective user participation in the development process	Ineffective user participation in the development process	(Fitzgerald, 1998; Jiang and Klein, 2000; Jiang et al., 1996; Johnson et al., 2001; Schmidt et al., 2001; Standish Group International, 1995; Verkerk et al., 2000; Wastell and Sewards, 1995; Wixom and Watson, 2001; Yetton et al., 2000)
Top management support	Lack of top management support	(Johnson et al., 2001; KPMG, 2005; Rainer and Watson, 1995; Schmidt et al., 2001; Standish Group International, 1995; Verkerk et al., 2000; Wixom and Watson, 2001)
Use of a standard method of IS development	Not using a standard method of IS development	(Barry and Lang, 2003; Fitzgerald, 1998; Jiang and Klein, 2000; Johnson et al., 2001; Schmidt et al., 2001; Wastell and Sewards, 1995)
Use of external consultants		(Rainer and Watson, 1995)
User commitment or buy-in	User resistance	(Jiang and Klein, 2000; Jiang et al., 1996; Schmidt et al., 2001; Yetton et al., 2000)
Well-defined user requirements	Poorly defined or changing user requirements	(Barry and Lang, 2003; Johnson et al., 2001; KPMG, 2005; Rainer and Watson, 1995; Schmidt et al., 2001; Standish Group International, 1995; Verkerk et al., 2000; Wastell and Sewards, 1995; Yetton et al., 2000)
	Political manoeuvring or disagreements within the organisation	(Schmidt et al., 2001; Wastell and Sewards, 1995)
	Technological problems	(Jiang and Klein, 2000; Schmidt et al., 2001; Standish Group International, 1995; Wastell and Sewards, 1995; Yetton et al., 2000)
	Unrealistic user expectations of the system	(Barry and Lang, 2003; Schmidt et al., 2001; Standish Group International, 1995; Verkerk et al., 2000)

Table 1: Items representing factors facilitating or inhibiting IS development

The number of responses received was 113, for a response rate of 25%. Seven responses were unusable, either because critical (demographic) data was missing or the reported organisational size was below 200 FTEs. This left 106 usable responses that formed the basis of subsequent data analysis. Characteristics of the responding organisations are shown in Table 2. The 106 organisations in the respondent population represent 17% of the target population and provide a reasonable match with respect to business sector and organisational size. The categories 'Government and Local Government' and 'Education, Health and Community Services' were used as a crude proxy for public sector organisations, representing 30 (28%) of respondent organisations. Seventy percent of 'public sector' organisations had 500 or more FTEs, compared with 51% of the 'private sector' organisations. A Chi-square test indicated a weak association between organisational size and business category on this basis (X^2=3.057, df=1, p=0.080).

Just over half the organisations reported sizes of IS function of fewer than 10 FTEs, and in the majority of organisations (78%) the IS function was located in one central unit. Most of the organisations reporting an outsourced IS function also had fewer than 4 IS FTEs. The majority of the IS functions with fewer than 10 FTEs were located in the 200 to 499 FTEs-sized organisations. Conversely, the largest IS functions were most commonly found in the organisations with 2000 or more FTEs. A positive association between organisation size and size of IS function was found using Kendall's tau (T_b=0.414, p=0.000). No such association was found to exist between the location of the IS function and organisation size. Proportionately more 'public sector' organisations had large IS functions; 69% had IS functions of 10 or more FTEs compared with only 39% of 'private sector' organisations. A Chi-square test indicated that this was a significant association (X^2=7.705, df=1, p=0.006).

Business Category	**% organisations** (n=106)
Communications & Media	2
Construction & Engineering	8
Education, Health & Community Services	16
Electricity, Gas & Water Utilities	3
Finance, Insurance & Banking	8
Government & Local Government	12
IT, Business, Legal & Property Services	8
Manufacturing & Processing	24
Primary Industries	1
Tourism, Accommodation & Food Services	3
Transportation, Logistics & Storage	6
Wholesale & Retail Trade	11
Organisational size (FTE)	**% organisations** (n=106)
200 to 499	43
500 to 999	25
1000 to 1999	13
2000 or more	19

Size of IS function (FTE)	**% organisations** (n=104)
Fewer than 4	23
4 to 9	30
10 to 19	9
20 to 49	13
50 to 99	16
100 or more	10
Location of IS function	**% organisations** (n=106)
Centralised	78
Distributed	12
Mainly outsourced	8
Don't know	1
Respondent's role	**% organisations** (n=106)
Chief Information Officer	22
IS Manager	45
Development Manager	9
Project Manager	8
System Administrator	5
Non-IS Manager	10

