Recruiting and Maintaining SME Involvement when Designing Voluntary Inter-Organisational IS

by

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### Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Meaning</th>
</tr>
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<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
</tr>
<tr>
<td>CA</td>
<td>Catchment Authority (Pseudonym)</td>
</tr>
<tr>
<td>CAQDAS</td>
<td>Computer Assisted Qualitative Data Analysis Software</td>
</tr>
<tr>
<td>CEM</td>
<td>Catchment Environmental Management (Pseudonym)</td>
</tr>
<tr>
<td>DOI</td>
<td>Diffusion of Innovation</td>
</tr>
<tr>
<td>DE</td>
<td>Department of Environment (Pseudonym)</td>
</tr>
<tr>
<td>DSS</td>
<td>Decision Support System</td>
</tr>
<tr>
<td>DLR</td>
<td>Department of Land and Resources (Pseudonym)</td>
</tr>
<tr>
<td>DMS</td>
<td>Dairy Management System (pseudonym)</td>
</tr>
<tr>
<td>EA</td>
<td>Environment Association (Pseudonym)</td>
</tr>
<tr>
<td>EDI</td>
<td>Electronic Data Interchange</td>
</tr>
<tr>
<td>EIMS</td>
<td>Environmental Information Management Systems</td>
</tr>
<tr>
<td>EM</td>
<td>Environmental Management</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Authority</td>
</tr>
<tr>
<td>EVAO</td>
<td>Estimated Value of Agricultural Operations</td>
</tr>
<tr>
<td>EVC</td>
<td>Ecological Vegetation Class</td>
</tr>
<tr>
<td>FA</td>
<td>Farmer Association (pseudonym)</td>
</tr>
<tr>
<td>FPT</td>
<td>Farm Planning Tool (Pseudonym)</td>
</tr>
<tr>
<td>GSCM</td>
<td>Green Supply Chain Management)</td>
</tr>
<tr>
<td>IOEIMS</td>
<td>Inter-organisational Environmental Information management Systems</td>
</tr>
<tr>
<td>IOIS</td>
<td>Inter-organisational Information Systems</td>
</tr>
<tr>
<td>ISD</td>
<td>Information Systems Design</td>
</tr>
<tr>
<td>PMP</td>
<td>Property Management Planning</td>
</tr>
<tr>
<td>RA</td>
<td>Requirements Analysis</td>
</tr>
<tr>
<td>RE</td>
<td>Requirements Engineering</td>
</tr>
<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>SCOT</td>
<td>Social Construction of Technology</td>
</tr>
<tr>
<td>SME</td>
<td>Small and Medium Enterprise</td>
</tr>
<tr>
<td>SST</td>
<td>Social Shaping of Technology</td>
</tr>
<tr>
<td>WFP</td>
<td>Whole Farm Plan (Pseudonym)</td>
</tr>
</tbody>
</table>
Abstract

Voluntary inter-organisational information systems (IOIS) intended for small and medium enterprises (SMEs) have been found to fail in part because SMEs were not involved in the design phase (e.g. Fisher & Craig 2004; Salmivalli et al. 2008). It can be difficult for organisations initiating voluntary IOIS to involve SMEs because it is optional for SMEs to adopt the IOIS (Chen et al. 2012; Følstad et al. 2004; Huang et al. 2010a), let alone take part in the design phase. Most IS research on SMEs focuses on adoption/implementation phases, not the design phase. The few studies on the design phase of voluntary IS/IOIS do not examine how organisational initiators manage (recruit and maintain) SME involvement in the design phase. The limited empirical research also means there was very little theorising about this problem domain. An important aim of the thesis is, therefore, to identify theoretical concepts for IS scholars to use for much needed future research to analyse and describe how initiators manage SME involvement in the design phase of a new voluntary IOIS.

The thesis addresses this aim by presenting an in-depth case study of an Australian State government initiator’s attempt to manage involving SME farmers in the design phase of a new voluntary IOIS, the Farm Planning Tool (FPT, pseudonym), for exchanging spatial information about environmental management (EM) between government agencies and the farmers. This unusual case, compared to typical IOIS studies on SMEs (e.g. Fisher & Craig 2005; Gengatharen & Standing 2005; Salmivalli et al. 2008), was selected because the initiator involved farmers directly in multiple requirements analysis (RA) activities to identify unknown farmer needs due to the infancy of spatial technology when the project started. This study then used multiple hermeneutic cycles to identify emergent themes from the case study, return to the literature to identify concepts useful for describing and making sense of the themes, and re-analyse the case study findings using these concepts. The case study and the hermeneutic process of analysis and interpretation showed the following.

First, it is viable for initiators to involve farmers directly in multiple RA activities, in contrast to prior studies suggesting initiators did not involve SMEs (e.g. Fisher &
Craig 2004; Salmivalli et al. 2008) or used only industry associations (Følstad et al. 2004; Wilkins 2005). The findings also show it is more complex for initiators to recruit and maintain SME participation than the literature on IOIS, RA and IS development recognises. In this study, the complexity was due to such issues as handling:

- the challenge of co-opting stakeholders internal and external to the initiator to recruit and maintain SME farmer involvement on their behalf, including negotiating/compromising on the initiator’s information needs from the FPT;
- the complication of farmer heterogeneity such as different computer skills, on-farm EM and productivity priorities and industries;
- the difficulty of convincing farmers to take part in RA activities when they did not understand the technology or potential of the FPT on their property; and
- the problems caused by other parties promoting a competing voluntary desktop alternative to the FPT, so that farmers were being discouraged by these parties from taking part in the design phase of the voluntary FPT.

Second, the thesis shows that combining concepts from Boonstra’s (2009) IS/IOIS stakeholder management framework and the diffusion of innovation (DOI) theory from Rogers (2003) was useful for analysing, and as a vocabulary for describing the complex case study. The lack of studies and theorising around how organisational initiators engage SMEs in the design phase of a voluntary IS/IOIS emphasises the need for this initial conceptual foundation as the basis for future research. For example:

- DOI concepts such as interpersonal and mass media channels can be used with Boonstra’s stakeholder interest types and IS/IOIS design phase stages (specification vs development) to compare what initiators state (and how) in different types of recruitment invitations used at different stages.
- The thesis uses DOI concepts to re-conceptualise how stakeholders recruit and maintain SME involvement as interrelated voluntary IOIS “instance” decision processes and RA activity participation decision processes. With the former, the initiator’s stakeholders offered an owner-manager knowledge
about the FPT instance in each RA activity to encourage participation in the first and subsequent RA activities. With the latter, stakeholders aimed to create conditions for an RA activity (e.g. location, owner-manager’s knowledge of the RA activity’s purpose) to encourage each owner-manager to take part in the first and subsequent RA activities.

Third, the thesis shows the value of IS scholars going beyond the dominant adoption/ implementation research questions (e.g. “Why do SMEs not adopt voluntary IS/IOIS?”) and including new design phase research questions of the form “How do initiators design voluntary IOIS to contribute to slow adoption rates by SMEs?”
Chapter 1 - Introduction

1.1 Research problem

Advances in information systems (IS), including the Internet, have enabled organisations to create and implement inter-organisational IS (IOIS). IOIS have been of interest to IS researchers for over three decades, and are defined in the seminal literature as computerised network-based, bi-directional information sharing, electronic transactions and trading between two or more organisations (Bakos 1991a; Barrett & Konsynski 1982; Cash & Konsynski 1985; Kumar & Van Dissel 1996; Vitale & Johnson 1988). Historically this definition has referred to IOIS such as electronic data interchange (EDI), supply chain management (SCM) and electronic marketplaces (e-marketplaces). Today, where many IS (e.g. mobile applications and social media) offer IOIS opportunities, contemporary IS scholars still use the definition from seminal works to define IOIS (see Chu et al. 2013; Phuaphanthong & Bui 2014; Singerling et al. 2015; Steinhueser et al. 2015; Tharwa & Mokhtar 2014). For this reason, this study also uses the seminal definition of IOIS.

Organisations using an IOIS have the potential to achieve win-win operational and strategic benefits such as improving service and quality, streamlining processes and enhancing partnerships (Maggiolini & Valles 2012; Seyal et al. 2013; Wang & Sarkis 2013). Large organisations initiating the design and implementation of IOIS typically only achieve benefits if their small and medium-sized enterprise (SME) partners use the IOIS (e.g. Chen et al. 2012; Francialanci & Morabito 2008; Haddara & Zach 2011; McGrath et al. 2006; Teoh et al. 2008). IOIS initiators with trading power can benefit by mandating that SME partners use their IOIS (Soinio et al. 2012), such as government agencies requiring SMEs to use an IOIS to meet regulatory and transaction requirements (e.g. Fernandes & Vieira 2015; Karjalainen & Kemppainen 2008; Wilkins 2005). In this thesis, I refer to these as mandatory IOIS.

Voluntary IOIS, by contrast, are more problematic because they are optional for SMEs to use (Chen et al. 2012; Følstad et al. 2004; Huang et al. 2010a). An example of such IOIS includes e-marketplaces initiated by third-parties, which SMEs can use to share knowledge with other SMEs (e.g. Nolan et al. 2007; Noor & Nordin 2012). Voluntary IOIS present challenges for initiators because, if SMEs decide not to use...
the IOIS, initiators waste valuable resources such as time and money from developing them (Gunawong & Gao 2010; Wiredu 2012). The same issue is reported for IS generally, where developers of software such as decision support systems (DSS) (e.g. Hayman & Easdown 2002; Oduoza & Xiong 2009; Parker & Sinclair 2001) and enterprise resource planning (ERP) systems (e.g. Ali & Xie 2011; Chamberlain 2014; Haddara 2011) for SMEs also can waste resources if their products are not adopted.

A major factor contributing to the failure of many voluntary IOIS is the lack of SME involvement during the design phase, which helps to understand SME needs and increase the chances the IOIS will be of interest to SMEs (e.g. Fisher & Craig 2004; Salmivalli et al. 2008). Organisations, including governments, initiating voluntary IOIS often have difficulty getting parties (including SMEs) to participate in the design phase (e.g. Følstad et al. 2004). This includes the challenge of handling SME constraints and barriers (e.g. lack of IS capabilities) and their heterogeneity (Gengatharen 2008). This raises the issue of how initiators of voluntary IOIS can encourage SMEs to participate in the design phase when it is optional for SMEs to participate in the design phase and to use/adopt the resulting IOIS.

The aim of this thesis is, therefore, to examine how organisational initiators of voluntary IOIS manage SME involvement during the design phase. This research contributes to IS knowledge for two reasons, stated briefly here and elaborated on in Chapter 2. First, most IS research focuses on post-design IS/IOIS adoption decisions and implementation by SMEs, not how initiators of IS/IOIS aimed at SMEs carry out the design phase. Second, the few studies exploring the design phase tend to focus on the requirements analysis (RA) methods used; the SME needs to be identified, and the efforts of researchers initiating IS/IOIS (not organisational initiators).

This thesis, by contrast, is concerned with how organisational initiators manage SME involvement in the design phase, such as inviting SMEs to participate and maintaining relationships with SMEs if they agree. The main contribution of this thesis to IS knowledge, therefore, is presenting the first detailed empirical analysis of what actors were involved, what they did and how to manage SME involvement
when an organisation initiated the design phase of a new voluntary IOIS. In Chapter 3, I argue this lack of empirical research also means there has been limited theorising relating to how initiators of voluntary IOIS recruit SMEs and maintain their involvement. The main theoretical contribution of this thesis is identifying concepts suitable for use as a vocabulary for describing and analysing (Gregor 2006) the complexity of how an organisational initiator of a voluntary IOIS manages SME involvement in the design phase. This thesis, therefore, provides a foundation for IS scholars to conduct future (e.g. explanatory) research in this under-explored problem domain.

The next sections elaborate on the research aim by providing further background on each aspect of the research problem. Section 1.2 justifies why it is important to involve users (including SMEs) in the IS/IOIS design phase. Section 1.3 explains the concept of voluntary IOIS in more detail, and why it is more difficult for initiators to involve SMEs during the design phase of voluntary IOIS compared to mandatory IOIS. Section 1.4 explains why the characteristics of SMEs make it difficult for initiators to involve SMEs in the design phase. The chapter then concludes with a summary of the research aim and question (Section 1.5), and of the remaining chapters in the thesis (Section 1.6).

1.2 Importance of user involvement during IS/IOIS design phase

It is widely acknowledged in the literature that user participation during the IS design phase is important because it is a major factor contributing to successful IS implementation (e.g. Kujala et al. 2005; Markus & Mao 2004; Petter et al. 2013). The literature on IOIS similarly reports that involving organisations in the design phase can help improve IOIS adoption and implementation success, because it increases the likelihood the system will meet the needs of organisations which will use the IOIS (Barki & Hartwick 1994; Boonstra 2009; Kujala et al. 2005; McLeod et al. 2008; Pouloudi & Whitley 1997).

It is therefore not surprising that IS scholars state it is important to involve SMEs in the design phase of IOIS (e.g. Følstad et al. 2004; Gengatharen et al. 2005; Ndou et al. 2011; Noor & Nordin 2012). The literature reports on numerous examples of IOIS, which failed because, for instance, they did not meet the (promised) needs of
SMEs (e.g. Fisher & Craig 2005; Gengatharen & Standing 2005; Salmivalli et al. 2008). A common factor contributing to IOIS failures identified in these studies is the lack of SME involvement during the design phase. This has also been reported in the context of voluntary IS (e.g. Lynch & Gregor 2004; Parker & Sinclair 2001; Quinn 2009).

As I explain in Chapter 2, most IS research does not explore in detail how IOIS initiators manage SME involvement in the design phase, despite recognition of the importance of their involvement. I will argue in Chapter 2 that the few studies which do investigate aspects of designing IOIS for SMEs provide limited insights into how IOIS initiators manage the complexity of involving SMEs in the design phase (see Sections 2.4 and 2.5). I argue that managing SME involvement is non-trivial and warrants study. It must be emphasised that this thesis does not aim to establish a link between SME involvement in the design phase, and IOIS adoption or implementation outcomes. Instead, this thesis focuses on establishing the first in-depth empirical investigation of how organisational initiators manage SME involvement in the design phase, given the limited IS knowledge relating to this phase of the IOIS lifecycle in an SME context.

The next section explains that the degree to which IOIS initiators involve SMEs and encounter challenges in the design phase may depend on the type of IOIS.

1.3 Challenges of involving SMEs in design phases of voluntary IOIS

As noted in Section 1.1, voluntary IOIS may present more challenges compared to mandatory IOIS for initiators when trying to involve SMEs in the design phase. Table 1.1 compares these two types of IOIS by showing that the thesis makes two important distinctions: whether the IOIS is mandatory or voluntary for SMEs to adopt and use; and whether it is mandatory or voluntary for SMEs to participate in the design phase of the IOIS. This thesis focuses on IOIS where it is optional for SMEs to adopt/use the IOIS (i.e. voluntary IOIS) and optional for them to participate in the design phase of the IOIS.
Table 1.1: Comparison of mandatory and voluntary IOIS

<table>
<thead>
<tr>
<th></th>
<th>SME participation in design phases</th>
<th>SME adoption/use of the IOIS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mandatory</strong></td>
<td>Large trading partner may make it voluntary for SMEs to participate in the design phase (i.e. maybe voluntary involvement in IOIS design).</td>
<td>Large trading partner makes it mandatory for SMEs to use the IOIS (i.e. mandatory IOIS).</td>
</tr>
<tr>
<td><strong>Voluntary</strong></td>
<td>Large trading partner makes it voluntary for SMEs to participate in the design phase (i.e. voluntary involvement in IOIS design).</td>
<td>Large trading partner makes it voluntary for SMEs to use the IOIS (i.e. voluntary IOIS).</td>
</tr>
</tbody>
</table>

**Mandatory IOIS**, as summarised in Table 1.1, apply in situations where SMEs are required to use IOIS to exchange information electronically with one or more other organisations. For example, Johnston and Mak (2000) reports on a web-based IOIS developed by a large retail organisation which their SME suppliers must use (if they are not Electronic Data Interchange (EDI) capable) to receive purchase orders and send other business transactions. In this example, SME suppliers must use either the Web-based (or the EDI-based) IOIS to sell to the large retailer, so that it is mandatory for them to use at least one IOIS via an electronic network.

In Chapter 2, I explain that IS studies relating to mandatory IOIS for SMEs report little information on if/how SMEs are involved in the design phase. For example, Johnston and Mak (2000) implied that SME suppliers provided feedback during the design phase, but the authors gave no further details about SME involvement. The lack of research regarding SME involvement during the design phase may reflect that SMEs are required to use the IOIS regardless of whether or not it meets their needs.

**Voluntary IOIS**, by contrast, apply when it is optional for SMEs to use any IOIS at all to exchange information with one or more organisations. There are various types of voluntary IOIS evident in the literature. One type is online portals and e-marketplaces initiated by third-parties, which SMEs can use optionally to conduct e-commerce (e.g. Fisher & Craig 2005; Gengatharen 2008). A second type is online communities, which SMEs can choose to use for sharing knowledge electronically with other SMEs and business advisers (e.g. Nolan et al. 2007; Noor & Nordin 2012). A third type is IOIS initiated by organisations, such as government agencies, where SMEs can choose whether to use the IOIS to exchange information electronically with the organisation (e.g. Huang et al. 2010a; Islam & Grönlund 2007). This can
mean, for instance, that SMEs have a choice to use paper-based (non-IOIS) or IOIS to exchange information. It can include situations, like the case study in this thesis, where the organisational initiator designs an IOIS for SMEs to use optionally for exchanging optional information with the initiator.

Voluntary IOIS initiators have at least two problems with involving SMEs in the design phase. First, if SMEs are not required to use the planned IOIS (see Section 1.1 and Table 1.1), it follows that it will also be optional for SMEs to participate in the design phase. This means that initiators must convince SMEs to take part in the design phase, as well as to adopt the resulting IOIS. Second, even if SMEs decide to become involved in the design phase, they may stop participating at any time. This means initiators face the further challenge of maintaining SMEs’ interest in staying involved to ensure there are SME participants in the design phase. In Chapter 2, I explain that IS studies have not explored how initiators manage these challenges.

A further complication for initiators trying to involve SMEs in the design phase of voluntary IOIS is dealing with SME characteristics, as explained next.

1.4 Implications of SME characteristics for designing voluntary IOIS

SMEs account for more than 90% of total businesses in many countries, and make a significant contribution to national economies (Wang & Hou 2011; Zorpas 2010) so that they are a large sector which can be targeted for voluntary IOIS. There are many different ways to define an SME. One of the most common ways in the literature (e.g. Parker et al. 2015; Rahayu & Day 2015; Zorpas 2010) is to use the number of employees. For example, the Australian Bureau of Statistics (ABS 2015) defines a small enterprise as an active business with 20 or fewer employees and medium-sized enterprise with 21-200 employees. I use this definition because Australia is the context of this study.

SMEs are a topic for investigation in IS due to their characteristics that differentiate them from large businesses. For instance, they are often characterised as having independent ownership, owner-manager centric decision-making (ABS 2002), and limited financial, personnel and other resources to implement IS/IOIS (Tan et al. 2010) when compared to large organisations. This means that findings from
research on large organisations may not apply to SMEs (e.g. Cragg et al. 2011; Duan & Xu 2009; Lopez-Nicolas & Soto-Acosta 2010; Parker et al. 2015).

Despite some characteristics SMEs often have in common, they are heterogeneous within a single country. This results in variations among SMEs in their adoption and use of IS/IOIS. Example ways that SMEs differ from each other include the following (Carr et al. 2013; Castleman 2004; Dobson et al. 2013; Galloway et al. 2011; Laukkanen et al. 2007; Naggi & Agostini 2011; Parker & Castleman 2007; Penttinen & Tuunainen 2011; Ramdani et al. 2009):

- the industries in which SMEs operate (e.g. manufacturing, services and retail) can have different levels of IS/IOIS sophistication;
- the extent of support from large trading partners to help SMEs with voluntary IOIS adoption and use can vary;
- the degree to which owner-managers perceive benefits from IS/IOIS depending, for instance, on their knowledge of and experience with IS;
- the different business value-oriented rationalities (e.g. profit maximisation, growth, community, family life) can shape and have significant implications for the way SMEs’ owners approach or adopt IS/IOIS; and
- their location (metropolitan versus rural) and their associated attitudes which can influence their decision to adopt IOIS. For instance, rural SMEs may find IOIS less attractive compared metropolitan SMEs unless they have a high percentage of trade external to their region.

This heterogeneity among SMEs presents challenges for initiators trying to manage SME involvement in the design phase of voluntary IOIS. This is because initiators need to invite and maintain the interest of SMEs with potentially varying interests in the IOIS, time constraints and priorities for participation, physical locations and levels of IS capability. These issues add to the challenges identified in Section 1.3 caused by SMEs being able to choose whether to participate in the design phase and whether they adopt after the initiator has designed and launched the IOIS.

1.5 Research Aim

The previous sections emphasise there is very little IS knowledge concerning how organisational initiators manage SME involvement in the design phase of a new

voluntary IOIS. I argued in Section 1.1, and explain further in Chapter 2, the need for an empirical study to produce the first detailed descriptions of what actors were involved, what they did and how they did it. This provided the basis for identifying concepts for making sense of the findings (for analysis and description) and provides a foundation for future research. The aim of this research was therefore to:

Investigate how organisational initiators manage SME involvement during the design phase of a new voluntary IOIS.

Achieving this aim involved conducting a study into the detailed account of how a government organisation conceived and initiated a new voluntary IOIS in which they did not know SME needs, and needed to involve SMEs directly in the design phase. It required identifying a voluntary IOIS where the initiating organisation sought to involve SMEs in various requirements analysis activities throughout the design phase. I needed to follow the historical accounts of actors within the initiating organisation (and co-opted external actors) who had responsibility for recruiting SMEs, the methods used to invite SMEs, and the types of benefits stated in these invites to encourage SME involvement. This is an important aspect of managing SME involvement because if initiators cannot get SMEs to volunteer for the design phase, then it will not be possible to elicit needs from SMEs. Addressing my research aim also required identifying how the initiator maintained the involvement of SMEs once they agree to participate during the design phase.

I anticipated that addressing this research aim would provide the foundation which IS scholars can use in future research which identifies practical strategies for initiators to encourage greater SME participation in future design phases of voluntary IOIS projects (an IS projects in general).

To achieve my research aim, I addressed the following research question:

How do organisational initiators manage SME involvement during the design phase of a new voluntary IOIS, and how can this be conceptualised?

To answer this research question, I had in-depth discussions with individuals internal to the initiating organisation who helped manage SME involvement during
the design phase of a new voluntary IOIS. It involved similar discussions with parties external to the initiator who were co-opted to help invite and maintain SME involvement. I also collected and analysed various project documents such as specifications, evaluation documents, survey instruments sent to SMEs, and examples of the promotional material used to advertise requirements analysis activities. This wide range of data enabled me to reconstruct, based on my interpretation, a detailed historical account of who was involved, when and what they did to recruit and maintain the involvement of SMEs in the design phase of the new voluntary IOIS. It also helped me identify any tensions affecting how individuals and groups managed SME involvement.

The question also emphasises the scope of this study:

- Answering the question did not require exploring the SME perspective because the project focused on how organisational initiators managed SME involvement and therefore focused on interviewing individuals who were responsible for this process. I did interview some SMEs to confirm some aspects of how initiators managed SME involvement (i.e. for triangulation), but this was not to understand their perspective of being involved.

- The research question focuses on SME involvement management, and the associated complexities, so it was outside the scope of this study to explore the voluntary IOIS artefact (e.g. interface, architecture, functionality).

- Answering the research question did not require exploring the detailed aspects of the requirements analysis (RA) methods (e.g. what needs were elicited, whether/how these were incorporated into the voluntary IOIS artefact). The question focuses instead on how organisational initiators manage SME involvement in these RA methods. This meant the research project focused, for instance, on how individuals or groups invited SMEs to participate in one or more RA activities and how they were encouraged to remain involved, regardless of the RA methods used.

- Answering this research question did not require identifying a successful voluntary IOIS design, adoption and implementation project. Achieving the research aim relied on selecting a voluntary IOIS project where the focus was on direct engagement of SMEs in multiple RA activities in the design
phase. Indeed, in the case study reported in this thesis, the initiator intended only that the design phase establishes proof-of-concept for a complex voluntary IOIS. This was the focus because the technology the voluntary IOIS was based on had only recently emerged globally at the time the project commenced. For this reason, SME needs were poorly understood and initiators recognised they needed to involve SMEs directly to complete the design phase. Further, the research aim was not to establish a link between involving SMEs in the design phase and the outcomes of the adoption/implementation phase.

Despite the Australian context of this study, I anticipate that the findings will be applicable to other countries and other design phases of voluntary IS/IOIS intended for use by SMEs. The literature shows that public/private organisations and researchers have attempted to initiate and design voluntary IOIS for SMEs in:

- developed countries such as USA (Breuer et al. 2008; Breuer et al. 2009), UK (Nolan et al. 2007) and Australia (Fisher & Craig 2005; Gengatharen et al. 2005); and
- developing countries such as Bangladesh, China, Tunisia, Malaysia, Tanzania and Brazil (Churi et al. 2013; da Silva & Fernandes 2000; Huang et al. 2010a; Islam & Grönlund 2007; Ndou et al. 2011; Noor & Nordin 2012).

This previous IS research, as well as studies investigating SME adoption and implementation of IS (see Sections 2.2 and 2.3), suggest that challenges associated with engaging SMEs in design, adoption and implementation phases are relatively consistent worldwide. For this reason, I anticipate that this first detailed study of how a government initiator managed SME involvement in the design phase of a new voluntary IOIS will provide the foundation on which future IS research in other countries can build. I, therefore, believe this thesis provides a starting point for future IS scholars to conduct research into how various types of initiators can manage SME involvement in the design phase of their voluntary IOIS and IS. The thesis achieves this by identifying existing concepts from the IS literature which made sense of the findings from my case study and which can be used by scholars to do their research.
1.6 Thesis Outline

I provide summaries of the remaining chapters below to guide the reader in understanding my approach to answering my overarching research question.

Chapter 2 aims to review the literature on IOIS, with a particular focus on SME-related research, to identify the current state of knowledge and to argue that little research has examined how organisational initiators of voluntary IOIS manage (recruit and maintain) SME involvement during the design phase. I found a similar lack of research into initiator management of SME involvement for voluntary IS design phases more generally. I argue in this chapter, based on the review of the IOIS literature, there is insufficient scholarly knowledge on the mechanisms used by organisational initiators to recruit SMEs and maintain their participation in the design stage of voluntary IOIS. The chapter then concludes by developing the overarching research question and specific sub-questions.

Chapter 3 builds upon Chapter 2 by introducing an overarching conceptual framework for guiding the empirical analysis, by reviewing the literature on IOIS, IS development and requirements analysis (RA) to identify useful concepts to make sense of how organisational initiators of voluntary IOIS manage SME involvement during the design phase. I argue that the conceptual framework developed by Boonstra (2009) was the most suitable, but it only provided concepts for two of my four sub-questions. This leads to the conclusion that it was important to: 1) conduct an in-depth study of how an organisational initiator of a voluntary IOIS manages SME involvement during the design phase to understand the complexity of this process; and 2) return to the literature to identify concepts to make analytical and descriptive sense of the findings and emergent themes. This chapter also refines the sub-questions to reflect the need to identify relevant concepts.

Chapter 4 presents my rationale for an interpretive study of how actors internal and external to the organisational initiator managed SME involvement during the design phase of a new voluntary IOIS. The study involved analysis and interpretation of accounts of these actors and over 200 project documents. The chapter describes the hermeneutic process used iteratively to: 1) finalise a detailed narrative of the design phase; and 2) identify emergent themes and associated concepts from the
literature to make analytical sense of these themes, and to describe the complexity of the design phase. The chapter then justifies the research design including case study selection, interviewee selection and data analysis approaches.

Chapter 5 presents the narrative of the case study or description of the chronological stages and events of the design phase of the organisational initiator’s new voluntary IOIS. As the narrative progresses, I introduce actors and explain their (in)direct impact or responsibilities for recruiting and maintaining SME involvement in the design phase. It includes accounts by the actors of challenges they experienced and how these were addressed during the design phase.

Chapter 6 presents the outcomes of the hermeneutic process described in Chapter 4, whereby I was able to identify emergent themes using concepts I identified from the literature, and to answer the sub-questions and the overarching research question. For each sub-question, the chapter summarises the key findings using the concepts, explains how the findings confirm and extend the existing IS literature, and argues why the new concepts make a theoretical contribution when combined with the concepts from Boonstra’s framework. The chapter concludes by answering the overarching research question using the combined concepts from the literature and Boonstra’s framework. This demonstrates how the concepts in combination provide a vocabulary for making sense of, and describing, the major findings of the thesis.

Chapter 7 summarises the major contributions of the thesis to knowledge (extending the literature) and to theory (combining concepts from the literature with Boonstra’s conceptual framework) relating to an improved understanding of how organisational initiators of a new voluntary IOIS manage SME involvement during the design phase. It offers recommendations for practice arising from the discussion in Chapter 6. The chapter also considers the limitations of my study and outlines future research opportunities, based on the foundation provided in this thesis, for more studies into how organisational initiators of voluntary IOIS manage SME involvement during the design phase.
Chapter 2 - Literature Review

2.1 Introduction

I explained in Chapter 1 that, given the value of involving users during the design phase of IS/IOIS, it important to examine in detail how organisational initiators of voluntary IOIS manage the complexities and challenges of involving SMEs in the design phase. Such insights will provide a starting point or foundation for future IS research to identify strategies and approaches initiators can use to increase the degree of SME participation during the design phase.

In this chapter, I review the literature on IOIS, with a focus on SME specific studies, to synthesise what is currently known relating to this research problem. I carried out the literature review by searching various databases (Google Scholar, ProQuest, ScienceDirect, AISeL, JSTOR, SpringerLink and EBSCOHost) for peer-reviewed articles in any journal and leading IS conference (e.g. ICIS, ECIS and HICSS) published in any year up to 2015. I used search terms, including Booleans, related to IOIS (e.g. “interorganisational” AND “information systems”, “IOS”, “IOIS”, “inter-organisational” AND “information systems”) and SMEs (e.g. “SMEs”, “small business”). I did not restrict my searches to any specific journals to ensure that all possible articles relevant to my research problem were identified.

The chapter starts by summarising two common streams of IOIS research on SMEs in Sections 2.2 and 2.3 which were consistent with the streams identified by Robey et al. (2008) relating to IOIS implementation and adoption (respectively) in large organisations. In Section 2.4, I then synthesise the literature on the IOIS design phase using search terms relating to IOIS (see above) combined with terms such as “development”, “design” and “requirements analysis”. This review shows that comparatively less IS research has been undertaken in the design phase of the IOIS lifecycle, when compared to the adoption and implementation phases. In particular, I show there has been limited work on how initiators of IOIS recruit and manage the involvement of other organisations in the design phase. The chapter then reviews the existing studies reporting on the design phase of voluntary IOIS aimed at SMEs (Section 2.5) to show there have been no detailed investigations into how initiators recruit and maintain SME involvement. Finally, in Section 2.6, I conclude by
developing the overarching research question and the sub-questions, which will be answered in this thesis to address this gap in current IS knowledge.

2.2 Research stream on the organisational impact of IOIS

According to Robey et al. (2008), studies in the first stream of the IOIS literature focus on the strategic benefits, operational benefits, relational benefits and the negative consequences of IOIS implementation. In other words, the focus of these studies is on the consequences of implementation after IOIS have been designed or developed and after organisations have decided to adopt the IOIS. This stream is relevant to this thesis because, as will be explained in Section 2.6.3, voluntary IOIS initiators need to communicate the benefits of the planned system being designed to encourage SMEs to participate in requirements analysis (RA) activities. The design phase is also an opportunity for initiators to identify the benefits sought by SMEs, and the negative consequences to be avoided.

My review of the literature suggests that research relating to this stream has continued since the review by Robey et al. (2008). More specifically, the four themes they identified are evident in more recent IOIS studies, as summarised next:

- Strategic benefits of IOIS include improving company image, opening of new markets, and developing new products and services (Maggiolini & Valles 2012; Seyal et al. 2013; Wang & Sarkis 2013);
- Operational benefits of IOIS include increasing the efficiency of transactions, and streamlining voluminous and complex information work processes (Mishra et al. 2013; Xu et al. 2014; Zhang et al. 2016);
- Relational benefits include the ability of IOIS to facilitate organisational learning, trust building and collaboration between supply chain partners (Prajogo & Olhager 2012; Wei et al. 2012; Wu et al. 2014);
- Negative consequences associated with IOIS (depending on the specific organisation’s perspective) include causing interdependencies and/or changing control structures between organisation participants, eliminating the power of particular parties, and requiring high set up costs (Chatterjee & Ravichandran 2013; Mallapragada et al. 2015; Rahim & As-Saber 2011).
I also found that these four themes were evident in studies on SME implementation of IOIS, as shown in Table 2.1. In Chapter 1, I stated there are various types of IOIS (e.g. mandatory IOIS, and different types of voluntary IOIS) and these in Table 2.1. I include voluntary IS (even though this thesis focuses on voluntary IOIS) because many benefits are similar. Overall, Table 2.1 shows that IS/IOIS can offer SMEs strategic benefits (e.g. relating to competitive advantage and quality information for decision-making), operational benefits (e.g. improving efficiencies and accuracy of processes), and relational benefits (e.g. improved customer service). As with all investments, negative consequences (e.g. costs, staffing and infrastructure requirements) need to be weighed up against the benefits (i.e. the business case).

The ability of SMEs to achieve the benefits listed in Table 2.1 from IS/IOIS implementation does not just depend on the type of IS/IOIS, but also on their heterogeneous characteristics see Section 1.4 and Parker et al. (2015). The seminal work of Levy et al. (2001), for instance, categorised SMEs based on their degree of strategic focus and customer dominance, and showed that the types of IS used, and the benefits sought, differed among SMEs. For instance, some SMEs have a strategic focus and prioritise the strategic benefits in Table 2.1, while others focus on one or more operational benefits in the table such as reducing costs and increasing efficiencies. Similarly, the importance of relational benefits to an SME owner-manager with organisations, in particular, depends, for example, on the dominance of a particular customer, the number of customers they need to service (Levy et al. 2001), and the preferences of customers regarding the use of IS/IOIS (Levy & Powell 2003).
<table>
<thead>
<tr>
<th>IS type</th>
<th>Examples</th>
<th>Example strategic benefits</th>
<th>Example operational benefits</th>
<th>Example relational benefits</th>
<th>Example negative consequences</th>
<th>Example literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory IS for SMEs against large</td>
<td>Electronic data interchange (EDI), e-procurement and e-government services with SMEs. These enable electronic business transaction exchanges.</td>
<td>• Keep a large client. • Supply to new (large) clients requiring IS capabilities. • Receive timely and accurate information for decision-making.</td>
<td>• Some organisations assist SMEs to reduce implementation costs, administration and personnel. • Reduce clerical errors in business transactions. • Reduce procurement cycle times.</td>
<td>• Some organisations provide SMEs with support services such as IS training. • Achieve better coordination with their large clients.</td>
<td>• SMEs must use IS even if there are no other benefits than trade with the large client. • Additional costs (e.g. new IT infrastructure, new staff) if SMEs are not supported by the large organisation.</td>
<td>Beynon-Davies et al. (2007); Chan et al. (2012); Chong and Bai (2014); Haag et al. (2013); Haddara and Elragal (2013); Kharuddin et al. (2015); Lin et al. (2005); Musawa and Wahab (2012); Rajesh and Margaret (2011); Sommer (2003); Thakkar et al. (2008)</td>
</tr>
<tr>
<td>IS for SME-SME collaboration</td>
<td>Portals, collaborative virtual workspaces, online business networks. These enable SME-SME knowledge sharing.</td>
<td>Share and leverage knowledge on, for instance, increasing market share and competition, improving client satisfaction, identifying opportunities for innovation and collaboration, etc.</td>
<td>• Upgrade employee skills or knowledge. • Better understanding of client needs and competitors. • Improve employee satisfaction  • Facilitate discussions about technical aspects of products, solutions or clients.</td>
<td>• Enable continued discussions between owner-managers over distance after trust is developed face-to-face. • Enhance respect and relationships amongst SME participants in the online community.</td>
<td>• Other SMEs taking advantage of knowledge. • Imperfect knowledge obtained could lead to risks (e.g. poor decisions, litigation). • Additional costs (e.g. staff and technology) to support online knowledge sharing.</td>
<td>Chong et al. (2011); Mason et al. (2008); Nguyen and Burgess (2014); Nolan et al. (2007); Noor and Nordin (2012); Palacios-Marqués et al. (2015)</td>
</tr>
<tr>
<td>IS type</td>
<td>Examples</td>
<td>Example strategic benefits</td>
<td>Example operational benefits</td>
<td>Example relational benefits</td>
<td>Example negative consequences</td>
<td>Example literature</td>
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</tr>
<tr>
<td>Voluntary IS used between SMEs and marketplaces</td>
<td>E-marketplaces, portals. These enable e-commerce by SMEs with other SMEs, consumers and large organisations.</td>
<td>• Access to new trading partners, markets and market information. • Enhance SME image with an online presence.</td>
<td>• Increase operational efficiencies. • Lower cost from electronic transactions. • Enhance trust when the market provides unsolicited feedback.</td>
<td>• Improve service to and relationships with customers. • Possible increase in transactions from (more) customers.</td>
<td>• Transaction risk if there is no reputable guarantors, or extra cost to secure it. • Extra cost to participate (e.g. member fees). • May restrict the flow of critical information required for decision making.</td>
<td>Brush and McIntosh (2010); Duan et al. (2010); Fisher and Craig (2005); Gengatharen (2008); Gengatharen and Standing (2005); Ndou et al. (2011); Sellitto and Burgess (2005); Stockdale and Standing (2004); Tatnall et al. (2004)</td>
</tr>
<tr>
<td>Voluntary IS used by SMEs</td>
<td>Websites, Internet or social media, ERP, marketing IS, accounting IS and decision support systems. Used internally and/or with consumers and/or to obtain information.</td>
<td>• Support better decision making and management control. • Access new (overseas) markets and improve marketing intelligence. • Enhance SME image with an online presence. • Analyse profitability.</td>
<td>• Reduce costs from reduced paperwork. • Improve internal process efficiencies. • Reduce working hours due to paperwork. • Increase quality of information compared to paper.</td>
<td>• Improve service to and relationships with consumers.</td>
<td>• Additional costs (e.g. new IT infrastructure, new staff, training). • Possible loss of competitive advantage. • Dependency on the IS developer. • Concerns for security, data privacy and service disruption if the IS fails.</td>
<td>Braojos-Gomez et al. (2015); Devi et al. (2013); Dwivedi et al. (2009); Eze et al. (2014); Grant et al. (2014); Ramsey et al. (2003); Ruivo et al. (2015); Schaupp and Bélanger (2013); Scupola (2003); Seethamraju (2015); Simpson and Docherty (2004); Sin Tan et al. (2009); Sousa (2007)</td>
</tr>
</tbody>
</table>
In summary, this research stream of IOIS research examines the benefits (and negative consequences) for organisations (including SMEs) when they implement and use IOIS. In the case of mandatory IOIS, SMEs may not have a choice if they rely on the business from a large customer, which requires SMEs to use their IOIS. The implication of this stream for voluntary IOIS initiators, by contrast, is that they are faced with the challenge of ensuring (heterogeneous) SMEs targeted for using their IOIS can achieve the benefits they desire. The second research stream identified by Robey et al. (2008), as discussed in the next section, suggests these challenges relate to the pre-implementation adoption decisions by SMEs (also known as adoption factors) when considering the suitability of voluntary IOIS. I will argue in sections 2.4 and 2.5 that the design phase of voluntary IOIS is equally important, warrants attention by initiators, and IS researchers.

2.3 Research stream on voluntary IOIS adoption factors

In the second, and quite common, research stream in the IOIS literature identified by Robey et al. (2008), scholars explore the factors, or drivers and barriers, that influence the decision of organisations to adopt voluntary IOIS. Robey et al. identified eight factors which can be grouped more broadly into internal factors (organisational readiness, perceived benefits, innovation characteristics which need to align with the firm) and external factors (external environment, resource dependence on other organisations, network externalities, culture/institutional forces, transaction characteristics with other organisations). My review of the IOS literature confirms that these adoption-studies and are still popular in recent IOIS literature (e.g. Chaparro-Peláez et al. 2014; Qrunfleh & Tarafdar 2014; Rajaguru & Matanda 2013; Sila 2013; Thatte et al. 2013).

Over many decades, there has been a lot of research in this second stream examining the reasons why SMEs have been slow to adopt voluntary IS and IOIS. This research is important because with voluntary IOIS, unlike mandatory IOIS, there is often no coercive pressures from companies (e.g. large government and private organisations) forcing SMEs to adopt the systems. Instead, I explained in Section 1.3 that voluntary IOIS are designed for and offered to SMEs as an optional inter-organisational channel through which they can collaborate and exchange information electronically with other parties, such as other SMEs and/or large
organisations. Further, even if SMEs adopt and use voluntary IOIS, they may stop using it at any time if the IOIS does not provide the expected benefits (see Table 2.1) they are seeking. The implication of this for voluntary IOIS initiators is that they need to determine ways to decrease the impact of factors, which may negatively influence SME adoption decisions.

Sections 2.3.1 and 2.3.2 provide an overview of the literature on internal and external adoption factors (respectively) relating to voluntary IOIS (and IS) adoption by SMEs. This will lead to my argument that there is a comparable lack of research on how initiators design voluntary IOIS to meet the needs of SMEs.

### 2.3.1 Internal barriers to voluntary IOIS adoption by SMEs

Many IS researchers have investigated factors or barriers internal to SMEs, which hinder or influence owner-manager decisions to adopt voluntary IOIS and often find the three categories of factors identified by Robey et al. (2008): (1) organisational readiness; (2) perceived benefits; and (3) innovation characteristics. These factors are largely the same regardless of whether we look at voluntary IS or IOIS, as summarised briefly next.

Organisational readiness refers to “...the availability of the needed organisational resources for adoption” (Iacovou et al. 1995, p. 467) of an IS/IOIS. Examples of organisational readiness factors found in the literature include SME owner-manager support for IS/IOIS, staff capabilities and experience with IS/IOIS, and financial resources to purchase and implement the IS/IOIS. These organisational readiness factors have been found in studies of SME adoption decisions relating to voluntary IS (e.g. Dangayach & Deshmukh 2005; Maijala & Pohjola 2006; Marsh et al. 2014; McIntosh et al. 2011; Olson & Staley 2012; Salleh et al. 2012) and voluntary IOIS (e.g. Brown & Kaewkitipong 2009; Brush & McIntosh 2010; Chong et al. 2011; Gilmore et al. 2007; Hsiao 2003; Johnson 2010; Lancastre & Lages 2006; Nguyen & Burgess 2014; Palacios-Marqués et al. 2015; Soto-Acosta et al. 2014; Stockdale & Standing 2004).

Perceived benefits refer to the degree to which SME owner-managers believe or accept the possible advantages they can gain from an IS/IOIS (Iacovou et al. 1995; Oliveira & Martins 2010). Robey et al. (2008) further categorised these benefits as
direct (measurable or observable) versus indirect or intangible. Direct benefits include the operational benefits in Table 2.1, while indirect benefits include the strategic and relational benefits in the table. One or more of these types of benefits are often found in the voluntary IS (e.g. Lee & Kim 2004; Marsh et al. 2014; Shtienberg 2013; Wang & Hou 2011) and voluntary IOIS (e.g. Chan et al. 2012; Chen et al. 2006; Chong et al. 2011; Duan et al. 2010; Fisher & Craig 2005; Gengatharen 2008; Ndou et al. 2011; Nguyen & Burgess 2014; Pollard & Svarcova 2009; Sellitto & Burgess 2005; Tatnall et al. 2004) literature as influencing SME owner-manager decisions to adopt.

Finally, innovation characteristics refer to aspects of an IS/IOIS which shape SME owner-managers’ decisions to adopt. Although IS literature has not produced a consistent set of innovation characteristics, IS researchers often use those proposed by Rogers (2003) to study IS/IOIS adoption. Rogers (2003) identified five innovation characteristics: relative advantage, compatibility, complexity, trialability and observability. Studies of IS/IOIS adoption by SMEs have often used some or all of these characteristics (e.g. Alam et al. 2008; Chong et al. 2009; Johnson et al. 2014; Kendall et al. 2001; Limthongchai & Speece 2003; Ramdani et al. 2013; Rowe et al. 2012; Wang & Hou 2011). For example, complexity, or the degree to which an innovation is perceived as difficult to use (Rogers 2003), has been widely identified as an inhibitor to IS/IOIS adoption.

2.3.2 External barriers to voluntary IOIS adoption by SMEs

The IS literature also reveals external factors which act as determinants of, or hinder, voluntary IS/IOIS adoption by SMEs (Alam et al. 2008; Khattak et al. 2013; Rahayu & Day 2015). Robey et al. (2008) categorised these external factors into: external environment, resource dependence on other organisations, network externalities, culture/institutional forces, transaction characteristics with other organisations. These are summarised next.

External environment factors include political, cultural, economic and other factors, often specific to a country, which SMEs have no control over (Kuan & Chau 2001). The literature has identified various external factors, which can inhibit IOIS adoption by SMEs such as lack of support from large organisations initiating the IOIS (Naggi &
Agostini 2011; Penttinen & Tuunainen 2011; Xu & Duan 2008). Cultural factors (e.g. different languages, shopping habits and the degree of bargaining and cash versus credit card cultures) have been found to inhibit IOIS adoption by SMEs (e.g. Fleenor & Raven 2011; Kabanda & Brown 2015; Kapurubandara & Lawson 2008; Lawrence & Tar 2010; Stockdale & Standing 2004). Unfavourable economic situations (e.g. low income per capita, inequalities in income distribution and recession) and electronic commerce infrastructure (e.g. difficulties with electronic payments) in a country can also inhibit IOIS adoption (Fleenor & Raven 2011; Kapurubandara & Lawson 2008; Lawrence & Tar 2010; Tao et al. 2007).

The other external factor referred to by Robey et al. (2008) is resource dependence on other organisations which may constrain IOIS adoption by SMEs. It has been widely understood that, due to limited knowledge and skill, many SMEs need support from external vendor-consultants (Carey 2008; Chamberlain 2014; Thong 2001). The literature reports that SMEs often become dependent on the vendor-consultant, especially when they face difficulties, which can lead some SMEs to decide against adoption to avoid such dependencies (Chen et al. 2006; Harindranath et al. 2008; Zadeh et al. 2012).

Robey et al. (2008) describe network externalities (also known as network effects) as the "effects on a product user of other users consuming the same product". This can influence the decision to adopt IOIS depending, for instance, on the size of the network, the size of own network and extent of service coverage. Researchers have reported how early movers adopting IOIS can create positive network externalities resulting in benefits to encourage SME adoption such as lower transaction cost, improved services and increased efficiencies (Bakos 1991b; Braun 2002; de Burca et al. 2005). This means the opposite can hinder SME adoption of IOIS when negative externalities produce unfavourable conditions (e.g. immature markets, weak access to global markets, not many customers and suppliers using the IOIS) (Awa et al. 2015; Zhai & Liu 2013). This is because SMEs may perceive they would gain no competitive advantage from IOIS adoption. Similarly, an overly large network size has been found to discourage SMEs from adopting IOIS because they perceive they would encounter too much competition (Windrum & de Berranger 2003).
Cultural or institutional forces in the context of voluntary IOIS include mimetic pressures (Robey et al. 2008) resulting in a conscious decision to copy the practices of competitors or influential actors (DiMaggio & Powell 1983). SMEs’ decision (not) to adopt IOIS can be explained as the process of following the practices of others organisations depending on what is the “norm” (Hart & Saunders 1997; Robey et al. 2008) in a particular industry to which an SME belongs (Son & Benbasat 2004). For instance, SMEs may not follow other parties to adopt IOIS to minimise cost, avoid risks and uncertainty that are experienced by early adopters. Some studies have found that mimetic pressure may not effect or directly lead to the IOIS adoption by SMEs (Azam & Quaddus 2012; Son & Benbasat 2004; Swilley et al. 2012). Another cultural or institutional force, according to (Robey et al. 2008), is regulatory regimes which could make reduce SME interest in adopting IOIS. For instance, the literature has reported that existing regulations associated electronic commerce that are unfavourable for SMEs (e.g. taxation, privacy of data user, intellectual property and inadequate ICT policy) can make it less compelling for them to adopt IOIS (Al-Somali et al. 2011; Kshetri & Dholakia 2002; Mashanda 2012; Meltzer 2014; Molla & Licker 2005).

Finally, transaction characteristics include transaction frequency, volume, duration, accuracy, cost and complexity of product descriptions (Robey et al. 2008). For instance, one study found that IOIS transaction cost was the main obstacle for adoption by some SMEs (Khalifa & Davison 2006). Others have found that the slow uptake of IOIS among SMEs can be due, for instance, to small-scale business operations and transaction volumes (Kannabiran & Dharmalingam 2012; Li 2011), or limited and unpredictable markets (Kale et al. 2010; Sharma & Bhagwat 2006), which reduce the value and benefits from IOIS to encourage SME adoption.

In summary, Sections 2.3.1 and 2.3.2 suggest there are different combinations of internal (e.g. organisational readiness, compatibility of IS/IOIS with internal processes) and external conditions (e.g. industry, IS infrastructure) which can affect a specific SME owner-manager’s decision to adoption voluntary IOIS. Chamberlain (2014) argues that a common view by IS scholars is that SME owner-managers should address these barriers themselves (e.g. gain IS education, change processes, analyse their needs and select a suitable IS/IOIS). Chamberlain also found that a
view held by other IS scholars is that external vendor-consultants and government can take responsibility for helping SMEs overcome these barriers (e.g. provide training or funding, analyse the needs of SMEs and propose a suitable IS/IOIS). In this thesis, I focus on the second view on how external parties can help SMEs. In other words, I take a voluntary IOIS supplier or the organisational initiator perspective, rather than an SME perspective (i.e. voluntary IOIS customer) perspective which is more common in the IS literature. More specifically, I take this perspective by looking at the design phase of voluntary IOIS which, as I argue in the next section, has received much less attention in the IS literature compared to the adoption and implementation phases of the IOIS lifecycle synthesised above.

2.4 Research stream on designing IOIS

Previous reviews of the IOIS literature (e.g. Chatterjee & Ravichandran 2004; Robey et al. 2008; Vaidya 2012) have not identified a research stream relating to the design phase of (new) voluntary IOIS. My review suggests there is an emerging stream of studies on voluntary IOIS design, but it is smaller than the adoption and implementation streams identified by Robey et al. (2008). IS scholars described activities involved in IOIS design phase differently (Aarabi & Shariatmadari 2012; Boonstra 2009; Butt et al. 2012; Herfurth & Weiß 2010; Kuziemsky & Lau 2010), but I identified two broad stages that defined as follows for this study:

- The specification stage aims to identify and define the purpose and the scope of an IOIS. Activities in this stage involve data collection, requirements gathering from related parties using different methods (e.g. surveys, workshops and interviews), diverse resources (e.g. documents and reports), and observations of existing IS. All the data collected in this stage are analysed and used to develop a conceptual model of the IOIS. In brief, the literature suggests that the specification stage includes all activities before any programming of the IOIS begins.

- The development stage starts when developers program the first IOIS based on the conceptual model from the specification stage. This stage includes one or more programming cycles (e.g. coding, refining the IOIS user interface and adding new functionality) based on stakeholder feedback. It also involves pilot testing to validate the prototype and to identify issues for
future improvement and capture emerging requests prior to formal implementation. For the purposes of this thesis, the development stage ends when project managers and/or decision-makers decide the IOIS is ready for deployment or full launch to all intended SMEs, which is when the adoption and implementation stages of a voluntary IOIS lifecycle begins.

I identified four research themes relating to the design phase of IOIS, as summarised next.

The first theme is a large body of literature exploring the design of IOIS standards, which then form the basis of IOIS application software (e.g. Klein & Schellhammer 2011; Saundage 2009). This theme is outside the scope of this thesis because my research project investigated the design phase associated with IOIS application software rather than IOIS standards. Further, the findings in this literature on IOIS standards suggests that SMEs are typically not directly involved during the design phase, especially compared to IOIS application software.

The second theme is that some studies report on technical aspects of IOIS software, including those intended to be used by organisations generally (e.g. Herfurth & Weiß 2010; Karetsos et al. 2007; Thitimajshima et al. 2015), and SMEs in particular (e.g. Aarabi & Shariatmadari 2012; Beck et al. 2002; Berlak & Weber 2004; Chan & Chung 2002; Dai & Zhang 2009; Germani et al. 2010; Ghaderi et al. 2010; Haki & Forte 2010; Hogrebe et al. 2008; Johnston & Mak 2000; Kaliontzoglou et al. 2005; Lin et al. 2012; Shamsedin-Tekieh et al. 2010). These scholars focus on describing aspects of the IOIS artefact such as hardware/software architecture, functionality, user interface, technical integration issues, and designs of e-marketplace websites. This theme was not directly relevant to this thesis because I was concerned with how initiators of voluntary IOIS manage SME involvement in the design phase, and not with the design of the voluntary IOIS artefact.

The third theme I identified was research showing that an essential aspect of all stages of an IOIS lifecycle, including the design phase (Boonstra 2009), is stakeholder identification and analysis (Achterkamp et al. 2013; Ballejos & Montagna 2008; Pouloudi & Whitley 1997; Rahman & Ko 2013). Stakeholders in the context of these studies are not just organisations but consider (groups of)
individuals and their roles associated with the IOIS (I explore this further in Section 2.6.1 and Chapter 3). This is a complex area which requires IOIS initiators to identify all possible parties which may have a direct or indirect influence on (or be influenced by) the IOIS and prioritising the level and type of involvement each party should have and when. The focus of these studies is typically on investigating, proposing and evaluating stakeholder identification and analysis methods, which can be used by IOIS initiators. These studies emphasise that all stakeholder types which are deemed to be important for an IOIS to be successful should be involved in relevant stages of the IOIS lifecycle, from the design phase through to final implementation.

In the context of this thesis, I explore how voluntary IOIS initiators managed the involvement of one stakeholder type (i.e. SMEs) during the specification and development stages of a new IOIS design phase. In other words, this study focused on voluntary IOIS initiators, which had already decided that SMEs, as prospective users, were an important stakeholder type to involve in both two stages. As a consequence, the initiator decides to manage the direct involvement of SMEs themselves, rather than to rely on industry associations and other peak bodies to represent SME interests. This thesis, therefore, did not explore how initiators undertook broader identification, analysis and prioritisation of other stakeholder types. This meant that the only aspects of voluntary IOIS initiator efforts with stakeholder identification and analysis which were relevant to this thesis related to co-opting non-SME stakeholder types to help the initiators manage SME involvement in the specification and development stages of IOIS design phase (see Section 2.6.1 and Chapter 3).

The fourth theme included studies reporting on project management and/or requirements analysis (RA) methods used by initiators during the design phase of IOIS for use by organisations in general including, potentially, SMEs (Følstad et al. 2004; Ketikidis et al. 2010; Lempinen et al. 2012; Salmivalli et al. 2008; Schooley et al. 2011; Wilkins 2005). One study in the second theme above Johnston and Mak (2000) did mention that SMEs were surveyed during the design phase of a mandatory IOIS, but these authors focused almost exclusively on a technical description of the mandatory IOIS software. In Sections 2.5 and 2.6, I analyse other
studies, which reported on one or more aspects of involvement SMEs in particular in the design phase of voluntary IOIS. The other studies cited here, by contrast, report on involving other organisations/stakeholders in general, but they did not state whether SMEs specifically were involved.

The studies in the fourth theme tended to focus on describing the specification and development stages of the IOIS design and the RA methods (e.g. interviews, observations, group workshops and discussions, questionnaires, “mock-up” demonstrations, storyboarding) used to identify, refine and reconcile the IOIS needs of relevant stakeholder types. Salmivalli et al. (2008) were different because it reported mostly on project management issues during the design phase, which led to the failure of the IOIS (e.g. inadequate funding, resourcing, governance, clarity of IOIS objectives, and coordination between organisations). They did not look at RA methods because there was limited involvement by the IOIS users.

Two studies in the fourth theme (Lempinen et al. 2012; Wilkins 2005) reported on how IOIS initiators managed inter-organisational relationships, which was of particular interest in this thesis. For example, Wilkins (2005) describes design aspects briefly (mostly implementation) of a mandatory IOIS, initiated by the Australian government, which was to be used by food exporters to obtain customs clearance. The IOIS initiator needed to negotiate with food export industry associations (e.g. dairy) with bargaining power to influence how the IOIS was designed to meet the needs of firms in their sector. Similarly, Lempinen et al. (2012) discussed the experiences of a not-for-profit organisation called Hansel in Finland which developed a prototype of IOIS for government e-procurement. Hansel was the only organisation in Finland responsible for managing e-procurement between government departments and suppliers, so it appeared to be a mandatory IOIS. Hansel found it difficult to get suppliers to participate voluntarily in testing the prototype. This finding was interesting because it demonstrates that, even with mandatory IOIS, it is not guaranteed that stakeholders will participate in the design phase of the project.

These two studies implied it could be even more challenging during the design phase of voluntary IOIS to manage SME involvement in RA activities. This is because
there would be less incentive for SMEs to participate during the specification and development stages of voluntary IOIS design, compared to mandatory IOIS, because they are not required to use the final IOIS. Further, it takes resources (e.g. time, money, personnel) to involve many stakeholder types such as users (including SMEs) in the design phase of IOIS projects (Følstad et al. 2004), which could affect how initiators of voluntary IOIS can manage SME involvement.

Figure 2.1 summarises the broader aim of this thesis by showing the focus of this research project was on how initiators manage SME involvement in the design phase of a new voluntary IOIS. This included how initiators manage other parties to help with managing SME involvement. As will be explained in Sections 2.5 and 2.6, the thesis did not aim to explore how the RA methods were used (e.g. what SME needs were identified, whether the methods were used successfully) as explored by most studies in the fourth theme relating to the design phase of IOIS. Instead, the thesis focuses on how initiators managed SME involvement in these activities more generally, such as inviting SMEs to participate in one or more RA activities, and maintaining SME interest to taking part in multiple RA activities. Figure 2.1 emphasises that the thesis focus was on management of SME involvement in RA activities, not implementation and detail of the RA methods themselves.
The next section reviews studies where SMEs, rather than representatives such as industry associations (Følstad et al. 2004; Wilkins 2005), were involved directly in the design phase of voluntary IOIS projects to explore what is known about how initiators manage this SME involvement.

2.5 SME involvement in the design phase of voluntary IS/IOIS

The previous section (see also Section 1.2) highlights the importance of voluntary IOIS initiators involving SMEs in the design phase. In this section, I examine the literature exploring how initiators manage SME involvement in the design phase and identify gaps in knowledge addressed by this thesis. I review studies on the design phase of voluntary IS (not just IOIS) to consider aspects of managing SME involvement which would be the same or similar regardless of the type of IS. Table 2.2 summarises all the studies I could find (11 articles) reporting on empirical
evidence relating to any aspect of managing SME involvement during the design phase of a voluntary IS/IOIS. The table shows I found five articles relating to voluntary IOIS, while the others looked at designing voluntary decision support systems (DSS). It also summarises whether or not other aspects managing SME involvement were explored by the articles in the various columns, and these themes are described in the next sections.
## Table 2.2: Studies on involving SMEs in the design phase of voluntary IS

<table>
<thead>
<tr>
<th>Articles</th>
<th>Type of voluntary IS</th>
<th>Recruiters</th>
<th>Design stages involving SMEs</th>
<th>Invitation techniques</th>
<th>Information stated in invitation</th>
<th>Maintaining SMEs involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huang et al. (2010a)</td>
<td>Voluntary IS used by SMEs (DSS)</td>
<td>Researchers</td>
<td>Specification</td>
<td>Survey used to invite SMEs and gather information needs.</td>
<td>Not specified</td>
<td>Once-off survey via “individual visits”</td>
</tr>
<tr>
<td>Breuer et al. (2008)</td>
<td>Voluntary IS used by SMEs (DSS)</td>
<td>Researchers</td>
<td>Specification</td>
<td>SME farmers were invited mainly by phone using contact info provided by extension agents to participate in interviews.</td>
<td>Not specified</td>
<td>Once-off interview at SMEs’ premises, multiple industries</td>
</tr>
<tr>
<td>Breuer et al. (2009)</td>
<td>Voluntary IS used by SMEs (DSS)</td>
<td>Researchers</td>
<td>Specification</td>
<td>Not specified how farmers invited to focus groups, association meetings, workshops or interviews, mostly during specification.</td>
<td>Not specified</td>
<td>Not stated if same/new SMEs involved</td>
</tr>
<tr>
<td>Churi et al. (2013)</td>
<td>Voluntary IS used by SMEs (DSS)</td>
<td>Researchers</td>
<td>Specification</td>
<td>Survey used during specification to invite SMEs and gather information needs. Not clear for development.</td>
<td>Not specified</td>
<td>Not stated if same/new SMEs involved</td>
</tr>
<tr>
<td>da Silva and Fernandes (2000)</td>
<td>Voluntary IS used by SMEs (DSS)</td>
<td>Researchers</td>
<td>Development</td>
<td>Invitation and requirements analysis method(s) were not specified.</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Islam and Grönlund (2007)</td>
<td>Voluntary IS used by SMEs (DSS)</td>
<td>Government</td>
<td>Specification</td>
<td>Survey used to invite SMEs and gather their information needs.</td>
<td>Not specified</td>
<td>Once-off survey</td>
</tr>
<tr>
<td>Noor and Nordin (2012)</td>
<td>IOIS for SME-SME collaboration</td>
<td>Researchers</td>
<td>Specification</td>
<td>Not specified how SMEs were recruited for specification focus groups and site visits.</td>
<td>Not specified</td>
<td>Not stated if same/new SMEs involved</td>
</tr>
<tr>
<td>Nolan et al. (2007)</td>
<td>IOIS for SME-SME collaboration</td>
<td>Researchers</td>
<td>Specification</td>
<td>Social gatherings/meetings (e.g. business breakfast) to invite SMEs to interviews.</td>
<td>Not specified</td>
<td>Not stated if same/new SMEs involved</td>
</tr>
<tr>
<td>Ndou et al. (2011)</td>
<td>IOIS between SMEs and the marketplace</td>
<td>Researchers</td>
<td>Specification</td>
<td>Face-to-face and email surveys used to invite SMEs and gather information needs.</td>
<td>Not specified</td>
<td>Once-off survey</td>
</tr>
<tr>
<td>Gengatharen et al. (2005)</td>
<td>IOIS between SMEs and the marketplace</td>
<td>Organisation (unclear)</td>
<td>Specification</td>
<td>Survey used to invite SMEs and gather information needs.</td>
<td>Not specified</td>
<td>Once-off survey</td>
</tr>
<tr>
<td>Fisher and Craig (2005)</td>
<td>IOIS between SMEs and the marketplace</td>
<td>Government</td>
<td>Not specified</td>
<td>Not specified how SMEs invited to industry breakfast where project input was sought.</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
</tbody>
</table>
2.5.1 Most studies do not explore both stages of the design phase

The studies summarised in Table 2.2 suggest that SMEs have been recruited and involved in the specification and/or development stages and that the activities in each stage are consistent with the examples outlined in Section 2.4. For instance, in most studies in Table 2.2, the specification stage includes stating what problem(s) the voluntary IS/IOIS will solve for SMEs (and other stakeholders), identifying who will use and benefit from the system, and identifying and specifying stakeholder needs. Further, all the studies summarised in Table 2.2 suggest the development stage begins when the very first prototype is developed, mainly involving activities such as programming and designing databases, user interfaces and IS infrastructure.

Table 2.2 shows that most studies reported only on a single stage of the design phase. It is important to explore how initiators manage SME involvement across both stages because, for instance, there may be different challenges and approaches needed between each. As will be explained in the remaining sections of this chapter, the five studies reporting that SME involvement occurred during both stages provided very little insight into how this was managed. Further, three of these five studies (Breuer et al. 2008; Breuer et al. 2009; Churi et al. 2013) focused on DSS rather than IOIS. Managing SME involvement during the design phase for voluntary IOIS would likely be more complex than DSS because there are multiple stakeholders with vested interests and power which could influence how SME involvement is managed by initiators (see Section 2.4). The DSS explored in these three studies, by contrast, were software (e.g. used internally to the SME) where information was not exchanged bi-directionally between SMEs and other organisations. This thesis, thus makes a contribution by exploring how initiators manage SME involvement during both stages of the design phase of voluntary IOIS.

Nolan et al. (2007) and Noor and Nordin (2012) were the only studies which reported that SMEs were involved during both the specification and development stages of designing a voluntary IOIS. The next section explains that these two studies, and others in Table 2.2, reported on how researchers, rather than organisational, managed SME involvement and argued why this thesis focused on organisational initiators.
2.5.2 Most studies explore how researchers design voluntary IS/IOIS

Table 2.2 shows that most studies reported that researchers managed the design phase of voluntary IS/IOIS, including managing SME involvement, rather than non-tertiary organisations. Research on how organisational initiators manage SME involvement has received less attention but is important because their approaches may differ to those of researchers. For example, organisational initiators such as governments and large firms may have more resources (e.g. finances, personnel) than researchers. This means they could use alternative ways of managing SME involvement, and possibly succeed in involving greater numbers of SMEs. For example, Nolan et al. (2007) stated that the design phase of their researcher-led voluntary IOIS project could not be finished because grant funding had run out. This means that findings relating to how researchers manage SME involvement during the design phase of voluntary IOIS may not be the same as those of organisational initiators.

It is, therefore, unclear from the literature how organisational initiators can engage SMEs in the design phase. There are limitations with the three studies, which did report on aspects of organisational initiator management of SME involvement:

- Fisher and Craig (2005) provide little insight into how SMEs were recruited and involved in the design phase. For example, they found that the IOIS initiator recruited three representatives onto the steering committee during the specification stage, but did not mention how they were invited or clarify whether they were SMEs. The authors did emphasise there was very little direct involvement by SMEs in the design phase and explained that this was a factor contributing to the failure of this project.

- The two remaining studies (Gengatharen et al. 2005; Islam & Grönlund 2007) reporting on organisational initiator management of SME involvement focused only on the specification stage. As will be explained in later sections, these two studies also provided little insight into how SMEs were involved, apart from stating that SMEs completed a survey to identify their needs.

These limitations of the existing literature led me to focus in this thesis on how organisational initiators manage SME involvement during both specification and
development stages when initiating a new voluntary IOIS. The next section examines in further detail how I interpreted “managing SME involvement”.

2.5.3 Distinguishing between recruiting and involving SMEs

I explained in Section 1.3 it could be difficult for initiators to manage SME involvement in the design phase of voluntary IOIS because it is optional for SMEs to take part in the design phase, as well as to adopt and implement the IOIS. The literature cited in Table 2.2 suggested that managing SME involvement involves two broad tasks, which are summarised in Table 2.3: recruiting SMEs to take part in the specification and/or development stage, and maintaining SME participation in multiple requirements analysis activities in one and across both stages. I noted in Section 2.4 that it can be difficult recruiting stakeholders into the design phase of mandatory IOIS (Lempinen et al. 2012), let alone the extra difficulty posed by the IOIS being voluntary for SMEs to adopt. These means that recruiting SMEs, and then maintaining their participation, is an important aspect of understanding how initiators manage SME involvement.

Table 2.2: Managing SME involvement in the specification/development stages

<table>
<thead>
<tr>
<th></th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recruitment</strong></td>
<td>Invite SMEs to take part in one or more specification stage activities.</td>
<td>Invite SMEs to take part in one or more development stage activities.</td>
</tr>
<tr>
<td><strong>Maintaining</strong></td>
<td>Encourage the same SMEs to take part in multiple specification stage activities.</td>
<td>Encourage the same SMEs to take part in multiple development stage activities.</td>
</tr>
<tr>
<td><strong>participation</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

More specifically, recruitment is where organisational initiators use various techniques to invite or encourage SMEs to participate in one or more RA activities within the specification and/or development stages. Example SME recruitment techniques include surveys and industry events (see Table 2.3). In later sections, I review the literature from Table 2.3 in more detail to identify specific gaps in knowledge to which this thesis was able to contribute.

Organisational initiators’ must maintain SME participation by either recruiting SMEs for each activity in the specification and development stage, or use techniques to encourage the same SMEs to agree to take part in multiple activities once they are recruited. Some studies in Table 2.2 imply the latter is potentially challenging, even though little detail is provided. For instance, each action research cycle by Nolan et
al. (2007) involved multiple recruitment interviews, although the researchers did not specify how they recruited SMEs into each cycle, or whether the same or new SMEs were interviewed each cycle. Breuer et al. (2008) provided more detail, by contrast, by stating that each cycle of telephone surveys with SMEs was carried out in a different industry sector. This emphasised that repeated recruitment steps were used rather than maintaining the involvement of the same SMEs for multiple activities in the specification and/or development stages. It appears that in many studies cited in Table 2.2, this problem was avoided because they only conducted one-off surveys with SMEs during either the specification or development stage (e.g. Huang et al. 2010a; Islam & Grönlund 2007; Ndou et al. 2011). This suggests that more extensive research is needed, as presented in this thesis, which explores in greater depth how organisational initiators recruit SMEs and maintaining their participation in multiple RA activities.

2.6 Developing the research questions

The analysis of the literature in Sections 2.5.1 to 2.5.3 led to refining the overarching research question from Section 1.6 as follows:

How do organisational initiators manage (recruit and maintain) SME involvement during the design phase (specification and development stages) of a new voluntary IOIS, and how can this be conceptualised?

Table 2.2 suggests that answering this research question required formulating sub-questions to be as specific as possible so that they were answerable, and thus ensure the answers to the specific questions could be used to answer the broad overarching research question, which could not be answered directly.

The next sections explain and justify the more specific sub-questions, which were developed to answer the question above.

2.6.1 Which stakeholder types manage SMEs during the design phase?

The literature reporting on aspects of the design phase of voluntary IS for SMEs (Table 2.2) identifies various stakeholder types associated with organisational initiators who can participate in the specification and development stages, such as developers, technical experts and industry representatives (Fisher & Craig 2005;
Ndou et al. 2011; Nolan et al. 2007). This prior research has not, however, explored the role of these stakeholder types in recruiting SMEs and maintaining their involvement in activities of the specification and development stages. As explained in Section 2.5.2, this is in part because in most IS studies cited in Table 2.2 it was researchers, not organisational initiators, who managed SME involvement (Breuer et al. 2008; Breuer et al. 2009; Ndou et al. 2011; Noor & Nordin 2012). The other studies did not state at all who recruited SMEs and maintained their involvement (Churi et al. 2013; da Silva & Fernandes 2000; Huang et al. 2010a; Nolan et al. 2007), but it was presumably the authors of the studies. Only Breuer et al. (2008); Breuer et al. (2009) mentioned the indirect involvement of some stakeholder types; government staff provided the researchers with SME contact details which the researchers used to recruit SMEs.

Similarly, the remaining studies in Table 2.2 reporting that organisational initiators (e.g. government agencies) designed the voluntary IS/IOIS for SMEs (Fisher & Craig 2005; Gengatharen et al. 2005; Islam & Grönlund 2007) did not state clearly which stakeholder types recruited SMEs and maintained their involvement. Further, these studies did not explore both stages of the design phase. It is, therefore, unclear from the IS literature which type of stakeholders internal and external to organisational initiators recruit SMEs and/or maintain SME involvement, and whether the stakeholder types varied between the specification and development stages. This emphasised the importance of answering the following sub-question:

**Which stakeholders type(s) recruit SMEs into and/or maintain their involvement in the specification and/or development stages?**

### 2.6.2 What invitation types do initiators use to recruit SMEs?

Table 2.2 shows there is limited research into the types of invitations which organisational initiators use to recruit SMEs into activities in the specification and development stages. Some studies did not report on this at all (da Silva & Fernandes 2000; Fisher & Craig 2005; Noor & Nordin 2012).

The remaining studies at least stated what invitation method(s) were used. Of these, some did not provide details of how they used the invitation method, such as
the type of survey (Churi et al. 2013; Gengatharen et al. 2005; Islam & Grönlund 2007). The others did provide some details:

- Huang et al. (2010a) used surveys when visiting farmers face-to-face;
- Breuer et al. (2008) conducted phone interviews using farmer contact details provided by government extension officers;
- Ndou et al. (2011) used SME contact details listed in the industry portal and invited them through survey; and
- Nolan et al. (2007) invited SMEs during social gatherings and network meetings (e.g. business breakfasts) to invite SMEs, but only during the development stage. The other stages involved interviews, but Nolan et al. (2007) did not state how SMEs were invited to take part in the interviews.

This means none of the studies provides an in-depth answer to the overarching research question for two reasons. First, the studies, which did state the invitation type(s) used were mainly those where researchers recruited the SMEs rather than organisational initiators. Second, none of the studies explored whether different combinations of invitation types were used in the specification and development stages and whether these varied between stages. Instead, the studies reported that a single invitation type was used in both stages (Breuer et al. 2008; Churi et al. 2013), or a single invitation type was used in one stage without exploring invitation type(s) used in the other stage (Gengatharen et al. 2005; Huang et al. 2010a; Islam & Grönlund 2007; Ndou et al. 2011; Nolan et al. 2007). This highlighted the importance of answering the following sub-question:

**What types of invitations do organisational initiators use to recruit SMEs into the specification and/or development stages?**

This question helped answer the overarching research question because we cannot explore the techniques organisational initiators use to maintain SMEs involvement during specification and/or development stages until after they are invited successfully using a combination of invitation communication techniques.
2.6.3 What do initiators state in invitations used to recruit SMEs?

All the studies cited in Table 2.2 stated that initiators (researchers or organisations) aimed to understand the interests or needs of SMEs to ensure that their voluntary IS/IOIS would have the functionality required by the SMEs. My analysis of these studies, however, shows that none reported what initiators stated in the recruitment invitations (e.g. introductory letters for surveys and calls to participate in interviews) to interest SMEs to take part in activities of either the specification or development stage. This is important because (organisational) initiators cannot identify the needs from SMEs directly until they convince SMEs of the value of participating in one or more requirements analysis activities in either or both of these stages so the SMEs’ needs can be determined. This meant the literature provided no insights into the answer to the following sub-question, which was needed to help answer the overarching research question:

What do organisational initiators state in invitations to encourage SMEs to agree to participate in specification and/or development stages?

My analysis of the various types of voluntary IS/IOIS benefits in Table 2.1 (see Section 2.2) implies that organisational initiators could state the strategic, operational and/or relational benefits in the invitations which are anticipated from the planned IOIS. The lack of research in this area highlights that it is unclear, for instance, what types of benefits are stated, whether there were any differences in what is stated between the types of invitations and the two stages of the design phase. This further emphasised the need to answer the above sub-question.

2.6.4 What techniques do initiators use to maintain SME involvement?

My observation of the studies cited in Table 2.2 is that most did not report findings on how the initiators (researchers or organisations) maintain SME involvement across both the specification and development stages and/or in multiple RA activities within a single stage. For many studies, they did not appear to maintain SME involvement because they only used a once-off RA method (e.g. survey) during a single stage (Gengatharen et al. 2005; Huang et al. 2010a; Islam & Grönlund 2007; Ndou et al. 2011). This meant that SMEs were not involved in multiple RA activities either in a single stage or across both stages. It was more difficult to determine in
the case of da Silva and Fernandes (2000) because they did not state what RA activities were used when they tested the prototype. Similarly, Fisher and Craig (2005) did not provide any details about if/how the industry breakfasts were used as RA activities so that I could determine if/how SME involvement was maintained. The lack of detail may be explained, in the case of Fisher and Craig (2005), by their statement that there was limited involvement by SMEs during the design phase.

Four studies (Breuer et al. 2009; Churi et al. 2013; Nolan et al. 2007; Noor & Nordin 2012) reporting that SMEs were involved in both stages did not state whether the same SMEs were involved or new SMEs were recruited for the various (cycles of) RA methods used by the researchers who initiated the IS/IOIS. For this reason, there was no insight from the literature on how the researchers maintained SME involvement. Breuer et al. (2008) provided a bit more insight when stating that interviews with farmers, including SMEs, were carried out one industry at a time. This meant that there was no need to maintain SME involvement across multiple design phase stages or in multiple RA activities on a stage, because they recruited new SMEs from new industry each time. In other words, the approach by Breuer et al. (2008) involved multiple iterations of sub-questions 1-3 (i.e. recruiting new SMEs each time).

Overall, this literature does not provide insights into how organisational initiators maintain the involvement of the same SMEs in multiple RA activities, instead of having to recruit new SMEs for each RA activity. This led me to formulate the following sub-question, which was answered in this thesis:

**What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages?**

There was some limited insight into ways that organisational initiators could maintain an SME’s involvement in multiple RA activities, even if the studies did not specifically research or report on this. For instance, the findings of Breuer et al. (2008); Huang et al. (2010a); Noor and Nordin (2012) suggest that organisational initiators can make it easier for SMEs to participate, such as running RA activities at the SMEs’ premises. This implies that SMEs may be willing to participate in multiple RA activities in these instances, even though these studies do not confirm if the
same SMEs participated in multiple RA activities within the same or across both stages. Fisher and Craig (2005) suggests that organisational initiators can also make it more difficult for SMEs to participate, such as charging money for SMEs to attend industry breakfasts where their needs for a voluntary IOIS might be identified. Overall, this suggests that encouraging SMEs to participate in multiple RA activities in a single stage or across both stages of the design phase is likely to be non-trivial, and therefore warranted further research to address this gap in IS knowledge.

2.7 Summary

In summary, this chapter aimed to determine the extent to which researchers have investigated how organisational initiators manage SME involvement during the design phase of a voluntary IOIS. My literature review shows that most research has examined IOIS adoption factors and the impact of implementation on organisations, with less research on how IOIS are designed by organisational initiators prior to being launched for adoption and implementation. I argued that the literature which does explore the design phase of IOIS has tended to focus on describing the IOIS artefact itself (e.g. functionality, architecture), identifying and analysing the power and interest of stakeholders to determine their responsibilities during the IOIS lifecycle, and the requirements analysis (RA) methods and/or project management issues associated with design phase.

My review of the literature reporting on at least some aspects of involving SMEs in the design phase of a voluntary IOIS revealed that most studies report on the work of researchers as initiators, rather than organisations as initiators. This means there is little IS knowledge about how organisational initiators manage SME involvement. I also argued that some studies reported only on one stage of the design phase (i.e. specification or development) and that almost none examine how voluntary IOIS initiators recruit SMEs into RA activities, and maintaining SME involvement in multiple RA activities once they are recruited. This led to my conclusion that there is need for research, which answered the following question:

How do organisational initiators manage (recruit and maintain) SME involvement during the design phase (specification and development stages) of a new voluntary IOIS, and how can this be conceptualised?
This research question emphasises that a conceptual framework was needed which provided overarching concepts for making sense of how organisational initiators manage SME involvement during the design phase of a new voluntary IOIS. In the next chapter, I, therefore, argue that the stakeholder management framework developed by Boonstra (2009) was an appropriate starting point for such a conceptual framework. I also argue that his framework needed extending by conducting empirical research to answer the sub-questions posed in Sections 2.6.1 to 2.6.4, and then returning to the literature to identify concepts, which made sense of the findings. This inductive approach was needed because, as I will explain in the next chapter, there has been little theorising about managing stakeholder involvement in the design phase of (voluntary) IOIS.
Chapter 3 - Theoretical Framework

In Chapter 2, I argued the IS literature provides little insight into how organisational initiators manage (recruit and maintain) SME involvement in the specification and development stages of the design phase of voluntary IS/IOIS. Filling this gap in knowledge required a conceptual framework to analyse and make sense of the findings, and to answer the research questions developed in Section 2.6.

In this chapter, I present a framework based on Boonstra’s (2009) work on the management of stakeholders during IS/IOIS projects as a starting point to make sense of the complexities associated with the problem domain. Boonstra does not directly explore how organisational initiators recruit and maintain SME involvement during design phase of voluntary IOIS. Nonetheless, his empirical work on managing the involvement of stakeholders during IOIS design and implementation phases offered great assistance to make sense of the problem domain of my thesis.

3.1 Identifying a suitable conceptual framework

I examined relevant theories and frameworks from the IS literature to determine any which were suitable as lenses for making analytical and descriptive (Gregor 2006) sense of how organisational initiators manage SME involvement during the specification and development stages of the design phase of voluntary IOIS. My review of the IS literature relating to the problem domain (see Sections 2.5 and 2.6) suggested the framework needed to include concepts relating to how individuals and/or groups (stakeholders) employed by organisational initiators manage the process of:

- recruiting one or more staff from SMEs (stakeholders) into requirements analysis (RA) activities during the design phase;
- maintaining the involvement of one or more staff from SMEs in multiple RA activities once they are recruited; and
- managing individuals and/groups (stakeholders) external to the initiator to recruit and/or maintain SME involvement in one or more RA activity on behalf of the initiator.
For this reason, answering the research questions required concepts relating to stakeholders (individuals or groups with particular responsibilities) managing other stakeholders, including SME owner-managers.

I concluded that theories used in the IOIS literature to examine adoption and implementation were outside the scope of this study, because this thesis focused on the design phase only, which included adoption/implementation theories such as:

- transaction cost theory (e.g. Bakos 1991a; Cannon et al. 2008; Fawcett et al. 2009; Kauffman & Mohtadi 2004; Reekers & Smithson 1995; Wever et al. 2012);
- resource dependency theory (e.g. Abdullah & Halim 2014; Carter & Rogers 2008; Chatterjee & Ravichandran 2013; Gold et al. 2010; Zhang & Dhaliwal 2009);
- social construction of technology (e.g. Abdelnour-Nocera & Dunckley 2008; Botha 2013; Johnson 2007; Mundkur & Venkatesh 2009);
- actor-network theory (e.g. Heeks & Stanforth 2014; Tatnall & Burgess 2011; Underwood & McCabe 2011);
- institutional theory (e.g. Bala & Venkatesh 2007; Gibbs & Kraemer 2004; Huang et al. 2010b; Teo et al. 2003); and
- diffusion of innovation theory (e.g. Chong & Pervan 2007; Pease & Rowe 2004; Sila 2013; Vaidya & Hyde 2011).

The studies that look at design fall mostly into either requirements analysis (RA) or Information Systems Development (ISD). My review of these two bodies of literature revealed limited insights into the process of recruiting users or other stakeholders in RA methods (e.g. surveys, interviews and workshops), or into how to manage or maintain stakeholder involvement throughout various RA activities once they are recruited. The RA literature focuses on describing RA methods, the needs identified using these methods, and/or the advantages and disadvantages of the methods (Bui et al. 2006; den Hengst et al. 2004; Donzelli & Bresciani 2003; Gordijn & Akkermans 2003; van Velsen et al. 2009; van Velsen et al. 2013). Similarly, the ISD literature mainly reports on IS/IOIS design principles, methodologies and RA
methods (e.g. Avison & Fitzgerald 2003; Bi et al. 2012; Brinkkemper 1996; Conboy 2009; Cram & Brohman 2013; da Silva et al. 2015; Marks 2012), and critical success factors (e.g. Byers & Blume 1994; Jennex & Adelakun 2003; Lu et al. 2011; Matook & Vidgen 2014; Nandhakumar 1996) needed to deliver successful ISD projects.

This body of literature overlooks recruiting and maintaining stakeholder involvement, perhaps because this is not challenging in the contexts studied. In other words, the RA/ISD literature appears to take recruiting and managing stakeholder involvement in RA activities for granted. I argued that this may not be the case, at least in the context of involving SMEs in the design phase of voluntary IOIS, may present difficulties for organisational initiators (see Chapter 1 and Sections 2.4 to 2.6). Given the apparent assumption in the RA/ISD literature, it is not surprising then that it does not offer overarching conceptual frameworks or theory suitable for this study. Further, I was not concerned with RA methods (e.g. types, selection, advantages and disadvantages), SME needs (e.g. if/how heterogeneous SME and other stakeholder needs were elicited), the IOIS artefact (e.g. whether SME needs were incorporated), or design project success factors, which tend to be the focus for RA/ISD studies.

The studies cited in Sections 2.4 to 2.6 relating to the design phase of IOIS were largely atheoretical or, in other words, did not use theory to make sense of their findings. The few of these studies using theory focused predominantly on IOIS adoption, implementation or use. Some offered insights into how design-related issues impacted on adoption/implementation, but did not look at the design phase (Gengatharen et al. 2005; Wilkins 2005). Nolan et al. (2007) used theory to make sense of SME use of voluntary IOIS (e.g. trust) which the researchers designed, but did not use theory to make sense of their design phase.