Table 2: Characteristics of respondent organisation

Number of projects undertaken by an organisation	% organisations (n=105)	Project costs	% projects (n=2215)
0	5	$1000 or less	7
1-5	39	$1,001 - $10,000	20
6-10	20	$10,001 - $50,000	27
11-20	13	$50,001 - $100,000	18
21-50	12	$100,001 - $500,000	16
51-100	7	$500,001 - $1,000,000	7
More than 100	4	$1,000,001 or more	5
		Don't know the project cost	1

Table 3: IS project details

4. RESULTS AND ANALYSIS

4.1 IS Projects

The number of projects completed (or substantially completed) over the three year period surveyed ranged from 0 to 230 projects per organisation, for an average of 7 projects per organisation per year. This figure is comparable with the 9 projects per organisation per year obtained by a 1994 survey of New Zealand organisations by Martin and Chan (1996). Five percent of organisations did not undertake any IS projects, while 59% of organisations undertook between 1 and 10 IS projects (Table 3). Mann-Whitney tests for equality of medians established that larger organisations (500 or more FTEs) undertook significantly more IS projects than smaller organisations (200-499 FTEs) (U=848.0, p=0.001). Similarly, organisations with large IS functions (10 or more FTEs) undertook significantly more IS projects than those with smaller IS functions (fewer than 10 FTEs) (U=597.5, p=0.000).

The majority of the projects (81%) cost between $1,001 and $500,000, with just over half (54%) costing $50,000 or less (Table 3). The 5% of projects costing over $1 million were undertaken by 41% of the organisations, suggesting that they are not the exclusive preserve of the larger organisations. However, the larger organisations had significantly higher medians than smaller organisations for the total cost of projects undertaken (U=541.5, p=0.000) and the average project cost (U=728.5, p=0.001). Similarly, the total cost of projects undertaken (U=392.5, p=0.000) and the average project cost (U=788.5, p=0.003) was significantly higher for organisations with larger IS functions than for those with smaller IS functions.

4.2 IS Development or Acquisition

Table 4 shows the types of IS development or acquisition of reported IS projects. Just over half (54%) were bespoke developments, while the remaining 46% involved the purchase of packaged software or applications. Of these package acquisitions, 38% were used as is, and 62% were customised for or by the organisation. Eighty-two percent of the reported projects involved bespoke development or customisation of packaged software. The majority of this work was done in-house (67% of these projects), with the remainder outsourced (33%). This is comparable with data reported by the Standish Group for US application projects in 2000 (Standish Group International, 2001). They found that 46% involved bespoke development, 14% involved purchase of packages without modification, 27% involved customisation of packaged software and 13% involved developing some components and purchasing others.

Taking into account the fact that organisations could use one, many or all of the development categories, 91% of 100 organisations reported using packaged software at some stage, while 76% reported using bespoke development (either in-house or outsourced) at some stage. Twenty four (24%) organisations reported obtaining all of their IS as packaged software. The data in Table 4 is comparable to an earlier survey of New Zealand organisations where 88% of the respondents reported using packaged software, 61% reported using in-house bespoke development, and 62% reported using outsourced bespoke development (MacDonell, 1994). The main difference over the 10 year period seems to have been a decrease (of 17%) in the proportion of organisations undertaking outsourced bespoke development.

While 76% of 100 organisations reported using in-house customisation or development, 23% reported using this type of development exclusively. Similarly, while 70% reported outsourcing customisation or development, 19% used outsourcing exclusively. However, 44% used outsourcing for at least half of their projects. This compares well with the 43% of

New Zealand organisations who reported that they outsourced most or all of their applications development in 2002 (up from 37% in 2001) (Hind, 2002). Half the organisations in the current study used both in-house and outsourced customisation or development.

Compared to prior studies between 1994 and 2001 (Table 5), the average development profile of organisations in this study has a higher level of packaged solutions and a lower level of bespoke development. In terms of bespoke development, while the level of outsourced development is consistent with some prior overseas studies (Fitzgerald, 1998; Fitzgerald et al., 1999), the level of in-house development is lower for this study. Consideration of the New Zealand data shows a continuing trend towards packaged solutions and away from bespoke development. MacDonell (1994) suggests that the preference for packaged solutions stems from the increasingly availability of quality software packages and the relatively high cost of in-house development.

	% projects (n=2039)
Purchase of packaged software or application	46
With little or no customisation	18
With in-house customisation	13
With outsourced customisation	15
Bespoke IS development	54
In-house	42
Outsourced	12
	% organisations (n=100)
Purchase of packaged software or application	91
With little or no customisation	61
With in-house or outsourced customisation	77
Bespoke IS development	76
In-house	57
Outsourced	45
In-house customisation or development	76
Outsourced customisation or development	70

Table 4: Types of IS development or acquisition

Type of IS development or acquisition	**New Zealand**			**Ireland**	**UK**		
	This study†	MacDonell (1994)	McAulay (1987), cited in MacDonell (1994)	Fitzgerald (1998)	Fitzgerald et al. (1999)	Wastell & Sewards (1995)	Doherty & King (2001) *
% In-house development of IS	27	29	56	47	45	)	50
% Outsourced development of IS	14	27	8	13	15	) 55	)
% Use of packaged software/application	59	44	27	40	40	42	) 50
With little or no customisation	23				23		
With in-house customisation	16				17		
With outsourced customisation	20				-		

† Projects reported in each category were expressed as a proportion of an organisation's total projects, then averaged over the 100 organisations.

***** Estimated from reported ranges of in-house developed IS

Table 5: Comparative development profile of survey respondents

Mann-Whitney tests found that, compared with the smaller organisations, the larger organisations had significantly more IS projects that were bespoke IS developments (U=820.0, p=0.005) and in-house bespoke developments (U=859.5, p=0.009). Similarly, compared with those organisations with smaller IS functions, organisations with larger IS functions had significantly more IS projects that were bespoke IS developments (U=500.0, p=0.000) and in-house bespoke developments (U=471.5, p=0.000). Organisations with larger IS functions also had significantly more IS projects that involved in-house customisation or development (U=548.0, p=0.000).

4.3 Standard Method Use

Table 6 shows the extent of reported use of a standard method (a formal or documented approach for directing or guiding the IS development process) in the IS projects surveyed. The vast majority of reported projects (91%) used a standard method of IS development for at least part of the development process. Similarly, 92% of organisations used a standard method in at least part of the development process in at least some of their IS projects. That 17% reported using a method for some but not all of their projects accords with Wynekoop and Russo (1995), who note that just because an organisation has a standard method does not mean that it will be used in all of their projects.

Compared to prior empirical studies (Table 7), this study shows higher reported levels of standard method use, either in terms of the proportion of organisations that reported using a standard method, the relatively low proportion of organisations doing at least some IS development without using a standard method, or the low proportion of reported projects in which a standard method was not used at all. It is worth noting that the highest prior reported level of method use (85%) was from another New Zealand (albeit a small sample, preliminary) study (Taylor, 2000).

Prior empirical studies have shown that the use of standard methods by organisations may be associated with various organisational characteristics. For example, method use may be correlated with organisation size (Fitzgerald, 1998; Kiely and Fitzgerald, 2002; Russo, Hightower and Pearson, 1996; Urban and Whiddett, 1996; Wastell and Sewards, 1995) or size of the IS function (Fitzgerald, 1998; Russo et al., 1996), or associated with organisations in a particular industry sector (Fitzgerald, 1998; Rahim et al., 1998). In this study, larger organisations reported significantly more projects for various extents of standard method use than their smaller counterparts: a method was used for more or less all (U=884.5, p=0.026), for only part (U=959.5, p=0.051), and for at least part (U=810.5, p=0.006) of the development process. Smaller organisations tended to report a higher median number of projects where a standard method was not used, although the difference in median compared to the larger organisations was not significant (U=1049.5, p=0.171). A similar pattern of results was observed for size of the IS function, with organisations with a larger IS function reporting significantly more projects in which a method was used for more or less all (U=755.0, p=0.002), for only part (U=914.5, p=0.027), and for at least part (U=655.5, p=0.000) of the development process, compared to organisations with smaller IS functions.

The most common reasons given for not using a standard method in particular IS projects were related to the nature of the project (e.g. the project was small or non-critical, was a packaged solution involving little or no customisation, or control of the project was outside the IS function) or organisational practice (e.g. the organisation had an informal or ad hoc approach towards development or no method was in place in the organisation). These reasons are consistent with prior studies (Fitzgerald, 1998; Fitzgerald, Russo and Stolterman, 2002; Huisman and Iivari, 2002; Kiely and Fitzgerald, 2002, 2003; Roberts, Leigh and Purvis, 2000; Wynekoop and Russo, 1995), and imply that organisations often choose to not use a standard method in a given IS project for pragmatic reasons (cf. Fitzgerald, 1996; 1998; 2000). Further detailed analysis of standard method use in IS projects in the surveyed organisations can be found in McLeod, MacDonell and Doolin (2007a).