This overall lack of knowledge and prior theorising suggested the need for concepts suitable for describing and analysing this problem domain to provide the basis for future (e.g. explanatory) research (Gregor 2006). The only studies offering a potential starting point for a conceptual framework were those relating to the third theme I identified from the literature on the design phase of IOIS in Section 2.4. Specifically, this theme relating to stakeholder management. The next section
therefore provides an overview of Boonstra’s (2009) stakeholder management framework and justifies the specific elements of this framework which had potential as a starting point for an overarching conceptual framework to explore how organisational initiators manage (recruit and maintain) SME involvement during the design phase of voluntary IOIS.

3.2 Justifying Boonstra’s stakeholder management framework

I used relevant parts of the stakeholder management framework developed by Boonstra (2009) as the starting point for the conceptual framework for this study for four reasons see also Boonstra and de Vries (2008):

1. Boonstra developed his framework by synthesising the work of IS scholars who have examined various dimensions of how project leaders manage stakeholders during IS/IOIS lifecycles. This matched my study on how organisational initiators and their stakeholders (e.g. project managers, decision-makers, and staff with other responsibilities) manage SME (i.e. their staff) involvement during the design phase of a new voluntary IOIS.

2. Boonstra’s framework recognises that stakeholder management varies between IS/IOIS lifecycle stages (i.e. concept, development, implementation, operation, maintenance, termination). This aligned with my study, which examined how organisational initiators manage SME involvement during the specification (or “concept” in Boonstra’s framework) and development stages of the design phase of a new voluntary IOIS.

3. Boonstra used his framework to analyse stakeholder management during the design and implementation of an IOIS for sharing patient records between a large hospital and its trading partners (pharmacies and general practitioners, which could have included SMEs but was not clarified), and internally within the large hospital. Boonstra’s empirical context was therefore similar to my project, because we both studied how an organisational initiator and its stakeholders managed other stakeholders during an IOIS project. His study provided some empirical evidence of the framework’s suitability for making sense of stakeholder management (e.g. categories of IS/IOIS lifecycle stages, and stakeholder types and interests) which could be used to make sense of SME management in my study. His
study provided little detail, however, on the specification and development stages (and instead summarised briefly the entire IOIS lifecycle), and also little insight into recruiting stakeholders and into managing SMEs in particular.

4. Elements of his framework matched some of my research questions relating to how organisational initiators manage SME involvement in the specification and development stages. I summarise the elements of Boonstra’s framework in Table 3.1, which aligned with the research questions from Section 2.6, as well as those research questions where Boonstra’s framework did not align. This presented an opportunity to make a theoretical contribution by extending Boonstra’s conceptual framework to address these areas.

**Table 3.1: Boonstra’s (2009) framework applied to the research questions**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Boonstra’s Framework element</th>
<th>Applied to this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: Which stakeholder type(s) recruit SMEs into and/or maintain their involvement in specification and/or development stages?</td>
<td>Stakeholder types: owner, project manager, user, developer, decision-maker, representative. Boonstra argues this list of stakeholder types are the main ones with responsibilities during the various stages of an IS/IOIS lifecycle.</td>
<td>It helped conceptualise the stakeholder types in organisational initiators and their responsibilities for recruiting SMEs into RA activities during each stage. It helped conceptualise stakeholder types recruiting SMEs on behalf of organisational initiators. It helped distinguish stakeholder types involved in recruiting SMEs versus those maintaining recruited SME involvement in multiple RA activities.</td>
</tr>
<tr>
<td>RQ2: What types of invitations do organisational initiators use to recruit SMEs into specification and/or development stages?</td>
<td>No corresponding element.</td>
<td>Boonstra’s framework needed extending by identifying appropriate ways to conceptualise invitation types used to recruit SMEs into one or both stages of the design phase of a new voluntary IOIS.</td>
</tr>
<tr>
<td>RQ3: What do organisational initiators state in invitations to encourage SMEs to agree to participate in specification and/or development stages?</td>
<td>Stakeholder interests: strategy, return on investment, business process performance, work satisfaction and employment, user friendliness, technical performance and security, quality of information, project performance. Boonstra argues these are the main types of stakeholder interests or priorities regarding a specific IS/IOIS design project</td>
<td>It helped conceptualise the types of interests or priorities SMEs may have regarding a new voluntary IOIS, which organisational initiators could include in the invitations to encourage SMEs to agree to being recruited in one or both stages of the design phase.</td>
</tr>
</tbody>
</table>
RQ4: What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages?

<table>
<thead>
<tr>
<th>Research question</th>
<th>Boonstra's Framework element</th>
<th>Applied to this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ4</td>
<td>No corresponding element</td>
<td>Boonstra’s framework needed extending by identifying appropriate ways to conceptualise how organisational initiators maintain SME involvement during one or both stages of the design phase of a new voluntary IOIS.</td>
</tr>
</tbody>
</table>

Many IS/OIS studies focusing on stakeholder management have used stakeholder theory (e.g. Fedorowicz et al. 2010; Flak & Rose 2005) or drawn on the work of stakeholder theorists (e.g. Boonstra 2009; Boonstra & de Vries 2008; McLeod & Clark 2009; Pouloudi & Whitley 1997) and adopted or referred to Freeman’s (1984) definition of stakeholders. I, therefore, adapted Freeman’s (1984) definition of stakeholders in (or co-opted by) organisational initiators for this study as “any individuals, groups, organisations or institutions which can have a direct or indirect influence on recruiting and maintaining SME involvement during the specification and/or development stages of the design phase of a new voluntary IOIS”.

Stakeholder theory explains that managers, such as those in organisations initiating voluntary IOIS, should take into consideration the interests and needs of other individuals and groups, both internal and external to an organisation, needs to be managed (Fedorowicz et al. 2010; Freeman 1984). The literature typically uses this theory to explain that organisational initiators of (voluntary) IOIS need to identify organisations, and individuals/groups within organisations, and determine their levels of power over and interest in the IOIS (e.g. Ballejos & Montagna 2008; Lim et al. 2010; Mantzana et al. 2007; Mitchell et al. 1997; Pouloudi & Whitley 1997; Rowley 2011). These IOIS studies, as I explained in Section 2.4, often did not explicitly look at or focus on the design phase. Some researchers have used stakeholder theory as the basis for justifying the importance of initiators managing the involvement and expectations of stakeholders during the IS design phase (e.g. Kujala 2003; Markus & Mao 2004; Sambamurthy & Kirsch 2000; Vink et al. 2008; Zhang et al. 2005), but they do not specifically look at recruiting and maintaining user involvement in RA activities.
Stakeholder theory is broad and does not provide a set of concepts or vocabulary for describing and making sense of the complexity of managing stakeholders in an IS/IOIS lifecycle. Boonstra’s framework is useful because it categorises some aspects of stakeholder management in the IS/IOIS lifecycle. For instance, stakeholder categories developed by Boonstra appeared to be useful for making sense of how organisational initiators and their stakeholders (e.g. project leaders) manage SME (i.e. staff who are stakeholders) involvement during two stages of an IS/IOIS lifecycle (i.e. specification and development stages) of a new voluntary IOIS.

Finally, the limited theorising about managing SME involvement in the design phase (see Section 3.1) emphasised the need to identify theories and concepts for making sense of the answers to the specific research questions presented in Section 2.6. For this reason, the research questions in section 2.6 are modified in the following sections to reflect the limited theorising. The limited theorising also justifies why Boonstra’s conceptual framework needed extending for the purposes of my problem domain, as explained further in the next sections.

### 3.3 Boonstra’s element: Categorising stakeholder types

I argued in Chapter 1 and Sections 2.6.1 that recruiting and maintaining SME involvement in the design phase of a new voluntary IOIS could be complex for organisational initiators. I also identified various stakeholder types who have participated in the design of voluntary IS/IOIS for SMEs (e.g. developers, technical experts, and industry representatives). These stakeholder types could be internal to an organisational initiator or external, which creates complexity regarding which types recruit and maintain SME involvement, and how the various types might interact with each other in doing so. However, I explained in Section 2.6.1 that only a few studies (e.g. Breuer et al. 2008; Breuer et al. 2009) identify which stakeholder types associated with organisational initiators are involved in recruiting and maintaining SME involvement during the specification and development stages of a new voluntary IS/IOIS, and none exploring in detail how they do it. This led to Research Question 1 (RQ1) in Table 3.1, which needed addressing to answer my overarching research question and other sub-questions.
Answering RQ1 required a taxonomy or classification of various stakeholder types (internally and externally to organisational initiators) to help me compare them on and explain, for instance, whether they were involved in recruiting SMEs or maintaining SME involvement or both, during which stages they helped, and whether they co-opted other stakeholder types. I found, overall, that the literature on IOIS (Ballejos & Montagna 2006; Cavaye 1995), RA (Alexander 2005; Checkland 1989; Coughlan & Macredie 2002; Saiedian & Dale 2000) and ISD (Bjerknes & Bratteteig 1995; Markus & Mao 2004; McKeen & Guimaraes 1997; Mumford & Weir 1979) tended to identify only a few stakeholder types in general such as top managers, change agents, developers and users. Pouloudi and Whitley (1997, p. 2) proposed even broader categories for IOIS projects comprising participants or "individuals, groups or organizations who take part in a system development process", or stakeholders as including participants and others which, directly or indirectly, can or are influenced by the IOIS. While developers and users were appropriate categories for this study, I also needed to differentiate between potential types of change agents and top managers to answer RQ1.

Boonstra’s 2009) stakeholder management framework appeared to address this requirement and offer a good starting point for this study. This is because it included, for instance, separate potential change agents and top management stakeholders such as IS/IOIS project managers, owners and decision-makers. Similarly categories of stakeholder types have been identified in other RA and ISD studies (Damian 2007; Glinz & Wieringa 2007; Pacheco & Tovar 2007; Razali & Anwar 2011; Sharp et al. 1999; Vidgen 1997), and also some IOIS studies (Ballejos & Montagna 2008). Table 3.2 lists Boonstra’s categories of stakeholder types, shows these categories were supported by other studies, and summarises typical responsibilities of each stakeholder type in IS/IOIS design projects in terms of their relevance to this study. I used Boonstra’s categories for two reasons. First, his study was the only empirical work that I could find which was similar to my research project (i.e. relating to more than one stage of a complex IOIS lifecycle). Second, his findings suggested his categories could apply to my context of stakeholders associated with an organisational initiator who are responsible for managing SME involvement in the design phase of a voluntary IOIS.
This thesis aimed to explore how organisational initiators manage SME involvement during the specification and development stages of the design phase of a new voluntary IOIS. Boonstra’s framework suggested that stakeholders associated with organisational initiators could include owners, project managers, decision makers and developers, all of which could recruit and/or manage SMEs. Further, the framework suggested these stakeholders could also get other stakeholder types (e.g. those outside the organisational initiator) to recruit and/or manage SMEs. I therefore concluded Boonstra’s stakeholder categories, as outlined in Table 3.2, would help me identify which stakeholder types had a responsibility for recruiting and maintaining SME involvement (RQ1), and provide the basis for answering the other research questions relating to how these stakeholders types recruit and/or maintain SME involvement during the design phase of a new voluntary IOIS.

Table 3.2: Stakeholder types during the design phase of IS/IOIS

<table>
<thead>
<tr>
<th>Stakeholder Types</th>
<th>Description of the responsibilities in the IS/IOIS design</th>
<th>Examples of Related works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>The IS/IOIS project owner provides resources (e.g. finances, personnel, top management commitment, etc) needed to design the IS/IOIS.</td>
<td>Ballejos and Montagna (2008); Checkland and Scholes (1990); Freeman (1984); Glinz and Wieringa (2007); Markus and Mao (2004); McManus (2004); Pacheco and Tovar (2007); Razali and Anwar (2011); Vidgen (1997)</td>
</tr>
<tr>
<td>Decision maker</td>
<td>Decision makers are involved in decisions with regard to the scope and design of the IS/IOIS. Decision makers could control the project and decide which parties, including users, should be recruited and involved during the design phase.</td>
<td>Alexander (2005); Ballejos et al. (2008); Markus and Mao (2004); Sharp et al. (1999)</td>
</tr>
<tr>
<td>Project Manager</td>
<td>The project manager monitors the performance of the project and takes action if the project does not achieve the desired progress. Their main responsibility is to ensure the IS/IOIS design phase occur, and oversees this phase. They could have other responsibilities such as creating opportunities for other stakeholders, including users, to be involved in the IS/IOIS design phase.</td>
<td>Alexander (2005); Ballejos et al. (2008); Glinz and Wieringa (2007); Lyytinen (1987); Mantzana et al. (2007); Razali and Anwar (2011); Sharp et al. (1999)</td>
</tr>
<tr>
<td>Developer</td>
<td>The developer designs the IS/IOIS, and can include consultants who contribute to the design project. The main responsibility of developers is to manage RA activities including: recruiting users to gather and model their needs; developing prototypes; running and evaluating the prototype with the users and other stakeholder types; and programming activities.</td>
<td>Alexander (2005); Ballejos et al. (2008); Glinz and Wieringa (2007); Lyytinen (1987); Mantzana et al. (2007); Pacheco and Tovar (2007); Sharp et al. (1999)</td>
</tr>
<tr>
<td>User</td>
<td>Users will use the IS/IOIS by entering data or</td>
<td>Alexander (2005); Ballejos et al. (2008); Glinz and Wieringa (2007); Lyytinen (1987); Mantzana et al. (2007); Pacheco and Tovar (2007); Sharp et al. (1999)</td>
</tr>
<tr>
<td>Stakeholder Types</td>
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<td>Examples of Related works</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Passive Stakeholder</td>
<td>by retrieving information once the IS/IOIS is implemented. For this reason, representatives of the broader group of users (or categories of different types of users) may participate in various RA activities to provide information about their needs and related knowledge about carrying out their work.</td>
<td>(2008); Boonstra and de Vries (2008); Glinz and Wieringa (2007); Lyytinen (1987); Mantzana et al. (2007); McManus (2004); Pacheco and Tovar (2007); Pouloudi and Whitley (1997); Razali and Anwar (2011); Sharp et al. (1999); Vidgen (1997)</td>
</tr>
<tr>
<td>Passive Stakeholder</td>
<td>Passive stakeholders may affect or be affected by the IS/IOIS, but are not directly involved in the design phase. They may add value to IOIS design project by helping other stakeholder types recruit or manage the involvement of other stakeholder types without participating in the IOIS design phase.</td>
<td>Alexander (2005); Davison et al. (2006); Friedman et al. (2008); McManus (2004); Pouloudi and Whitley (1997)</td>
</tr>
</tbody>
</table>

I noted above there is a lack of research relating to RQ1 and that Boonstra is the only study to apply this framework empirically. This suggested the thesis could contribute to theory by collecting new data to investigate whether there is further empirical evidence of the usefulness of Boonstra’s framework for conceptualising stakeholder management and involvement during different IS/IOIS lifecycle stages. More specifically, managing the recruitment and ongoing participation of SMEs during the specification and development stages of a new voluntary IOIS. I also anticipated that, given the limited research in this area, I could contribute to theory by identifying emergent themes from my data and then returning to the literature to see if alternative theories helped make sense of these themes. For this reason, I revised RQ1 from Section 2.6.1 to reflect these theoretical aims as follows:

**Which stakeholder type(s) recruit SMEs into and/or maintain their involvement in specification and/or development stages, and how can these stakeholder type(s) be conceptualised?**

Answering this question helped determine which stakeholder types recruited and maintained SME involvement in the design phase of a new voluntary IOIS. It was also important to understand how relevant stakeholder types recruited SMEs, and to determine the way this could be conceptualised.

As outlined earlier in Section 3.2 (see Table 3.1), Boonstra’s framework did not conceptualise all aspects of recruitment, especially relating to Research Question 2. The next section, therefore, explains that I aimed to contribute to theory by
extending Boonstra’s framework to conceptualise the types of invitation techniques each stakeholder type could use to recruit SMEs during the specification and development stages during the design phase of a new voluntary IOIS.

3.4 New element needed to theorise recruitment invitation types

Research Question 2 (RQ2) emphasises that the first step in recruiting SMEs is to understand what types of invitations stakeholders from an organisational initiator, and other stakeholder types (as per RQ1), use to encourage SMEs to be involved in the design phase of a new voluntary IOIS. The literature on SME involvement in the design phase of voluntary IS/IOIS reviewed in Section 2.6.2 indicated that invitation types could include surveys, public invitations, and social or business meetings. I also pointed out, however, that prior studies provided little insight into the invitation types used by organisational initiators (because they focus on researcher initiators), or into how these invitations were used (e.g. how they were sent). Further, Table 2.2 which reviewed these studies showed they did not explore if combinations of invitation types were used (most studies focus on one only type), nor if different types were used in the specification stage versus the development stage. Finally, I anticipated that invitation types were likely to be complex for voluntary IOIS projects because of the need to convince SMEs to take part in one or more RA activities.

I reviewed the literature on RA, ISD and IOIS and found that none provided any relevant theories or concepts relating user invitation types or recruitment techniques. As noted in Section 3.3, this literature focuses on the importance of identifying appropriate stakeholder types and involving them in RA activities. The theorising by the studies cited in Section 3.3, therefore, relates to categorising stakeholder types.

More broadly, the RA, ISD and IOIS literature did not explore the recruiting of these stakeholder types, so it was not surprising the literature did not theorise the types of invitations to recruit stakeholders such as SMEs in specification and development stages of a new voluntary IS/IOIS. This includes Boonstra’s framework, which does not conceptualise how IS/IOIS project stakeholders (e.g. project managers, owner) manage recruiting other stakeholders. Overall, this suggested Boonstra’s framework
needed extending with the relevant concepts or theory relating to stakeholder recruitment. Further, it implied empirical work was needed to identify emergent themes relating to invitation types used by stakeholders to recruit SMEs, followed by returning to the literature after data collection and analysis to identify any theory to make sense of the findings. For this reason, I revised RQ2 from Section 2.6.2 (see also Table 3.1) to reflect these theoretical aims as follows:

**What types of invitations do organisational initiators use to recruit SMEs into specification and/or development stages, and how can these invitation types be conceptualised?**

The next section focuses on the content of each type of invitation to convince SMEs to participate in RA activities during the design phase of a new voluntary IOIS, and the extent to which prior IS research has theorised about such invitation content.

### 3.5 Boonstra’s element: categorising stakeholder interests

My review of the literature (see Section 2.6.3) indicated that prior studies have focused on understanding the interests or benefits SMEs might be able to gain from using the voluntary IS/IOIS being developed. In the other words, the studies have investigated requirements analysis (RA) rather than the details of what organisational initiators state in invitations to encourage SMEs to participate in the specification or development stages of a new voluntary IS/IOIS. This led to Research Question 3 (RQ3), which required examining the different types of SME interests or benefits to be included in invitations presented to SMEs to encourage their participation.

Answering RQ3 required a suitable way of conceptualising different types of SME interests to determine which were (not) used in the recruitment invitations. I explained in Section 2.6.3 that prior studies relating to involving SMEs in the design phase of voluntary IS/IOIS had not explored recruitment invitations, and therefore did not offer any useful conceptualisations.

Table 3.3 shows that Boonstra’s framework was suitable for this purpose because it categorises stakeholder interests or benefits, which could be included in recruitment invitations to motivate them to take part in RA activities within the
specification and/or development stages of a new voluntary IOIS. I used Boonstra’s
categories because his study was the only empirical work similar to my research
project (i.e. looking at stakeholder interests addressed in more than one stage of a
complex IOIS lifecycle), which suggested his categories may apply to my context of
stakeholders in large government organisations recruiting SMEs. Further reason was
that the categories of IOIS implementation benefits proposed by Robey et al.
(2008), and presented in an SME context in Table 2.1, corresponded with Boonstra’s
categories. The relational benefits category was not used because these benefits
can, for instance, be categorised as strategic, operational and financial benefits and
therefore did not warrant its own category. Finally, my review of the RA and ISD
literature showed that benefits or interests being elicited from stakeholders could
be grouped based on Boonstra’s categories.

I discuss further rationale for using Boonstra’s stakeholder interest categories next.

**Table 3.3: SME interests to address in voluntary IS/IOIS design invitations**

<table>
<thead>
<tr>
<th>Interests in the IS/IOIS</th>
<th>Description</th>
<th>Examples of related works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic benefits</td>
<td>To what extent the proposed new voluntary IS/IOIS could align with one or more business strategies of the SME.</td>
<td><strong>IOIS studies:</strong> Brush and McIntosh (2010); Chan et al. (2012); Kartiwi (2006); Kharuddin et al. (2015); Maggiolini and Valles (2012); Musawa and Wahab (2012); Rajesh and Margareet (2011); Robey et al. (2008); Seyed et al. (2013); Sousa (2007); Tai et al. (2010); Tai et al. (2010); Tatnall et al. (2004); Thakkar et al. (2008); Wang and Ahmed (2009); Wang and Sarkis (2013).  <strong>RA/ISD studies:</strong> DeLone and McLean (1992); DeLone and McLean (2003); Petter et al. (2013); Shang and Seddon (2002); El-Masri (2009).</td>
</tr>
<tr>
<td>The economy benefit, Return of investment (ROI)</td>
<td>To what extent the proposed new voluntary IS/IOIS could save money and/or help increase revenue for the SME.</td>
<td><strong>IOIS studies:</strong> Brush and McIntosh (2010); Chan et al. (2012); Kharuddin et al. (2015); Matolcsy et al. (2005); Musawa and Wahab (2012); Nicolaou et al. (2003); Poston and Grabski (2001); Ranganathan et al. (2011); Shau et al. (2009).  <strong>RA/ISD studies:</strong> DeLone and McLean (1992); DeLone and McLean (2003); Petter et al. (2013); El-Masri (2009).</td>
</tr>
<tr>
<td>Business Process Management (BPM) and operational benefits</td>
<td>To what extent the proposed new voluntary IS/IOIS could improve efficiency and effectiveness of one or more of the SME’s workflows or processes.</td>
<td><strong>IOIS studies:</strong> Brush and McIntosh (2010); Chan et al. (2012); Kharuddin et al. (2015); Musawa and Wahab (2012); Rajesh and Margareet (2011); Reekers and Smithson (1996); Robey et al. (2008); Shang and Seddon (2002); Sousa (2007); Tai et al. (2010); Tan et al. (2009); Thakkar et al. (2008).  <strong>RA/ISD studies:</strong> DeLone and McLean (1992); DeLone and McLean (2003); Lempinen et al. (2012); Petter et al. (2013); El-Masri (2009).</td>
</tr>
<tr>
<td>Work/user satisfaction/employment</td>
<td>To what extent the SME manager’s and/or staff job enjoyment or satisfaction</td>
<td><strong>IOIS studies:</strong> Bradford and Florin (2003); Kartiwi (2006); Poon and Strom (1997); Quayle (2002); Rajesh and Margareet (2011).  <strong>RA/ISD studies:</strong> DeLone and McLean (1992); DeLone and McLean (2003); Lempinen et al. (2012); Petter et al. (2013); El-Masri (2009).</td>
</tr>
<tr>
<td>Interests in the IS/IOIS</td>
<td>Description</td>
<td>Examples of related works</td>
</tr>
<tr>
<td>----------------------------------------</td>
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<td></td>
<td>could be improved by the proposed new voluntary IS/IOIS.</td>
<td><strong>RA/ISD studies</strong>: DeLone and McLean (1992); DeLone and McLean (2003); Lempinen et al. (2012); Petter et al. (2013); El-Masri (2009).</td>
</tr>
<tr>
<td>User friendliness/ system quality</td>
<td>To what extent the proposed new voluntary IS/IOIS could be easy to use (compared to what the SME is currently using).</td>
<td><strong>IOIS studies</strong>: Brush and McIntosh (2010); Chan et al. (2012). <strong>RA/ISD studies</strong>: DeLone and McLean (1992); DeLone and McLean (2003); Lempinen et al. (2012); Petter et al. (2013); El-Masri (2009).</td>
</tr>
<tr>
<td>Quality information</td>
<td>To what extent the proposed new voluntary IS/IOIS could produce, or improve access to and/or management of, quality of information used and/or wanted by the SME.</td>
<td><strong>IOIS studies</strong>: (Brush &amp; McIntosh 2010); Chan et al. (2012); Kharuddin et al. (2015); Lempinen et al. (2012); Nolan et al. (2007); Ranganathan et al. (2011). <strong>RA/ISD studies</strong>: DeLone and McLean (1992); DeLone and McLean (2003); Kartiwi (2006); Petter et al. (2013); El-Masri (2009).</td>
</tr>
<tr>
<td>Technology performance/ security</td>
<td>The extent to which the technical operation (e.g. speed, security and ease of use) of the proposed new voluntary IS/IOIS could be better than the existing (computerised) IS/IOIS the SME uses.</td>
<td><strong>IOIS studies</strong>: Brush and McIntosh (2010); Chan et al. (2012); Kharuddin et al. (2015); Lin et al. (2005); Rajesh and Margaret (2011); Ranganathan et al. (2011); Sousa (2007). <strong>RA/ISD studies</strong>: DeLone and McLean (2003); Lempinen et al. (2012); Petter et al. (2013); Shang and Seddon (2002); El-Masri (2009).</td>
</tr>
</tbody>
</table>

As with Boonstra, none of the RA/ISD/IOIS studies have explored whether these stakeholder benefit or interest types are incorporated in recruitment invitations for the design phase, instead, focus on whether these stakeholders perceive these from IS/IOIS adoption or after IS/IOIS implementation. For this reason, the aim of this thesis was to determine whether there was evidence that Boonstra’s stakeholder interest categories were useful for conceptualising which types of SME interests organisational initiators included in their recruitment invitations for the specification and/or development stages of the design phase of a new voluntary IOIS.

Similarly, I already explained in Section 3.1 that theories used in IOIS studies have mostly focused on IOIS adoption and implementation, rather than on recruiting stakeholders into the design phase of voluntary IOIS projects. The lack of prior research in this area, therefore, suggested new empirical work was needed to identify emergent themes relating to the content of SME recruitment invitations, followed by returning to the literature after data collection and analysis, to identify any alternative theory to make sense of the findings. I revised RQ3 from Section 2.5.3 (see also Table 3.1) to reflect these theoretical aims as follows:
What do organisational initiators state in invitations to encourage SME participation in specification and/or development stages, and how can these types of invitation statements be conceptualised?

The next section focuses on how organisational initiators manage SME involvement in the specification and development stages of a new voluntary IOIS once the SMEs are recruited. It also examines the extent to which prior IS research has theorised about such stakeholder management.

3.6 New element to theorise managing stakeholder involvement

My review of the literature on involving SMEs in the design phase of a new voluntary IS/IOIS (see Section 2.6.4) revealed that few studies explore how organisational initiators maintain SME involvement in the specification and development stages once SMEs are recruited to participate in one or more RA activities. Instead, prior research focuses on the needs identified from SMEs, the IS/IOIS functionality and user interface design. This led to Research Question 4 (RQ4), which required identifying how organisational initiators maintain the involvement of SMEs during the specification and development stages during the design phase of a new voluntary IOIS. The lack of existing studies meant there has also been no theorising in this area.

In addition to the review of voluntary IS/IOIS literature, I reviewed RA and ISD studies to determine if they investigate and theorise stakeholder management during RA activities after stakeholders are recruited. I found this literature instead focuses on:

- describing methods for eliciting needs from stakeholders, such as interviews, surveys, brainstorming, prototyping and workshops (Goguen & Linde 1993; Kotonya & Sommerville 1998; Pohl 2010; Zowghi & Coulin 2005) and explaining how the methods can be combined (Avison & Fitzgerald 2003; Chakraborty et al. 2013; Conboy 2009; Cram & Brohman 2013; Duggan & Thachenkary 2004; Goguen & Linde 1993; Jiang et al. 2005; Mannio & Nikula 2001; Marks 2012; Montabert et al. 2009; Nuseibeh & Easterbrook 2000; Sutcliffe 1997)
• examining the strengths and weaknesses of the elicitation methods (Browne & Rogich 2001; Cooke 1994; Escalona & Koch 2004; Haron & Sahibuddin 2010; Lim et al. 2010; Lloyd et al. 2002; Zhang 2007) and the factors (e.g. project size, information sources, obstacles and stakeholder characteristics) which influence the selection of particular methods (Alford 1977; Anwar & Razali 2012; Asghar & Umar 2010; Duggan & Thachenkary 2004; Hansen & Lyytinen 2010; Jiang et al. 2005; Katina et al. 2014; Lloyd et al. 2002; Mannio & Nikula 2001; Mishra et al. 2008; Zhang 2007); and
• categorising the RA methods based on characteristics, such as the means of communication (Cooke 1994; Goguen & Linde 1993; Mrayat et al. 2013; Zhang 2007) between developers and users.

These aims were not relevant to my study, however, because I was not interested in the details of the RA methods, selection or strengths/weaknesses of RA methods, nor with how stakeholders communicated with SMEs during RA methods. Instead, this study was concerned with how organisational initiators manage SME involvement including, for instance, enable, constrain, convince or support SMEs to continue participating in multiple RA activities.

Similarly, Boonstra’s (2009) framework recognises the need to understand the interests of stakeholders. However, it does not conceptualise how stakeholders maintain the participation of other stakeholders in multiple RA activities. This suggested empirical work was needed to identify emergent themes relating to how organisational initiators achieved this with SMEs during the specification and development stages, then returning to the literature after data collection and analysis to identify theory that could make sense of the findings. For this reason, I revised RQ4 from Section 2.6.4 (see also Table 3.1) to reflect these theoretical aims as follows:

**What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages, and how can these techniques be conceptualised?**
3.7 Summary

In summary, this chapter has argued that Boonstra’s framework provided a useful starting point as a conceptual framework for answering RQ1 and RQ3. I also explained that the lack of IS research regarding how organisational initiators and their associated stakeholders manage the involvement of other stakeholders, such as SMEs in this study, meant there were no apparent theories or concepts to underpin answering RQ2 or RQ4. Boonstra’s stakeholder management framework was the most suitable for this study, because it covered half the research questions and because his empirical work, using the framework, was the closest to my study.

Overall, however, this chapter showed that an important theoretical contribution needed was to extend Boonstra’s framework to incorporate concepts from other theories to make it even more useful for my problem domain. More specifically, I first needed to conduct new empirical work relating to how an organisational initiator managed SME involvement during the design phase of a new voluntary IOIS. Then I needed to return to the literature to identify relevant theoretical concepts to use as vocabulary for making sense of, and describing, the findings relating to RQ1-4. This would then provide the foundation for future research by other IS scholars in this problem domain. In other words, this foundation would propose potentially new concepts or a vocabulary for describing and making sense of the complexity associated with organisational initiators managing SME involvement in the design phase of a new voluntary IOIS. IS scholars in future research can then use this as the basis for exploring if these concepts are useful in other contexts and whether they help develop a greater understanding of this under-explored problem domain.

The next chapter discusses the research approach I use to achieve this. In particular, the next chapter discusses details about and justification of research paradigm, method, data collection, case study overview, data analysis and limitations.
Chapter 4 - Research Approach

In Chapter 3, I presented a conceptual framework, derived from Boonstra (2009), as a starting point for to guide my analysis of how organisational initiators (and their internal and external stakeholders) manage (recruit and maintain) SME involvement in the specification and development stages of the design phase of a new voluntary IOIS. I explained that his framework had limitations because it did not offer concepts for all my sub-questions, and that this necessitated returning to the literature after data analysis to identify theories and concepts to help me make analytical and descriptive sense of the findings.

In this chapter I describe and justify the aims of the study, philosophical assumptions underpinning this research, the research method (and limitations and strategies I used to minimise them), the data collection process to recruit informants and gather other data, and finally, the data analysis approaches used to interpret the results and generate the findings.

4.1 Research aims

The purpose of my research was to answer the following overarching research question and the more specific sub-questions:

How do organisational initiators manage (recruit and maintain) SME involvement during the design phase (specification and development stages) of a new voluntary IOIS, and how can this be conceptualised?

1. Which stakeholder type(s) recruit SMEs into and/or maintain their involvement in specification and/or development stages, and how can these stakeholder type(s) be conceptualised?
2. What types of invitations do organisational initiators use to recruit SMEs into specification and/or development stages, and how can these invitation types be conceptualised?
3. What do organisational initiators state in invitations to encourage SME participation in specification and/or development stages, and how can these types of invitation statements be conceptualised?
4. What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages, and how can these techniques be conceptualised?

Answering these questions required identifying a voluntary IOIS project with a completed specification and development stage where SMEs were directly involved in multiple requirements analysis (RA) activities per stage to identify needs, which were not easily determined from peak bodies and other representatives of SMEs. The IOIS needed to be a newly designed system rather than just a modification to an existing system to increase the likelihood of SME involvement. It required detailed accounts by individuals who were involved directly (and indirectly) in the complex events and processes of inviting SMEs into RA activities, and/or in maintaining recruited SMEs’ involvement in various RA activities. I required access to various project documents such as specifications, evaluation documents, survey instruments sent to SMEs, and examples of the promotional material used to advertise RA activities.

I needed to analysis and interpret this text-rich data to reconstruct a detailed account of the complexity of the RA activities, who was involved, when and what they said and used to recruit and maintain the involvement of SMEs in the design phase of the new voluntary IOIS. Answering the questions required exploring hidden and subtle messages between individuals’ accounts and secondary data to determine any tensions affecting how the organisational initiator managed SME involvement, and to identify inconsistencies in any accounts.

The complexity of a new voluntary IOIS and its design phase (and the text-based accounts) suggested I should focus on a single design phase of a single, new voluntary IOIS to answer the research questions. This was preferred to studying two or more design projects, which would have increased the risk of missing details about the complexities of how an organisational initiator managed SME involvement during the design phase of a new voluntary IOIS. The lack of prior research (Chapter 2) and theorising (Chapter 3) in this problem domain meant it was preferable to focus on a single, complex design project so that I had detailed
descriptions for identifying concepts for making analytical and descriptive sense of emergent themes.

The next section explains why an interpretive research paradigm helped me collect this type of data to answer my research questions.

### 4.2 Research paradigm

The research aims above suggested that an *interpretive research paradigm* (Klein & Myers 1999) was the most appropriate underlying philosophical paradigm for this study. The interpretive paradigm “… is concerned primarily with generating context-based understanding of people’s thoughts, beliefs, values, and associated social action” (Taylor et al. 2012, p. 377). Interpretivist research often focuses on collecting information about events, and make meaning of that information by drawing inferences or by judging the match between the information and some abstract pattern (Aikenhead 1997).

These descriptions of interpretivism were consistent with my aim in Section 4.1. For example, answering my research questions required interpreting, based on individuals’ accounts, their understanding of the events relating to how they (and others) helped manage SME involvement during the design phase. This included identifying possible tensions and inconsistencies between these verbal accounts, and with secondary documents, I collected. This enabled me to reconstruct a detailed historical account of how stakeholders internal and external to the organisational initiator of a new voluntary IOIS managed SME involvement during the specification and development stages of the design phase.

In Section 4.10, I explain how the principles of interpretive research by (Klein & Myers 1999) were applied in my study based on my description of my research approach in the sections to follow. In the next section, I discuss and justify the interpretivist single case study method used in my research.

### 4.3 Research methodology

Broadly, the aims of this study were consistent with qualitative methods which often intend to help the researcher understand and explain social phenomena in their natural setting, rather than situations controlled by the researcher (Flick 2009;
Patton 2002). This is consistent with the objective of my study, which was to reconstruct an account of the details of a real design phase of a new voluntary IOIS project where stakeholders internal and external to the organisational initiator managed the involvement of real SMEs. This required (see Section 4.1) detailed, contextualised descriptions by stakeholders regarding the actions and steps they were involved in during the design phase associated with recruiting and/or maintain SME involvement. This is also consistent with the goal of qualitative research to preserve chronological flow (Miles & Huberman 1984) and description of what took place.

There are various qualitative research methods such as action research, grounded theory and cases study methods, which have been used previously to conduct research on IOIS, which could have been used for this study. I justify briefly, why I decided not to use the first two methods next.

Action research has been commonly used by researchers to build theory and knowledge, as well as initiate and involve themselves in cycles of change within the setting being studied to examine the outcomes (e.g. Allen et al. 2000; Braa & Hedberg 2002; Checkland & Holwell 2007; Wastell et al. 2004). Action research was not suitable for this study because my aim was not to be directly involved myself in the design of a voluntary IOIS, but rather to reconstruct from the accounts of others how organisational initiators managed SME involvement in the design phase of a new voluntary IOIS.

Grounded theory has been used by IOIS researchers and mainly involves theoretical sampling, exploring the state of the art and generating theories from practice (e.g. Golicic et al. 2002; Paphathanassis & Knolle 2011; Rodon & Pastor 2007). This approach did not match my aims because I had the starting point for a conceptual framework and because my goal was to identify concepts from existing theory to make sense of emergent themes after my data collection. I was therefore not attempting to generate new theory relating to how organisational initiators management SME involvement during the design phase of a new voluntary IOIS.

In the following section, I outline the rationale for selecting the single case study method.
4.4 Single case study method

In this study, I aimed to reconstruct an in-depth account, from individuals and secondary data, of the complexity of how internal and external stakeholders recruited and maintained the involvement of SMEs in multiple RA activities during the specification and development stages of a new voluntary IOIS. As I explained in Section 4.1, answering the research questions, therefore, required a method which allowed me to investigate the phenomena (i.e. the design phase of a new voluntary IOIS) in depth and provide detailed descriptions of how SME involvement was managed by the stakeholders. These requirements for answering my research questions matched the single case study method for the following reasons.

First, Yin (2009) explains that a single (rather than multiple) case studies is appropriate when, for example, it is extreme or unusual, is longitudinal and/or aims to test a specific theory. My research project satisfied the first criterion because I anticipated that the case could be unusual because my review of prior research on involving SMEs in voluntary IS/OIS design shows that cases matching the criteria in Section 4.1 for answering the research questions had not been examined, or at best not reported on (see Section 2.5). For example, I needed a case study of an IOIS project where the organisational initiator involved SMEs directly in multiple RA activities across both the specification and development stages of a new voluntary IOIS. Finally, my study satisfied the third criterion because, as I explained in Chapter 3, I aimed to determine if Boonstra’s conceptual framework helped make sense of some of my case study findings, which involved confirming if his concepts applied.

Second, a major strength of the single case study method, like case studies in general, is it focuses on in-depth understanding and descriptions of complex social phenomena and the dynamic real live context within a single setting (Eisenhardt 1989; Flyvbjerg 2006; Yin 1993). This was consistent with my project because my aim was to make sense of the complexity of how stakeholders internal and external to an organisational initiator recruited and maintained SME involvement during the design phase of a new voluntary IOIS (see Section 4.1). I anticipated this complexity could include tensions and contradictions in the accounts of stakeholders given the inter-organisational nature of such projects and the different information
requirements. The single case study, therefore, allowed me to use various data collection methods for understanding and describing this complexity.

Third, case studies, and single case studies, in particular are suitable for exploratory research projects (Eisenhardt 1989; Walsham 1995) involving “how” type questions and where theorising is incomplete (Yin 2009). This was consistent with my research project because there has been little research (see Sections 2.4 to 2.6) and theorising (see Chapter 3) in my problem domain. This meant I needed to return to the literature after my data analysis to identify theory or concepts, which helped make sense of themes emerging from my exploratory study.

Fourth, single (and multiple) case studies enable the researcher to explore unforeseen issues (Chen 2009; Themistocleous et al. 2004). The lack of prior research (see Chapter 2) and the unknown nature of the complex details of the case meant that I needed a method with flexibility. For example, I needed flexibility during the case study to change whom I interviewed and to adapt data collection procedures in response to what I discovered about how organisational initiators manage SME involvement during the design phase of a new voluntary IOIS. I, therefore, could not plan my data collection ahead of time.

Fifth, case studies in the IS discipline, and single case studies in particular, mainly focus on managerial and organisational research questions rather than technical problems (Benbasat et al. 1987). This was consistent with my research project because I examined how organisational initiators managed SME involvement during the design phase of a new voluntary IOIS. More specifically, stakeholders who recruit and maintain SMEs would need to convince owner-managers of the strategic and/or operational benefits (see examples in Table 2.1) to encourage participation in RA activities. I was therefore not interested in the technical aspects of the voluntary IOIS such as how it works and its technical architecture (see Section 2.4). Further, I stated in Chapter 3 I was not looking at the details of how RA activities were conducted, as RA researchers would do.

The main limitation of a single case study is that it does not lead to generalisable findings beyond the case (Flyvbjerg 2006), but this was not my research aim. My objective was to conduct the first comprehensive empirical study, given the lack of
research in my problem domain (see Chapter 2), of how an organisational initiator managed SME involvement during the design phase of a new voluntary IOIS. The insights gained, and the theories/concepts identified for making sense of my findings can be used in future research aimed at validating my conclusions in other contexts.

4.5 Single case study selection criteria

In Section 4.1, I described the type of design phase of a voluntary IOIS project, which was needed to achieve my research aim and answer my research questions. I developed these into specific criteria for selecting my case study as follows:

1. The IOIS needed to enable computer network-based bi-directional information sharing at least between many SMEs and the organisational initiator to satisfy the definition of IOIS I used for the purposes of this thesis (see Section 1.1).
2. It had to be for voluntary for SMEs to use the IOIS (or any other IOIS) for sharing information with the organisational initiator to satisfy my definition of voluntary IOIS used in this thesis (see Section 1.3). This meant SMEs could not be mandated or forced by the organisational initiator or other organisations to use any IOIS for sharing the information. That is, it either needed to be optional for SMEs to share the information at all, or that they could share it using paper.
3. It was important that the voluntary IOIS be a new system (rather than changes to an existing IOIS) where the needs of SMEs were largely unknown so that more complex SME involvement in the design phase would be necessary.
4. The organisational initiator had to involve SMEs directly in both the specification and development stages of the design phase of the voluntary IOIS and to have at least two RA activities per stage. This ensured I could answer my research questions by studying how initiators recruited and maintained SME involvement in multiple RA activities, rather than just in one or two for the design phase.
5. The specification and development stages of the new voluntary IOIS needed to be completed already. This was to eliminate the chance of selecting a case study where SME involvement was planned by did not eventuate during the course of my data collection.

I identified a case study, which satisfied these criteria in two steps.
First, I used desk research to identify numerous IOIS, which had been initiated and designed by public (government) organisations or private organisations from various industry sectors for use with SMEs, which could serve as potential cases. I examined the information gained from the desk search and short-listed three voluntary IOIS, which appeared to match my selection criteria.