4.4 User Participation

Table 8 shows the extent of reported user participation in the IS development process for the projects surveyed. Users participated in the majority of reported projects (92%) for at least part of the development process, and for more or less all of the development process in 61% of the reported projects. This level of user participation is higher than that reported in Kiely and Fitzgerald's (2002) survey of medium to large Irish organisations, in which users participated in 65% of the projects and played a significant role in 56% of projects. All organisations in the current study reported having at least some level of user participation in at least some of their IS projects.

	% projects (n=2026)
Standard method not used	9
Standard method used	91
For more or less all of development	77
For only part of development	13
	% organisations (n=99)
Standard method never used	8
Standard method used	92
Standard method always used	69
For more or less all of development	44
For only part of development	6
For either all or only part of development	19
Standard method used for some but not all projects	17
Missing some project data	6

Table 6: Extent of standard method use

Standard method use	This study	Prior studies
% organisations reporting use of a standard method	92	40 to 85 (μ=69 σ=12) (Barry and Lang, 2001, 2003; Eva and Guilford, 1996; Fitzgerald, 1998; Fitzgerald et al., 1999; Hardy, Thompson and Edwards, 1995; Iivari and Maansaari, 1998; Kiely and Fitzgerald, 2002; Rahim et al., 1998; Russo et al., 1996; Taylor, 2000; Wastell and Sewards, 1995)
% organisations reporting at least some IS development without use of a standard method	25	46 (Russo et al., 1996)
% projects in which a method was not used at all in development	9	31 (Chatzoglou, 1997; Russo et al., 1996)

Table 7: Comparative use of standard methods

	% projects (n=2129)
Users did not participate at all	8
Users did participate	92
For more or less all of development	61
For only part of development	31
	% organisations (n=100)
Users did not participate at all	0
Users did participate	100
Users always participated	84
For more or less all of development	46
For only part of development	19
For either all or only part of development	18
Users participated for some but not all projects	16

Table 8: Extent of user participation

Larger organisations reported significantly more projects in which users participated for at least part of the development process (U=876.0, p=0.017). Organisations with a larger IS function reported significantly more projects in which users participated for more or less all (U=816.5, p=0.006) and for at least part (U=702.0, p=0.000) of the development process, compared to organisations with smaller IS functions.

The most common reason given for no user participation in particular IS projects was that the project was perceived to be of little or no relevance to users, usually because of its technical or infrastructural nature. Users were also not involved in two projects where the IS was packaged software requiring little or no customisation, consistent with Butler and Fitzgerald (1999). Further detailed analysis of user participation in IS projects in the surveyed organisations can be found in McLeod, MacDonell and Doolin (2007b).

4.5 Factors Facilitating IS Development

Respondents were asked to indicate how important twelve factors had been in facilitating IS development in the projects undertaken over the three-year time frame. These factors are shown in Figure 1, in order of their perceived relative importance. As might be expected, the respondents felt that most of the factors identified in the literature had played an important role in facilitating IS development, reinforcing the validity of their inclusion in the survey.

The two factors perceived to be important by most respondents were *adequate resources or time* and *well-defined user requirements*. Virtually none of the respondents felt that *adequate resources or time* was of little importance in facilitating IS development. Of interest is the high level of importance placed on aspects potentially related to users in the development process, including *well-defined user requirements*, *effective communication between developers and users*, and *user commitment or buy-in*. Although *effective user participation* was the third lowest factor, it was still perceived as important by 76% of the respondents. None of the respondents felt that *user commitment or buy-in* was of little importance in facilitating IS development.

By contrast, the *use of a standard method* was perceived as important by only 47% of the respondents. Although not all respondents used a standard method, this suggests that some organisations are using a standard method despite the perception that standard methods were not of high importance in facilitating IS development in their IS projects. The factor perceived to be of least importance was *use of external consultants*. This probably reflects the relatively low use of external consultants across all projects, despite changes to the IS development environment, such as the increase in package software acquisition.

Overall, the relative ranking of the factors facilitating IS development in this study do not show a high degree of consistency with comparable factors in prior empirical studies (Table 9). Of the two highest ranked factors in this study, *adequate resources or time* and *well-defined user requirements* are also ranked highly in some of the prior studies. *Effective project management*, of middle order ranking in this study, was generally ranked highly in other studies. *Effective management of change*, also of middle order ranking in this study, was ranked lowly in other studies. *Effective functioning of the project team*, *top management support* and *effective user participation*, all of low ranking in this study, tended to be ranked higher in other studies. However, the low ranking of *use of a standard method* and of *external consultants* in this study is consistent with prior studies measuring these factors. The current study is consistent with the other New Zealand study that considered factor influence (Verkerk et al., 2000) in that *well-defined user requirements* was ranked relatively highly, while *effective user participation* had a low rank. However, the very high rankings of *effective project management* and *top management support* in the earlier study are not confirmed in the current study.