Second, I then identified a contact person for each of IOIS and sent enquiries through email and then a follow-up phone call to organise a meeting to find out more details about the IOIS to see if they met my selection criteria. Based on the follow-up process, it was found that all the identified systems were IOIS, but the meeting and a site visit revealed that two (DMS and WebFarm, pseudonyms) were not suitable. DMS was designed by a private organisational initiator without involving the intended SME users in the design phase. Further details about the WebFarm project are explained in Section 4.6 to justify why this project was not suitable for my study.

The next section provides an overview of the completed design phase of the third voluntary IOIS called the Farm Planning Tool (FPT) and justify why it met the case study selection criteria listed above. Its suitability was determined based on informal discussions with a contact person about the FPT design phase prior to data collection.

4.6 Case study overview

The design phase of the project was initiated by a State government organisation led by a consortium of individuals representing agencies within the organisation: the Department Land Resources (DLR); the Department Environment (DE); and four Catchment Authorities (CAs) (pseudonyms). The roles of agencies and their relations with SMEs are summarised in Table 5.1 of Chapter 5. DairyCo was a third-party organisation, which joined the consortium later in the project during a second cycle of FPT evaluation. I explain in Chapter 5 that DairyCo was a cooperative and why this meant the FPT was still a voluntary IOIS for its SME dairy farmer members.

The aim of the project was to establish proof-of-concept that it was possible to design a web-based spatial system which was voluntary, free, practical and easy for SMEs farmers to use to enter and manage information about their on-farm activities.
(e.g. crop rotations, fertiliser use and effluent management) on web-based maps provided and maintained by the agencies (e.g. aerial photos of their farm). The agencies hoped to use the spatial data entered voluntarily by farmers to monitor and report on (e.g. to Ministers, managers) the state of natural resources owned and used by farmers. It, therefore, met the definition of voluntary IOIS (selection criteria 1 and 2) because it was web-based, bi-directional, voluntary exchange of spatial data between agencies and SME farmers.

The FPT project aimed to establish “proof-of-concept” because when the design phase started in 2005 web-based spatial technology was new, so that it was not clear to the consortium that the planned FPT would be feasible. Further, most SME farmers were unaware of the technology and its potential for farming use, so that the consortium did not know the farmers’ needs or whether these needs would align with the agencies’ needs. The FPT consortium found no suitable web-based tools available where they could maintain ownership and control over the spatial data they provided to the SME farmers. This meant the consortium needed to design a new web-based tool, and they needed to involve SMEs directly in the design phase to ensure the new FPT met farmer needs. This satisfied selection criteria 3.

The consortium targeted SME farmers in particular because they were less likely to be doing environmental management (EM), or reducing their negative impact on the environment from their farming activities (e.g. fertiliser run-off entering waterways). The consortium aimed to make it desirable and easier for farmers to do EM, with the FPT helping (among other initiatives) by making on-farm decision-making relating to EM and general farm management easier. The consortium knew from successful desktop decision support system (DSS) projects that involving SME farmers early in the design phase was an important contributor. For this reason, the consortium recruited and maintained SME farmer involvement on a reference group for the FPT project. It also recruited and maintained other farmers’ involvement in two further RA activities during the specification stage and two prototype evaluation cycles. Each evaluation cycle involved FPT training, use and post-use feedback, and each of these resulted in increased knowledge about SME farmer needs and were treated as RA activities in their own right by the FPT project.
team (see Table 5.6 in Section 5.4.7). The design phase of the FPT project, therefore, satisfied selection criteria 4.

As noted above, an overall aim of the FPT project was to determine SME (and other stakeholder) needs for web-based spatial tool, and to demonstrate “proof-of-concept” that such a voluntary IOIS was feasible. The FPT consortium had already completed the design phase and established proof-of-concept, and had used the knowledge gained from the FPT prototype. The FPT project therefore satisfied selection criteria 5. The outcomes of the design phase of the FPT project led the State government to start a new project, which involved developing IOIS standards and the technical spatial mapping infrastructure. The resulting architecture would be accessible to private software developers to build spatial farm tools, which supported bi-directional information exchange between government, farmers and other parties. This architecture project was called FarmWeb (pseudonym). The FarmWeb consortium, which included members of the original FPT consortium, planned to run an evaluation of a software tool with SME farmers but this phase of the project had not been reached at the time of my data collection and thus was not suitable.

The next section discusses how the data collection for this study was undertaken.

4.7 Data Collection

In this section, I explain and justify the two main types of data collected, which occurred from June 2012 to December 2013, for the case study of the design phase of the new voluntary FPT: semi-structured interviews, and secondary document data.

4.7.1 Semi-structured interviews

I explained in Section 4.1 that I needed in-depth, detailed descriptions of how an organisational initiator (i.e. State government), and its staff and external parties, managed SME involvement during the design phase of a new voluntary IOIS (i.e. web-based FPT). This required talking directly to stakeholders to hear their accounts of the RA activities used and who was involved, when and what they said and used to recruit and maintain SME involvement in the RA activities. Interviews were most appropriate for this purpose because they enable researchers to gather detailed
information such as past behaviours or experiences (Harrell & Bradley 2009; Kvale 1996), which was consistent with my aim of asking stakeholders to describe aspects of the completed design phase. The interviews also lead to constructive suggestions by informants about additional informants I should talk to, and therefore gave me the flexibility I needed to discover how the design phase occurred and who was involved in an exploratory manner.

There are three types of interviews I could have used: structured; semi-structured; and unstructured. Structured interviews are a set of specific and precisely formulated questions which should be read word-for-word to each informant by the researcher without any deviation (Gray 2004). It is useful for obtaining very specific information and keeping the data concise and reduces researcher bias (Bryman 1989; Corbetta 2003; Kvale 1996). This approach was not suitable for my research because not much was known about my problem domain (see Chapter 2). This suggested I needed the flexibility to ask non-formulated questions if the need arose.

Unstructured interviews, by contrast, are flexible, non-directed interviews where there are no restrictions on what questions are asked or how (Kvale 1996). It allows researchers to pose open-ended questions to allow informants to express their thoughts freely. Thus, it is possible to gather rich and in-depth information and historical data in unstructured interviews. This interview approach is most suitable when little knowledge exists about a topic (Creswell 2007; Walsham 1993). This situation applied to my study, however, some structure to the questioning across informants was needed to identify (in)consistencies in their accounts of events regarding how SMEs were recruited and their involvement maintained during the RA activities. This meant asking informants, where suitable, the same (often open-ended) questions for triangulation purposes. Further, I had specific research questions and a conceptual framework to guide the data collection, at least for sub-questions 1 and 3 (see Chapter 3).

For this reason, I combined the advantages of both structured and unstructured interviews by using semi-structured interviews. These interviews use formulated questions (like a structured interviews), but allow researchers to modify questions, ask additional questions or change the order of questions depending on the stories
told and background of the informant (Corbetta 2003). I conducted semi-structured interviews based on the concepts of *laddering* (Reynolds & Gutman 1988) and *floating prompts* (McCracken 1988), whereby answers to broad questions such as “What do you understand by X?” are probed further with more specific questions to gain more in-depth, context-specific information. Semi-structured interviews also allow the researcher to clarify ambiguous answers and, when appropriate, seek follow-up information in further interviews, phone or email. At the same time, this approach provides enough structure to ensure desired information was sought from all informants (Leedy & Ormrod 2001). The semi-structured approach gave informants the flexibility to tell their stories and experiences with my guidance, but also enabled me to ask additional questions to gather data about all the specific research questions.

I mainly used face-to-face interviews, rather than telephone interviews, to gain detailed and specific information on how informants recruited and/or maintained the involvement of SMEs in the various RA activities. Face-to-face interviews had the advantage of enabling me to capture or respond to non-verbal cues (e.g. body language and gestures, facial expressions) which helped my interpretation and understanding (Opdenakker 2006). A further advantage of face-to-face interviews was that some informants used media (e.g. diagrams, screen shots and demonstration of user interfaces) when providing background on the FPT prototype or other aspects of the RA activities they ran with SME farmers. A number of telephone interviews were also conducted in cases where the informants were unable to meet in person. In addition, telephone interviews and email were used to clarify answers or confirm information gathered during the face-to-face interviews.

An interview schedule, based on the laddering approach, was prepared for the interviews comprising the questions in Table 4.1, which also shows how the questions related to my research questions. I explained in Chapter 3 there was little theorising relating to my research questions, so I could not map interview questions to theoretical concepts/constructs. Instead, the questions had to be sufficiently flexible to allow new themes to emerge so I could identify alternative theory/concepts relevant to each research question after data analysis (see Section 4.9).
I used these questions to guide my interviews with informants who had experience with the whole or part of the FPT design process. The interview guide allowed me to ask floating prompts, depending on the answers given, to gain additional information into specific aspects of relevance to the research questions. For example, after informants described how they encouraged others to participate in the design phase if they said they recruited SMEs I asked floating prompts about the specifics of how this was done. These prompts included asking for examples of what they said or produced, how it was delivered to SMEs and other related details (e.g. relating to research questions 2 and 3). My primary aim during the interviews, however, was to let the informant tell their account and using the questions from Table 4.1. Additional floating prompts (e.g. "how", "why", and "then") were used only if necessary to guide or seek clarification of their answers.

### Table 4.1: List of interview questions aligned with research questions

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Interview questions for stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background / context</td>
<td>• What was your position and role in your organisation during the FPT design? What was the role of your organisation?</td>
</tr>
<tr>
<td></td>
<td>• Do you recall how the idea for the FPT came about?</td>
</tr>
<tr>
<td></td>
<td>• What problems were to be solved by designing the FPT?</td>
</tr>
<tr>
<td></td>
<td>• Who, or which organisation(s), initiated the idea for the FPT?</td>
</tr>
<tr>
<td></td>
<td>• Who else should I be talking to about the FPT design? Why do you recommend them?</td>
</tr>
<tr>
<td>Which stakeholder type(s) recruit SMEs into and/or maintain their involvement in the specification and/or development stages, and how can these stakeholder type(s) be conceptualised?</td>
<td>• When did you (your organisation) become involved?</td>
</tr>
<tr>
<td></td>
<td>• How were you invited into the FPT design?</td>
</tr>
<tr>
<td></td>
<td>• How would you describe your role during the FPT design?</td>
</tr>
<tr>
<td></td>
<td>• Can you describe what design activities you were involved in?</td>
</tr>
<tr>
<td></td>
<td>• Who (which organisations) were involved in these activities?</td>
</tr>
<tr>
<td></td>
<td>• Did you invite others into the FPT design? If not, which other parties did?</td>
</tr>
<tr>
<td>Research Questions</td>
<td>Interview questions for stakeholders</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------</td>
</tr>
</tbody>
</table>
| What types of invitations do organisational initiators use to recruit SMEs into specification and/or development stages, and how can these invitation types be conceptualised? | • Can you describe what design activities you were involved in?  
• How were others involved in these activities? What were their roles?  
• How did you encourage others into the FPT design?  
• What were the difficulties in involving other parties in the FPT design? How did you address these difficulties?  
• Were the FPT design activities different to the stages used to design other applications you have been involved with?  
• If you were to do the FPT design or something similar again, what would you do differently regarding the design phase and involvement of other parties? |
| What do organisational initiators state in invitations to encourage SME participation in specification and/or development stages, and how can these types of invitation statements be conceptualised? |  |
| What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages, and how can these techniques be conceptualised? |  |

### 4.7.2 Secondary document data

Different forms of secondary data associated with the design phase of the FPT was identified, for instance, during interviews and using internet searches for publicly available information. It was obtained to fill gaps not addressed by the informants about how organisational initiators managed SME involvement, and to compare the documentary data with the verbal accounts of the informants to identify or resolve inconsistencies (Yin 2009). The multiple data sources were, therefore, important for triangulation purposes (Eisenhardt 1989).

Examples of the types of over 200 secondary data documents I collected and analysed during the study included:

- Documents relating to the FPT design phase such as the project proposal, training notes, specification documents and minutes from meetings to gain background information about the project. The training notes helped to determine how SME farmers were involved during the design phase.
• Documentation about the FPT prototype and other computer systems being used by the SME farmers to gain background information about the project, and to understand what types of benefits were stated to SME farmers.
• Documents relating to the evaluation of the FPT prototype such as user responses to feedback and usability surveys to determine how SMEs farmers were involved in RA activities.
• Documents such as evaluation reports on the FPT project which included some information relating to the RA activities and SME involvement.
• Environmental Management Plans (EMPs), annual reports and environmental performance reports of organisations involved in the FPT design. These included statements how the organisation was involved in the FPT project.
• Various diagrams, mock-up screens and other visual representations used during the FPT prototype development so that I could see how SME farmers were involved and what they saw during the RA activities.
• Newspaper articles, newsletters, bulletin or other publication that were used to recruit SMEs into RA activities of the FPT project.

In this study, I applied a number of means and strategies to collect the secondary data. For instance, during the interview, I asked the informants if they could provide or allow me to copy any documents used or created during, such as design and system specifications, brochures, invitation letters, project evaluation reports and survey responses from SME participants. I also used the Internet to identify and collect further secondary data pertaining such as publications about the FPT design project, advertising brochures and newsletters of FPT pilot testing. I also accessed the FPT prototype to collect related documents (e.g. training notes and user manuals) and to enhance my understanding of the system, the different representation of environmental information needs by farmers, the business processes supported, and the possible benefits of the system.

After collecting the documents, I stored and managed them by categorising them into folders on my computer, and by writing summaries of the documents in terms of the stage during the FPT design process when they were produced or used. I identified three major stages (the conceptual design, prototyping development, trial and evaluation periods) and created a folders for each stage. The hermeneutic
analysis process discussed in Section 4.9 was used to categorise these documents into further sub-folders based on themes and sub-stages I identified.

The next section discusses the recruitment of informants for the case study.

4.8 Recruiting case study informants

The initial informants were identified based on desk research to identify individuals from the organisations involved in the FPT design phase, and their responsibilities. This thesis also adopted non-probability sampling technique known as snowballing. In this method, informants “... with whom contact has already been made use their social networks to refer the researcher to other people who could potentially participate in or contribute to the study. Snowball sampling is often used to find and recruit hidden populations, that is, groups not easily accessible to researchers” (Heckathorn 2002, p. 12). I show how I used this technique during my interview in Table 4.1, which lists the questions asked. This was done at the end of the interview. This technique was important in my study because I did not know beforehand which stakeholders were involved in recruiting and maintaining SME involvement (Mack et al. 2005).

Ethics clearance was obtained from my university (see Appendix 1 for a copy of the approval letter) before any contact was made with informants. I invited informants identified through my desk research by contacting them through email to explain the purpose of the research with a Plain Language Statement and a consent form (see Appendix 2). If they agreed to participate, I arranged a meeting for the interview at the informants’ most suitable time and venue. Prior to starting the interview I ensured they had read and understood the Plain Language Statement and asked them to sign the consent form, and if they consented to the interview being taped.

I stopped searching for new informants and collecting secondary document data when I reached theoretical saturation, or in other words, when there was not learning anything new from the additional interviewees (Given 2008; Patton 2002; Strauss & Corbin 1998) or secondary sources. One challenge with accessing informants was that some, for example, had left the organisation, changed employment or moved overseas, and was beyond my control.
Table 4.2 summarises the informants, using pseudonyms, who I identified from my desk research and snowballing approach, and then interviewed. Further details about the informants are provided in the case study narrative in Chapter 5, who are introduced as the story of the FPT design phase is described. The table also shows that I interviewed SME_Farmer1, who participated in the FPT reference group, and SME_Farmer2 who had participated in the second FPT evaluation. As I emphasised by my overarching research question and my explanation in Section 1.5, the aim was only to explore how organisational initiators (and their internal and external stakeholders) managed SME involvement during the design phase. I was therefore only concerned with the perspective of these stakeholders, not the perspective of SME farmers about their experience with participating. I used these two interviews with SME farmers to triangulate what the initiator stakeholders stated in their interviews, not to explore their perspectives of their involvement.
Table 4.2: Overview of participants in the semi-structured interviews

<table>
<thead>
<tr>
<th>Informants</th>
<th>Responsibilities during the FPT design phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager_CA1</td>
<td>This informant was on the steering committee and represented his CA in the State government organisation. He was the project leader and was able to describe first-hand the project history, the RA activities, the responsibilities of various stakeholder, how SME farmers were recruited, etc.</td>
</tr>
<tr>
<td>DLR_Researcher</td>
<td>This informant was on the steering committee and represented the DLR in the State government organisation, and was involved in all project stages. This informant’s main responsibility was designing the FPT prototype evaluation activities involving SME farmers.</td>
</tr>
<tr>
<td>SpatialCo_Manager</td>
<td>This informant was contracted to develop the FPT prototype, organising/designing RA activities, developing FPT specification documents, improve the prototype based on SME farmer feedback, and running FPT evaluations sessions. He was able to describe first-hand the project history, SME involvement, etc.</td>
</tr>
<tr>
<td>DLR_Manager</td>
<td>This informant did participate in managing SME involvement, but provided background details on the FPT, and issues during the design phase which impacted on SME involvement.</td>
</tr>
<tr>
<td>CA2_Field_Officer</td>
<td>This informant supported SME farmers with environmental management (EM). She provided first-hand details of how she and other CA field officers recruited SME farmers into and participated in RA activities, provided FPT training and helpdesk support for farmers using the FPT during the FPT evaluation period. She created spreadsheet tools to complement the FPT.</td>
</tr>
<tr>
<td>DLR_Field_Officer1</td>
<td>These informants supported SME farmers with general farm planning and using farm planning software. Field_Officer1 was initially involved in the first FPT evaluation as a project officer, including providing FPT training for SME farmers but stopped due to agency changes (see Chapter 5). Field_Officer2 was not involved. Both informants provided details to understand the challenges with recruiting and maintaining SME involvement.</td>
</tr>
<tr>
<td>DairyCo_Manager</td>
<td>This informant represented DairyCo on the FPT consortium and steering committee for the second FPT evaluation, and provided details of how involvement by DairyCo farmers were supported.</td>
</tr>
<tr>
<td>DairyCo_Field_Officer1</td>
<td>These informants supported DairyCo’s (SME) dairy farmers with various aspects of farm management (e.g. regulations) and EM. They were involved in the second FPT prototype evaluation, and provided FPT training to dairy farmers. They provided first-hand descriptions of how farmers were recruited and involved.</td>
</tr>
<tr>
<td>SME_Farmer_1</td>
<td>This informant was an SME farmer (ABS 2012) and a member of the reference group. He provided confirmation about his recruitment and involvement in the group.</td>
</tr>
<tr>
<td>SME_Farmer_2</td>
<td>This informant was an SME DairyCo farmer (ABS 2012) provided confirmation on recruitment and involvement in the second FPT evaluation.</td>
</tr>
</tbody>
</table>

Table 4.2 shows that the informants all offered information about how the State government organisation initiator (and its agencies) recruited SME farmers and/or
maintained SME involvement in RA activities during the design phase of the FPT. In some cases (e.g. the DLR field officers), the informants were also able to provide insights into challenges which initiator stakeholders and/or SME farmers faced recruiting and maintaining SME involvement during the design phase. All interviews were audio-taped and transcribed and then analysed as described in the next section.

4.9 Data Analysis

My approach to data analysis was adapted from the qualitative data transformation process by Wolcott (1994) involving description, analysis and interpretation. According to Wolcott (1994), description is the process of building a narrative (i.e. case study in my context) as close as possible to the account of the informants using information gathered during the data collection. The analysis is a systematic process of identifying themes from data using the QSR NVivo Qualitative Analysis software to record and manage emergent themes mapped to “nodes” and sub-nodes. Since software does not carry out the analysis (Weitzman 2000), the interpretation was needed to make sense of the narrative and/or themes to achieve understanding beyond just the narrative and analysis. I explain this process further next.

I achieved these aspects of qualitative data analysis using a hermeneutic process involving multiple cycles of reading and analysis of textual information to seek understanding (Kinsella 2006). According to Bleicher and Bleicher (1980, p. 1) hermeneutics is "defined as the theory or philosophy of the interpretation of meaning". The hermeneutic cycle principle suggests that "all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form" (Klein & Myers 1999, p. 72). The characteristics of hermeneutics include seeking understanding rather than explanation and acknowledging the situated nature of interpretation (Kinsella 2006). Indeed, in this study, my aim was to identify empirical themes and theoretical concepts for describing and analysing a specific (situated) case of a State government initiator’s design phase of a new voluntary IOIS.
I began the data analysis process with the collection, categorisation and organisation of initial data gathered from desk research in the form of secondary documents (see Section 4.7.2). The first hermeneutic cycle involved reading and analysing the documents to develop my initial narrative description and understanding of the case, such as the impetus for the FPT to be designed, identifying the main RA activities in the specification and development stages, identifying the major stakeholders from the initiating government organisation involved in recruiting and maintaining SME involvement. This provided the basis for the interviews with informants.

The next phase of data analysis involved analysing the professionally transcribed interview transcripts and the additional secondary data collected from informants. I sorted the secondary data into folders based on their chronological order. I also used NVivo to categorise the interview transcript data into a similar chronological order. I then did multiple hermeneutic cycles to analyse both data types by producing codes based on Boonstra’s categories (see Chapter 3), and emergent codes relating to my research sub-questions. Appendix 3 provides an example of my NVivo coding relating to RQ1 on stakeholder types involved in recruiting SMEs (first level Node) during the development stage (second level Node) into two broad RA activities (third level Node) to identify specific stakeholders involved in recruiting SMEs (fourth level Node).

I used this analysis as the basis for drafting my case study narrative. This sometimes revealed that I needed to make follow-up inquiries to my informants’ to seek clarification on any areas of ambiguity, and to fill missing details. I also found that writing the narrative resulted in alternative interpretations of my codes. For example, I determined that the broad RA activities in the third level Node were actually a series of separate RA activities. These new ideas resulted in further hermeneutic cycles. I used this process to finalise my detailed narrative of the case study in Chapter 5.

I then did further hermeneutic cycles to identify major themes emerging from the coding of the interview transcripts and secondary data. I returned to the literature to identify theoretical concepts for analysing, and vocabulary for describing, the
themes I identified. The concepts I identified then meant I needed to re-analyse and re-code some of the data and themes to take advantage of the new ideas that the literature offered. I also found I needed to re-interpret some of the theoretical concepts if IS scholars had used them in different contexts to my study, but where I believed they still offered a useful vocabulary for making sense of the themes.

By employing the hermeneutic cycles of interpretation of the empirical data, literature and theories, I was able to answer the research questions. These hermeneutic cycles continued until no new themes or concepts were forthcoming and further cycles shed no further light on the findings, or in other words when the data analysis had reached “theoretical saturation” (Patton 2002; Strauss & Corbin 1998). At this point, I terminated the hermeneutic cycles. I present the result of this process in Chapter 6.

4.10 Evaluation

The credibility of qualitative research studies heavily relies on the confidence readers have in the researcher’s ability to be sensitive to the data and to make appropriate decisions in the field (Patton 2002). Since I was the primary data collection instrument, it was important for me to recognise and understand my personal values, assumptions and biases as early as possible (Creswell 2003). Furthermore, I achieved the theoretical sensitivity needed to be an effective data collection instrument through a systematic review of the literature (see Chapter 2) and a conceptualisation of the problem domain (see Chapter 3).

To ensure internal validity, I used multiple sources of data such as interviews and secondary documents to triangulate the data (see Section 4.7). I also continually used interviewees as a point of reference to cross-check my understanding of their story. To ensure external validity, I provided a rich, thick description of the findings (Merriam 1998) in the form of a case study narrative in Chapter 5. I ensured the reliability of the project by a detailed description of the research strategy and the data collection process I adopted for this study (Creswell 2003) in this Chapter.

I used the seven principles from Klein and Myers (1999, p. 72) to conduct and evaluate interpretive research. These principles are formulated to assist researchers
to understand the human thought and action in social and organisational contexts. They are more of guidelines rather than mandatory rules to follow.

**Principle One: The fundamental principle of hermeneutic circle**

I used the hermeneutic circle to analyse data, as explained in Section 4.9 on data analysis.

**Principle Two: The principle of contextualisation**

I used a rich, thick description of the FPT design phase (see Chapter 5).

**Principle Three: The principle of interaction between the researcher and the subject**

One important data collection technique used in my study was semi-structured interviews. The type of questions I asked undoubtedly changed how interviewees viewed their involvement in the FTP project. The interviewees in turn influenced the questions I asked and the language I should use. For example, I started using terms extensively in subsequent interviews the specific terms informants commonly used such as “proof-of-concept”, “mock-up prototype” and the specific terms for particular RA workshops such as “regional workshops”.

**Principle Four: The principle of abstraction and generalisation**

This thesis used concepts from Boonstra’s (2009) stakeholder management framework to derive insights from the case study. With careful and purposeful selection of a case study, the aim of this thesis is not to create a grand theory that explains the collective behaviour of organisations and individuals in technology design, development and implementation. Instead, it is to make sense of how an organisational initiator (and its internal and external stakeholders) managed SME involvement during the design phase of a new voluntary IOIS. The limited research in my problem domain (see Sections 2.5 and 2.6) meant that the contribution of my study was to lay the foundation for future IS research.

**Principle Five: The principle of dialogical reasoning**

As Bourdieu et al. (1999, p. 7) suggests, the intention and procedural principles of the my research were made explicit, including:
• the influence on my decision to use the case study method;
• the rationale for selecting the case; and
• the details of how the data were collected and analysed.

**Principle Six: The principle of multiple interpretations**

This principle involves addressing contradictions in the accounts of participants and revising understanding. In the light of this, different interpretations within the case study were taken at face value (see next principle). In cases where a particular interpretation could not be accounted for, it was revised to accommodate the current understanding.

**Principle Seven: The principle of suspicion**

Klein and Myers (1999) acknowledge that the need for critical research in social research is debated among interpretive researchers, and for this reason some IS scholars do not always follow this principle. I did not apply this principle to the story told by the interviewees because it was important to accept the interviewees experience as valid. This meant that my biases did not impede my contribution to knowledge.

**4.11 Summary**

In summary, this chapter summarised my research aims and justified my research paradigm, single case study method, case selection, data collection, data analysis and interpretive research evaluation approach. In the next chapter, I present the narrative of my case study on how a State government initiator recruited and maintained the involvement of SMEs during the design phase of a new voluntary IOIS.
Chapter 5 - Case Study Narrative

In Chapter 4 I described and justified the single case study method (see Section 4.2.1) used to explore how a government initiator managed SME farmer involvement (recruitment and participation maintenance) in the design phase (specification and development stages) of their voluntary IOIS (i.e. a spatial web-based FPT prototype). This chapter provides the accounts of individuals associated with the initiator (internal staff and external parties) who had responsibility for recruiting SMEs and maintaining SME participation during the design phase, based on interviews, follow-up emails or phone calls, and documents such as project reports, survey results, guidelines and specifications. The chapter only provides an account of aspects of the project, which had relevance to the recruiting of SMEs and maintaining their participation.

I start the narrative by describing how and why the FPT design project was initiated (Section 5.1). In Section 5.2, I explain the first step of the specification stage, which involved recruiting SME farmers (and other parties), into RA activities to identify and incorporate their needs into the FPT design principles. In Section 5.3, I describe the second step of the specification stage, which involved converting the FPT design principles into mock-up screens of the FPT, which were evaluated by recruited SME farmers. In Sections 5.4 and 5.5, I present the story of the development stage, which involved recruiting and maintaining SME farmer participation in two FPT prototype evaluation cycles. This development stage aimed to confirm the SME farmers’ (and other parties’) needs identified during the specification stage, and to identify any new emerging needs to be incorporated into the FPT.

5.1 Impetus of FPT design project

In the next section, I describe how the FPT project started. The sections present the events that occurred before the FPT design project when government departments at national and state levels had initiated the Catchment Environmental Management (CEM, pseudonym) project. This account is useful because it summarises the context behind the rationale of the FPT design project, the individuals and organisations, which started the project, what types of organisations
and SMEs were involved, and what problems the CEM project identified which led to the FPT project.

5.1.1 Background of FPT design project

The impetus for the FPT design project originated from the CEM project. The CEM project involved the collaboration of a consortium of three state-based government agencies. The major responsibilities of these agencies are summarised in Table 5.1, along with the main work they did with SME farmers or landholders.

Table 5.1: Organisational initiator agencies in the CEM project

<table>
<thead>
<tr>
<th>Initiator agencies</th>
<th>Agency description</th>
<th>Responsibility with respect to SMEs</th>
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<tbody>
<tr>
<td><strong>Catchment Authorities (CAs), pseudonym</strong></td>
<td>Each catchment and land protection region in the State had a CA. CAs reported to a Minister on region priorities and strategies, resource allocation, action plans and targets, and progress. Projects related to biodiversity, water and land. Employed field officers (also known as extension officers).</td>
<td>Each CA administered grants and programmes so (SME) farmers worked towards their region’s targets and action plans. Each region’s Environment Association (EA) groups, comprising networks of local farmers, applied to CAs for funding. Field officers provided one-on-one and group support to farmers to implement projects.</td>
</tr>
<tr>
<td><strong>Department of Land Resources (DLR), pseudonym</strong></td>
<td>The DLR led State research/innovation into on-farm initiatives resulting in improved production outcomes and reduced environmental impact. Employed field officers (also known as extension officers).</td>
<td>An example project was research on reducing carbon emissions from cows and fertiliser use with farmers. Field officers provided one-on-one and group support to help farmers implement research outcomes / best practice.</td>
</tr>
<tr>
<td><strong>Department of Environment (DE), pseudonym</strong></td>
<td>The DE collected and analysed environmental information on public land (e.g. rivers, national parks) for reporting and future programs on natural resource management.</td>
<td>Provided services and information to help (SME) farmers to improve on-farm EM and productivity, such as chemical use, preparing properties for drought or fire, helping with natural resource management.</td>
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</table>

The FPT project report documents indicated that the CEM project mainly aimed to help and encourage SME farmers to incorporate Environmental Management (EM) principles into their farm processes (e.g. relating to crop rotation, fertiliser use, nutrient loss and effluent management). Another aim was that the three agencies in the consortium wanted to determine how to make it easier for farmers to voluntarily collect EM-related information, which could then be shared with the
three agencies. There were two major reasons why farming businesses were chosen.

First, farms in the agriculture sector had a significant negative environmental impact. This was due, for instance, to their continuous land use and widespread fertiliser/pesticides use. These on-farm production activities contributed to the cumulative negative effect on natural resources, and therefore the environment. This was especially the case with small family-operated farms, because they often did not have a strong motivation to carry out on-farm EM due to their limited resources, lack of knowledge of EM and absence of incentives. It was therefore anticipated that if SME farmers were encouraged and supported to implement EM principles voluntarily, it would reduce the impact of this sector on the environment.

Second, the various state-based government agencies involved in the CEM project, at that time, all had environmental impact reduction targets, monitoring and/or initiative responsibilities (see Table 5.1). Especially in the agricultural sector, these agencies were exploring ways to reduce the possibility of natural resources depletion or degradation resulting from on-farm activities by promoting EM farming practices. The agencies anticipated that focusing on EM implementation on farms would enable them to achieve their environmental impact reduction goals, and help farmers provide EM information voluntarily so the agencies could do their environmental monitoring and management without imposing regulations on farmers.

The CEM project started when the consortium of three agencies established a steering committee comprising individuals who represented the three CAs, the DE and the DLR, and who had responsibility for overseeing and promoting the CEM project. In addition to the steering committee, a project team was assigned comprising a project officer and one or two field officers (also known as extension officers) for each CA region (see Table 5.1 for an overview of CA field officer roles). This project team was responsible for recruiting SME farmers in the CEM project. Table 5.2 summarises the CEM project team members in the CEM project and an overview of the SME farmers recruited into the project for each CA region.
Table 5.2: Members of the CEM project team

<table>
<thead>
<tr>
<th>Region</th>
<th>Project team</th>
<th>Farmer recruitment approaches</th>
<th>Farmer groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA1</td>
<td>one project officer and one field officer</td>
<td>Approach made to farmers who had experience with a paper-based EM manual which helped farmers self-assess their EM</td>
<td>32 landholders from three different cropping groups</td>
</tr>
<tr>
<td>CA2</td>
<td>one project officer and two field officers</td>
<td>Information meeting for farmers regarding the project, public notices in newspapers, personalised letter</td>
<td>41 landholders in three groups representing beef, grains and some horticulture.</td>
</tr>
<tr>
<td>CA3</td>
<td>one project officer and one field officer</td>
<td>Personal approaches made to groups through the project officer</td>
<td>29 landholders in three groups representing beef, wool and lamb</td>
</tr>
</tbody>
</table>

The CEM project team in each CA region developed (or refine in the case of CA1) a paper-based EM manual to guide farmers in identifying important environmental issues, setting their priorities relating to on-farm activities and collecting environmental information. The manual was mainly derived from the Australian EM Manual Workbook and ISO 14001, which is an international standard for EM. Each CA tailored their EM manual for farmers in their region by incorporating local catchment targets and by considering local environmental priorities such as land salinisation, soil structural decline and water quality. This tailoring was intended to provide farmers with locally relevant EM guidelines to help develop on-farm activities for reducing environmental impact specific to their location.

During the CEM project, the project team then used the EM manuals to assist farmers with collecting on-farm environmental information. Upon completing the information collection, farmers could assess the environmental impact of their farm against the priorities specified by their field officers in the EM manual. At the same time, the field officers used the information collected by each farmer to evaluate the catchment’s progress in meeting CA region environmental targets and priorities. In addition, each CA region could use this information for decision-making, catchment planning and designing support programmes.

After the three-year CEM project (which involved planning, collecting, monitoring, measuring and analysing on-farm environmental information), two rounds of evaluations were conducted, including at the farm level and catchment region levels.
At the farm level, the evaluation involved surveying and interviewing farmers who had been using the EM manual, as well as those who decided not to continue using the manual. The evaluation showed that some farmers gained benefits from the EM manual to guide them in on-farm environmental information collection. This was confirmed in a CEM evaluation report, which quoted one farmer in the project:

_We were doing most of the things with regard to environmental management that the [CEM project] is about anyway, but there were a couple of areas that we needed to do a lot of work in. Like most farmers I hate doing bookwork but have found that part of the programme most rewarding. Going through and identifying problem areas, then working out solutions and setting goals to achieve these solutions has been a worthwhile if not very difficult exercise, it makes all of those things that had been put in the ‘too hard basket’ achievable._ [CEM evaluation report]

The quote suggests this farmer was already committed to EM prior to the CEM project. It also highlights that while the farmer experienced benefits from using the EM manual, it also required a lot of work. Indeed, the CEM evaluation report showed that in contrast to farmers such as this one who was already committed to EM, some farmers who were less interested in EM stopped using the EM manual to collect their environmental information. A number of reasons found in the report included that farmers thought that implementing EM practices was tedious and required too much paper-work and that environmental information collection, monitoring and analysis was too time-consuming. In addition, some farmers felt there were no clear incentives to engage in EM such as market drivers, and it was expensive to get fully EM accredited. As a result, it was often difficult to keep farmers using the EM manual voluntarily to help them reduce their negative environmental impact.

At the catchment level, the evaluation report also revealed there were various challenges for CA regions achieving their goals. First, it was more difficult than anticipated for CA field officers to link information about on-farm EM activities gathered by farmers with CA environmental targets. This was because the priorities for the catchment targets were quite complex and often did not transfer to or match with the farm-level information provided by farmers using the EM manual. Second, the conditions of the natural resources and the targets in the three CA
regions were different, which added complexity when the state-based agencies (e.g. DLR or DE) or national government needed to gain insight into on-farm, sub-catchment and catchment level natural resources management. Third, assisting farmers with on-farm EM required skilled and experienced CA field officers regarding both EM and farm production. However, this was difficult because there was high turn-over of field officers, which resulted in the loss of knowledge and reduced services to farmers.

The CEM project was perceived as promising by the steering committee, but it convened several meetings to discuss and propose solutions to enhance the future of on-farm EM to address the problems identified. One major recommendation the committee proposed and wanted to implement in the next project was to develop a computer-based monitoring and farm planning mapping tool to make it easier for farmers to participate in on-farm EM (see Table 5.3 for a summary of how it was expected to be used by three types of users). This is indicated in the following quote:

*So that was our basic idea. We thought, okay, we need a [computer-based] mapping system that’s accessible to farmers that can be readily updated, and also has the ability to access spatial information from government, but also to facilitate the two-way exchange of information.* [Manager_CA1/Thesis Interview]

### Table 5.3: Example bi-directional information flows of the FPT prototype

<table>
<thead>
<tr>
<th>Planned users</th>
<th>Information inputs</th>
<th>Information outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government managers</strong></td>
<td>Specify state/regional level EM targets, conditions of natural resources, provide recent spatial maps for use by SME farmers.</td>
<td>Aggregate farm data for reports, planning, extension activities, etc at all government levels at the state and catchment levels.</td>
</tr>
<tr>
<td><strong>CA field officers</strong></td>
<td>Review and approve SME farmer EM action plans. Entry of farm based details on behalf of farmers if requested.</td>
<td>Aggregate farm data, develop summary reports on activities undertaken (e.g. farms visited, outcomes reviewed, activities for follow up) and maps to assist extension activities.</td>
</tr>
<tr>
<td><strong>SME farmers</strong></td>
<td>Input on-farm data such as paddock details (e.g. layout), EM details (e.g. action plans, targets, proposed activities, extension support requests, issue locations).</td>
<td>Produce farm paddock map, report on activities (e.g. fertiliser inputs, progress on targets), view benchmark against other farms, measurements (e.g. fencing).</td>
</tr>
</tbody>
</table>
The committee referred to this tool as a spatial web-based Farm Planning Tool (FPT, pseudonym). It was anticipated that developing the FPT would mean that delivery of on-farm EM at the farm-level, and linking this to the catchment region, would be more efficient with the use of a computer-based, IOIS tool (see Table 5.3). The other reason was that there was a need for more user-friendly and practical ways to manage environmental information collected by landholders at the farm level, and to share this with regional agencies (e.g. DE, DLR and CAs).

Table 5.3 shows that various people with different responsibilities were the intended users of the planned FPT. The FPT was intended to make it easier for each party to exchange EM-related information compared to the challenges with the paper-based approach to EM. The next section summarises how the FPT project consortium was formed.

5.1.2 Formation of the FPT design project consortium

The steering committee held a meeting to start the design phase of the FPT project. It took some time to get the institutional settings of the project lined up in relation to funding, project team formation and technical support. This was because the national government, which funded the CEM project, had decided not to invest further in the FPT design project. This issue was resolved because the DE, which was one of the CEM steering committee members, was keen to pursue the FPT design project. The DE, therefore, initiated and led the FPT design project by providing funding, staff and technical support upon which the FPT could be designed, built and hosted.

The DE, as the project leader, then established a consortium to support the funding of the FPT design project. The consortium was assembled by the DE through the identification of relevant government agencies and CAs who had been involved previously in the CEM project; the DLR, CA1, CA2 and CA3 (see Table 5.1). The DE was also identified CA4 which wanted to join the consortium. All six became the members of the FPT project consortium.

The consortium convened several internal meetings and agreed to undertake the FPT design as a pilot system (prototype). One reason for developing the FPT prototype was to demonstrate the 'proof-of-concept' that a monitoring tool could
be used for on-farm EM (e.g. monitor, capture and manage environmental information) and also for higher level monitoring and management of catchments (CA) and other natural resources (DE, DLR). The other reason was that, due to the limited budget and time, the consortium decided to develop the FPT as a prototype, with requirements analysis (RA) activities used with farmers and government agencies, so that it could be used as the basis for securing future funding to develop a fully operational system. In other words, the FPT prototype was not intended to be a fully operational system, but rather a means to identify the needs of various groups which could then be turned into a fully operational system at a later time. This case study narrative only discusses the design phase involving the development of the FPT prototype.

A key philosophy of the FPT consortium, which was relevant to this thesis, was their perception of the importance of involving SMEs in this FPT design project. This philosophy was explained by Manager_CA1:

I think for some government agencies they like to design something, and then give it to the farmers, and say this is it. Use it. Whereas I think our philosophy is to try and understand the needs of the users [farmers] and to design something that is meeting their needs, and the best way to do that is to ask them what they need. So that's what we did early on in the project. [Manager_CA1/Thesis Interview]

The focus of this chapter, therefore, is on how the FPT consortium recruited and maintained the involvement of SMEs during the design phase of the FPT project.

5.1.3 Changing of Project Leader

When the FPT design project was about to start, the DE and DLR changed their responsibilities away from natural resources management and on-farm EM (see Table 5.1 for their original responsibilities). These changes were summarised by DLR_Manager:

... at the moment DE is much more the public land and management of the main resources, water and such, whereas DLR is more on the private land stuff. So the emphasis in DLR these days is very much on [private farm, landholder] productivity... [DLR_Manager/Thesis Interview]
Instead, being consortium members, they mainly provided funding, technical support and personnel only if required during the FPT design project. The DE, in particular, stopped being actively involved in the consortium entirely, but as the owner of the project, the DE still provided funding to support the FPT prototype development.

The consortium members reacted to the DE ending its project leadership by selecting a new project manager. Since the main purpose of the FPT was to link on-farm EM activities and catchment planning, the consortium agreed that CAs would be candidates, which should undertake and nurture the FPT prototype development, as explained by DLR_Manager:

*The FPT was a tool that was developed with real focus on catchment management and environmental management and found its home within a few CAs.* [DLR_Manager/Thesis Interview]

As a consequence, the consortium agreed that Manager_CA1 would become the project manager, mainly in recognition of his prominent role in using electronic-based EM and monitoring packages in the previous CEM project, as mentioned by DLR_Researcher (a representative in the consortium) during my interview:

*Other CAs were really interested in it [FPT design project]... But they didn’t drive it. It was really Manager_CA1 who drove it.* [DLR_Researcher/Thesis Interview]

Manager_CA1’s experience was also seen as important by the other consortium members because he was expected to fill the position left by the DE and organise the whole FPT design project. At this point, Manager_CA1 became the new project manager responsible for using different strategies to ensure the success of the FPT prototype design project.

In the next sections, I discuss how Manager_CA1 recruited relevant parties, including SME farmers, and involved them in the first step of the specification stage.

### 5.2 Specification stage, step 1: FPT design principles

Manager_CA1 initially led the consortium in defining the FPT design principles:
... about what we wanted the system [FPT prototype] to be able to do. So we developed that partly through our project team clearly articulating the vision of the system. [Manage_CA1/Thesis Interview]

The next sub-sections describe the SME farmers were recruited and involved in needs identification activities to produce the FPT design principles.