4.6 Factors Inhibiting IS Development

Respondents were asked to indicate how important fourteen factors had been in inhibiting IS development in the projects undertaken over the three-year time frame. These factors are shown in Figure 2, in order of their perceived relative importance. The two factors perceived to be the most important in inhibiting IS development were *resource or time constraints* and *poorly defined or changing user requirements*. *Ineffective communication between developers and users* was also ranked highly, with 60% of respondents rating it as of high importance. The bi-polar distribution of responses for the factors related to *political manoeuvring or disagreements*, *lack of top management support*, *ineffective user participation*, and *ineffective functioning of the project team*, suggest that these factors have the potential to be influential in certain projects. *User resistance*, *technological problems* and *not using a standard method* were not considered to be important in inhibiting IS

development, with more respondents ranking them of little or no importance than of high importance.

Overall, the relative ranking of the factors inhibiting IS development in this study show a reasonable degree of consistency with comparable factors in prior empirical studies (Table 10). Looking first at the more highly ranked factors in this study, both *resource or time constraints* and *poorly defined or changing user requirements* display considerable variation in importance in prior studies, although both are ranked highly in the other New Zealand study (Verkerk et al., 2000). *Ineffective project management* and *ineffective management of change* are also generally ranked highly in prior studies.

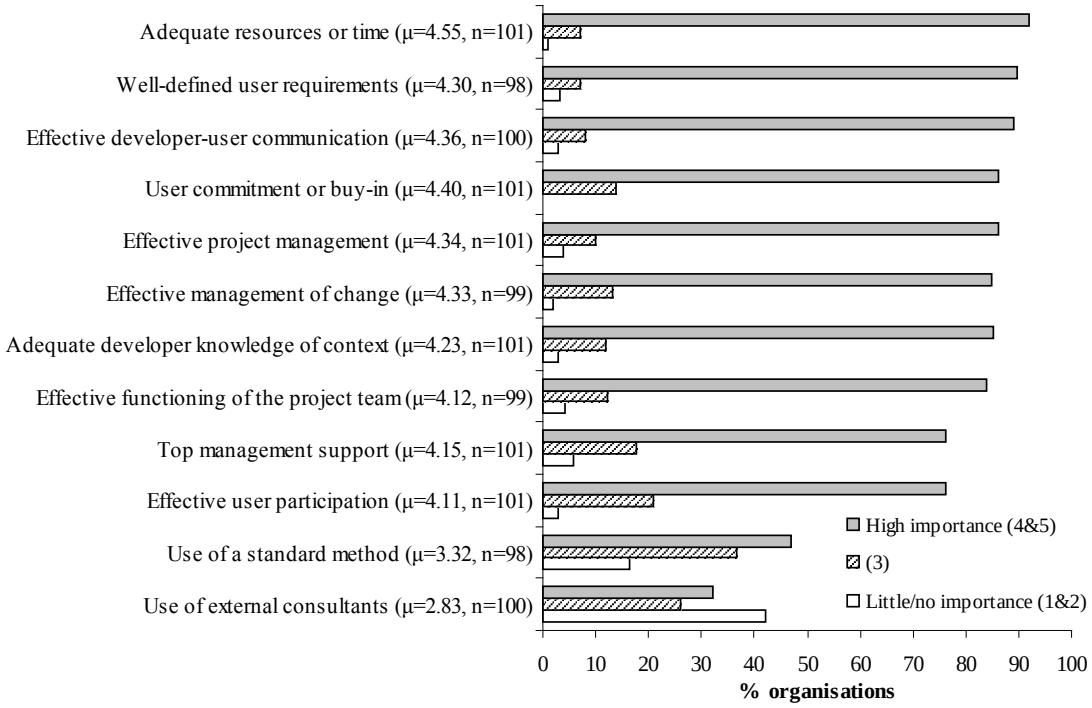

Figure 1: Relative importance of factors in facilitating IS development

Of the middle ranked factors in this study, *unrealistic user expectations* also tends to be of moderate importance in prior studies (although low in Finland and New Zealand). *Inadequate developer knowledge of the system context* shows mixed importance in prior studies, while *political manoeuvring or disagreements* is only rated lowly. In contrast, *lack of top management support* is generally given high importance in other studies (although not in the prior New Zealand study). Of the lower ranked factors in this study, *ineffective user participation* and *user resistance* tend to be ranked more highly in other studies. The low rankings for *ineffective functioning of the project team*, *technological problems*, and *not using a standard method* are largely consistent with other studies. Interestingly, the current study is consistent with the other New Zealand study (Verkerk et al., 2000) across four of the five common factors.