5.2.1 Recruiting three farmers into the reference group

Manager_CA1 established a reference group comprising representatives of CA field officers, government staff who worked with farmers, as well as technical experts in the areas of natural resource monitoring, spatial technology and EM. These representatives were recruited into the reference group because they had extensive knowledge and had worked with Manager_CA1 in previous natural resource management, farm planning and environmental information monitoring projects such as the CEM project. The main role of this reference group was to provide technical input into defining the FPT design principles. The other role was to help specify the needs of the groups they represented, and to suggest appropriate options and solutions associated with the design of the FPT prototype.

Manager_CA1 also wanted to recruit representatives of SME farmers into the reference group to get farmer viewpoints and to help produce FPT design principles which would reflect farmer interests. For this purpose, Manager_CA1 identified and used his contact lists to recruit three farmers via telephone who had knowledge and passion for both monitoring technology and environmental initiatives to help produce the FPT design principles. This was explained by Manager_CA1 as follows:

The farmers were critical and... So we had three farmers [in the reference group]... who were leading farmers, who previously had been involved in things like precision agriculture, farm mapping. So those farmers were very important in the project... not so much [for] the detailed design, but more the conceptual framework, the design framework. [Manager_CA1/Thesis interview]

SME_Farmer1 confirmed that he agreed to join the reference group voluntarily due to his interest in EM, which was in line with the objective of the FPT design project:
And I think you were talking to Manager_CA1 and that’s how Manager_CA1 pointed me to this particular committee on FPT [design project] because he knew I had the interest in remote sensing, and having someone to understand the technology... I have a set a passion for the environment, so and so that’s why the FPT [design project] appealed to me. [SME_Farmer1/Thesis interview]

Manager_CA1’s quote above confirms he was able to identify and recruit the SME farmers into project reference group because he knew them from previous EM projects (e.g. sustainable farm practices, biodiversity protection and water management). This was confirmed by SME_Farmer1, who said he was contacted directly by Manager_CA1 and invited to be involved because they had worked closely in previous projects:

We’re [Manager_CA1 and two reference group farmers] doing all the different projects we had together... So then when something comes up like the FPT project..., so it was natural just to get invited to go along and see what we can do there. [SME_Farmer1/Thesis Interview]

The above quotes also suggest Manager_CA1 had developed personal contacts with the farmers, and that he was able to recruit the farmers into the reference group more easily compared to farmers he did not know or had other interests.

The common interests between Manager_CA1 and the farmers, and the goals of the FPT design project, indicated that the farmers did not need too much convincing to join the reference group. For instance, SME_Farmer1 had retired from farming and gave accounts of his various travels to explore how technology could improve farming practices. He gave examples such as paddock moisture and temperature sensors, which had become more accessible to farmers for early detection of problems. He wanted technical people to work out how to make these EM and farm production benefits of technology possible. Manager_CA1, when describing the goals of the FPT project, emphasised the link to SME_Farmer1’s passion for technology and the environment. As will be explained in the next section on how Manager_CA1 involved the three farmers in the project, Manager_CA1 also explained that participation in the reference group involved travel to see new farming initiatives. This too aligned well with SME_Farmer1’s interest in such travel.
5.2.2 Maintaining the three farmers’ participation in the FPT project

The previous section highlights that a key aspect of maintaining the involvement of the three farmers in the reference group was ensuring they had time to spend, and that the work involved aligned well with the farmers’ personal interests and passions.

Initially, Manager_CA1 convened various internal needs identification activities involving the three farmers and other reference group members to define the FPT design principles. Manager_CA1 particularly wanted to identify and incorporate the needs reflecting farmers’ interests, because the FPT was intended to be designed mainly for use by farmers for on-farm EM and farm management/productivity. This was initially achieved by talking directly with the three farmers in the reference group during group communication activities such as meetings, storyboarding, brainstorming sessions and technical workshops, as confirmed by SME_Farmer1:

> Well initially, I was just on the committee [reference group] that we met trying to streamline the FPT, what we expected out of it and going to meetings and sitting down with people and doing the schooling on just what we needed. [SME_Farmer1/Thesis Interview]

A second needs identification technique used by Manager_CA1 with members of the reference group, including the three SME farmers, was undertaking discussions about the technical requirements of the FPT. SME_Farmer1 confirmed this as follows:

> The farmers sitting on the committee would tell the technical people what we would like, and the technical people then would have to go and design what we’d like, because we didn’t have the IT power to fulfil our wish. [SME_Farmer1/Thesis Interview]

Manager_CA1 also organised the needs identification activities in ways that made it appealing for the three SME farmers to take part. Examples included undertaking study trips to a number of universities and farm business, paying for the farmers to attend agronomy conferences, and inviting them as speakers to share and discuss their experiences and views at conferences. All these activities encouraged the three SMEs farmers to be active participants throughout the FPT design project, as confirmed by SME_Farmer1 below:
We went to all these universities just to get a good understanding of just what was going on agriculturally, and we travelled freely. I mean some of the trips we did to Queensland, just to go out and talk to farmers how they were doing things there, we addressed the agronomy conference in Toowoomba; we were invited to go up and speak to them about what we were doing. And to me, travelling is still the best way of learning. [SME_Farmer1/Thesis Interview]

This quote from SME_Farmer1 also suggests that farmer needs did not just come from the three farmers, but also from other farmers during these farm visits.

The reference group members, including the three farmers, enabled the team to produce the following FPT design principles:

- The FPT should be designed with simplicity and ease of use in mind to increase the likelihood of acceptance by farmers.
- The FPT would mainly be designed as a monitoring tool to assist farmers with one or both of:
  - on-farm environmental management (EM) activities such as collection and assessment of soil, waste and water information.
  - non-EM, or farm production, activities which may still have EM implications, such as feeding operations, fertilisers and pesticide application.
- It was also intended that the FPT would enable farm production record keeping, including Property Management Planning (PLP), which would allow farmers (via the web) to access a variety of spatial datasets, aerial photos and satellite imagery of their property. The FPT would enable farmers to manipulate the data to illustrate property layout, assets, and current and future management activities.

The FPT project team then aimed to get feedback from a wider range of SME farmers to turn the FPT design principles into a high-level specification, as discussed next.

5.3 Specification stage, step 2: high-level FPT specification

Manager_CA1 and the consortium planned various needs identification activities with the aim to expand the FPT design principles produced by the reference group
into a high-level specification of the functionality of the FPT prototype. The next sections summarise the account of how Manager_CA1 and his team recruited and involved SME farmers in two main needs identification activities: regional workshops; and mock-up workshops. Activities involving other parties prior to these workshops (e.g. to develop technical specifications relating to the spatial data, determining how to make these accessible to farmers via the web using FPT prototype) are outside the scope of this thesis.

5.3.1 Recruiting the FPT prototype developer

The first activity was recruiting a software developer to help define and develop the FPT prototype because none of the consortium members (e.g. CAs, DE) had internal expertise to develop computer system artefacts. The consortium invited software developers via a tendering process and selected SpatialCo (pseudonym). SpatialCo won the tender because they had relevant expertise after working closely with some of the FPT consortium members (e.g. DE, DLR and CAs) in previous projects developing spatial IS for natural resources management (e.g. biosecurity, surveillance, incident response and tracing). SpatialCo joined the rest of the FPT project team (e.g. Manager_CA1 as the project manager, and CA managers representing the other CAs).

5.3.2 Recruiting farmers into FPT regional workshops

The FPT project team ran a series of workshops with SME farmers (and other parties which are outside the scope of this thesis) to produce a high-level specification of the FPT prototype. The FPT project team ran the workshops in all four CA regions to identify locally relevant needs reflecting different environmental conditions.

Regional workshops were the first type of workshop organised in all four CA regions to involve SME farmers in needs identification activities. Unlike the reference group workshops attended by only the three farmers in that group (see section 5.2.2), the consortium aimed to recruit more farmers into these regional workshops to represent various farm businesses (e.g. grain, lamb or beef), farmers experiencing different environmental issues (e.g. soil acidification, water erosion and land salinisation), and farmers from different catchment regions. SpatialCo_Manager summarised the farmer recruiting approach as follows:
We also had workshops with various farmers. So we had some regional workshops, they weren't all in the city, and in the regional workshops. The CA [field officers] invited along some of the farmers that they had been working with on some of these projects [e.g. CEM project]. So that they [farmers] could have a say about what they would want to see in a computer system that would be useful for them to use. [SpatialCo_Manager/Thesis Interview]

The quote emphasises that two aspects to their approach were running workshops locally to make it easier for farmers to participate, and getting CA field officers to recruit farmers on behalf of the consortium by making use of their prior working relationships with farmers. The first aspect was achieved by each CA region running regional workshops in towns to increase the chances that a workshop ran nearby to the farmers. These meant farmers did not need to travel far and increased the chances they would participate. The following quote from SME_Farmer1 in the reference group highlights the challenge of getting farmers involved in anything, let alone design phases of voluntary IOIS projects:

Now what appeals to people to get them to meetings these days, the demand on people’s time is greater than I’ve ever remembered in my lifetime. I could seem to go to meetings two or three times a week if I had time, but now nobody’s got no time to go. So how do you make or get people to come to a meeting? It’s jolly hard, jolly hard. [SME_Farmer1/Thesis Interview]

The second aspect was achieved by the consortium asking CA field officers (most of whom were involved as project officers, and recruited farmers, in the CEM project as reported in Section 5.1.1) to recruit farmers on their behalf. Manager_CA1 and SpatialCo_Manager believed the field officers were suitable recruiters because they delivered the CEM project from start to finish over a long period time, including recruiting farmers, so field officers were the first line of contact between the consortium and farmers.

The field officers targeted farmers who had participated in the CEM project. As noted in Section 5.1.1, field officers worked with local Environment Association (EA) groups comprising SME farmers with an interest in (some with a passion for) EM initiatives (e.g. biodiversity) on their farms. Field officers helped these groups and farmers by, for instance, designing EM farm projects, helping them apply for CA
funding, and providing training in new EM initiatives. Farmers from the CEM project were targeted in particular because this project had run in three of the four CAs in the consortium (see Table 5.2), and because the farmers had different business types, catchment targets, environmental conditions, and a mix of positive and negative experiences with the paper-based EM manual. It was thus anticipated these farmers could provide diverse perspectives on the type of information they wanted to collect, how the future FPT should be designed, and the problems with on-farm EM so that the FPT would then suit the needs of a greater variety of SMEs.

The field officers recruited the farmers into the regional workshops using interpersonal approaches such as one-to-one contact when field officers visited farmers to provide services, and follow-up information through phone calls to invite and encourage the farmers to take part. Farmers in the local EA groups, which engage in business networking, also helped recruit other farmers on behalf of the field officers. The field officers tried to interest the farmers in coming to a workshop by explaining to the farmers that the tedious and time-consuming paperwork associated with the paper-based EM manual used during the CEM project would be easier with the proposed computer-based spatial monitoring tool. This persuasion included describing what spatial monitoring tools were, which was important because most SME farmers were unaware of these tools or how they could be used on their farm. This challenge was explained by SpatialCo_Manager as follows:

Although Google was around it was really quite new...And so web mapping was still pretty new, and it wasn't very [user] friendly. [SpatialCo_Manager/Thesis Interview]

The field officers also had to explain how the proposed FPT could potentially help farmers plan and make decisions about their farming and EM initiatives. They indicated that farmer involvement was needed to explore their needs, and ensure it would meet their needs and be usable. Farmers from the CEM project were, therefore, interested in taking part in the regional workshops.

The decision by the FPT project team to recruit farmers involved in EM did mean that the FPT would be more biased to the needs of these farmers rather than those without such interests. This approach was still seen as appropriate because the
consortium wanted to determine the proof-of-concept of voluntary IOIS information exchange mainly between government initiators such as CAs and farmers who were willing to do EM on their farms. In other words, the goal was to make it easier for farmers to do EM and to exchange their EM information with government departments such as the CAs.

5.3.3 Managing farmer participation in FPT regional workshops

Section 5.3.3 identified the main difficulties with, and approaches to, recruiting farmers into the regional workshops. Some of these approaches also made it easier for farmers to maintain their involvement in this, and subsequent, workshops. For example, the regional workshops were run in local towns so the farmers did not need to travel. Aligning the workshops with local EA groups meant farmers who were involved in these business networks could continue supporting each other.

Another challenge with maintaining farmer participation in the regional workshops was the facilitators’ (e.g. CA managers, field officers and SpatialCo staff) aim of ensuring farmers were able to have their say about their needs for such a tool. This aim was complex because of the varying levels of knowledge farmers had about computer-based spatial monitoring technology, and computing in general. This meant difficulties in getting input from across these backgrounds. Farmers would be less likely to keep participating if their views were not being heard.

The issue of diverse backgrounds was addressed by running the regional workshops differently to the reference group workshops (see Section 5.2.2). The reference group workshops involving the three farmers were informal, such as brainstorming sessions, as described in Section 5.2.2. This was possible because the three farmers had worked with members of the reference group, such as Manager_CA1, on other projects (see Section 5.2.1). The regional workshops, by contrast, used a guided discussion format so that initially details about spatial monitoring technology could be explained for those with limited knowledge, and then discussions could be directed to those with different backgrounds to ensure all farmers had their say.

All the information gathered from the regional workshops was used to develop the high-level FPT specification document which described what the FPT prototype should be able to do, how each user would interact with the FPT, and which other
parties would be involved in the FPT project. The specification document included high-level “use cases” for specific tasks farmers would complete using the FPT prototype, as summarised in Table 5.4. The specific needs identified at this, and other stages, during the FPT design project are outside the scope of the thesis, because this thesis focuses on how SMEs were recruited and their participation maintained during needs identification activities and not exploring what needs were obtained. Table 5.4 summarises the objectives of the FPT stated in the high-level specification to give an overview of the voluntary IOIS.

Table 5.4: SME and non-SME parties’ uses of the FPT

<table>
<thead>
<tr>
<th>SME use of FPT</th>
<th>Non-SME parties’ use of FPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Set long term property targets for increases in native vegetation cover, including target years</td>
<td>• CA managers set long term (sub-)catchment targets for increases in native vegetation cover, including target years</td>
</tr>
<tr>
<td>• Spatial tools to edit how existing vegetation cover maps are presented and to correct errors with the spatial maps</td>
<td></td>
</tr>
<tr>
<td>• Compare targets against current situation</td>
<td></td>
</tr>
<tr>
<td>• Compare farm targets against the catchment and sub-catchment targets</td>
<td></td>
</tr>
<tr>
<td>• Set long term property targets for perennially based on native vegetation cover</td>
<td>• CA managers set long term (sub-)catchment targets for perennially based on native vegetation cover</td>
</tr>
<tr>
<td>• Similar capabilities as per above</td>
<td></td>
</tr>
<tr>
<td>Enter multiple activity plans, where each activity has issue to be addressed, one or more polygons (spatial map detail) relating to the activity, and the vegetation type as the activity progresses</td>
<td>• CA field officers enter that they have reviewed the SME’s activity plan</td>
</tr>
<tr>
<td></td>
<td>• CA managers review SME targets and action plans against catchment targets</td>
</tr>
<tr>
<td>Carry out an annual review of the action plans by stating status of each activity and comments, comparing activity to farm targets</td>
<td>• CA field officers enter that they have reviewed the SME’s annual review</td>
</tr>
<tr>
<td></td>
<td>• CA managers review SME targets and action plans against catchment targets</td>
</tr>
<tr>
<td>Farmers can enter details about:</td>
<td></td>
</tr>
<tr>
<td>• soil types and crop types for each paddock</td>
<td></td>
</tr>
<tr>
<td>• farm assets (e.g. sheds)</td>
<td></td>
</tr>
<tr>
<td>• annual property crop sales</td>
<td></td>
</tr>
<tr>
<td>• weather observations at a specific location</td>
<td></td>
</tr>
<tr>
<td>• nitrogen level observations at specific locations</td>
<td></td>
</tr>
</tbody>
</table>

The next section summarises further “mock-up” workshops, which were run with SME farmers to verify and refine their needs in relation to the use cases in Table 5.4.
5.3.4 Recruiting SMEs into FPT “mock-up” workshops

Once the high-level FPT specification was developed (see Table 5.4), the FPT project team ran “mock-up” workshops. SpatialCo_Manager described the “mock-ups” and the purpose of the workshops as follows:

So this is just built using Flash, it’s not real software, it’s just a visualisation. But it took the use cases that we had described in that document [Table 5.4] and it sort of mocked-up a series of computer screens of what this thing might look like in practice, and how you might interact with it... [W]e then ran a series of follow up workshops, with the same groups, where we said, OK, we’ve agreed on what the general requirements are, now let us show you what that might look like in a computer system. [SpatialCo_Manager/Thesis Interview]

The quote confirms that the mock-up workshops were run with the same SME farmers who participated in the regional workshops. The method of recruitment was the same in other ways too to encourage participation, such as running them in towns nearby the farmers, and asking CA field officers to recruit farmers using their business networks. These approaches meant that field officers succeeded in recruiting the same farmers in the mock-up workshops, and in maintaining ongoing farmer involvement in multiple needs identification activities (i.e. both the regional and mock-up workshops). The field officers did not show the mock-ups when recruiting farmers, but farmers were shown the mock-ups during workshops described next.

5.3.5 Managing farmer participation in FPT “mock-up” workshops

The goal of the mock-up workshops, as suggested in the above quote, was to facilitate discussions with farmers about, and get their feedback on, the proposed functionality of the FPT (see use cases in Table 5.4). Farmer participation in these workshops was maintained using the same approaches described in Section 5.3.3 with the regional workshops. SME_Farmer1, who was a member of the reference group, confirms that farmers who attend these EM-related workshops tend to be the same people:

So if I see them at that meeting, I’d see them at another meeting, I’d see them at the field days we’d have, so the same sort of
people keep coming, but they change a wee bit, but mostly the same people are. [SME_Farmer1/Thesis interview]

This quote emphasises why it was important for CA field officers to focus SME involvement management on local EA groups, for instance, because it increased the likelihood they could get farmers interested in EM to maintain participation in the regional and mock-up workshops.

The mock-ups also helped maintain farmer interest in the project by giving them a practical sense of how the FPT could address their needs (or not), which were more difficult in the regional workshops, as explained by SpatialCo_Manager:

And the reason we did that is that our experience of building software for people who aren't used to software design is that you can show them bits of paper with words written on it, but it doesn't really help them understand what it's going to feel like... We weren't too fussed about the details, it's [the mock-up] more the type of information that they would be using, and how they would be seeing, for example, graphs, how they would be interacting with maps on the screen, how they would be drawing things like their land cover and their paddocks, and so on. [SpatialCo_Manager/Thesis Interview]

The FPT project team used the feedback from the mock-up workshops to develop a detailed functional specification used to develop the FPT prototype. I discuss this in the next section, along with other steps relating to recruiting and maintaining SME farmer involvement during the development stage of the FPT design project.

5.4 Development stage: first FPT evaluation

Once the detailed FPT specification was approved, SpatialCo developed the FPT prototype over a five-month period. Manager_CA1 and SpatialCo_Manager then ran various evaluation workshops with field officers and farmers to gain their feedback and identify any additional needs. The next sections provide an account of this first FPT evaluation involving training and feedback workshops with SME farmers. The workshops focused on identifying the needs of other parties are outside the scope of this thesis.
5.4.1 Technical workshops involving the three reference group farmers

The FPT project team ran a series of technical workshops with technical people from various government agencies and with reference group members including the three SME farmers (see Section 5.2). During the workshops, the FPT prototype was reviewed and assessed to see how it worked in terms of technical perspectives such as software operation, the mapping functionality, security and privacy. As noted in Section 5.2, the FPT project team had no difficulty maintaining the participation of the three farmers in these workshops because of the strong alignment of the FPT project goals and the farmers’ passion.

5.4.2 Planning the first FPT evaluation

The FPT project team then planned an FPT prototype evaluation over a four-month period with two user groups: field officers; and farmers. Each group would take part in training on how to use the FPT, then trial the FPT individually (e.g. on their farms) or in groups, and then participate in a final evaluation involving feedback workshops, interviews and surveys. The idea of this approach to the first FPT evaluation was to validate the FPT specification, as well as obtain feedback about the prototype functionalities, usefulness and useability as described in the following quote:

So then we wanted to test it from two perspectives. One was from the perspective of useability. So if you pressed the button would something happened and also from the perspective of usefulness. [Manager_CA1/Thesis Interview]

This implied that if there were issues with FPT usability and usefulness, that this feedback would be used to identify new needs from farmers. SpatialCo_Manager also explained that the aim of the FPT evaluation step was to obtain feedback from farmers, but added that feedback from catchment managers and field officers was also important:

And as part of that process where we would find out, from the farmers, were they happy to use FPT, was it easy enough to use, did it provide them with any value, did they think they'd be willing to use in the future? We would find out from the [CA] staffs [managers and field officers] did they find the FPT easy-to-use, were the farmers easy to train, was the information the
This quote and my analysis of other FPT project documents indicated that farmer feedback was sought to determine how easy the FPT prototype was to use and how this could be improved if support/training was adequate, how the tool was accessed from home, and which parts were useful. The interests of government agencies were also apparent because this quote and other evidence suggested they were interested to know if the FPT helped farmers improve their understanding of catchment targets and on-farm EM practices.

For CA field officers, the feedback activities focused on determining how easy the FPT prototype was to use, its suitability for farmers to implement EM recording, and their experiences helping farmers to use the FPT, as well as how the FPT’s usability might be enhanced. The FPT evaluation report indicated the FPT project team wanted to gather information on the benefits of the FPT as an extension tool which field officers could use with farmers, and whether it was a useful addition to the on-farm EM practices for farmers. Feedback from catchment managers was sought so the FPT project team could determine the FPT prototype’s usability for assessing progress towards catchment targets, for reporting processes, and how it could be improved.

My analysis of the reports on the FPT design phase indicated that the FPT project team aimed to achieve the objectives of the FPT evaluation in two steps. The first step involved CA managers, CA field officer representatives from the four CA regions, and DE and DLR staff and DE/DLR field officers were invited to take part in the evaluation. This step was important because field officers, in particular, would be the main people helping recruit and maintain farmer involvement in the evaluation. The second step involved field officers running evaluation activities in their own regions with small (groups of) farmers over a four-month period. The next sections discuss the FPT evaluation in more detail.

5.4.3 Difficulties involving DE/DLR field officers in the FPT evaluation

Manager_CA1 wanted to recruit DE and DLR field officers into the FPT evaluation, but it was difficult to gain their involvement for four reasons, as summarised next.
First, Manager_CA1 explained that the DE and the DLR responsibilities regarding natural resources management had changed. Although DE funded the project, they were not involved in the day-to-day FPT design project, including evaluation. This meant that both agencies (and DLR in particular) did not encourage their field officers to be involved in the FPT evaluation, as commented by Manager_CA1 in my interview:

*But the DLR as organisation was not [promoting the FPT evaluation]. It didn't actively promote FPT as an approach because, well, some of the reasons that are in the paper. But, they, since then they have developed [Whole Farm Plan (WFP), pseudonym], where they would give farmers the spatial information and a software package to use for farm planning [instead of the FPT]. [Manager_CA1/Thesis Interview]*

Second, the quote indicates that DLR did not encourage its field officers to be involved in the FPT evaluation because DLR was piloting a Whole Farm Plan (WFP, pseudonym) programme they believed would help farmers improve farm productivity. The programme included offering field officers and farmers a desktop software mapping tool as an alternative to the FPT known as MyFarm (pseudonym) for engaging with farmers and delivering field services. MyFarm included static aerial maps farmers could use for property planning, but it was not an IOIS and it did not allow maps to be updated automatically via the Internet. DLR field officers were, therefore, reluctant to be involved in any FPT evaluation activities. The quote from CA2_Field_Officer illustrates the difficulties between the CAs and the DLR:

*Well, they [DLR] were very supportive at the start [of the FPT project]. And it’s been very disappointing, the lack of support from potentially DE and DLR actually. Locally, regionally, they didn’t want us to teach FPT to landholders. They wanted to use a tool [MyFarm] that they would take out to a farmer, show them it and then take it away again. They didn’t believe... they told us it [the FPT] wouldn’t be a success, that landholders wouldn’t be able to manage it, they wouldn’t use it and wonderfully, we’ve proven them wrong... They also developed [a] little GIS program [MYSoil, pseudonym], and it was developed in-house by DLR. It’s good for them but wasn’t good for farmers. [CA2_Field_Officer/Thesis Interview]*
Third, Manager_CA1 explained that the DE and DLR field officers felt their objectives in delivering WFP were not well addressed by the FPT prototype. My interviews with DLR field officers, who had an aversion to the FPT project, showed they felt the FPT was not suitable for their area and that it had some technical issues, as indicated in the following quote:

The principle reason why [MyFarm] is being used now over FPT is basically round the fact that FPT needed internet access to run. A lot of the locations where we deliver our [WFP] courses don’t have internet access. [MyFarm] just runs off your computer, it doesn’t need internet access... So from just a delivery point of view, it makes live a lot easier [than FPT]...
[DLR_Field_Officer2/Thesis interview]

Fourth, Manager_CA1 and CA2_Field_Officer believed DLR and DE field officers were reluctant to be involved in evaluation activities because the FPT might threaten these field officers’ power over farmers. They described their views as follows:

They do the work mapping sitting down with landholders but then they'd take it away and just send the landholders some hard copy maps. You know [using] FPT they [farmers] can plan... they can measure, they can design fences themselves when they have time to do it, not when that, when there’s time for an extension officer to come out... [CA2_Field_Officer/Thesis Interview]

So we were very interested in the power relationship between, if you are the extension officer and I’m the farmer, and you have all the information and I get to see it, but I don’t get to... I am not able to interact with it after you go, then the power relationship is unequal. And we were keen to provide more power to the farmers so they could access the information themselves... But some extension staff found that they had to give up some of their power through this [FPT project], so they were less enthusiastic about it. [Manager_CA1/Thesis Interview]

The quote from CA2_Field_Officer shows that the FPT, by contrast, enabled farmers to collect data at their farm, make farming decisions, share information with relevant parties, and receive up-to-date aerial maps for free over the Internet without the DE/DLR field officers.
Manager_CA1, therefore, decided only to involve field officers from the four CA regions who agreed to take part in FPT evaluation activities voluntarily, as described in the next section.

5.4.4 Maintaining CA field officer involvement in the FPT evaluation
The FPT project team first needed to identify field officers from all four CAs who could learn to use the FPT, so that they could later recruit and manage the involvement of farmers in the evaluation. The CA managers were responsible for recruiting the field officers. Manager_CA1 devised various programmes to prepare field officers to fulfil their responsibilities in the evaluation. For instance, Manager_CA1 and SpatialCo offered training on the use of the FPT prototype to the CA managers and field officers during a one-day course. They also provided follow-up training or one-to-one meetings and support via telephone, as well as an online “help-desk”, for field officers when they had difficulties using the prototype. Finally, the field officers were encouraged to familiarise themselves with the FPT prototype on their own, provide feedback through a questionnaire, and fill out a session log book to document any issues.

Overall, Manager_CA1 was able to interest the targeted CA field officers, who voluntarily took part in the FPT evaluation, and delivered needs identification activities to farmers. Field officers generally felt the FPT would fit with their various EM programmes, and thus they were interested and willing to be involved. CA2_Field_Other was so motivated to take part that she developed statistical and spreadsheet tools to complement the FPT prototype to make the FPT more useful and practical for farmers.

5.4.5 Recruiting farmers into the first FPT evaluation
The primary challenge faced by CA field officers during the first FPT evaluation was convincing farmers in each CA region to participate in the FPT evaluation for four months. That is, after FPT training, farmers were required to use the FPT on their properties for four months, and then participate in a final evaluation. The challenge was, therefore, “selling” the benefits, incentives and relevance of the FPT prototype to the farmers’ business. This meant that field officers needed to promote and recruit more intensely (and support them once recruited) to ensure enough farmers
continued through the FPT evaluation until the final feedback workshops. The field officers used five broad techniques, which are described next.

First, field officers used the same interpersonal communication approaches as they did for the regional and mock-up workshops (see Sections 5.3.2 and 5.3.4) to target farmers from the Environment Association (EA) groups and previous EM programmes such as the CEM project. For example, they used phone calls and visits to farmers’ premises when providing field services as opportunities to recruit farmers into the FPT evaluation, and the initial training in particular. As with the regional and mock-up workshops, farmers in the EA groups who were respected “champions” of EM also helped to promote the benefits of the FPT. CA2_Field_Officer confirmed that this approach of targeting her local EA groups was particularly effective:

... told them about the tool [FPT] and offered them free training, so individual and group training, and really, the fact, it sold itself, nearly, just about. So, by just making people aware of it and what its capacity was, people signed up... I think I’ve been lucky here because we’ve had very active EA groups, so I’ve tapped into those. [CA2_Field_Officer/Thesis Interview]

One advantage, field officers and farmer champions had at this time, compared to the regional and mock-up workshops, was highlighted in an FPT evaluation report:

Initially, it was difficult to communicate what we meant by spatial data and information management systems. Once the FPT prototype was developed, this was much less of a problem. Once people (farmers, other public sector agencies, and private companies) became aware of the potential power and use of spatial information management systems, it was hard to hold enthusiasm back. People want it to become available as soon as possible. [FPT evaluation report]

The meant field officers and farmer champions could demonstrate the FPT prototype to farmers to get them interested, especially during farm visits, by showing potential benefits, the FPT prototype could offer. Examples benefits field officers and farmer “champions” explained to farmers included that they could: create farm maps; include these maps in CA grant applications; and upload details of proposed works into the FPT, which field officers would view and contact the
farmers if funding became available. They also stated that the FPT was free and that they could access more accurate, recent aerial maps of their properties. According to CA2_Field_Officer, an advantage of the FPT was that it empowered farmers to take control of their EM initiatives on their property, rather than waiting for field officers to visit and create the design for the farmer. She stated another benefit was that field officers could show the (planned) initiatives by farmers in their location area to seek CA/government funding for the area more effectively.

Insight into the types of benefits, which CA field officers explained to farmers to recruit them into the FPT training, and then remaining steps of the FPT evaluation, were implied by the responses farmers provided to a pre-training questionnaire on their motivation to attend. In other words, for farmers to have had these motivations to attend, they would have gotten these expectations after talking to field officers (and perhaps farmer champions) about the potential of the FPT prototype and what spatial monitoring technology could achieve:

- Strategic and farm planning motivations included: improving the quality and ease of farm planning; making better stock, crop and fencing decisions; and learning about new farming approaches;
- IS/mapping related motivations included: learning mapping skills and how to use spatial data on a computer; improving computer skills; and improving access to more accurate and recent farm mapping information;
- Environmental Management (EM) motivations included: improving EM planning, assessment and reporting; measuring water courses; creating visual records of EM plans; and improving land selection and classing;
- Farm productivity motivations included: improving farm measurement accuracy; and improving ease of paddock fertiliser application (e.g. calculations of quantities).

Second, field officers in CA1 and CA2 designed and used mass media campaigns to promote the FPT and to recruit farmers, such as brochures, newsletters, project leaflets and public notices. These were often displayed in the offices of, and distributed by, the CAs, so they were accessible to farmers. An example newsletter extract promoting the FPT below shows that it stated similar benefits as stated
above about the value or benefit of FPT to get farmers interested in participating in the FPT training and evaluation:

The FPT is a web-based mapping program, which will enable you to directly upload and export your dung beetle monitoring results. It is also a great farm planning tool which will give you access to numerous data layers including: aerial photography, geographic coordinates, property boundaries, public land areas and environmental data as part of compiling the submission for funding supports. The FPT is easy to use. All you need is a computer and reasonably fast internet connection. If you can use a mouse, you can use the FPT! There is no software to purchase and access to the site is free. The FPT is accessed through a secure login and password. [CA2 newsletter]

Third, CA field officers got other groups, such as the local EA groups and the Farmer Association (FA, pseudonym), to display these communications (e.g. brochures, leaflets) in their offices and to send them to members. For instance, a brochure was delivered to farmers by the FA, which had about 230 branches and covered the whole state. Field officers also used FA’s frequent media releases and a bimonthly magazine, which were sent to all FA members.

Fourth, field officers in the CA1 region used their website to recruit and interest farmers in the FPT evaluation. I found that, in some instances, the field officers posted information on the FA or EA websites. This was particularly the case when field officers were jointly or collaboratively undertaking the FPT evaluation with those groups (e.g. EA). This approach was mainly used to recruit farmers who were actively involved in such groups.

Fifth, the long four-month period of the FPT evaluation meant field officers needed to determine ways of recruiting farmers so that they were more likely to continue. The main approach (in addition to the promotional techniques above) was to incorporate the FPT evaluation into other local extension programmes. For example, FPT evaluation reports stated that, in CA2 region, field officers initiated a sustainable farm programme known as Soil Management (Pseudonym) with local EA groups. This programme encouraged farmers to do paddock soil tests to understand, and make sound decisions about, soil fertility and management. Farmers were involved a series of activities over several months, including field days.
to test farmers’ soil, training and education to understand soil structure, soil carbon management, grazing management and soil fertility. The FPT was introduced as a monitoring tool to help record and analyse the soil condition of their paddocks. Therefore, during the Soil Management project, farmers were invited to FPT training workshops, encouraged to use the FPT for soil management for four months, and later asked to give feedback regarding the usefulness and useability of the FPT during feedback workshops.

To recruit farmers into this Soil Management programme, and thus encourage use of the FPT and involvement in its evaluation, field officers used various approaches such as: discussing the Soil Management programme at local EA group meetings; sending a whole-of-catchment mail-out using tailored postcards with programme information and contacts; and sending regular newsletters and soil improvement information sheets to farmers. These communications explained the link between farm production benefits and environmental benefits to convince farmers to participate in the Soil Management programme. Other incentives included: attending free workshops; having access to soil testing results and free expert advice on how to interpret the results; and allowing farmers to select an agronomist from a panel nominated by field officers to provide up to four free on-site advice sessions.

Similar approaches were found in other CA regions where the FPT had been incorporated into programmes to recruit and involve farmers in the FPT evaluation:

- CA1 ran the FPT evaluation to assist farmers with a property management programme, and a programme aimed to encourage EM best practice;
- CA2 used the FPT evaluation to support farmers with a local dung beetle monitoring programme, in addition to its Soil Management programme; and
- CA3 used the FPT evaluation as part of a course run annually to help farmers develop land management and EM plans.

Manager_CA1 recalled phone calls at night, which indicated that the mass media, and/or potentially farmer word-of-mouth, had been effective in cases where farmers had not interacted directly with CA field officers:
In some cases, like I often received phone calls from farmers at night, who would ring me and say I've heard about the FPT, and I've heard that you can help me... [Manager_CA1/Thesis interview]

Manager_CA1 also acknowledged that they expected to recruit farmers with a bias, as shown in the next quote, but these farmers were the main ones with interests common with the CAs, which were being targeted for recruitment:

So what that means is that you'll tend to get farmers who are interested in, in technology and interested in the environment. So you don't get a random selection of farmers. [Manager_CA1/Thesis interview]

This was confirmed by FPT reports based on pre-training questionnaire responses which showed that farmers were mainly those from local EA groups. The motivations for attendance listed earlier shows farmers also had some non-EM related motivations such as general farm planning and fencing decisions and even gaining more skills in the use of computers. The farmers had at least some basic computing skills (e.g. using office software such as word processing, the web and email), but varied in terms of using farm management software and the quality of the Internet (e.g. most in the CA1 region were on dial-up, while in the CA2 region many had broadband). The responses confirmed that farmers were SMEs. For example, the majority in the CA3 region were small and intensive (e.g. dairy) of less than 100 hectares, CA1 farmers were medium size and mainly farmed both crops and livestock, CA2 farmers were small and medium (100 to 1000 hectares) farming mostly cows, and C4 farmers small hobby farmers living on their properties.

5.4.6 Difficulties maintaining farmer involvement in the FPT evaluation

CA field officers experienced various challenges with maintaining farmer involvement in the FPT evaluation once the farmers had been recruited. This is because farmers needed to complete three broad steps. First, there were 2-3 training sessions on using the FPT prototype. If required, the CA field officers would conduct follow-up or one-to-one training with individual farmers or groups of farmers who needed extra support. Second, the training was followed by four months of using the FPT at the farmers’ properties with field officers support. Finally, the four-month trial was followed by a final evaluation where farmers
described their experience, problems and feedback. CA field officers thus needed to maintain farmer involvement in all these activities for the FPT evaluation to be completed in its entirety.

The first challenge was how to deliver the FPT training to farmers so that they could use it on their own. As reported in the FPT evaluation reports, field officers needed to ensure farmers were 100% confident before they could use the FPT at their properties. This situation was described by SpatialCo_Manager during the interview:

Farmers aren’t dumb and they’re willing to do this stuff, but it’s not what they do every day.... They love doing it, but they just need assistance to do it. And I think had we taken the approach of just saying the farmers here is the application, here is the web address, go and use it, maybe here is the manual to read, you wouldn’t have got anywhere near the value out of this. You really have to do that hand on and that is a bit of problem because that’s expensive. [SpatialCo_Manager/Thesis Interview]

The quote highlights that delivering the FPT training was difficult because, while most farmers had IS/computer skills, many were unfamiliar with spatial web-based tools (see Section 5.4.5).

The second challenge, which also made it harder for farmers to become comfortable with the FPT, was its useability, as described by a field officer in an evaluation report:

It [FPT prototype] is not an easy tool. [I] did not find it intuitive (as a program as opposed to the concept). Not ingrained or ‘natural’ and therefore hard to use. [MySoil (see Section 5.4.3)] is more refined and part of a process and easier... you only need to click once to make a paddock, as opposed to the FPT. Too many processes for one operation [in the FPT] – needs to be simplified. [FPT evaluation report]

An example indication of the complexity of the FPT prototype was that farmers had to record the vegetation condition on their paddock based on complex Ecological Vegetation Class (EVC) parameters, which were mainly only understood by CA field officers (see Section 5.4.8 later). This information was required mainly by CAs for their reporting and management purposes, which can be seen in “use cases” in
Table 5.4, and suggests that CA information needs had taken precedence over FPT usability when it came to EM related entry of information. The complexity of the FPT tool for farmers was explained by SpatialCo_Manager:

Very few farmers managed to complete that entire amount of activity on the FPT. It probably took them ten to 20 hours on the FPT to create the basic map of their farm, by the time they got used to using the software and so on. Maybe another ten to 20 hours to sketch out the land cover on their current paddocks. To be honest... we didn't have too many farmers who went the whole way... [SpatialCo_Manager/Thesis Interview]

The consequence of these usability issues was that CA field officers needed to spend a lot of time delivering the training to farmers. It took 4-5 hours to train a group of farmers, and more training was needed in another day of two 4-hour sessions with individual farmers. In addition, other tasks took time such as spending a day organising the venue and computers, and travelling to the regional locations to give the training. Despite these efforts, these field officers felt farmers needed still more training sessions to be confident with the FPT. Therefore, they felt that the time allocated to undertake the training for farmers was not sufficient.

A third challenge in running the FPT evaluation was the limited and declining number of trained and skilled CA field officers. The FPT evaluation reports stated that this issue was due to the high employment turn-over among government staff, including CA field officers. In addition, the CA field officers were involved in the FPT evaluation voluntarily, so they could stop participating if they wished. This obstacle to providing adequate support was confirmed by SpatialCo_Manager in the interview:

And the big change we've seen in government over the last 15, 20 years is that the number of extension officers has fallen dramatically. If you go back 30 or 40 years, [government agencies] would have had hundreds of extension officers across the state who spent their entire life in the field helping farmers to improve their practices. Now you're lucky to find a dozen across [the state]. [SpatialCo_Manager/Thesis Interview]

Initially, a team comprising a project officer and one field officer was voluntarily recruited to run the FPT evaluation, including training of farmers, in each CA region.
However, sometimes two field officers were recruited to deliver the group training with large groups of farmers. With such limited numbers of field officers, the team often needed to cover more than one group, and in some regions the training was rushed and the computer time was inadequate. This was because the team had to travel between each group training session. In addition, field officers were often involved in other projects, so it was difficult to fit in time for the FPT evaluation.

A fourth related resourcing issue stated in the FPT evaluation reports, which threatened the continuity of the FPT evaluation was limited funding for extension activities from government, as confirmed by SpatialCo_Manager:

> And we’re just not investing in that stuff [extension activity]... [and] that it has dramatically decreased our ability to do this [recruiting farmers in the evaluation]... because actually most extension activity in the field now is being delivered not by government funded employees, but by private companies, or by grower organisations. [SpatialCo_Manager/Thesis Interview]

A fifth challenge was encouraging farmers to trial the FPT at their own properties over a four-month period. Manager_CA1 perceived these on-farm trials as important for evaluating farmer experiences of how easy and useful the FPT prototype was to use. Manager_CA1 believed that, in order for farmers to provide useful feedback for future FPT improvements, they needed to engage with and have experience using the FPT at their own properties over time. However, the findings indicated it was not easy for CA field officers to maintain farmer participation. For instance, some farmers in remote areas stopped using the FPT prototype after completing the training, because the limited numbers of field officers were unable to provide the immediate support the farmers needed when they faced problems.

A sixth challenge, which hindered farmer involvement, was technical issues. One main technical barrier faced by farmers who trialled the FPT prototype on their farm, and noted in FPT evaluation reports, was poor quality Internet connections. This reduced ease of use and prevented farmers accessing the web-based FPT prototype. This was a major limitation, but an FPT evaluation report justified this as follows in the context that the aim of the FPT project was to establish “proof-of-concept” and lead later to the development of an operational system:
Because we aimed to demonstrate the potential of the tool to provide rich map-based data and functionality, design was not constrained to the lowest common denominator of technology currently available in Australian rural areas, but to cater for the level of technology expected to be generally available in the medium term (2–5 years), namely broadband internet connection. [FPT evaluation report]

The final challenge faced by the FPT project team was how to stop other parties like field officers from the DLR, as explained in Section 5.4.3, from encouraging farmers to discontinue their participation in the FPT evaluation. The DLR’s Whole Farm Planning programme, which included helping farmers to use computer-based tools such as MyFarm (see Section 5.4.3) and offering farmers incentives to participate, was running at the same time as the FPT evaluation. As a result, some farmers who worked with the DLR discontinued their participation in the FPT evaluation.

The FPT project team used various techniques to overcome these challenges, as described next.

5.4.7 Addressing farmer participation challenges in the FPT evaluation

The FPT project team attempted to address the challenges in various ways to maintain farmer involvement in the FPT training, trial the FPT on their farm for four months and participate in the final evaluation. This was achieved overall, as shown in Table 5.6, by the FPT project team treating each of these steps as a requirements analysis (RA) activity in its own right. In other words, during each of these steps farmer needs, difficulties and feedback were being gathered.

Table 5.6: Requirements analysis activities during the FPT evaluation steps

<table>
<thead>
<tr>
<th>FPT evaluation step</th>
<th>Example RA activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer FPT training</td>
<td>Farmers completed pre- and post-training questionnaires. CA field officers kept a session logbook during training and/or after the training was completed with farmers.</td>
</tr>
<tr>
<td>Farmer FPT use</td>
<td>Farmers were encouraged to keep a session logbook to record problems. CA field officers kept a session logbook to record problems when helping farmers on-site or via phone.</td>
</tr>
<tr>
<td>Farmer FPT evaluation</td>
<td>Surveys, semi-structured interviews and feedback workshops.</td>
</tr>
</tbody>
</table>

First, the FPT useability issues affecting farmer involvement were addressed by a mixture of multiple group training sessions for farmers (e.g. CA3 field officers conducted three follow-up sessions with farmers, while in the other CA regions
farmers commonly attended two training sessions), individual training sessions at farmers’ properties to give more support, and developing manuals to assist farmers with common difficulties identified from farmer feedback. As mentioned in Section 5.4.4, CA2_Field_Officer explained the additional work she did to complement and improved the usefulness of the FPT, as follows:

[I undertook] training and development of other tools to go alongside with the FPT... it’s just a spreadsheet, but it’s formatted much... very attractive... in a simple one page scoring system about size of hectare... it’s been very useful for people [to apply for funding support]. [CA2_Field_Officer/Thesis interview]

Similarly, the following quote from an FPT evaluation report states how issues with the FPT prototype during the trial were addressed:

There were glitches in the prototype during testing, and as reported previously this can seriously damage the perception of a [system]. The fact that Land Managers were supported by trusted Extension Officers, plus rapid fixing of problems has minimised any such damage. [FPT evaluation report]

Second, field officers tried to emphasise in the manuals and during the training how the FPT could solve particular problems relating to farm management or environmental monitoring, not just teaching how to use the tool, as indicated below:

I also teach them about what the layers in the data mean. Not just how to drive it, but why are these for...why is this vegetation layer and what does it tell you about your property and why is that important? So, it’s been not just teaching them how to use it, but really show them what it can tell them as well and that’s been really valuable for catchment planning. [CA2_Field_Officer/Thesis Interview]

For instance, Manager_CA1 and field officers from the other three CA regions showed farmers how they could use the FPT prototype to produce property maps. Further, I explained in Section 5.4.5 how the FPT was incorporated into other extension programmes as part of recruitment. This approach encouraged farmers to maintain interest and participation in the FPT evaluation because they could see how the FPT supported their specific EM work in these other programmes. Since
farmers were often committed to such specific EM programmes, they were more likely to use the FPT than alternatives (e.g. MyFarm from the DLR as described in Section 5.4.3) when the FPT was embedded as part of the programmes.

Third, the issue of the limited number of field officers in some CA regions was addressed by the project team only doing group training sessions with 10 farmers rather than one-on-one. A related technique was to get the group of 10 farmers to break up into two or three, with at least one farmer being more experienced or having the ability in using computers. This worked because the FPT evaluation reports indicated more than 70% farmers were competent with IS/IT. It also facilitated group learning, where farmers helped each other. This was useful because fellow farmers were more likely to understand for what other farmers wanted to use the FPT.

Fourth, Manager_CA1 explains the typical approach used to address the problem of poor Internet connections in the following quote:

*One barrier was the technology itself, in that it didn’t... because we didn’t have reliable broadband Internet everywhere. It was difficult for some farmers to use FPT successfully. So one of the things we did to try and overcome that problem was to run training sessions for farmers in rural... in places where there was a collection of computers with better Broadband capability. So that might be like a community centre in the town, where the training happened.* [Manager_CA1/Thesis Interview]

The evidence overall suggested that by using the above approaches, the FPT project team in all four CA regions were able to maintain many farmers’ involvements in the four month FPT prototype trial. Manager_CA1 also acknowledged in the following quote that this was only achievable because of the roles played by the field officers:

*I think it’s very beneficial to have an extension agent acting as an intermediary. So they can support the farmer to learn the system, they can understand how the farmer’s using it, they can provide additional help or training.* [Manager_CA1/Thesis Interview]
This also enabled the FPT project team to maintain the involvement of farmers (at least those who were able to continue accessing support and the FPT) in the post-trial evaluation of the FPT prototype. This was possible in part because of the ongoing working relationships, which the CA field officers had with the farmers. Further, the farmers were also given opportunities to provide feedback in a wide variety of ways to suit their availability and to ensure they had an opportunity to offer their views:

- Feedback workshops run locally, just like the regional and mock-up workshops, where farmers could share their experiences of using the FPT regarding its usability or usefulness. The workshops included a questionnaire with a mixture of multiple choice and open-ended questions.
- Semi-structured interviews to ask how usable and useful each FPT feature was, whether they would use the FPT in the future, what other functionality they thought the FPT should have, the most or least useful features, and the typical information they wanted to collect using the FPT.
- Surveys which farmers could complete if they were not able to attend the group feedback workshops.

The FPT consortium concluded from the FPT evaluation that the prototype had demonstrated “proof-of-concept” that a web-based spatial tool could be developed to support bi-directional EM information exchanges between farmers, CA field officers, CA management and other government agencies. This was because the FPT prototype: linked to government agency datasets (see Section 5.2.1); it had potential for farmers to access aerial photography, property boundaries and satellite data for EM and farm management; it made electronic information exchange between government, field officers, catchment planners and farmers more effective; and it reduced environmental information asymmetry between these parties.

The FPT project team was also able to identify emerging or new needs of farmers for future improvement. This was because there had been a number of issues regarding usability and usefulness in terms of using the FPT for both EM and non-EM farm production activities, as well as technical problems which had reduced its
suitability for farmers. For instance, the scales of soil maps which were available were too coarse for farm planning purposes, and could only provide a regional-level (rather than farm-level) indication of soil inventory.

Other technical issues repeatedly mentioned in the feedback sheets as an obstacle, especially for farmers, was the need to record their farm information in too much detail and using scientific terms they did not understand. For instance, farmers were required to record the vegetation condition on their paddock based on Ecological Vegetation Class (EVC) parameters, but not all EVC parameters are applicable to the farmers’ paddock, farm business (e.g. crop, meat and wool), environmental concerns (e.g. salinisation, water level table or waste), or biodiversity conditions. As a result, the early FPT prototype was considered too complex for farmers, as admitted by SpatialCo_Manager in the interview:

*The problem [with the FPT prototype] is, it makes all essential a scientific perspective but if you’re a farmer standing in the field it is almost impossible to identify the EVC type for your paddock because it’s quite a complex piece of analysis. And when we were originally building FPT we ask them to identify the EVC for each of their paddocks and really that was just beyond them you know. You really needed government officer go out with them who was trained up in the EVC monitoring investigations to do that analysis for them. So I think it was unrealistic that farmers will never be able to do that type of thing. That is another example where either the government has to say well let’s not required to enter that much more complicated data [SpatialCo Manager/Thesis interview]*

Therefore in response to these limitations, Manager_CA1, and the consortium members planned to enhance the FPT by including a number of functions that would be attractive to farmers, including the inclusion of more up-to-date and better quality maps they could print when they wanted to apply for government support such as funding and field work services. The FPT project team planned to incorporate these improvements into an enhanced version of the FPT prototype and then run a second round of evaluation involving more farmers. This second round of FPT evaluation is presented in the next section.
5.5 Development stage: second FPT evaluation

Similar to the first FPT evaluation, the second evaluation was run to determine the useability and usefulness of the enhanced version of the FPT prototype. Therefore, the next sub-sections present the narrative on the second FPT evaluation.

5.5.1 Challenges in undertaking the second FPT evaluation

My analysis showed that the FPT project team had to deal with various issues before they could start the second FPT evaluation. One of the key learning from the first FPT evaluation was that obtaining feedback from farmers required skilled and supportive field officers, as described by SpatialCo_Manager:

There was a strong view that the only way this [evaluation] was going to work is if these guys, the extension officers actually went and sat with the farmers and use the system. [SpatialCo_Manager/Thesis Interview]

However, as previously presented in Section 5.4.6, one challenge in undertaking the first FPT evaluation was the limited number of skilled CA field officers. In addition, there was a problem retaining field officers to run feedback activities due to the voluntary nature of their involvement in the FPT project. These issues would have caused difficulties with delivering the second FPT evaluation.

A new problem for the second FPT evaluation was a shortage in funding, because the DE and DLR were not actively involved in the project (see Section 5.4.2), and the DE declined to provide funding for the second FPT evaluation.

A good outcome from the first FPT evaluation was that it received favourable attention from industry groups and related organisations, which became interested in being involving in the second FPT evaluation. The most notable was DairyCo (pseudonym). The next section summarises how DairyCo became involved.

5.5.2 DairyCo's interest in the second FPT evaluation

DairyCo was a cooperative of dairy farmers, and unlisted public company, where farmers had shares in the organisation. This meant DairyCo was run mainly by farmers for its dairy members. The cooperative was responsible for all marketing, branding and production of consumer dairy products on behalf of its members to both domestic and international markets. Members supplied milk to the
cooperative. DairyCo_Manager, Manager_CA1 and SpatialCo_Manager explained, collectively, four main reasons why DairyCo joining the consortium was mutually beneficial.

First, DairyCo was committed to EM in its production facilities due to increasing global market pressures (e.g. consumer, international regulations, and global industry best practice). The cooperative focused on EM during production, but it was optional for members to engage in EM practices on their farms and DairyCo wanted to encourage them to do EM voluntarily. The cooperative recognised that barriers to EM for many members, which were SMEs, included the time-consuming nature of carrying out and reporting on EM. DairyCo was thus interested in initiatives such as the FPT project to explore if it could make EM practices and reporting easier for its dairy farmers. This meant DairyCo and the CAs had common goals, as Manager_CA1 confirmed:

[DairyCo] are interested in helping farmers record their farm practices as they relate to milk production... Because if they can demonstrate [a] link between farm management and good land and water management and a good product then that, ultimately the standards that are required to sell your products into the market are increasing... So that would be of direct interest to, that's where CA's and organisations like DairyCo have a fair bit in common. [Manager_CA1/Thesis Interview]

Second, DairyCo had been working with researchers from the DLR on a spreadsheet tool called “Nutrient Budgeting” (pseudonym) to help farmers calculate fertiliser quantities for paddocks to minimise excess amounts and run-off, which resulted in wasted money and also environmental damage if the run-off entered waterways. Some DairyCo field officers were using the FPT with farmers (see Section 5.5.3 below for details), and suggested to the DLR the idea of incorporating this into the FPT. SpatialCo_Manager explains how DLR then approached the FPT team:

They'd built this model, in theory they wanted to put it into the FPT so it could be used by the farmers with a map view. So the idea was we would modify the FPT so that against each paddock they had drawn they could record the same parameters. And then the FPT would come back and colour code the paddocks by how much nutrient was being lost, and it would be able to recommend to them how they could change their fertiliser...
practices on each paddock to improve the retention of fertiliser.
[SpatialCo_Manager/Thesis Interview]

Third, DairyCo had a voluntary web-based IOIS called Dairy Management System (DMS, pseudonym) members could use for various purposes. They could receive reports on their milk (e.g. after testing) and details of payments. They could submit mandatory data relating to regulations, and voluntary data relating to areas such as EM, to DairyCo. The DMS also provided access to (free) third-party web-based and downloadable tools (e.g. Nutrient Budgeting). DairyCo recognised that many of its farmers were not computer literate, so these farmers exchanged mandatory information using paper. The DMS was therefore a voluntary IOIS (see definition in Section 1.3) because farmers did not need to use computers to exchange information with DairyCo (e.g. they could receive milk quality reports via fax). This flexibility can be explained by the fact DairyCo was a cooperative owned by and serving its members, not a separately owned customer which could dictate terms to external dairy suppliers. DairyCo was therefore interested in the FPT because it meant that the FPT’s functionality did not need to be added to their DMS, and that farmers could be interested in the FPT and then start using the voluntary DMS (see quotes from DairyCo_Manager and Manager_CA1 respectively):

It was really that rather than sort of reinventing something we knew that [FPT] was there. It was a good spatial tool, it did a number of things that we are going to tick the box in terms of what we thought was required, but there was just some extra work that needed to be done to sort of support it and to add some extra functions that were seen as valuable to suppliers. [DairyCo_Manager/Thesis Interview]

So DairyCo had a clear need, and that was about wanting more farmer use of their software [DMS], and that they could see that the FPT was like a hook to encourage people. [Manager_CA1/Thesis Interview]

Fourth, Manager_CA1 recognised that DairyCo had resources (e.g. funding and staff) to support the second FPT evaluation, as DairyCo_Manager explained:

We invested a little bit of money to try and improve FPT, or give it extra functions that we thought were going to be useful, and we then provided, sort of, on-the-ground support through pilot programmes to work with our suppliers to try and develop
environmental management practices, and try and help those suppliers work to best practice. [DairyCo_Manager/Thesis Interview].

Such a relationship between government and organisations such as DairyCo is critical when taking into account the changing political landscape (e.g. reduced numbers of field officers) explained in Section 5.4.6. DairyCo’s commitment to improving EM in its production, and to supporting farmers with optional EM, meant it was prepared to provide funding and access to their field officers and dairy farmers now that government resources are being cut back. SpatialCo_Manager stated in my interview that governments are increasingly looking to organisations such as DairyCo to provide the extension services and officers, which used to be provided by the government.

Finally, Manager_CA1 thought DairyCo’s involvement was useful due to their decades of experience in the dairy industry, which meant DairyCo had valuable input into the FPT evaluation and into future improvements to get dairy farmers to participate:

... there were some design improvements made to FPT as a result of feedback from DairyCo to help them make the system more useful for their farmers. So yeah, DairyCo were, as an industry group, were very, very important... [Manager_CA1/Thesis Interview]

The FPT consortium was therefore keen to build an alliance with DairyCo to secure its support in the second FPT evaluation. Nutrient Budgeting was considered to be consistent with the focus of the FPT, so it was agreed between the FPT consortium and DairyCo to incorporate the feature into the prototype for testing by DairyCo farmers. This led to DairyCo joining the consortium and agreeing to be involved in the second FPT evaluation.

The extended consortium, and associated project team, aimed to explore whether the enhanced FPT (with Nutrient Budgeting) could complement DMS, help farmers without expert assistance to reduce the burden of collecting, storing and reporting on EM at their farm, and to maximise pasture growth while minimising environmental impact. The aim was also to determine how useable and useful the
FPT and the DMS were based on the views of dairy farmers. The consortium then commenced the second FPT evaluation as discussed next.

5.5.3 Recruiting DairyCo field officers in the second FPT evaluation

The FPT project team got field officers to recruit farmers without difficulty for three reasons. First, DairyCo had field officer employees, just like the CAs did during the first FPT evaluation. In contrast to the CAs, DairyCo required its field officers to support farmers directly (or put them into contact with field officers with FPT expertise). This was due to DairyCo field officers effectively being employed by the farmers, via the cooperative, to support the farmers. CA field officers supported farmers across various industry sectors and were involved in a range of projects, which competed for their time (see Section 5.3.1).

Second, some of DairyCo’s field officers had an interest in and experience with using the FPT because of two reasons explained by Manager_CA1 and DairyCo_Field_Officer2 respectively:

*Some of their [DairyCo] extension officers, particularly [Name], had used FPT and found it very useful, and the feedback she'd had from farmers that she was working with was that they really liked it.* [Manager_CA1/Thesis Interview]

*The people [DairyCo field officers] that we had involved in the original [project] had come from the CA background, so they were aware that the FPT program existed, and so we sort of started using that with our farmers.* [DairyCo_Field_Officer2/Thesis Interview]

DairyCo and SpatialCo ran a one-day course on the use of the FPT and the Nutrient Budgeting feature. The field officers were also given time to familiarise themselves with the systems before they delivered training to farmers. They were offered follow-up training and support via telephone and online ‘help-desk’ if needed.

DairyCo field officers were also intended users of the FPT because they were responsible for the FPT administration on behalf of dairy farmers (e.g. creating usernames and passwords), and because they could view each farmer’s information in the FPT as part of their support services to farmers.
Once the field officers had experience with the FPT, the FPT project team organised and ran feedback activities, which included recruiting farmers, delivering training, encouraging on-farm use, and then running feedback sessions. This meant the broad steps of the second FPT evaluation were the same as the first FPT evaluation.

5.5.4 Recruiting DairyCo farmers into the second FPT evaluation

DairyCo field officers started the evaluation by recruiting farmers, so that each farmer could trial the FPT and DMS for eighteen months. As with the first FPT evaluation (see Section 5.4), farmer participation in the second FPT evaluation was voluntary. The voluntary nature of farmer use of the FPT and participation in the DairyCo trial was confirmed by SME_Farmer2:

[DairyCo field officer] rang us up. It [the FPT trial] sounded interesting and we thought we might get something out of it. [SME_Farmer3/FPT evaluation report]

This meant DairyCo and its field officers did not have power over members. That is, it was optional for farmers to use the FPT, and even DairyCo’s DMS. Field officers therefore needed to persuade farmers to participate. They recruited farmers with two types of interests (EM and reducing compliance burden), as explained by DairyCo_Field_Officer1 at two different points during my interview:

Initially we engaged with the farmers that had an interest in environmental stewardship and they were the easy. They were already interested in those sorts of things so they were happy to engage with it.

...

[Compliance] is managed by us and the regulatory authorities... [We] ask ... farmers ... to have a farm map and be able to identify paddocks as part of our food safety program... It can be something drawn on an A4, but we’re trying to encourage them to improve their resources and the FPT fits the bill there.

The quotes confirmed my conclusion in Section 5.5.2 that the FPT was a voluntary IOIS for DairyCo (not just the CA), because it was optional for farmers to exchange (mandatory) information in electronic form with the cooperative. The quotes also show that a goal behind DairyCo offering third party tools (e.g. the FPT which could link automatically to their DMS) was to reduce administrative and compliance time.
One difference between DairyCo and the CAs (see Section 5.4) was that DairyCo field officers mainly emphasised the farm mapping capabilities of the FPT, rather than trying to train farmers in using more complex EM functionalities. This was expected because the core business of the CAs was EM, and they needed to collect data for this purpose. DairyCo_Field_Officer2 explained DairyCo’s alternative focus with the FPT, which can be understood since EM was optional for farmers (see Section 5.5.2):

*I think it [the FPT] meets their needs really well to produce a farm map, I mean the FPT does a lot more than just produce maps, and that’s our challenge is to get farmers to use the whole spectrum of things such as soil test information and mapping, nutrient use and fertiliser use and so forth. But we’re happy to get them to engage at the basic level of drawing a map and as time goes by, then we can broaden that out.*

[DairyCo_Field_Officer2/Thesis Interview]

According to SpatialCo_Manager, this idea by DairyCo of focusing on more specific tasks for farmers was a key learning outcome from the first FPT evaluation:

*So I think everybody [government agencies in FPT consortium] has sort of realised that upfront we were probably a little bit too optimistic about what farmers would do... They need to decide on a simpler set of data because there’s no point in designing a really complex system with lots of really complex data, and not getting anyone to fill it in. You’re better off coming back to a simpler set and getting that filled in more reliably and by more farmers, even though it’s maybe not everything you would want, you end up with a better quality of data even though it’s, as I say, not quite as sophisticated than that.*

[SpatialCo_Manager/Thesis Interview]

I now describe the main techniques, which DairyCo field officers used to recruit farmers next, within the broader recruitment strategy outlined above.

One technique used by DairyCo field officers, as shown in the SME_Farmer3 quote above, was to make direct interpersonal contact with farmers. This was similar to the direct approach used by CA field officers (e.g. Sections 5.3.2, 5.3.4 and 5.4.5). One difference between DairyCo and CA was that DairyCo field officers did not rely on the Environment Association (EA), because they only worked with DairyCo
farmers. Field officers also worked with farmers across many aspects of their business (e.g. milk quality) and not just EM issues.

This close working relationship, in which field officers are employed to service the cooperative’s members, gave field officers the chance to tell farmers how the FPT was a free tool which provided access to a recent aerial map of their property, and which could be used to drawing their farm maps (e.g. paddocks) for decision-making and planning purposes. Field officers emphasised that the tool was easy to use for drawing farm maps (i.e. the basic level mentioned above), even if they had little computer experience. DairyCo_Field_Officer1’s comment next even suggested his ability to use computer-based tools was used as benchmark:

But yeah we’ve met all range of skill level in regards to computer use and I’m [laughs], my major contribution is that I’m not really interested in technology and I’m not very good with technology. So I am the end user, I am exactly what the farmers are, if I can’t use it nine times out of ten the farmer can’t use... [DairyCo_Field_Officer1/Thesis interview]

This direct contact approach field officers used with farmers was combined with various other media, as stated below:

We invited farmers [into the FPT evaluation] by a number of means, personal written invitation, phone calls, flyers delivered directly to farm, field services newsletter articles, DairyCo’s newspaper articles. [DairyCo_Field_Officer1/Thesis interview follow-up].

An example personalised form-based letter, which was prepared based on DairyCo’s prior knowledge of support needs of its members, included the following:

Dear [Farmer Name],

It was identified at your recent [extension programme] audit that you require some assistance with a farm map.

As part of our programme we are able to offer farm mapping for suppliers using the FPT mapping program. I invite you to attend a free training session where you will learn how to use the program to map your farm. In this session you will be assisted to learn:
• Use mapping program to map and plan your properties

• Use a new nutrient calculator for analysing soil tests and calculating nutrient requirements

• Use Nutrient Budgeting to assesses loss of nutrients from the farm

These training sessions are conducted in small groups of 5 participants and as such booking is required.

Computers and a light lunch will be provided.

Sessions will be conducted at the following locations:

This extract shows that a major focus of the personalised letter was that the FPT could be used for creating farm maps and for nutrient testing. The latter benefit was the main feature added to the FPT based on DairyCo’s collaboration with the CAs. The focus on using the FPT for nutrient testing was also apparent in an extract from a DairyCo flyer shown below. This flyer informed dairy farmers about DairyCo’s DMS and the online third-party tools accessible from the portal to assist with such areas as food safety/quality, animal management and occupational health and safety. Under “Sustainable environmental management” the brochure included this text:

• The DMS provides an on-line program, which takes you through a step by step process of collecting, storing and reporting data, if required, for regulators such as the EPA.

• The DMS introduces tools that assist in decision making or demonstrating good environmental management such as the mapping program, the FPT, a new nutrient calculator for analysing soil tests and calculating nutrient requirements, and the [Nutrient Budgeting] that assesses loss of nutrients from the farm.

• The DMS also takes you to the quick & easy [Industry-wide Software Name] to benchmark your farm business environmental credentials and sign posts you to practical information for working towards best management practices.

As the second FPT evaluation continued, and dairy farmers started using the FPT, DairyCo started including additional information about the FPT and quotes from dairy farmers who were using the FPT in their media. For example, DairyCo developed farmer profiles and a report on the FPT and their DMS which were
provided to their dairy farmer members. Text relating to the FPT from the report included:

What are the opportunities for DairyCo dairy farmers?

- Access to a web based aerial photography and mapping tool, the FPT, which allows farmers to map their property to the paddock level. Data relating to soil testing, fertiliser application or harvest results, for example, can be uploaded using information provided by the farmer or a third party such as a fertiliser spreader.

- Linkages with tools on DMS such as Nutrient Budgeting which can ‘talk’ to the FPT to map information automatically and also produce reports.

... 

- Participants undertake Nutrient Budgeting which assists farmers to earmark where they may be losing valuable nutrients from the farm or demonstrates their good planning and management around fertiliser usage.

- Financial assistance can be provided to test soils and effluent, and subsequent assistance is offered to make informed nutrient and effluent management decisions[;] the FPT captures all data relating to this process.

...

What do DairyCo suppliers have to say about the program?

...

‘The new farm map has good accuracy and is really useful—measuring paddocks and using this to order fertiliser. Prior to this we always had leftovers to find a place for.’

[DairyCo FPT/DMS report]

The quotes from dairy farmers enabled other dairy farmers to gain confidence that the FPT could also benefit them in the same way.

The previous quote from the DairyCo FPT/DMS report was used to promote a broader on-farm EM program being offered by DairyCo, with its focus on nutrient and effluent management. This is similar to the approach taken by the CA field officers of embedding the FPT evaluation as part of other extension programs (see
Sections 5.4.5 and 5.4.7). The report implied the programme also led to non-EM outcomes, and included a testimonial from a farmer about how the FPT helped:

Whilst the programme is designed to emphasise nutrient and effluent management issues and solutions, participants have found that it offers many avenues for exploring new ideas and assistance in implementing on farm management projects in other aspects of their business.

...‘The FPT has been a magnificent tool, especially for planning around the farm.’ [DairyCo FPT/DMS report]

The report also provided evidence that DairyCo farmers responded more favourably to being recruited because of DairyCo, as shown under “What is DairyCo learning?”:

- Suppliers are more willing to get involved in improving their environmental management when supported by DairyCo rather than an external organisation.
- Suppliers are embracing the opportunity to initiate two-way conversation between themselves and government authorities through the programme.

This quote suggests DairyCo believed they had more success recruiting farmers than the CAs, who were targeting a broader base of farmers.

Following the farmer recruitment, DairyCo needed to run and maintain farmer participation in the second FPT evaluation. This is explained in the next section.

5.5.5 Maintaining dairy farmer involvement in the second FPT evaluation

DairyCo field officers ran the second FPT evaluation broadly the same as the first FPT evaluation in three steps. First, they delivered training on the use of the DMS, and the FPT with its new Nutrient Budgeting functionality, either in a group or individually. Second, once farmers were confident to use the two systems, they were encouraged to use them on their own properties, and offered additional training and support if required. Finally, farmers took part in an evaluation. DairyCo and its field officers, therefore, needed to maintain farmer participation in all these steps.
The following quote shows that field officers were very aware of the consequences of an unsuccessfully development stage such as the second FTP evaluation:

*And the other issue for us is that we’ve put the cart before the horse a few times with our own technology, so our own risk management programme hasn’t been fully developed and we’ve had pilot groups [farmers] go out and use it. And you kind of need to do that with pilot groups, but if there’s a bad experience from the user with the technology for a start that sits with them... [DairyCo_Field_Officer1/Thesis Interview]*

This was a more critical issue for DairyCo compared to the CAs because of the supply-related relationship between DairyCo and its farmers. In other words, if the design phase fails, it affected this ongoing relationship and the willingness of suppliers to participate in future design phases of new IS/IOIS.

The field officers used a similar approach to CA field officers, such as providing one-on-one training at the farmer’s property or group training. DairyCo_Field_Officer2 explained the reason for his preference as follows:

*... I think we all find that a better way is in a group atmosphere. So we have small group training sessions where they can learn how to use it and go home and support it with a user manual and that sort of thing. [DairyCo_Field_Officer2/Thesis Interview]*

The quote also shows that DairyCo field officers benefited from the earlier work of the CA field officers, because they had access to manuals and other resources developed during the first FPT evaluation, which they could give to farmers.

One challenge for DairyCo field officers was that, in some cases, there was no local support for dairy farmers. As DairyCo_Field_Officer2 explains, they did try to find other support, but if it was not available then farmers stopped participating:

*... if we [DairyCo] didn’t have a dedicated person ... in a particular region, that we targeted the CA to help provide that support... And so we find where we’ve had a DairyCo person that no longer exists in a region, then that sort of support has been felt as well, and farmers have stopped using or we’ve stopped getting farmers onto it, because there’s no support. So it seems to me that the program and support go hand in hand... [DairyCo_Field_Officer2/Thesis Interview]*
Other challenges, which hampered the training, were technical issues experienced by some farmers. One related to Internet access as identified during the first FPT evaluation (see Section 5.4.6). DairyCo_Field_Officer1 also state that the fact the FPT was a prototype, rather than a completed system, mean that it had usability issues.

A further issue faced by DairyCo field officers with maintaining dairy farmer involvement in the second FPT evaluation was their lack of computer skills. The next quote from DairyCo_Field_Officer1 suggests that being able to use the FPT to create a farm map motivated some farmers to address their lack of skill:

_A lot of farmers have no reason to use technology, they couldn’t find anything other than they would look at their production data and some of those other bits and pieces and that’s all that interested them. When they found that they could produce a farm map, that created some interest so they got on and used that and that developed their actual computer skills to a level that they progressed further into other areas of DMS. [DairyCo_Field_Officer1/Thesis Interview]_

DairyCo field officers used a range of techniques to help address computer skill issues among farmers. One approach is described by DairyCo_Field_Officer2:

... so what we find is that [in] a lot of family farming businesses, one member of the family will be able to use a computer, and it’s usually but not always the wife. So she has a bit of ability with a computer, mainly because she’s probably got a bit more time to spend on it, but it might be paying bills electronically, that sort of thing, accessing information. So she has a grasp of the computer usage and it’s really valuable for us to sit both the couple down when we’re doing the training, because the husband usually has the hands-on ability to say, well here’s the farm, here’s where the paddocks are... [DairyCo_Field_Officer2/Thesis Interview]

Another way field officers addressed the challenge of limited computer skills of farmers was running training sessions in groups. The field officers believed this had advantages such as farmers engaging in discussions with other farmers who were more competent using the systems. The field officers also supplemented the training with a user manual, which the farmers could take home after the training.
The field officer training and ongoing support enabled farmers (at least those with Internet access) to develop their skills to use the FPT for basic farm mapping and, if desired, the more complex Nutrient Budgeting. This ongoing work with farmers meant they were able to keep participating up to the post-trial evaluation. Farmers were given an opportunity to provide feedback using a few techniques, which were designed to be as unobtrusive as possible:

- A phone survey by an independent party about their experiences, including what parts of the FPT and DMS were useful and how, any issues, and extra features to be added to make them useful for EM and farm management.
- Semi-structured face-to-face interviews to expand on the insights gained from the phone survey in more detail.

5.6 Summary

In summary, this chapter has provided a narrative on the approaches that an organisational initiator (a state-based government Catchment Authority) used to manage the involvement of SME farmers during the specification and development stages of a voluntary IOIS (the FPT) design or prototyping project. It has shown there were various difficulties with recruiting SME farmers to participate in various training and feedback workshops, which were held, and describes some of the approaches used to address those challenges. The narrative highlighted various challenges with maintaining the involvement of SME farmers, especially during the development stage when participation was required over an extended period of time during the FPT evaluations. It included accounts from various individuals and also representatives of organisations such as DairyCo, which were involved in recruiting and/or maintaining SME involvement during the design phase of the FPT prototype.

The next chapter uses this narrative as the basis for answering the sub-questions and overarching research question developed in Chapter 3, and explaining how the findings confirm and extend existing IS knowledge. The next chapter interprets the findings and answers to these questions using Boonstra’s stakeholder management framework and also identifies theoretical concepts I found in the literature which make sense of the findings and which extend Boonstra’s conceptual framework.
Chapter 6 - Findings and Discussion

This study explored how an organisational initiator managed (recruit and maintain) SME involvement in the design phase of a new voluntary IOIS. In Chapters 1, 2 and 3 I argued that, while the literature recognises the importance of user involvement in IS design, there is almost no empirical work reporting on how organisational initiators of voluntary IOIS involve SMEs. It was thus useful to analyse an in-depth case of an Australian State government’s attempt to manage SME farmer involvement in the design phase of a voluntary IOIS (FPT prototype) to exchange environmental management (EM) information between the government and farmers. The case provided the basis for hermeneutic cycles of identifying emergent themes, returning to the literature to identify concepts to make sense of the findings, and re-analysing the findings based using these concepts.

This Chapter is the result of that hermeneutic process. The theoretical contribution of this thesis, given the lack of prior empirical research and theorising relating to my problem domain, was to provide an analytical and descriptive foundation for future research. I achieve that in this chapter by answering the four research sub-questions introduced in Chapter 2 and refined further in Chapter 3:

1. Which stakeholder type(s) recruit SMEs into and/or maintain their involvement in specification and/or development stages, and how can these stakeholder type(s) be conceptualised?
2. What types of invitations do organisational initiators use to recruit SMEs into specification and/or development stages, and how can these invitation types be conceptualised?
3. What do organisational initiators state in invitations to encourage SME participation in specification and/or development stages, and how can these types of invitation statements be conceptualised?
4. What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages, and how can these techniques be conceptualised?

Each major section to follow will answer one of the questions above by discussing the findings (Chapter 5) and exploring concepts I identified from the literature,
which helped, make sense of the findings. Each section will also discuss how the findings from this study confirm and extend the literature reviewed in Chapter 2 on designing voluntary IS/IOIS for use by SMEs. Section 6.5 will then answer my overarching research question by using the combination of concepts from the framework by Boonstra (2009) introduced in Chapter 3 and from the literature to summarise the answers to the sub-questions.

6.1 What stakeholder types recruit SMEs?

The first research question this study sought to answer was:

Which stakeholder type(s) recruit SMEs into and/or maintain their involvement in specification and/or development stages, and how can the stakeholder type(s) be conceptualised?

This question was important for answering the other sub-questions (and the overarching research question) for four reasons. First, I could determine stakeholder types (internal and external to the government initiator) who used particular types of invitations (RQ2), and who maintained SME involvement in the specification and development stages (RQ4). Second, the overarching question included understanding how the initiator co-opted external stakeholder types to help recruit and/or maintain SME involvement on their behalf, not just those internal to the initiator. Third, previous IS studies (see Section 2.6.1) provide little insight into stakeholder types internal and external to organisational initiators who recruit SMEs into requirements analysis (RA) activities, and instead report on researchers who initiate voluntary IS/IOIS. Fourth, I explained in Section 3.3 that IS research has done little theorising about stakeholder types involved in recruiting parties during the design phase, except to categorise stakeholder types e.g. Boonstra (2009). It was thus useful to use the empirical work in this thesis as the basis to identify concepts for making sense of the responsibilities different stakeholder types had in recruiting SMEs into RA activities.

This study, therefore, extends and contributes to IS knowledge by providing the first empirical findings, summarised in Table 6.1, regarding the responsibilities various stakeholder types played in recruiting SMEs into the specification and development stages of the design phase. (The types of stakeholders involved in maintaining SME
involvement after recruitment, to answer Research Question 1 in full, is covered in Section 6.4.) The thesis also contributes to knowledge by showing that Boonstra’s framework, which lists various stakeholder types (see Table 3.2), can be used to analyse and describe those which (do not) recruit SME farmers into the specification and development phases. I discuss these contributions further next.

**Table 6.1: Stakeholder types involved in recruiting SME farmers**

<table>
<thead>
<tr>
<th>Boonstra’s types</th>
<th>Stakeholder involved</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>DE</td>
<td>Did not recruit SMEs or get other stakeholder types to recruit SMEs.</td>
<td>Did not recruit SMEs or get other stakeholder types to recruit SMEs.</td>
</tr>
<tr>
<td>Decision Makers</td>
<td>Representatives of the 4 CAs in the consortium</td>
<td>All four CA representatives got field officers to recruit SME farmers in regional workshops (Section 5.3.2) and mock-up workshops (Section 5.3.4).</td>
<td>All four CA representatives assigned one or two field officers to organise the FPT evaluations, including recruiting SME farmers (Section 5.4.4).</td>
</tr>
<tr>
<td>DairyCo</td>
<td>Not involved in this stage</td>
<td>Organised its field officers to run the second FPT evaluation, including recruit SME farmers (Section 5.5.3).</td>
<td></td>
</tr>
<tr>
<td>Project Manager</td>
<td>Manager CA 1</td>
<td>Recruited three SME farmers into the FPT design reference group to help oversee this stage (Section 5.2.1). Got CA1 region field officers to recruit farmers in regional workshops (Section 5.3.2) and mock-up workshops (Section 5.3.4).</td>
<td>Got the three farmers in the FPT reference group to oversee this stage (Section 5.4.4). Got field officers from CA1 region to recruit SME farmers in the first FPT evaluation (Section 5.4.3).</td>
</tr>
<tr>
<td>Developer</td>
<td>SpatialCo</td>
<td>Not involved in recruitment.</td>
<td>Not involved in recruitment.</td>
</tr>
<tr>
<td>Users</td>
<td>Field officers from the four CA regions</td>
<td>Recruited farmers into the FPT regional workshops (Section 5.3.2) and mock-up workshops (Section 5.3.4).</td>
<td>Recruited SME farmers to the first FPT evaluation (section 5.4.4). Each CA field officer recruited at least 10 farmers.</td>
</tr>
<tr>
<td>DairyCo field officers</td>
<td>Not involved in this stage</td>
<td>Recruited SME farmers into the second FPT evaluation (Section 5.5.4).</td>
<td></td>
</tr>
<tr>
<td>Farmers in CA regions, Environment Association (EA) members</td>
<td>EA members promoted calls to attend the regional workshops (Section 5.3.2) and mock-up workshops (Section 5.3.4).</td>
<td>EA members helped field officers recruit other farmers in the first FPT evaluation (Section 5.4.4). Some farmers were case studies in recruitment media used by DairyCo (Section 5.5.4).</td>
<td></td>
</tr>
<tr>
<td>Farmer Association (FA)</td>
<td>No evidence of their involved at this stage</td>
<td>FA promoted calls to participate in the first FPT evaluation for CA field officers (Section 5.4.4).</td>
<td></td>
</tr>
<tr>
<td>Passive stakeholder</td>
<td>DLR and its field officers</td>
<td>Not involved in this stage</td>
<td>Put details of the first FPT evaluation on their website. They promoted their desktop spatial tool (myFarm), instead of the FPT (section 5.4.3). Some tried to stop SME farmers from being recruited, in favour of using their own desktop spatial tool.</td>
</tr>
</tbody>
</table>
The second part of RQ1 focuses on how to make analytical and descriptive sense of the stakeholder types involved in recruiting SMEs into the design phase of a new voluntary IOIS. Table 6.1 provides indicative support that Boonstra’s framework, which categorises stakeholder types in a similar manner to other IS scholars (see Table 3.2), is useful for this purpose for three reasons, as explained next.

First, the framework helps make sense of which stakeholder types are (not) involved in recruiting SMEs in specification and/or development stages. For instance, it was interesting that the Owner (the DE) and Developer (SpatialCo) stakeholder types did not recruit farmers at any stage. The DE was not involved because they were not active in the day-to-day aspects of the FPT design phase after their agency focus changed from managing the environment on private and public land to managing only public land such as national parks only (see Section 5.1.3), even though they continued as the Owner. The Developer left SME recruiting responsibility to other stakeholder types. Table 6.1 shows that all other stakeholder types in Boonstra’s framework had direct responsibility at some point during the design phase in recruiting SMEs, and/or recruiting other stakeholder types to recruit SMEs on their behalf.

Second, Table 6.1 shows that stakeholder types employed by the government initiator (e.g. project manager and other CA staff such as field officers) used external stakeholder types to help recruit SMEs on their behalf. This included other SME farmers, industry associations and DairyCo field officers who appeared to be groups or individuals some farmers trusted. Boonstra’s framework thus helps make sense of the stakeholder types who recruited other stakeholder types, who in turn recruited SMEs. For example, the stakeholder categories in Boonstra’s framework enabled me to identify three types of stakeholder roles involved in recruiting SMEs into RA activities during the design phase:

<table>
<thead>
<tr>
<th>Boonstra’s types</th>
<th>Stakeholder involved</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE field officers</td>
<td>Not involved</td>
<td>Not involved</td>
<td></td>
</tr>
</tbody>
</table>
1. Role 1 was the Project Manager recruiting SMEs directly, and specifically recruiting the three SME farmers (Users) into the project’s reference group.

2. Role 2 was the Project Manager and Decision Makers (e.g. CAs, DairyCo) getting other future Users (i.e. field officers) to recruit SMEs on their behalf (see Table 5.3 in Section 5.1.1 showing that field officers were FPT users).

3. Role 3 was Users (i.e. field officers) getting assistance from other Users (i.e. SME farmers) and Passive Stakeholders (e.g. Farmer Association representing and comprising Users) to recruit on their behalf.

Third, Boonstra’s framework defines various IS/IOIS lifecycle stages, two of which apply to the design phase (specification and development), so these can be compared in terms of which stakeholder types recruit SMEs. For example, this study found that one stakeholder type (Passive Stakeholder) was only involved during the development stage. A similar example is that the framework also appears to have the potential for identifying stakeholder type instances (that is, particular firms or groups within a stakeholder type) not involved in both stages, such as DairyCo (see Table 6.1). Section 5.5.2 reported reasons why the consortium invited DairyCo, such as shared interest, their access to further resources, and their expertise and influence with a targeted industry sector for more targeted FPT evaluation. These examples highlight the potential value in future research of using Boonstra’s lifecycle stages and stakeholder types as an analytical tool for identifying design phase changes over time.

The findings relating to DairyCo add further complexity and suggest Boonstra’s categories are not always distinct, because the one stakeholder can be in more than one category. DairyCo was a cooperative, with most of the board of directors being (SME) dairy farmers elected by other dairy farmers (see Section 5.5.2). This meant some stakeholders (or farmers) were both a Decision Maker and potential User of the FPT. Boonstra’s categories were, therefore, useful for making sense of, and providing a vocabulary for describing these dual stakeholder roles. More specifically, the DairyCo Decision Makers/Users negotiated with government initiator Decision Makers before agreeing to become part of the FPT consortium and then authorising their field officer staff (Users) to recruit other Users (i.e. dairy farmers).
The three examples of applying Boonstra’s work suggested the framework was useful for making analytical and descriptive sense of what stakeholders recruited SMEs and in what stage (i.e. when). I returned to the literature after the data analysis to identify other concepts offering potential insight into what stakeholder types recruit SMEs.