The ten matched pairs of inhibiting and facilitating factors from Tables 9 and 10 tended to be given comparable relative rankings of importance (Table 11). Equivalent (but opposite) factors were given the same relative ranking in seven of the cases, including the top six factors. However, overall, the inhibiting factors listed tended to have lower average rankings of importance than the factors facilitating IS development. The differences between the ten matched pairs of inhibiting and facilitating factors were found to be significant ($p<0.001$) using a Wilcoxon signed-rank test. This suggests that, overall, factors facilitating IS development outcomes were perceived as more influential than factors inhibiting development in the IS projects surveyed. A similar result was found in a survey of New Zealand organisations involved in IS development where respondents gave significantly higher ratings to the importance of factors in IS success

than they did for factors in IS failure, a result attributed to developer optimism (Hood, 1999).

	NZ	NZ	Ireland	UK	Mostly US	US	US	US
	This study IS executives	Verkerk et al. (2000) IS & other executives	Fitzgerald (1998) IS managers	Wastell & Sewards (1995) IS directors	Wixom & Watson (2001) IS managers	Johnson et al. (2001) IS executives	Jiang et al . (1996) IS professionals	Rainer & Watson (1995) Various†
Total number of factors ranked	12	10	5	6	8	10	13	23
Adequate resources or time	1		2		5		5	21
Well-defined user requirements	2	3				7		3
Effective communication between developers & users	3						7	
User commitment or buy-in	4						12	
Effective project management	5	1		4		3	3, 10	
Effective management of changes resulting from system implementation	6				7			17
Adequate developer knowledge of the system context	7		3					
Effective functioning of the project team	8				3		4	
Top management support	9	2			1	1	2	2
Effective user participation in development process	10	6	1	3, 5	4	2	6	
Use of a standard method of IS development	11		4	6		8		
Use of external consultants	12							23
† Including IS professionals, executive users, vendors & consultants								

Table 9: Comparative ranking of factors facilitating IS development

4.7 Proposed Changes in IS Development

Table 12 summarises the general changes to IS development in the subsequent three years anticipated by the respondents. Two of the most common expected changes were an increase in IS development (often because of the need to replace or integrate legacy systems or to migrate to new architectures), and an increase in outsourced development. The latter is consistent with an established trend towards outsourcing IT operations in New Zealand (Bell, McMath and Bland, 2003; Bland, 2005; Greenwood, 2006; Hind, 2002) and overseas (Colquhoun and Paredes, 2004; Santosus, 2005). The popularity of outsourcing may in part reflect a shortage of IT skills (MIS New Zealand, 2006; Paredes, 2005).

Another common anticipated change mentioned by respondents was an increasing requirement for IS development to meet business needs or benefits. This was referred to in terms such as IS development being "driven for business benefit", "focus[ed] on business outcomes", "better align[ed] with real business needs", and "more strategically aligned". As one respondent summarised, this reflected a "stronger focus on business processes driving the development of systems, rather than the other way around".