My interpretation of Diffusion of Innovation (DOI) theory by Rogers (2003) suggested it had useful concepts for making sense of stakeholder types involved with recruiting SMEs. In Section 3.1, I noted the literature applies DOI theory to IS/IOIS adoption and implementation. My review of the literature after data analysis confirmed DOI theory is not used to make sense of recruiting and maintaining stakeholder involvement during the IS/IOIS design phase. For example, Iivari (2007) uses DOI theory to conceptualise the types of IT artefacts on which to base design science research. Other IS scholars have used DOI theory to make sense of how requirements analysis (RA) methods are diffused in the software development industry (e.g. Beynon-Davies & Williams 2003). Ashry and Taylor (2000) links aspects of DOI theory to (dis)advantages of requirements analysis (RA) methods, communication between developers and users during RA methods, and conceptualising user requirements. Ashry and Taylor (2000) also linked Rogers’ organisational innovation process stages (agenda setting, matching, redefining/restructuring, clarifying and routinisation) and the software development lifecycle. I show in Section 6.3 that I take a different approach by using the individual innovation-decision process proposed by Rogers (2003) to analyse and describe how stakeholder types recruit SME farmers into a particular RA activity.

The concepts described by Rogers (2003) which were most relevant to making sense of what stakeholder types recruit SMEs into an RA activity were change agents, opinion leaders, homophily and heterophily. The concepts of homophily and heterophily correspond respectively to the roles opinion leaders and change agents have in diffusing innovations. Homophily is “...the degree to which two or more individuals who interact are similar in certain attributes, such as beliefs, education, socioeconomic status, and the like”, while heterophily is “...the degree to which two or more individuals who interact are different in certain attributes” (Rogers 2003,
pp. 18-19). Change agents and opinion leaders can both influence potential adopters’ decisions to adopt an innovation, but change agents typically have heterophilous interactions with potential adopters, while opinion leaders often have homophilous relationships. Further, according to Rogers (2003, p. 366), a change agent is “...an individual who influences clients’ innovation decisions in a direction deemed desirable by a change agency”. This means a change agent may have more of a stake in diffusing the innovation (e.g. they are selling it) compared to opinion leaders. IS scholars writing on user participation in IS development have mentioned the important role of change agents but have not linked this role explicitly to DOI theory (e.g. Markus & Mao 2004).

The concepts of change agents and opinion leaders are useful because they can be used to produce meta-groups of stakeholder types proposed by Boonstra (2009). We can consider Decision Makers and the Developer, for example, to be change agents because they mainly influenced other stakeholder types (Users) to recruit farmers on their behalf. These stakeholder types (e.g. CA upper management, SpatialCo) had a high degree of heterophility with farmers due to being city-based and having little day-to-day, direct contact with farmers. Further evidence (see Section 5.3.2) was the Developer emphasising the importance of running feedback workshops in rural areas rather than the city, which reflected the Developer’s city location.

The exception of Decision Makers being change agents was DairyCo because they had dairy farmers on the board of directors. This meant these Decision Makers had a more homophilous relationship with other DairyCo dairy farmers because they were also dairy farmers. I, therefore, considered the DairyCo board (Decision Makers) to be potential opinion leaders, in addition to the other farmers (Users) and Farmer Association (run by farmers) farmers who helped CA field officers to recruit farmers. I considered these farmers to be opinion leaders because they had greater homophilous relationships (i.e. farmers understand other farmers) compared to other stakeholder types, and because they had respected EM expertise.
The role of field officers operated between the extremes of change agents and opinion leaders. For example, on the one hand they can describe as change agents because they acted as envoys of their CA/DairyCo Decision Makers. Nonetheless, the evidence in Chapter 5 (e.g. Section 5.3.2) showed they had close working relations with farmers. For example, CA field officers visited farmers and their local EA groups to offer assistance through extension programmes and training relating to EM, and to help farmers with accessing financial assistance (e.g. grants) for EM work on their farms. Field officers interacted directly with farmers so that, over time, field officers had a greater understanding of the needs and challenges faced by local farmers. They were therefore somewhat homophilous with respect to EM practices, but perhaps more heterophilous in respect to other aspects of the farmers’ business. DairyCo field officers, by contrast, had a thorough understanding of dairy farmer needs because these field officers only had to support farmers from a single industry and producer.

Overall, this thesis contributes to theory by showing that Boonstra’s categorisation of stakeholder types combined with specific DOI theory concepts have potential to make sense of what stakeholder types have a responsibility for recruiting SMEs into the design phase. More specifically, the findings suggest that the main stakeholder types from Boonstra’s framework who recruit SMEs directly tend to be opinion leaders. This answers the last part of RQ1 on how to conceptualise the stakeholder types, which recruit SMEs in the design phase of a new voluntary IOIS.

The findings of this study also extend IS knowledge because existing IS/OIS studies tend not to examine the nuances and challenges organisational initiators face when recruiting stakeholders into the design phase of an IOIS. For example, I noted in Section 2.4 that Lempinen et al. (2012) was the only non-SME study relating the IOIS design phase which reported on recruiting organisations. They found that even with mandatory IOIS it is not a trivial matter to recruit suppliers into the design phase, let alone for voluntary IOIS. Further, in Section 2.6.1 I explained that the literature relating to recruiting SMEs in the design phase of voluntary IS/OIS either did not clarify which stakeholders recruited SMEs, or reported that researchers instead of organisations recruited SMEs. This means the literature offers little insight into the
complexities, nuances and challenges associated with the responsibilities of stakeholder types in recruiting SMEs.

New insights offered by this study are therefore summarised next. I use the concepts from Boonstra and DOI theory to show that combining them results in a useful vocabulary for describing and making sense of the complexities, nuances and challenges faced by the government initiator stakeholders when recruiting SMEs.

First, the thesis extends knowledge by showing that change agents such as Project Managers and Decision Makers can have difficulties encouraging other stakeholder types (e.g. Users) to recruit SMEs into the design phase of a new IS/IOIS. For example, the findings show the FPT consortium had difficulty maintaining CA field officer involvement in the first FPT evaluation. This was interesting because I expected, because CAs employed field officers, CA Decision Makers would require their staff to participate, but instead, it was optional. By contrast, Section 5.5.3 shows DairyCo field officers were required to participate. The CA Project Manager had difficulties maintaining CA field officer involvement due to such issues as FPT project funding limitations, high employment turnover of field officers in government agencies, and the different levels of experience among field officers in the use of mapping tools like the FPT. This emphasises that change agents such as Project Managers and Decision Makers can experience difficulties recruiting other stakeholders (e.g. Users) who might recruit other Users.

Second, the thesis extends IS knowledge by suggesting that some stakeholder types (e.g. Users) may have greater success recruiting SMEs into the design phase of a new IS/IOIS. For example, Section 5.5.4 provided a quote stating that DairyCo members took part more willingly when supported by DairyCo. The concept of homophily helps make sense of DairyCo’s statement, because DairyCo field officers had specialised knowledge of the needs and concerns of their members, compared to CA field officers who worked with farmers from a broad range of industry sectors.

Third, the thesis extends IS knowledge by emphasising the adverse impact which conflicts between stakeholder types can have on recruiting SMEs into the design phase of a new IS/IOIS. For example, the findings show that change agents such as
Decision Makers and the Project Manager failed to interest the DLR and their field officers (Passive Stakeholder) in recruiting SME farmers into the first FPT evaluation (see Section 5.4.2). The DLR not only discouraged its field officers from recruiting SME farmers, but also dissuaded farmers from taking part and encouraged farmers to use the DLR’s competing for desktop spatial mapping tool. The case findings suggest DLR field officers were successful as opinion leaders because CA informants reported that some farmers were discouraged from participating in the FPT project. This highlights challenges organisational initiators can have negotiating with other stakeholders (in this case another government agency) during SME recruitment. It also illustrates a complex problem for SMEs (Users), who may be confused when targeted for recruitment by multiple parties (change agents including Users, Passive Stakeholders).

6.2 What types of invitations do initiators use to recruit SMEs?

The second research question this study sought to answer was:

What types of invitations do organisational initiators use to recruit SMEs into the specification and/or development stages, and how can these invitation types be conceptualised?

This question is important to answer for three reasons. First, exploring how organisational initiators maintain SME involvement during specification and/or development stages (i.e. RQ4) is not possible until after SMEs are invited successfully using recruitment invitations. This is particularly important in the context of voluntary IS/IOIS because SMEs are not required to use the final system, let alone participate in the design phase. Second, RQ2 was important because, as I discussed in Section 2.6.2, there has been little attention in the IS literature on the invitation types used by organisational initiators to recruit SMEs in specification and development stages. Prior studies provide limited details because most focus on a single invitation type during only one stage. There was similarly no literature on the invitation types used in the broader literature on the design phase of IOIS (see Section 2.4). This means it was unclear in the literature how initiators use multiple invitation types during both stages. Third, the limited research in this area meant there was no apparent theorising about the invitation types used to recruit SMEs.
(see Section 3.4). This meant it was important in this thesis to return to the literature to identify concepts for making sense of invitation types used by organisational initiators to recruit SMEs.

With the limited theoretical insights from Boonstra’s framework and previous studies of voluntary IS/IOIS design, I returned to the literature to see if there were concepts to help make analytical and descriptive sense of my findings on the invitations used to recruit SMEs. Some of Rogers’ (2003) DOI theory concepts appeared to be useful, even though they had not been applied previously to recruiting stakeholders during the design phase of IS/IOIS (see Section 6.1). Nonetheless, encouraging adoption, and inviting stakeholders into the design phase, both require IS/IOIS initiators (and/or others) to convince stakeholders to take action, as explained next.

The DOI theory concepts of homophily, heterophily and communication channels (mass media and interpersonal communication) appeared to be the most relevant to my findings answering RQ2. Rogers (2003, p. 18) states that “mass media channels involve a mass medium, such as radio, television, newspapers, and so on, which enable a source of one or a few individuals to reach an audience of many.” Mass media channels are one-way methods of sending limited information about an innovation’s existence, including basic features, to reach a large number of people rapidly. Interpersonal channels, by contrast, “involve a face-to-face exchange between two or more individuals” (Rogers 2003, p. 18) and provide a two-way exchange of information between stakeholders and the target audience. Interpersonal channels have greater effectiveness in motivating audiences whose attributes may be similar with the stakeholder, or dealing with resistance and persuading other parties to hold or change particular attitude (Rogers 2003). In this thesis, I was not exploring the effectiveness of the invitation types, but instead looking for concepts to analyse and describe the invitation types used. This insight from Rogers (2003, p. 18) was useful because it encouraged me to consider which stakeholder types from RQ1 (e.g. change agents versus opinion leaders) used particular communication channels (RQ2). For example, DOI theory suggests opinion leaders might be more inclined to use interpersonal channels compared to
change agents due to their higher degree of homophily. Future research can explain any relationships observed and effectiveness of techniques.

There was some evidence in prior studies on involving SMEs in the design phase of voluntary IS/IOIS that initiators have used both mass media and interpersonal channels (see Section 2.6.2). For example, prior research implies self-administered surveys are a mass media channel used for both recruiting and identifying needs from SMEs, and that site visits and phone interviews are interpersonal channels. I pointed out, however, that these studies provided little detail about the use of these channels (if they mentioned recruitment at all). More importantly, they did not explore if/how organisational initiators used multiple mass media and/or interpersonal channels to recruit SMEs in the specification and development stages.

Further, I explained in Section 2.4 that studies on the design phase of IOIS, in general, have explored RA activities, but my review of these studies revealed they did not examine how the initiators recruited participants (e.g. invited them) into these RA activities. This thesis, therefore, makes a contribution to IS knowledge by providing further detail about the use of these channels for invitations (as explained further next) to recruit SMEs into the design phase, and by describing the use of these invitations based on DOI theory.

Table 6.2 summarises the types of invitations used to recruit SME farmers in both the specification and development stages by categorising them based on the two DO theory channels (mass media and interpersonal) proposed by Rogers (2003, p. 18).

<table>
<thead>
<tr>
<th>Channels</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
</table>
| Interpersonal | • Manager_CA1 used interpersonal calls to recruit three SME farmers to the FPT reference group. He knew them from other projects and that they had knowledge and interests in spatial/monitoring tools (Section 5.2.1).
  • Manager_CA1/CA field officers recruited farmers to regional workshops (Section 5.3.2) via networking with local EA groups.
  • EA group members networked with and recruited farmers. |
|          | Section 5.4.5 shows CA field officers used various interpersonal channels to recruit farmers into the first FPT evaluation:
  • Personal phone calls and on-site farm visits.
  • Co-opted EA members to help recruit other farmers. EA members networked interpersonally with fellow farmers.
  • Used the FPT as part of interpersonal run extension programs (e.g. soil management, dung beetles). DairyCo field officers used phone calls to recruit farmers to the second FPT evaluation (Section 5.5.4). |
<table>
<thead>
<tr>
<th>Channels</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
</table>
| Mass media  | There was no evidence in the findings that mass media channels were used to recruit farmers during this stage. | Section 5.4.4 showed CA field officers used various media to recruit farmers into the first FPT evaluation:  
- Media such as invitation letters, leaflets, public notices, newsletters and brochures displayed at public spaces (e.g. CA and Environment Association offices).  
- Used existing agriculture information services such as radio, websites, circulars and post.  
- Using Farmer Association channels (about 230 branches covered the whole state that released frequent media such as bimonthly magazine, quarterly newsletter and weekly updates sent to all farmer members).  
Section 5.5.4 reported that DairyCo field officers used media such as flyers, field services newsletter articles, and invitation letters to recruit farmers into the second FPT evaluation. |

Table 6.2 shows that an important theoretical contribution made by this thesis was to extend Boonstra’s framework with the concept of communication channels from DOI theory by Rogers (2003). More specifically, the channels helped make analytical and descriptive sense of the types of invitations used by organisational initiators and other co-opted parties to promote the FPT prototype and to recruit SMEs into RA activities. The findings also suggest Boonstra’s framework is useful because it distinguishes between the stages of the IS/IOIS lifecycle (i.e. the specification and development stages) with respect to the types of invitations used. This comparison of the stages extends IS knowledge because previous studies (see Section 2.6.2) mainly focus on a single stage, or only report on using a single invitation type such as surveys. This thesis, therefore, extends IS knowledge by providing nuanced insights into various interpersonal and mass media channels which an organisational initiator used to recruit SMEs into each stage of the design phase of voluntary IOIS. For example, the combination of Boonstra’s design phase stages and the channel types by Rogers (2003) resulted in a useful analytical tool which helped me see that the government initiator’s CA field officers only used interpersonal approaches (i.e. not mass media) during the specification stage. Two aspects of this finding warranted further analysis and description, as summarised next.
First, the CAs wanted to target and recruit SMEs without resistance during the specification stage, which they achieved in part by focusing on SME farmers who had an interest in EM (see Section 5.3.2). For this reason, the CA field officers relied on personal relationships they had developed with these farmers during the previous CEM project (see Section 5.1.1) and other work undertaken between field officers and local EA group members (see Sections 5.3.2 and 5.3.4). This finding is consistent with DOI theory (Rogers 2003), which suggests interpersonal channels are especially useful for opinion leaders with homophilous relationships, or similar beliefs and values. As noted in Section 6.1, even though CA field officers did not have complete homophilous relationships with the targeted EA group members, they did share a common interest in EM initiatives and were, therefore, homophilous in this regard.

Second, during the specification stage there was no FPT artefact which SME farmers could see and use, which SpatialCo_Manager mentioned had presented a challenge in previous IS projects (see Section 5.3.4). He addressed this problem by developing “mock-ups” to help farmers visualise the functionality of the proposed FPT. I noted in Section 5.3.4, however, that CA field officers recruited the same EA group members through interpersonal discussions, and that there was no evidence field officers used the mock-ups when inviting SMEs to the mock-up workshops. Instead, recruitment involved explaining to farmers, when recruiting them to the regional and mock-up workshops, how computer-based spatial mapping would make EM easier than the paper-based EM manuals. This was important and difficult because many SME farmers had little or no knowledge of spatial mapping technology, nor how they could use it to improve EM and general farming practice. This finding is also consistent with DOI theory, which suggests interpersonal channels can be used to persuade audiences to adopt complex innovations (Rogers 2003), and shows this might also apply during IS/IOIS design as well as post-design adoption or implementation.

The findings suggest some interesting nuanced insights, which extend IS knowledge, by comparing the above points about the specification stage with the development stage. For example, the FPT consortium wanted to target more farmers with greater heterogeneity into the first FPT evaluation during the development stage, including
those with less interest in EM (see Section 5.4.5). This meant they needed to promote the FPT prototype more widely. Mass media, including newsletters from the Farmer Association with its focus on farm productivity rather than EM was, therefore, an important complement to interpersonal channels. Further, there was an artefact to promote during the development stage (i.e. a prototype), which meant it was possible to include tangible benefits in mass media recruitment material (see answer to RQ3 in Section 6.3). Finally, the findings suggest organisational initiators can use complex combinations of interpersonal and mass media invitations to recruit SMEs into the development stage. For example, Table 6.2 summarises quite varied interpersonal approaches such as direct conversations (e.g. via on-site visits) and more subtle methods such as embedding FPT recruitment within broader face-to-face programmes in which CA field officers were already engaging the SME farmers.

The findings in this thesis also contrast the IS literature reviewed in Section 2.6.2, which shows that initiators mostly used surveys to recruit SMEs as well as elicit their needs during the design phase of voluntary IS/IOIS. The initiators in the FPT prototype project, by contrast, embedded surveys into training (see Section 5.4.5) and feedback workshops (see Section 5.4.8). Nolan et al. (2007) and Noor and Nordin (2012) were the only studies similar to the FPT project, whereby the needs elicitation methods (e.g. focus groups, interviews) may have been separate from recruitment invitations. Nonetheless, these two studies did not report how they invited SMEs into the design phase of their voluntary IOIS projects.

6.3 What do stakeholders state in SME recruitment invitations?

The third research question this study sought to answer was:

**What do organisational initiators state in invitations to encourage SME participation in specification and/or development stages, and how can these types of invitation statements be conceptualised?**

This question is important to answer for four reasons. First, it helped answer the overarching research question because organisational initiators cannot manage SME involvement in the specification and/or development stages unless they convince SMEs to take part in RA activities. RQ3, therefore, examines what initiators
state in the invitations to encourage SMEs to participate voluntarily in the design phase. Second, it extends the answer to RQ2 by determining what initiators stated in mass media and/or interpersonal invitations to recruit SMEs. Third, answering RQ3 makes a contribution to IS knowledge because the review of the IS literature (Section 2.6.3) showed that prior studies have not explored what initiators state in invitations to encourage SMEs to take part in the design phase of voluntary IS/IOIS. Further, the broader research on the design phase of IOIS (see Section 2.4) does not report on the content of initiators’ recruitment invitations aimed at encouraging other parties to participate. Fourth, answering RQ3 enabled me to determine if the categories of IS/IOIS adoption/implementation benefits proposed by Boonstra (2009) were a suitable way to make analytical and descriptive sense of what initiators state in their recruitment invitations, and/or whether alternative concepts were needed.

This thesis extends IS knowledge by providing empirical evidence (see Table 6.3) of which of Boonstra’s interest types (see Table 3.2) were stated in mass media and/or interpersonal invitation types by organisational initiators (and co-opted external parties) to encourage SMEs to participate in the specification and/or development stages of the voluntary FPT prototype. I discuss these contributions further next.

Table 6.3: Types of SME interests stated in recruitment invitations

<table>
<thead>
<tr>
<th>Interest</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
</table>
| Strategic benefits  | • Manager_CAI said to the three farmers recruited to the reference group that the FPT would help farmers plan and monitor their paddocks to improve on-farm environmental improvement (EM) activities (Section 5.2.1).  
• CA field officers invited farmers to the regional workshops (Section 5.3.2) by saying the FPT would help farmers plan and make decisions about EM activities. | • CA field officers and farmers invited other farmers to the first FPT evaluation during networking by stating farmers could use the FPT for farm management such as planning, improved decision-making, and learning new farming approaches (Section 5.4.5).  
• DairyCo field officers stated in interpersonal channels and mass media to farmers in the second FPT evaluation that the FPT would assist with producing maps for farm planning and decision-making (Section 5.5.4). Some mass media included statements from farmers who had used the FPT prototype for such purposes. |
<table>
<thead>
<tr>
<th>Interest</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
</table>
| Economic benefits and return on investment | Not found | • CA field officers and farmer champions invited farmers to the first FPT evaluation by stating in interpersonal and mass media channels that they could use the FPT for free to create farm maps (including to apply for grants/funding) and that the FPT training was free (Section 5.4.5).  
• DairyCo field officers stated in interpersonal and mass media channels, to invite farmers to the second FPT evaluation, that FPT training sessions were free. Mass media stated the FPT reduced wasted nutrients, and implied it helped saved costs based on farmer testimonials (Section 5.5.4). |
| Business process management and operational benefits | • CA field officers invited farmers to the regional workshops (Section 5.3.2) by saying the FPT will make EM easier or more efficient than the paper-based EM manual used in the CEM project (see Section 5.1.1).  
• Mass media used by CA field officers to invite farmers to the first FPT evaluation stated the FPT would make it easier to upload/export dung beetle monitoring results. They also used interpersonal channels to promote the ease of taking farm measurements, calculating fertiliser quantities, getting visual assessments of EM, and preparing EM reports (Section 5.4.5).  
• DairyCo field officers stated in mass media invitations the FPT linked automatically to the DMS to make producing farm maps and reports more efficient (e.g. loading farm data onto maps). They stated in interpersonal channels that the FPT would help reduce paperwork burden, including compliance to provide a farm map (Section 5.5.4). |
| Work satisfaction / enjoyment | • Manager_CA1 invited farmers to the reference group by linking FPT goals to their passion for the environment, technology and travelling to see farming best practice (Section 5.2.1).  
• CA field officers recruited farmers with environment related values/passion to the regional (Section 5.3.2) and mock-up workshops (Section 5.3.4).  
• CA field officers used interpersonal channels, in particular, to recruit farmers with environment related values/passion to the first FPT evaluation because most were members of local EA groups (Section 5.4.5).  
• DairyCo field officers initially used interpersonal channels to recruit farmers with environment related values/passion to the second FPT evaluation because they were easy to recruit (Section 5.5.4). |
| User friendliness and system quality | • CA field officers invited farmers to regional workshops (Section 5.3.2) by saying the FPT makes EM easier than the CEM project paper-based EM manual (Section 5.1.1).  
• CA mass media inviting farmers to the first FPT evaluation stated if they could use a mouse, they could use the FPT (Section 5.4.5). |
The findings in Table 6.3 extend IS knowledge because prior studies on managing SME involvement in the design phase of voluntary IS/IOIS (see Table 2.2 in Section 2.6.3) do not explore what organisational initiators state in invitations to recruit SMEs. This thesis shows government initiator staff (CA field officers) and external stakeholders (e.g. DairyCo field officers, other farmers) stated various interest types in mass media and interpersonal invitations to SME farmers. I examine the nature of these statements in the invitations by using Boonstra’s categorisations and alternative theoretical concepts next.

This thesis contributes to theory by providing the first empirical study to explore if Boonstra’s interest types (which I show in Section 3.5 are well supported in the IS literature) make sense of the invitation statements used to recruit SMEs. The findings provide some indicative evidence for its usefulness for three reasons:

- There was at least one example of each interest type observed in one or both stages. Table 6.3 shows that CAs covered all the interest types, while DairyCo omitted user friendliness and technology performance which related more to the qualities of the FPT prototype rather than what it could be used for. The findings, therefore, suggest IS scholars can use these

<table>
<thead>
<tr>
<th>Interest</th>
<th>Specification stage</th>
<th>Development stage</th>
</tr>
</thead>
</table>
| Quality information              | Not found           | • CA mass media inviting farmers to the first FPT evaluation stated the FPT would give them access to various data layers about their farm. They also used interpersonal channels to promote that the FPT included access to accurate, recent farm aerial maps of their properties (Section 5.4.5).  
• DairyCo stated in mass media to recruit farmers into the second FPT evaluation that farmers who had used the FPT prototype found it enabled them to create more accurate paddock measurements for ordering fertiliser quantities. DairyCo field officers stated in interpersonal channels that the FPT provided farmers with access to recent aerial photos of their farms (Section 5.5.4). |
| Technology performance / security| Manager_CA1 stated to the farmers recruited to the reference group the project looked at how technology can improve farm EM and productivity (Section 5.2.1). This matched the farmers’ interests in technology. | • CA mass media inviting farmers to the first FPT evaluation stated they needed just a computer and reasonably fast internet connection to use the FPT (section 5.4.5). |
interest types to analyse and describe the content of stakeholders’ recruitment invitations, and to compare which stakeholder types cover which interest types. This can include determining if all stakeholders omit particular benefit types entirely from all recruitment invitations during the design phase of the voluntary IOIS.

- IS scholars could use the framework to identify differences between the two design phase stages. For example, Table 6.3 shows that stakeholders stated all interest types during the development stage, but omitted economic/ROI and information quality interest types during the specification stage. This would provide the basis for IS scholars to explore the reasons behind these differences, such as whether it is because it is only when a prototype exists that financial benefits are known and can be stated reliably.

- IS scholars could use the interest types to compare the depth of coverage across the entire design phase. For example, the findings in Table 6.3 suggest FPT system-level interest types (e.g. technical performance and user friendliness) had few instances and detail compared to some other interest types (e.g. strategic benefits, BPM and operational benefits). This partly reflects that DairyCo did not state these types of benefits in their mass media or interpersonal channels. Nonetheless, even when examining the interest types stated by the CAs, the technical performance and user friendliness instances were only brief statements in mass media (see Section 5.4.5). There were multiple examples of most of the other interest types stated by CA field officers in both interpersonal and mass media channels. As I noted in the first point, these latter benefits reflect what farmers can use the FPT to achieve on their property, while the former reflect qualities of the FPT prototype itself.

The extension to Boonstra’s framework made in Section 6.2 by adding the concepts of mass media and interpersonal channels adds a further analytical and descriptive potential. For example, it was interesting to compare the interest types covered in the example CA newsletter used to recruit SME farmers (see Section 5.4.5), with the interest types in interpersonal channels of CA field officers. That is, in both cases the majority of the interest types were covered. The main result, in the case of the
newsletter, was that it listed benefits with no rationale, rather than stating in detail and the advantages of fewer interest types. The CA approach was a little different to DairyCo’s mass media invitations (see Section 5.5.4). DairyCo’s mass media focused on two uses of the FPT: mapping the farm for planning purposes, and calculating nutrient loss and requirements. The coverage of the two uses varied from brief (e.g. the personalised letter) to more detail (the FPT report sent to farmers). The extra detail provided by DairyCo also meant that the text covered more than one interest type, so that Boonstra’s interest types are not necessarily separate. For example, Table 6.3 shows that these two uses were associated with other multiple interest types, such as the use of the FPT for nutrient loss calculations being associated with both economic benefits and quality information. This could provide IS scholars with the basis for examining the impact of the different invitation designs on SME recruitment outcomes.

Boonstra’s framework, therefore, helps analyse and describe some aspects of what stakeholders can state in invitations to recruit SME farmers into the design phase. I also returned to the literature after my data analysis to see if there were other concepts for making sense of how stakeholders state the interest types, in addition to what interest types were covered, when and by whom during the design phase. This is important because the main objective of the invitation is to convince an SME to participate in one or more RA activities. I found that the innovation-decision process concept described by Rogers (2003) as part of DOI theory appeared to make sense of the content from a communication purpose viewpoint.

Table 6.4 summarises the stages of the innovation-decision process, described as “an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation” (Rogers 2003, p. 172).

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>An individual learns about the innovation and seeks to understand how it works. According to Rogers, mass media channels can be important at this stage.</td>
</tr>
<tr>
<td>Persuasion</td>
<td>An individual forms an (un)favourable attitude towards the innovation after gaining the knowledge about it. In this stage, interpersonal channels can be more important.</td>
</tr>
<tr>
<td>Stage</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Decision</td>
<td>An individual chooses to adopt or reject the innovation. In the rejection process, the individual may try the innovation before deciding not to adopt (discontinuance or active rejection) or does not adopt without trying it (passive rejection).</td>
</tr>
<tr>
<td>Implementation</td>
<td>An individual puts the innovation in a place. At this stage, change agents may help address uncertainties about the innovation or assist to make the innovation easier to adopt.</td>
</tr>
<tr>
<td>Confirmation</td>
<td>An individual looks for support for the decision in adopting the innovation. At this stage, discontinuance may occur due to dissatisfaction or because they find an alternative innovation.</td>
</tr>
</tbody>
</table>

Organisational initiators face some challenges during the design phase of a voluntary IOIS when compared to adoption/implementation phases. The relative newness of a voluntary IOIS concept (during the specification stage) or prototype (during the development stage) means there is limited knowledge about the voluntary IOIS for potential participants to seek. This may be true also when a voluntary IOIS is initially launched (e.g. Fisher & Craig 2005; Gengatharen et al. 2005), but this issue becomes less pronounced as adoption levels increase.

Even the DOI concept of early adopters takes a new nuanced meaning in the context of the design phase compared to the launch of an operational voluntary IOIS. As I explained in Section 5.3.2, understanding of web-based spatial tools was quite new when the FPT design phase started. This meant there were few existing tools for early adopters to “adopt”, and that on-farm web-based spatial tools were largely conceptual. Early adopters in the FPT design phase include the three farmers in the reference group, who had some knowledge of spatial technology and its potential use in farming. Given the newness of the technology, these farmers could only envisage what such tools might look like and be used for until prototypes of such spatial tools (e.g. IS and IOIS versions) start to emerge. Most other farmers were in a more difficult position because they had little (if any) knowledge. The implication for the design phase is that recruitment invitations must address both lack of knowledge about the technology, and persuasion, before an SME owner-manager will agree to participate in early RA activities in particular. Table 6.5 summarises some of RA activities, and shows how the development of knowledge concerning spatial mapping technology developed during those RA activities and influenced recruiting farmers.
Table 6.5: Applying innovation-decision process to recruiting SME farmers

<table>
<thead>
<tr>
<th>E.g. RA activity</th>
<th>Knowledge</th>
<th>Persuasion</th>
<th>Decision to do the RA activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional workshop</td>
<td>CA field officers explained the concept of spatial mapping tools and possible (hypothetical) benefits to SME farmers.</td>
<td></td>
<td>SME farmers decided if to participate in the workshop to discuss their needs.</td>
</tr>
<tr>
<td>Early FPT training</td>
<td>CA field officers showed the FPT and explained/showed the potential benefits to SME farmers. DLR field officers made this difficult by promoting their competing tool.</td>
<td></td>
<td>SME farmers decided if to participate in the FPT training.</td>
</tr>
<tr>
<td>sessions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early FPT use</td>
<td>CA field officers providing multiple training options (on-site, group), user manuals and complementary tools to build SME farmer confidence they can use the FPT. Farmers computing skills (opinion leaders) helped other farmers during the training. DLR field officers made this difficult by promoting their tool.</td>
<td></td>
<td>SME farmers used the training outcomes to decide if they would use the FPT on their farm for a four-month period.</td>
</tr>
<tr>
<td>Later FPT training</td>
<td>Some SME farmers gained experience using the FPT.</td>
<td>SME farmers persuaded other farmers in their local EA groups based on their experience.</td>
<td>Additional SME farmers decided if to participate in the FPT training.</td>
</tr>
<tr>
<td>sessions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The importance of distinguishing between knowledge and persuasion is most apparent when examining the CA newsletter used to recruit SME farmers (see Section 5.4.5) which lists various benefits without explanation of how or why the FPT prototype would achieve those benefits. We can make sense of the newsletter, potentially, as providing SME farmers with knowledge about the FPT, but less likely persuasion. CA and DairyCo field officers using interpersonal channels, by contrast, could introduce, describe (i.e. knowledge) and persuade SME farmers about the potential benefits of the FPT and of participating in RA activities. The DairyCo mass media examples (see Section 5.5.4) suggest that, like with the adoption phase with a completed voluntary IOIS ready for launch, organisational initiators can combine knowledge and persuasion when they have SME farmers who had used a prototype and could provide testimonials. It was only at this point that the design phase of a new voluntary IOIS started to look like DOI-related adoption by early adopters, except they were “adopting” a prototype rather than a fully functioning, complete IOIS.

6.4 What techniques do initiators use to maintain SME involvement?

The fourth question this study sought to answer was:
What techniques do organisational initiators use to maintain recruited SME involvement during specification and/or development stages, and how can these techniques be conceptualised?

This question was important to answer for three reasons. First, answering the overarching research question associated with managing SME involvement in the design phase of a voluntary IOIS requires initiators to maintain SME participation in the specification and development stages. This can include conducting new SME recruitment activities for each stage or RA activity (repeating RQs1-3), and/or encouraging the same SMEs to participate in multiple RA activities or stages. RQ4 focuses on the latter. Second, I explained in Section 2.6.4 that most studies of SME involvement in the design phase of voluntary IS/IOIS do not explore how initiators maintain SME participation across multiple RA activities or stages, and instead only report on a single RA method or did not provide insights at all. This suggested the need for an empirical study to generate new IS knowledge on how organisational initiators maintain SME involvement across multiple RA activities. Third, in Section 3.6 I argued that, due to the lack of research, IS studies have not theorised how initiators of voluntary IOIS maintain stakeholder participation in multiple RA activities. It was thus important to examine this empirically and then return to the literature to identify concepts for making sense of the findings.

This thesis extends IS knowledge by providing the first empirical evidence that organisational initiators (the CAs) can involve the same SMEs in multiple RA activities during the specification and development stages, not just a single survey or recruiting different SMEs for each RA activity as reported in prior studies (see Section 2.6.4). For example, Table 6.6 shows that the three SME farmers in the reference group were involved in multiple RA activities across the specification (“FPT concept” column) and development stages (“FPT development” column). Similarly, the same SME farmers from local Environment Association (EA) groups participated in two workshops in the specification stage (“FPT mock-up” column) and multiple RA activities in the development stage (“First FPT evaluation” column).

As I noted in Sections 6.1 to 6.3, the CAs aimed to recruit, and then maintain the involvement of, SME farmers from local EAs because their interests were similar to
those of the CAs and because these farmers were more likely to be willing to exchange EM information using the FPT.

Table 6.6 also shows that the organisational initiator (the CAs), and DairyCo when they joined the consortium, encouraged the same SMEs to participate in multiple RA activities within the development stage lasting many months. More specifically, Table 5.6 (see Section 5.4.7) shows that the two FPT evaluations involved three steps (training, use and post-use evaluation) involving RA activities in their own right to generate feedback to help the CAs and DairyCo understand farmer needs. The main goal for CA and DairyCo field officers was to maintain farmer participation through the first two RA activities so that farmers could participate in post-use evaluation such as the feedback workshops and interviews. The project team used the feedback obtained during all three steps to identify changes needed to the design of the FPT.
### Table 6.6: Initiator maintaining recruited SME involvement in the design phase

<table>
<thead>
<tr>
<th>Maintaining involvement in the specification stage</th>
<th>Maintaining involvement in the development stage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FPT concept</strong></td>
<td><strong>FPT mock-up</strong></td>
</tr>
<tr>
<td><strong>Activities (Section 5.2.2)</strong></td>
<td><strong>Activities</strong></td>
</tr>
<tr>
<td>Three reference group farmers involved in brainstorming, meetings and storyboarding, and workshops and field trips to define the FPT design principles which meet other SME farmer needs.</td>
<td>Regional workshops in four CA regions to identify high-level farmer needs (Section 5.3.3). Mock-up workshops of the FPT to review high-level FPT design and to identify new needs (Section 5.3.5).</td>
</tr>
<tr>
<td><strong>Maintaining involvement</strong></td>
<td>Initiators ran workshops at local towns to reduce travel. Guided discussions helped diverse farmers (e.g. varying knowledge of spatial tools, computers) to have input. Local EA members encouraged participation via existing networking relationships (Section 5.3.3 and 5.3.5).</td>
</tr>
<tr>
<td>The three farmers’ were retired. All the activities aligned with the farmers’ passion for technology, the environment and field trips, which the farmers did to explore new opportunities farming best practice.</td>
<td>DLR field officers promoted MyFarm. Poor Internet quality in some areas. CA field officers had other projects and not enough of them. The FPT was difficult for farmers to use. There was limited funding for the evaluation.</td>
</tr>
<tr>
<td><strong>Maintaining involvement</strong></td>
<td>Field officers offered FPT manuals, other software tools, on-site/phone help and group training to address FPT usability issues. CA resourcing was addressed by avoiding individual training and by getting experienced farmers to help. Internet issues were addressed by running training at public places. The FPT was embedded in EM programmes to promote it as the preferred tool. Used multiple options for the final evaluation.</td>
</tr>
</tbody>
</table>
The findings of my study also helped complete the answer to RQ1 relating to what stakeholder types maintain SME involvement in the specification and development stages of the design phase of a new voluntary IOIS. More specifically, the summary of the findings in Table 6.6 shows that the main stakeholder type, based on Boonstra’s categories, which helped achieve this outcome were Users. CA field officers, who were Users in their own right (see Table 5.3 in Section 5.1.1), were the dominant stakeholders who maintained SME farmer involvement, but there was also evidence in Table 6.6 that some farmer Users helped other farmers during feedback workshops and training. The latter provides empirical support for the idea proposed by Nolan et al. (2007), who ran out of funding before they could investigate the impact of designing a voluntary IOIS within the context of existing business networks. The findings of this study suggest, at the very least, SME business network members can help recruit and maintain the involvement of other members during the design phase. There was also evidence that Project Managers can maintain SME involvement, as found in this study where Manager_CA1 maintained the involvement of the three farmers in the FPT reference group during various RA activities. These findings support the DOI concept of opinion leader as a useful way of describing stakeholders (CA field officers and other farmers) who help maintain SME involvement in multiple RA activities (see Section 6.1).

The findings suggest that an important aspect of maintaining SME involvement in multiple RA activities is first getting various other parties, which will support SMEs, to collaborate and work together. In this sense, the findings are consistent the literature examining IOIS stakeholder negotiation and analysis during the IOIS design and later phases (see Section 2.4). For example, Wilkins (2005) reported on the importance of collaboration between government agencies and industry peak bodies during IOIS design. The findings of my study revealed problems when collaboration does not go well, and the better outcomes achieved when it does. More specifically, I noted already in Section 6.1 (see also Table 6.6) how the DLR caused difficulties for the CAs during SME recruitment by promoting their own desktop spatial mapping tool as a competitor to the FPT. This lack of collaboration between government initiator agencies also meant SME farmers were encouraged
by DLR field officers to stop trialling the FPT prototype during the development stage (see Section 5.4.6).

The CAs and DairyCo, by contrast, were able to negotiate and align their goals successfully, which led to them adding Nutrient Budgeting to the FPT. This also enabled the CAs to gain access to funding and resources such as DairyCo field officers (see Section 5.5.2), which was important because the CAs had difficulty securing funding (see Section 5.5.1) and field officers (see Section 5.4.6) to recruit and maintain SME involvement. DairyCo was able to increase the likelihood their dairy farmers would use the FPT rather than the DLR’s competing tool for two reasons. First, DairyCo top management supported the FPT, and the board included dairy farmers who understood the needs of dairy farmers. Second, farmers trusted the advice of the field officers because they understood the dairy sector specifically.

The findings in Table 6.6 are also consistent with the literature on SME adoption of IS, even though this thesis focuses on the design phase of voluntary IOIS. The similarities, especially during the development stage, are apparent because a major goal of the initiator (the CAs) and DairyCo in maintaining SME involvement was encouraging SMEs to trial (or adopt) the FPT prototype to provide feedback and to develop a better understanding of SME farmer needs. Parallels between this study on the design phase and the literature on SME adoption of IS include the following.

First, one challenge faced by the initiator (the CAs) and DairyCo when maintaining SME involvement during the specification and development stages, was handling SME heterogeneity. The issue of SME heterogeneity is well explored in the IS literature (see Sections 1.4 and 2.2). The CAs and DairyCo handled this to some degree in their recruitment approach (see Sections 6.1 to 6.3) by focusing on SME farmers interested in EM. This is similar to Levy et al. (2001) who proposed that SMEs will adopt different IS depending on their strategic focus and customer dominance, whereby in this study the focus of the SMEs, the CAs, DairyCo and the FPT was mainly on EM. This group of farmers, however, still came from different industries (e.g. dairy, sheep, grain crops) and property sizes, and with varying computer skills levels and productivity and EM priorities. This heterogeneity meant farmers had different FPT functionality and support needs the CAs and DairyCo
needed to address to maintain farmer willingness to keep participating. The CAs addressed this by focusing on resource-intensive individualised farmer training and supports to help farmers develop the computing skills. They also embedded the RA activities in broader EM programmes (e.g. soil management, dung beetle monitoring) to focus on specific EM priorities relevant to the local area being serviced by individual CA field officers. DairyCo had fewer issues with heterogeneity because they only serviced one industry, but they further focused on a single EM priority for its farmers (i.e. fertiliser application on paddocks). For farmers with no-EM interest and/or limited computer skills, DairyCo focused on the narrow objective of creating basic spatial maps of their properties. DairyCo, and to a lesser extent the CAs, showed that an overall approach to handling SME heterogeneity during the design phase is to be narrow in focus. Interestingly, only the first of DairyCo’s focal areas (fertiliser application) aligned with the immediate interests of the CAs. The second focal area by DairyCo was a longer-term view aimed at encouraging dairy farmers to develop computer skills by creating basic maps, and then consider EM in future.

Second, the findings suggest there were difficulties in maintaining the high levels of support the SME farmers needed during the development stage, such as CA resourcing issues affecting support levels for farmers, poor Internet quality in some rural areas, and differing computing skill levels of the SME farmers. These challenges have parallels with the literature on SME adoption barriers, such as the importance of external support and IS/IOIS knowledge and skills of staff (see Section 2.3). The solutions used by the CAs and DairyCo (e.g. training, user manuals and telephone support to help farmers use the FPT) to address these barriers are also reported in the literature. Nonetheless, these issues were more difficult during the design phase, compared to adoption phases of fully operational IS/IOIS, due to the prototypical nature of this phase. For example, the findings (see Section 5.4.7) emphasise that the FPT project team needed to develop and adjust the user manuals and training approaches to meet the needs of farmers, as problems using the FPT prototype became apparent. Further, the FPT prototype was not a fully functional/complete system, and this resulted in usability issues (see Sections 5.4.6 and 5.5.5).
The findings in Table 6.6 also extend knowledge, in contrast to the literature on SME adoption of IS, by providing insights into the nuanced complexities of maintaining SME involvement in multiple RA activities across both the specification and development stages, and also multiple RA activities within the development stage (i.e. the three FPT evaluation steps). These are summarised next.