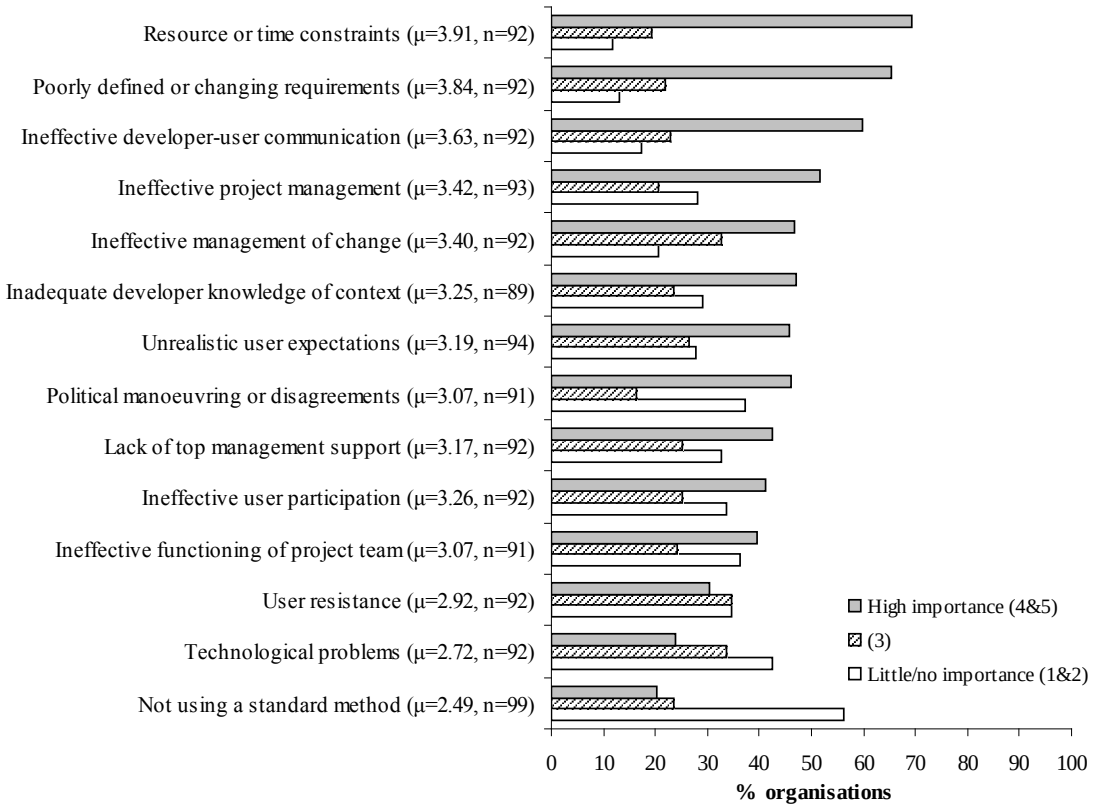

Figure 2: Relative importance of factors in inhibiting IS development

5. CONCLUSION

This study has provided an updated assessment of IS development practice in New Zealand organisations based on empirical data from actual IS projects. Where available, data from other countries were compared to the New Zealand findings.

Before the conclusions are stated it is important to acknowledge the limitations of our study. As for virtually all survey-based research, aspects of the sample – its size, the exclusively New Zealand nature – and the respondents – whether representative of the intended population – are potentially influential in limiting the applicability and generalisability of the outcomes. While we remain pleased with the response rate (and we note that it is comparable to that achieved in many other such studies) it is true that the group of respondents is a subset of those organisations we are wishing to characterise. It should also be acknowledged that respondents may have answered – consciously or unconsciously – in a way that would portray them in a more favourable light. We can only hope that the anonymity given to respondents, and the absence of any particularly contentious questions, would mean that the extent of any exaggeration was minimal. With those caveats in mind, we draw the following conclusions.

The size of an organisation's IS function was positively associated with the organisation's size and whether it was in the public sector or not. Most organisations had a centralised IS function. Organisations that outsourced their IS function tended to have few IS personnel, presumably as either a cause or consequence of outsourcing. On average, the organisations undertook seven IS projects per year from 2001 to 2003, with 72% of projects costing under $100,000. Larger organisations or those with larger IS functions undertook significantly more projects or more expensive projects than their smaller counterparts, although very expensive projects were not the exclusive preserve of larger organisations. The prevalence of smaller sized projects is consistent with the IS literature in that most organisations spend the

majority of their time on smaller projects (Eva and Guilford, 1996) and that the development of smaller-sized projects is an emerging part of the modern IS development landscape (Johnson et al., 2001; SoftwareMag, 2004). There was no significant difference between public and private sector organisations in terms of the median number of projects undertaken or the total and average project costs.

	NZ	NZ	NZ/ UK	Global	UK	Ireland	Finland	Hong Kong	US	US	US
	This study IS executives	Verkerk et al. (2000) IS & other executives	Yetton et al. (2000) IS managers	KPMG (2005) ?	Wastell & Sewards (1995) IS directors	Barry & Lang (2003) Developers	Schmidt et al. (2001) Project managers	Schmidt et al. (2001) Project managers	Schmidt et al. (2001) Project managers	Jiang & Klein (2000) Project managers	Standish Group (1995) IS executives
Total number of factors ranked	14	10	12	?	7	14	23	14	17	12	10
Resource or time constraints	1	3	5		7	1, 2, 8,10	7, 15	15	13	3	6, 9
Poorly defined or changing user requirements	2	1, 2	6	1	1	4, 3	9	8	14		2, 3
Ineffective communication between developers & users	3										
Ineffective project management	4	5		2	4		1		5		
Ineffective management of changes resulting from system implementation	5						4		3	4	
Inadequate developer knowledge of the system context	6						3	13	11	7	
Unrealistic user expectations of the system	7	9				5	23	9	7		7
Political manoeuvring or disagreements within the organisation	8				5		22	10	16		
Lack of top management support	9	4		3			2	1	1		4
Ineffective user participation in development process	10	7	11		3		11	2	6	8	1
Ineffective functioning of the project team	11		7, 12							5, 12	
User resistance	12		9				8	3, 4	4	6	
Technological problems	13		10		6		13	12	12	1,9	10
Not using a standard method of IS development	14					14		14		10	

Table 10: Comparative ranking of factors inhibiting IS development

Factors facilitating IS development	Rank	**Factors inhibiting IS development**	Rank
Adequate resources or time	1	Resource or time constraints	1
Well-defined user requirements	2	Poorly defined or changing requirements	2
Effective developer-user communication	3	Ineffective developer-user communication	3
Effective project management	4	Ineffective project management	4
Effective management of change	5	Ineffective management of change	5
Adequate developer knowledge of context	6	Inadequate developer knowledge of context	6
Effective functioning of project team	7	Ineffective functioning of project team	9
Top management support	8	Lack of top management support	7
Effective user participation	9	Ineffective user participation	8
Use of a standard method	10	Not using a standard method	10

Table 11: Relative rank order of ten matched pairs of factors

	% organisations (n= 63)
No change	21%
Less IS development	3%
More IS development	11%
More outsourced development	13%
More in-house development	5%
More packaged solutions	6%
Development moving off-shore	3%
More local development (compared to offshore)	2%
More focus on business outcomes	16%
Increased requirement for accountability	6%
Closer involvement with external business partners	3%
Improved project management	6%
Increased IS control of IS projects	6%
Change in development techniques or tools	3%
Changes arising from a change in company ownership	2%

Table 12: Anticipated changes in IS development

At 54% of reported projects, bespoke development was the most common method of IS development or acquisition. The balance (46%) involved the purchase of packaged software, 62% of which were customised before use. Two-thirds of development or customisation work was conducted in-house, although the outsourced remainder represents 27% of reported projects. On an organisational basis, the trend towards increased use of package solutions and outsourced development or customisation appears to be even stronger. These results, together with observations in the local IS practice literature (e.g. Bell et al., 2003; Bland, 2005; Gordon, 2005; Greenwood, 2006; Hind, 2002; Watson, 2004), suggest that New Zealand organisations have been realising some of the benefits of using packaged software or outsourcing. These include reduced cost, reduced requirements for internal skilled technical staff, ongoing support, access to upgrades and avoiding operations outside their core business (Cope, 2000; Palmer, 1999). Even so, these acquisition options are unlikely to answer all of the IS needs of an organisation (especially in terms of non-standard problems), suggesting that there is still a place for in-house development (Palmer, 1999).

Both user participation and standard method use continue to play a prevalent role in IS development in New Zealand, although there seems to be some variation in how these techniques are enacted in practice. All organisations that undertook IS projects had users participate to some extent in at least some of the projects, and users participated in 92% of reported projects. Standard methods of development were never used in only 9% of projects and 8% of organisations. Standard methods were used for all of the development process in 77% of reported projects, and always for all of development by 44% of organisations. The implication is that, despite the various criticisms

directed at standard methods within the IS literature and questions about the relevance of traditional standard methods in the modern IS development context, the organisations that participated in this survey still perceive some benefit to be had in using standard methods for at least part of development in some of their projects. The number of projects in which users participated or in which a standard method was used was significantly higher for larger organisations or those with larger IS functions.

Whether viewed as facilitating or inhibiting IS development, the six most highly ranked factors influencing development in the projects surveyed in this study were related to availability of resources or time, definition of user requirements, communication between developers and users, project management, management of IS development-related change, and developer knowledge of the IS development context. Overall, the results of this survey support observations in the IS literature highlighting the importance of organisational or people-related issues in determining the outcome of IS development (Doherty and King, 2001, 2005; Doherty, King and Al-Mushayt, 2003; Eason, 2001). These studies suggest that organisations that treat various organisational issues are more likely to enjoy a higher level of IS project success.

The changes to IS development anticipated by many of the survey respondents reflect the changing development environment. For example, some respondents anticipated increased levels of IS development, purchase of packaged solutions and outsourcing. Others emphasised an increasing need for accountability or IS control of projects, or for IS development to be more aligned with business needs. Linking IT and business strategies or objectives has emerged as a key concern of senior IS managers in both New Zealand and overseas (e.g. Chang, 2006; Hind, 2002; KPMG, 2005), and seems to reflect the demands placed on IS by the modern business.

Prior studies suggest that New Zealand IS development practices tend to mirror trends in the wider international community. As we could have expected, the findings of this study generally reflect this, particularly with respect to the prevalence of smaller sized projects, greater use of packaged software and outsourcing at the expense of bespoke development, the importance of organisational or people-related factors in facilitating IS development, and the ongoing reliance on user participation and some form of method use. With respect to the latter, however, the reported level of standard method use in this study is higher than expected based on prior empirical studies from other countries. Further research is need to monitor the development and acquisition practices of organisations as the IS development environment continues to change, both in New Zealand and other national contexts.

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