First, I argued in Chapter 2 that the dominant research topics relating to SMEs and IS relates to examining barriers/drivers of IS adoption, and to exploring implementation outcomes and issues. The indicative findings of this study provide some insight into the importance of the design phase. For example, DairyCo field officers found that the ability to use the FPT prototype to create basic maps had encouraged some farmers to trial the FPT and develop their computer skills (see Section 5.5.5). The insights from the field officers suggest that instead of seeing the lack of computer skills as a barrier to SME adoption of IS (see Section 2.3.1), lack of adoption may in part be due to organisational initiators not designing tools that SMEs need or want to adopt despite their lack of computer skills. We must treat this finding with caution because this thesis did not explore the SME perspective or their motives for participation in the design phase. Nonetheless, it does raise the question for future research to consider the role of the design phase on SME adoption of IS (see Parker et al. 2015).

Second, there are parallels between the findings of this study and research on IS alignment of SME goals and IS (e.g. Cragg et al. 2002; Gutierrez, 2009; Hussin et al. 2002; Ismail & King 2007), except this thesis reports on the additional challenge of aligning these with the aims of the multiple RA activities. For example, the alignment of two or three of the reference group farmers’ interests (i.e. field trips, EM and technology) and the aims of the FPT and RA activities (see Table 6.6) meant the farmers agreed to participate in multiple RA activities during the specification and development stages. Further, the CA and DairyCo field officers aimed to achieve alignment between the FPT, RA activities and the farmers’ interest types by incorporating the FPT evaluations into broader EM extension programmes of interest to the targeted farmers. This meant the EM programmes were the centre of interest, and the field officers contextualised the FPT as a support tool.
Third, the FPT project was different to most other IOIS studied in the IS literature (both in the design and adoption phases) because of the nature of the information being exchanged between the initiator and the SME farmers. Prior studies focus on IOIS where the nature of information is comparatively understood, such as e-commerce transactions (Fisher & Craig 2005; Gengatharen et al. 2005; Ndou et al. 2011) and customs documentation (Wilkins 2005). In this thesis, by contrast, SME needs were largely unknown because spatial mapping technology was new when the FPT project started, so that farmers did not know how it could be used on their farm (see Section 5.3.2). The CAs thus had the challenge of explaining spatial mapping technology to farmers and its potential to recruit them (see Sections 6.2 and 6.3), while also eliciting unknown needs from farmers on what uses of spatial mapping would encourage them to continue participating in the design phase. The findings suggest the FPT project team tried to manage this difficulty by getting initial ideas from the reference group farmers (see Section 5.2) and the regional workshops (see Sections 5.3.2 and 5.3.3). The FPT team then combined these ideas with the needs of the CAs to produce “use cases”. The CAs then had farmers review and provide feedback on these use cases during the mock-up workshops (see Sections 5.3.4 and 5.3.5) and the first FTP evaluation (see Section 5.4).

This difficulty meant it was not until the FPT team developed the prototype that SME farmers (and other parties) started to understand, and see the potential of, spatial mapping technology (see Section 5.4.5). Further, the findings suggest this difficulty might partly have led the initiator (the CAs) to develop the FPT prototype to focus on what information they wanted to collect from SMEs and how, which resulted in a design which was too complex for many SME farmers to use (see Section 5.4.7). This was most apparent in the reflection by SpatialCo_Manager that the team had been too ambitious when designing the FPT prototype (see Section 5.5.4).

It is, therefore, interesting to contrast this with the approach taken by DairyCo, which focused on a more specific EM and dairy farm management problem (i.e. Nutrient Budgeting) relating to fertilisers and run-off. Another difference between the CAs and DairyCo approaches related to their outlook. The CAs had a very short-term focus of determining proof-of-concept they could use to secure future funding
to develop an operational voluntary IOIS. DairyCo had a similar short-term goal in the context of farmers interested in EM. They also had a longer-term goal that farmers would initially develop basic farm maps (to develop their computing skills) and, in time, they might consider using spatial mapping technology for Nutrient Budgeting. This meant they aimed to recruit and maintain the involvement of these farmers, even though their use of the FPT was not of specific interest to the CAs.

The discussion above, which is the outcome of my hermeneutic process of comparing my data and emerging themes against the literature, also helped identify potential concepts for making sense of these findings. I explained in Section 3.6 that Boonstra’s work needed extending because his framework and previous literature on RA and IS development does not theorise how organisational initiators maintain SME involvement in multiple RA activities. As with RQ3 (see Section 6.3 and Tables 6.4 and 6.5), the innovation-decision process from DOI theory by Rogers (2003, p. 366) appeared to be useful for analysing and describing the themes associated with RQ4. In Section 6.3, I explained how the knowledge, persuasion and decision steps related to recruiting SMEs into RA activities.

In the context of maintaining SME involvement in multiple RA activities, the latter two steps of implementation and confirmation appeared to be relevant. In the context of innovation adoption, these steps relate to SMEs using an innovation and deciding based on this use whether they will continue or stop using the innovation. In the context of the design phase, we can consider the “innovation” to be different “instances” of the FPT prototype. Example instances included the FPT being a set of design principles (see Section 5.2), a collection of “use cases” (see Section 5.3.3), a series of mock-up screens (see Section 5.3.5), and multiple prototype versions (e.g. Section 5.4 and then a major revision to the prototype in Section 5.5). A major challenge for CA field officers (as noted in Section 6.3) during the specification stage was ensuring farmers understood each conceptual “instance” of the FPT and its potential benefits. In other words, farmers had to be convinced of the value proposition of each “instance”. Once a tangible prototype exists, it started to look closer to typical innovation decision processes, as farmers decided whether to (dis)continue believing the value proposition and (dis)continue using the prototype.
The contribution of this thesis is to extend this perspective to another level of farmer continuation in participating in the RA activities in which the FPT “instances” appear. There is an interrelationship between the FPT instance decision process and the RA activity decision process, but they are not necessarily the same. For instance, the findings suggest that an initiator’s internal and external stakeholders must ensure suitable conditions exist for SME farmers to participate in RA activities, in addition to ensuring farmers see the value proposition of the FPT “instance”. For example, DairyCo field officers found that some farmers stopped participating in RA activities primarily due to the lack of local support (see Section 5.5.5), which suggests that even if the FPT “instance” was valuable the conditions of the RA activities made their participation difficult. Similarly, CA field officers tried to remove participation barriers by running regional workshops locally so farmers did not need to travel, and embedding the FPT evaluation steps within EM programmes. The aim was to increase the chances that SME farmers would continue to take part in multiple RA activities (i.e. RA activity confirmation) rather than stopping their participation. This required making it easier to participate in the RA activities, as well as ensuring that the value proposition of the FPT “instances” were communicated and convincing.

The DOI concepts from Rogers (2003, p. 366) relating to innovation characteristics (see Table 6.7) can also be used to compare the FPT instances in the specification and development stages and to describe the challenges for maintaining SME involvement in the design phase. More specifically, CA field officers had more challenges during the specification stage due to the conceptual nature of the FPT instances. For example, I have already discussed issues with communicating the relative advantage of the conceptual FPT instances in Section 6.3 and this section. These findings suggest the concept would have been complex for SME farmers, due to their lack of knowledge the concept of spatial tools. Similarly, trialability and observability were more difficult without a tangible tool farmers could see and use. The Developer addressed these issues to some extent, as noted previously, by creating mock-up screens during the specification stage so SME farmers could observe the anticipated functionality of the spatial tool, and confirm whether they believed the tool would address their needs.
Table 6.7: Innovation characteristics (Rogers 2003)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>“… the degree to which an innovation is perceived as being better than the idea it supersedes” (Rogers 2003, p. 229).</td>
</tr>
<tr>
<td>Trialability</td>
<td>“… the degree to which an innovation may be experimented with on a limited basis” (Rogers 2003, p. 16).</td>
</tr>
<tr>
<td>Observability</td>
<td>“… the degree to which the results of an innovation are visible to others” (Rogers 2003, p. 16).</td>
</tr>
<tr>
<td>Compatibility</td>
<td>“… is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (Rogers 2003, p. 15).</td>
</tr>
<tr>
<td>Complexity</td>
<td>“… the degree to which an innovation is perceived as relatively difficult to understand and use” (Rogers 2003, p. 15).</td>
</tr>
</tbody>
</table>

The findings suggest that the FPT project team did not address some of these innovation characteristics adequately during the development stage. For example, I have noted already in this section that the Developer highlighted that a major problem with the FPT prototype was that it was ambitious. The evidence relating to the work involved in training farmers to use the FPT prototype (see Sections 5.4.6 and 5.4.7) confirmed this problem. DairyCo field officers addressed this issue to some extent, as noted above, by focusing on basic farm maps for farmers who had difficulty with the more complex aspects of the FPT prototype.

The next section answers my overarching research question based on my discussion of the findings, and concepts making sense of these findings, for RQs 1-4.

6.5 Theorising how organisational initiators manage SME involvement in the design phase of a new voluntary IOIS

I have argued in this thesis that there has been little empirical work (see Chapter 2) and theorising (see Chapter 3) specifically relating to how organisational initiators manage (recruit and maintain) SME involvement in the design phase (specification and development stages) of a new voluntary IOIS. This is despite recognition in the IS literature that user involvement in the design phase of IS/IOIS is important (see Section 1.2). I noted in Chapter 3 that the requirements analysis (RA) and IS development literature which does explore user involvement in design does not tend to look at how organisations such as SMEs are recruited and their participation maintained in RA activities. Nor does this literature offer any apparent theories or concepts to make sense of my problem domain.
In this section, I, therefore, answer the following overarching research question:

How do organisational initiators manage (recruit and maintain) SME involvement during the design phase (specification and development stages) of a new voluntary IOIS, and how can this be conceptualised?

The lack of theorising in my problem domain, and the hermeneutic process I followed to identify useful concepts (see Chapter 4), led me to combine Boonstra’s conceptual framework with DOI theory by Rogers (2003, p. 366). Table 6.8 summarises my answers to the sub-questions (see Sections 6.1 to 6.4) based on combining the concepts from both theoretical frameworks.

In the next sections, I use these concepts summarised in Table 6.8 to describe and make sense of how the State government initiator of the voluntary FPT, and its associated internal and external stakeholders, attempted to recruit SMEs into RA activities and maintain their involvement across multiple RA activities during the design phase. I also use these concepts to describe how some stakeholders (e.g. other agencies within the State government) created challenges for those trying to manage SME involvement during the design phase. The theoretical contribution of the thesis, therefore, is providing indicative evidence that combining Boonstra’s framework and DOI theory concepts might provide an initial theoretical basis on which IS scholars can commence future research on how organisational initiators manage SME involvement during the design phase of voluntary IS/IOIS.

**Table 6.8: Combining concepts from Boonstra’s framework and DOI theory**

<table>
<thead>
<tr>
<th>Key elements</th>
<th>Concepts from Boonstra’s framework and DOI theory applied to the element</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS/IOIS lifecycle stages</td>
<td>Boonstra’s IS/IOIS lifecycle stages helped make sense of the design phase by distinguishing between the specification stage (where there is no prototype) and the development stage (prototype exists). This helped identify differences relating to various aspects of recruiting and maintaining SME involvement between stages in the design phase. These stages can also be broken up into multiple RA activities.</td>
</tr>
</tbody>
</table>
| Stakeholder types  | • The DOI theory concepts change agents and opinion leaders, and the related concepts of homophily and heterophily, helped make sense of the broad stakeholder types who recruited SMEs directly (opinion leaders). It also made sense of which types (change agents) recruited stakeholders, who in turn recruited SMEs.  
• Boonstra’s stakeholder types helped make sense of specific types of change agents and opinion leaders were involved in recruiting and maintaining SME involvement, based on their responsibility during the IS/IOIS lifecycle. It also helped make sense of stakeholders with multiple roles. The IS/IOIS lifecycle stages also enabled comparisons between stages to determine which stakeholder types were (not) involved in recruiting/maintaining SME involvement. |
<table>
<thead>
<tr>
<th>Key elements</th>
<th>Concepts from Boonstra’s framework and DOI theory applied to the element</th>
</tr>
</thead>
</table>
| Invitation types | • The DOI theory concepts of mass media and interpersonal communication channels helped make sense of the invitation types used by stakeholders to recruit SMEs into one or more RA activities. They are also useful for making sense of invitation types used to recruit stakeholders, who in turn recruited SMEs.  
• Boonstra’s framework did not offer concepts for making sense of invitation types, but the IS/IOIS lifecycle stages helped make sense of differences in the invitation types used between stages. |
| Interest types | • Boonstra’s interest types helped make sense of the nature of the content of mass media or statements during interpersonal communication. The interest types could encourage SME farmers to agree to participate in one or more RA activities.  
• The DOI concept of the innovation-decision process, and the knowledge, persuasion and decision steps in particular, helped make further sense of the process of using interest types to encourage SME farmers to participate. It suggests invitations need to transfer knowledge of the web-based spatial technology, and the planned FPT in particular. The invitation may then persuade farmers the promised interest types are of interest to help them make the decision to participate in the RA activity. |
| Maintaining SME involvement in multiple RA activities | • The DOI concepts of the innovation-decision process and innovation characteristics helped make sense of the process of maintaining SME involvement in design phase. Innovation characteristics suggest there are principles each voluntary IOIS “instance” in an RA activity must address (e.g. high degree of compatibility, low degree of complexity) to increase the chances SME farmers will agree to participate in the next RA activity. The innovation-decision process, and the implementation and confirmation steps in particular, suggest that while SME farmers are attending (implementation) an RA activity they will evaluate the potential of the voluntary IOIS instance to address their needs, and the value of participating in further RA activities (confirmation).  
• The IS/IOIS lifecycle stages of Boonstra’s framework helped make sense of changes in approach to maintaining SME involvement between the stages. |

My answers to the sub-questions in Sections 6.1 to 6.4 suggest the main approach the State government initiator used to manage SME involvement during the design phase of the new voluntary FPT was to:

- Establish a reference group including a small number of SMEs with expert knowledge relating to the new system. This reference group oversaw both the specification and development stages of the design phase.
- Recruit stakeholders internal to the initiator (i.e. government agencies and their staff) and external (i.e. DairyCo and its staff) who would recruit and maintain the involvement of SMEs. Initiators can repeat this at different times during the specification and development stages of the design phase (e.g. the initiator recruited DairyCo during a later development stage).
- Rely on these recruited stakeholders to recruit SMEs into specific RA activities and to maintain SME involvement across multiple activities in both the specification and development stages of the design phase.
The next sections take each part of the approach separately and apply concepts from Boonstra’s framework and DOI theory to make sense of them. More specifically, these sections suggest that the combination of the two offers a suitable vocabulary for making sense of, and describing, these aspects of managing SME involvement.

6.5.1 Theorising how initiators establish a reference group with SMEs

In this section, I show the value of combining concepts from Boonstra’s framework and DOI theory by using them as a vocabulary for making sense of, and describing, how an organisational initiator can manage SME involvement in a reference group during the design phase of a new voluntary IOIS. Figure 6.1 is an overview of this process, which I explain in more detail next using the case study findings.

*Figure 6.1: Recruiting SMEs to the reference group*

The State government initiator initially established a reference group to oversee the specification stage and development stage of the design phase of the voluntary FPT. The project manager (change agent) recruited three SME farmers with some knowledge of and interest in web-based spatial technology. He used interpersonal communication to recruit the farmers, explaining how the FPT project aligned with the farmers’ interest types such as on-farm strategic benefits, work enjoyment relating to environmental management (EM) passion, and technology performance relating to on-farm use of technology. The three farmers agreed because they had a high degree of homophily with the project manager due to their common interest types, and to their previous collaborations on other EM projects.
The project manager was able to maintain the three farmers’ ongoing involvement in various RA activities in the specification stage (e.g. meetings, brainstorming, farm site visits) and in the development stage (technical workshops). This was in part because there was alignment between the farmers’ interest types, the aims of the FPT and the goals of the RA activities. Further, the farmers had time to spend on the reference group because they had retired from farming and enjoyed travel to see farm related technology performance. The farmers’ existing knowledge about technology also meant the innovation-decision process (see Figure 6.1) led more easily to agreement to participate in the RA activities. In other words, the farmers already had knowledge about on-farm technology, web-based spatial technology and EM, so that there was little persuasion needed for them to decide to participate in the RA activities (i.e. implementation). The farmers’ experience during the RA activities offered the confirmation needed to do further RA activities. Figure 6.1 shows a generic version of the process combining concepts from DOI theory and Boonstra’s framework.

The three farmers were valuable contributors to the reference group because they were able to explain the potential uses of the web-based spatial tool on farms, and therefore how these might align with other farmers’ interest types. The farmers were not potential users of the FPT because they had retired from farming, but they were potential opinion leaders other SME farmers might find persuasive regarding the value of the planned FPT and the value of participating in RA activities.

Another important objective for organisational initiators of a new voluntary IOIS is to recruit appropriate stakeholders who can manage SME involvement during the design phase. Initiators can do this at the start of the project, but they can also do this at any other stage during the design phase. The next section explores this further.

6.5.2 Theorising how initiators manage stakeholders who manage SME involvement

In this section, I show the value of combining concepts from Boonstra’s framework and DOI theory by using them as a vocabulary for making sense of, and describing, how an organisational initiator recruited and maintained the involvement of non-SME internal and external stakeholders. These stakeholders, in turn, managed SME
involvement during the design phase of a new voluntary IOIS on the initiator’s behalf.

The change agents needed to recruit opinion leaders who provided valued support services to SME farmers, and who could help recruit and maintain the involvement of farmers in one or more RA activities of the FPT design phase. More specifically, the project manager and decision-makers in Catchment Authority (CA) agencies were the change agents who recruited CA field officers. The field officers were not just opinion leaders, but also intended users of the FPT in their own right. The change agents used interpersonal communication to recruit the field officers, who agreed to their responsibility for recruiting and maintaining SME farmer involvement due to their passion for EM. That is, there was a degree of homophily between the opinion leaders and change agents.

The CA field officers joined the FPT project team and worked with the project manager and CA decision-makers to establish conditions that would help maintain SME farmers’ involvement during the design phase. The specification stage, for instance, involved running regional and mock-up workshops in local areas to make it easier for farmers to attend. The development stage involved, for example, ensuring that field officers were confident FPT prototype users, as well as skilled trainers of SME farmers. The FPT project team needed to be flexible to make changes to these conditions throughout the design phase as new issues emerged. For example, the developer fixed errors with the FPT prototype identified during the RA activities, the field officers developed improved FPT manuals, and the field officers organised better FPT training locations if farmer users had poor Internet connectivity at home.

The project manager and CA decision-makers faced various challenges maintaining the involvement of CA field officers, for such reasons as limited numbers of field officers and time-pressures due to their work on other projects. One approach the FPT project change agents used to address these challenges was to recruit DairyCo as a new change agent and opinion leader. The FPT change agents such as the project manager used interpersonal communication with DairyCo decision-makers to discuss and identify common interest types. The aligned interest types included
strategic benefits relating to DairyCo wanting to support its suppliers to engage in EM to improve DairyCo’s image, and to helping its farmers increase operational benefits on the farm. The CAs and DairyCo determined they had a high degree of homophily, and DairyCo agreed to offer funding and the support of its field officers (opinion leaders).

DairyCo’s change agents (i.e. board of directors or decision-makers) were different to the CAs because they were also opinion leaders and users. In other words, DairyCo was a cooperative run by dairy farmers, so that the decision-makers were more likely to have a homophilous relationship with other dairy farmers because the decision-makers themselves were also dairy farmers.

The change agents also had difficulty recruiting some potential opinion leaders who could have helped recruit SME farmers. This was especially the case with the DLR field officers because they had a similar homophilous relationship with farmers as the CA field officers did. The change agents could not recruit the DLR field officers because the DLR focus had changed from EM to helping farmers with farm productivity. Further, the DLR had an alternative desktop (i.e. non-IOIS) spatial mapping tool, and the DLR field officers believed their tool addressed the needs of SME farmers better than the voluntary FPT.

The next section summarises the common themes relating to how opinion leaders recruited and maintained SME involvement in the design phase or, in the case of DLR field officers, how they made it more difficult.

6.5.3 Theorising how initiators manage SME involvement in RA activities

In this section, I show the value of combining concepts from Boonstra’s framework and DOI theory by using them as a vocabulary for making sense of, and describing, how non-SME stakeholders can recruit and maintain the involvement of SMEs during the design phase of a new voluntary IOIS initiated by an organisation. Figure 6.2 shows an overview of the design phase and the two major changes stages, and the (potentially) multiple RA activities which can be part of each stage (which could be in parallel rather than sequential). I describe this process in more detail next using the case study findings.
Figure 6.2: Managing SME involvement in the design phase

Opinion leaders (CA/DairyCo field officers or FPT users) recruited by change agents were responsible for recruiting and maintaining SME farmer user involvement in the multiple RA activities comprising each stage, where each RA activity had an instance of the FPT (see Figure 6.2). The specification stage involved two RA activity instances where the respective FPT instances were a conceptual idea (regional workshops) and a Flash-based mock-up of how the FPT could function (mock-up workshops). The development stage involved two cycles of various RA activity instances (FPT user training, FPT use by users, and post-use FPT feedback through a feedback workshop, interviews and surveys), where the respective FPT instance were different versions of a prototype changed to varying degrees between these RA activities. For example, there was a major change to the FPT prototype between the CA evaluation cycle RA activities and the DairyCo evaluation cycle RA activities due to the introduction of the Nutrient Budgeting functionality. Within each cycle, however, the developer made minor changes to the FPT prototype by comparison in response to feedback and problems identified. Figure 6.2 states that SMEs could be involved at different points in the design phase. For instance, CA field officers recruited SME farmers into initially the regional workshops, and then attempted to maintain SME involvement in the mock-up workshops and RA activities of the CA evaluation cycle. DairyCo field officers recruited dairy farmers into the FPT training of the second evaluation cycle and attempted to maintain their involvement in the remaining RA activities of that cycle.
CA and DairyCo field officers sometimes recruited SME farmer *users* to help recruit other SME farmers on their behalf, similar to how the *change agents* relied on the field officers to manage SME involvement on their behalf. SME farmers were better *opinion leaders* than the field officers because they had even greater levels of *homophily*. These farmers stated the types of *interest types* or benefits they had achieved during *interpersonal communications* during recruitment initiatives, and in the form of testimonials in *mass media*. This was most evident during the *development* stage when farmers had a tangible FPT prototype they had used.

One challenge faced by *opinion leaders* when attempting to recruit SMEs into their first RA activity was the heterogeneity of farmers in such areas as industry (e.g. dairy, sheep, grain crops), land size of their farm, the level of computer skills of the farmer(s) and their family, interest in EM, and different on-farm EM and/or productivity issues. This was a challenge because these and other differences meant farmers could have different *interest types* regarding the planned FPT, resulting in different functionality the FPT instance had to address. CA and DairyCo *opinion leaders* handled this heterogeneity by targeting farmers with an interest in EM, specific *interest types* (e.g. operational benefits) and problems within those *interest types* (e.g. fertiliser application for DairyCo, and dung beetle or soil management for CAs). DairyCo’s recruitment was even more specific because they focused on only one industry.

A second challenge for *opinion leaders* recruiting SMEs into their first RA activity, especially during the *specification stage*, was the lack of owner-manager *knowledge* of web-based spatial technology or what *interest types* it could satisfy. Further, *opinion leaders* and the *change agents* wanted to learn the needs of (and from) these potential SME *users* during each RA activity to determine what functionality the FPT should include. In Section 6.4, I explained this as a significant challenge because the FPT team was trying to elicit needs relating to *interest types* from owner-managers about a new voluntary IOIS very few owner-managers understood.

Figure 6.3 shows the “RA activity decision process” *opinion leaders* used in an attempt to address this. Table 6.8 summarised the five steps of this process: *knowledge, persuasion, decision, implementation* and *confirmation*. For example,
CA field officers recruited SME farmers into the regional workshops by providing knowledge about web-based spatial technology, and comparing the concept of the FPT (i.e. “instance” of the voluntary FPT) to the paper-based EM manual. This helped owner-managers to gain some initial ideas of the anticipated benefits they could achieve using the technology. The opinion leaders provided this knowledge using interpersonal communication to persuade the owner-managers to decide to attend the regional workshop. The CA field officers had a degree of homophily with the local Environment Association group farmers because the field officers had supported these farmers on other EM-related projects, such as soil management programmes. Farmers then attended the regional workshops (implementation) to help opinion leaders, change agents and the developer to explore the conceptual idea of the FPT further. These SME farmers were interested enough in the FPT project (confirmation) from the regional workshops to attend further RA activities.

Figure 6.3: RA activity decision process

The RA activity decision process shown in Figure 6.3 occurred at different times and with some variations during the design phase. For example, DairyCo field officers used the same process as CA field officers to recruit its dairy cooperative members into their first RA activity (i.e. FPT training) during the second evaluation cycle of the development stage. The knowledge and persuasion aspect of this process were easier for the DairyCo opinion leaders, compared to the CA field officers, because they had a tangible instance of the voluntary FPT (i.e. a prototype) to show farmers during their interpersonal communication. The tangible nature of the FPT instances during the development stage also enabled the CA and DairyCo field officers to use
mass media channels to recruit new farmers into the first RA activity (i.e. FPT training) of the first evaluation cycle. The thesis did not aim to examine the effectiveness of the communication channels, but my analysis of the mass media examples (see Section 6.3) suggests that, especially with CA opinion leaders, it was apparent that very little knowledge and persuasion related content was included to assist potential owner-manager users with their decision about whether to attend the first RA activity.

The RA activity decision process is therefore not the same as the innovation-decision process developed by Rogers (2003, p. 366). The latter focuses on the FPT instances (or innovations) as a conceptual artefact or idea farmers can “adopt” or accept as valuable or useful, or a tangible artefact they can adopt and use. In other words, Rogers (2003, p. 366) focuses on innovation adoption (and use/implementation) without considering how this might occur within a broader design phase, especially in the context of IS. The RA activity decision process, by contrast, embeds the traditional innovation-decision process concerning the FPT instance (e.g. idea, prototype) within a broader context of opinion leaders trying to encourage farmers to attend an RA activity involving, for instance, discussing, reviewing and using the FPT instance. In this sense, users undertake an innovation-decision process relating to the FPT instance, and an RA activity decision process concerning whether to attend the RA activity which includes the FPT instance. The two processes are intertwined because the RA activity includes the implementation and confirmation steps of the innovation-decision process relating to the FPT instance.

The CA and DairyCo opinion leaders also aimed to create the conditions needed so that potential SME farmer users not only agreed to participate in their first RA activity, but also agreed to maintain their involvement in the other RA activities to follow. More specifically, during and/or after each RA activity farmers would reassess their confirmation (see Figure 6.3) to make a decision on whether to continue with further RA activities or to discontinue their involvement.

The main favourable conditions were running RA activities (e.g. regional/mock-up workshops, FPT training) locally to make it easier for farmers to attend, visiting
farmers at their premises (e.g. FPT training and FPT use RA activities), and being available via distance (e.g. phone call, help desk). The CA and DairyCo opinion leaders acknowledged that the lack of localised support for farmers did result in some farmers ending their participation during the design phase. This was challenging for CA field officers because there were limited numbers of them, they had competing projects and time constraints and there was high turnover of staff. This was less of an issue for DairyCo field officers because DairyCo decision-makers ensured resources were available to support the project.

Another challenge the CA opinion leaders experienced was that the FPT instances were conceptual rather than tangible during the specification stage, while it was easier for the DairyCo opinion leaders because they had a tangible FPT instance during the development stage. The impact of this evolution of the FPT instances throughout the design phase is more apparent when comparing them based on innovation characteristics. For example, the conceptual FPT instances, compared to the FPT prototypes, were less trialable and observable, and therefore more complex for farmers to understand and see how the concept would be compatible with their needs. This required more effort on the part of the opinion leaders, developer and project manager to ensure conceptual FPT instances addressed these issues. The mock-up screens, produced by the developer, were an example of an attempt to do this.

The third challenge for CA opinion leaders trying to maintain potential farmer user involvement in multiple RA activities was DLR opinion leaders promoting their alternative desktop spatial mapping tool. This was less of an issue for DairyCo because the change agents, who were also opinion leaders and users, supported the FPT, ensured the new FPT instance met the needs of their dairy farmers, and had the advantage that only DairyCo field officers interacted mostly with the dairy farmers.

### 6.6 Summary

In summary, Section 6.5 has highlighted that it is far from trivial for an organisational initiator to recruit and maintain the involvement of SMEs in the specification and development stages during the design phase of a new voluntary
IOIS. I interpreted and described the complexity of this work by stakeholders internal and external to the initiator using concepts (or vocabulary) combined from Boonstra’s stakeholder management framework and DOI theory. In the next chapter, I discuss the contributions this study made to knowledge and practice, outline the limitations of the study, and summarise opportunities for future research which can be achieved by using the theoretical foundation provided in this thesis.
Chapter 7 - Conclusion

7.1 Introduction

This final chapter aims to conclude the research project. It starts by presenting a summary of the key findings (Chapter 6) in light of the research questions developed from the literature (Chapter 2) and revised in Chapter 3. I then present the major contributions of this study, and then outline recommendations for practitioners based on the findings. This chapter ends by summarising the limitations of this research project and by proposing future research opportunities.

This study aimed to answer the following overarching research question:

How do organisational initiators manage (recruit and maintain) SME involvement during the design phase (specification and development stages) of a new voluntary IOIS, and how can this be conceptualised?

The thesis answered this question by investigating how a State government initiated a new voluntary IOIS, in which stakeholders (staff from Catchment Authorities (CAs) in the State government and from the independent cooperative DairyCo) managed SME farmer involvement in multiple requirements analysis (RA) activities during the specification and development stages of the design phase. The IOIS intended to enable the CAs and SME farmers to share spatial information on environmental management (EM) (e.g. vegetation coverage in and fertiliser used on paddocks affecting water quality) via a website called the Farm Planning Tool (FPT). CA stakeholders needed this spatial information to monitor and report on targets relating to managing natural resources such as waterways in their assigned regions.

The case study on the design phase of the FPT was interesting because the project commenced when web-based spatial technology was emerging, so that SME farmers’ needs relating to the FPT were unknown compared to better-understood inter-organisational information exchanges (e.g. business transactions and SME knowledge sharing). CA stakeholders wanted to develop an understanding of farmer needs for the FPT directly from farmers, and to see how SME needs could align with the CAs’ own information needs. The newness of web-based spatial technology, however, meant farmers did not understand the potential use on their
farms to articulate their needs. CA stakeholders, therefore, had to convince farmers of the value in participating in RA activities relating to the design of an optional tool for which most farmers did not understand the technology or yet see a need on their properties.

This case study was, therefore, suitable as a context for answering the research question, because CA stakeholders in the State government wanted to recruit and maintain the direct involvement of SME farmers in RA activities. I, therefore, used the FPT design phase as the basis for identifying which stakeholder types had responsibility for recruiting and maintaining SME farmer participation, what invitation types and statements in those invitations they used to recruit farmers, and what techniques they used to encourage farmers to participate in multiple RA activities during the specification and development stages.

In this study, I contribute to theory by combining the stakeholder management framework by Boonstra (2009) and concepts from diffusion of innovation (DOI) theory by Rogers (2003), and by using these as an analytical and descriptive conceptual framework for making sense of my findings.

7.2 Significance and contributions of this research

It is widely recognised in the IS literature that user participation in RA activities throughout the design phase of an IS/IOIS is an important contributor to the success of IS/IOIS adoption and implementations (see Section 1.2). My review of the literature on IOIS (see Section 2.4) revealed, however, that IS scholars have largely overlooked how initiators of a new IOIS recruit and maintain the involvement of stakeholders (such as users) during the design phase. Instead, most research on IOIS focuses on the adoption and implementation phases of the IOIS lifecycle; that is, once the IOIS is already designed and ready for launch (see Sections 2.2 and 2.3). Similarly, my review of the RA and IS development literature (see Chapter 3) showed these studies focus on RA methods and the needs identified, and critical success factors of IS development. This literature also overlooks how developers of IS recruit and maintain stakeholder involvement in multiple RA activities during the design phase when participation by intended users is voluntary.
I argued in Chapter 1 that recruiting and maintaining the involvement of SMEs in the design phase of a new voluntary IOIS is difficult for initiators. Some reasons for this included SME heterogeneity and the need to convince resource poor owner-managers to take part in one or more RA activities due to the optional nature of their participation in the design phase. The challenge of encouraging SME participation during the design phase is further complicated because the final IOIS, launched after design, is also optional for SMEs to use. My review of the IS literature (see Sections 2.5 and 2.6) showed that IS scholars have not investigated how organisational initiators of voluntary IOIS manage these aspects of SME involvement during the design phase.

In this study, I did not aim to contribute to specific theories such as stakeholder theory or diffusion of innovation (DOI) theory. Instead, the overall lack of research in this area meant that prior studies had not identified theories or conceptual frameworks to make sense of this problem domain. The theoretical contributions of this thesis are therefore identifying concepts which IS scholars can use for analytical and descriptive purposes (Gregor 2006). These concepts are intended to offer a vocabulary and theoretical foundation for future (e.g. explanatory, predictive) research (Gregor 2006) relating to organisational initiators and their management of SME involvement during the design phase of a new voluntary IOIS.

This thesis, therefore, addressed this gap in IS knowledge and identified suitable concepts by studying how a government organisation initiator (and its internal and external stakeholders) managed (recruited and maintained) SME farmer involvement during the design phase (specification and development stages) of a new voluntary, web-based IOIS called the FPT. The thesis presented Boonstra’s work as a starting point for a conceptual framework, and then reported on the results of a hermeneutic process involving cycles of data analysis, returning to the literature to search for theory/concepts making sense of the emerging themes, and then re-analysis of the data (see Chapter 3).

I summarise the main contributions of this thesis in the points below. This study was exploratory and involved only a single case study, and therefore the thesis did not aim to produce generalisable conclusions. Nonetheless, the contributions can be
considered *naturalistic generalisations* (Gomm et al. 2000; Stake 1978; Stake & Trumbull 1982). In other words, the case study is presented with in-depth information which is sufficient for IS scholars (and practitioners in the case of recommendations for practice in Section 7.3) to determine if the analytical and descriptive concepts might apply to the contexts they are investigating.

1. **The thesis contributes to theory by confirming Boonstra’s conceptual framework was useful for making descriptive and analytical sense of some themes relating to how an organisational initiator managed SME involvement during the design phase of a new voluntary IOIS.** This is an important contribution because the IOIS literature (see Sections 2.4 to 2.6) does not examine the complexity of recruiting and maintaining stakeholder (and SME in particular) involvement during the design phase of an IS/IOIS, and thus the suitability of Boonstra’s concepts. The findings of this study confirmed the usefulness of three aspects of his conceptual framework to my problem domain:

   a. Boonstra’s framework distinguishes between *IS/IOIS lifecycle phases* and the *specification* and *development* stages of the design phase in particular, which enables IS scholars to analyse and describe if/how managing SME involvement differs between the two stages (examples are included below).

   b. The *stakeholder types* proposed by Boonstra enable IS scholars to analyse and describe which types were involved in recruiting and maintaining SME farmer participation, which types were not, and which types created problems. It also helped describe the complex responsibilities of more than one stakeholder type. For example, the board of directors’ responsibility in DairyCo was both a Decision-maker type and prospective User type based on Boonstra’s categories, because DairyCo was a cooperative and the board included active dairy farmers who could also be users of the FPT.
c. I found that stakeholders, both internal and external to the government initiator, had used all of Boonstra’s interest types or benefits in at least one instance of the invitations they used to recruit SME farmers. This finding suggests IS scholars can use these interest types to analyse and describe the nature of stakeholder invitations to recruit SMEs. For example, IS scholars can determine if an initiator’s stakeholders focus in their invitations on describing features of the voluntary IOIS (e.g. Technology Performance, User Friendliness) rather than benefits relating to using the voluntary IOIS (e.g. Strategic and/or Operational benefits).

Further, I show IS scholars can combine these concepts in Boonstra’s framework for further analytical and descriptive purposes. For example, I observed in my case study that stakeholders recruiting SMEs did not use some stakeholder interest types (e.g. Economic benefits) during the specification stage.

2. This thesis makes a theoretical contribution by extending Boonstra’s framework using concepts from diffusion of innovation (DOI) theory from Rogers (2003). This contribution was important because IS scholars have previously used DOI theory mainly to explore IS adoption/implementation phases, and not the design phase. The few IS scholars who apply DOI theory to the design phase focus on the diffusion of RA methods and conceptualising the IS artefact, or on the mechanisms of running RA activities (see Section 6.1). I make a contribution in this thesis by showing these concepts can also help IS scholars describe and analyse themes relating to how organisational initiators manage SME involvement during the design phase of a new voluntary IOIS. For example:

a. The DOI concepts of change agents and opinion leaders, and the associated concepts of homophily and heterophily, help describe the nature of the stakeholder types from Boonstra’s framework which had most responsibility for recruiting and maintaining farmer involvement. For example, prospective FPT Users were opinion leaders with a high degree of homophily with SME farmers involved directly in recruiting and maintaining farmers. Stakeholder types who were change agents
(many Decision-makers, the Developer) with a higher degree of heterophility relations with SME farmers were not involved directly.

b. The DOI concepts of interpersonal and mass media channels can help IS scholars describe and analyse the invitation types stakeholders use to recruit farmers. In this study, I found that stakeholders recruiting SME farmers used variations of both types of channels.

The analytical and descriptive potential of these DOI concepts were more evident when combined with Boonstra’s stakeholder interest types and IS/IOIS lifecycle phases (i.e. specification and development stages). For example, in my study it was interesting that CA staff recruiting farmers only used mass media channels during the development stage, and listed many interest types briefly in mass media rather than explaining how the FPT could achieve fewer benefits.

3. The thesis contributes to theory by presenting a new conceptualisation of how organisational initiators of a new voluntary IOIS manage SME involvement in the design phase using DOI innovation characteristics and innovation-decision process concepts described by Rogers (2003). I used these concepts to describe and analyse how stakeholders internal and/or external to the initiator recruited and maintained SME involvement as voluntary IOIS “instance” decision processes and RA activity participation decision processes. This is important because the IOIS, RA and IS development literature tends to view RA activities as, for instance, methodological steps, stakeholder identification/prioritisation and requirements which need to be elicited. These are important, but this literature does not use concepts to describe and analyse how initiators of a cyclical design of a new IS recruit and maintain the involvement of intended users in multiple RA activities. The two processes I describe are intertwined and relate to how stakeholders recruit SMEs into their first RA activity, and then maintain their involvement in further RA activities during the design phase:

a. Each RA activity has an “instance” of the new voluntary IOIS evolving during the design phase. These can include an initial idea (i.e. in this
study, web-based spatial technology) in the first RA activity of the specification stage, through to different versions of a prototype (i.e. the FPT tool) in each RA activity during the development stage. An initiator’s internal and external stakeholders need to provide knowledge about the “instance” to persuade intended users (i.e. farmers) of the value of the “instance” when inviting farmers using communication channels. Farmers base their decision to participate in their first RA activity on this knowledge and persuasion. My study suggests this was challenging when farmers had little knowledge of the voluntary IOIS technology. During the first RA activity, farmers seek confirmation of whether the instance is valuable as part of their decision to continue in the next RA activity. In any subsequent RA activity, farmers seek confirmation for each new instance.

b. An initiator’s stakeholders must also manage another aspect of a farmer’s decision to participate in their first and further RA activities; the RA activity decision process. This is related, but separate, to the “instance” decision process because there needs to be conditions to ensure RA activity attendance is easy for farmers. This can include providing knowledge about the RA activity aims and running the activity locally so that farmers do not need to travel. Farmers seek confirmation that participation in the RA activity was worthwhile as part of their decision to continue in the next and subsequent RA activities.

c. The innovation characteristics of DOI theory were useful in this study for characterising or describing the nature of voluntary IOIS “instances” between the specification and development stages. For example, early “instances” of an innovation (e.g. conceptual ideas) tend to have less trialability and observability, while later “instances” there are tangible “instances” (e.g. a prototype) which can be trialled and observed. The findings enabled me to analyse and describe how initiator stakeholders (e.g. the Developer) attempted to address these problems during the
specification stage, such as creating non-functional mock-ups of the conceptual idea so that farmers could observe how the FPT might work.

4. The thesis contributes to IS knowledge by providing evidence of the importance of IS scholars answering new research questions in future research. In Sections 2.2 to 2.5, I showed that most literature on IOIS focuses on the adoption and implementation phases of the IOIS lifecycle. For example, the dominant adoption-related research question is of the type: “Why do SMEs not adopt voluntary IS/IOIS?” This thesis, by contrast, emphasises that exploring the design phase of a voluntary IOIS could lead to new research questions of the form: “How do initiators design voluntary IOIS which contribute to slow adoption rates by SMEs?” For example, I found that DairyCo field officers were able to recruit SME dairy farmers with limited computer skills to try the FPT to create maps of their farm, and then develop their computer skills. This suggests that some “barriers” to SME adoption (e.g. lack of computer skills) may in part be due to initiators not designing voluntary IOIS which encourage SME owner-managers to adopt (or at least try out the tool) despite the barriers. This does not mean typical barriers are irrelevant, but it does suggest value in IS scholars examining the approaches used by initiators to see if they are contributing to the problem.

5. This thesis makes a contribution by extending three bodies of IS literature:

   a. This thesis extends the limited empirical literature on the design phase of IOIS (see Sections 2.4 to 2.6) by investigating how organisational initiators of voluntary IOIS manage SME involvement in the design phase. Importantly, I have shown in this thesis that an initiator’s internal and external stakeholders are non-trivial (i.e. complex and problematic), and that it warrants future research in its own right.

   b. I have explained in Contribution 3 that this thesis contributes to the literature on RA and IS development by investigating the overlooked area of how IS developers can recruit and encourage users to participate in multiple RA activities. This study suggests organisational initiators of
voluntary IOIS for use by SMEs, in particular, cannot take user involvement in RA activities for granted, as implied by the current RA and IS development literature.

c. While not an aim of the thesis, it also contributes to the growing body of research on the nexus between IS and environmental management, which is often termed “green IS” (Jenkin et al. 2011; Melville 2010; Melville 2012). In particular, Kurnia et al. (2014b) and Kurnia et al. (2014a) argue there has been little research on green IS in an inter-organisational context. This thesis extends IS knowledge in this area by reporting on a voluntary IOIS which was developed by a State government initiator with the aim of enabling stakeholders from the initiator to exchange spatial information on environmental management (EM), such as vegetation coverage in and fertiliser use on paddocks which affect water quality, with SME farmers via the FPT.

7.3 Recommendations for practice

In this thesis, I have argued there is a considerable lack of knowledge about the practical methods organisational initiators can use to handle the complexities of recruiting and maintaining SME involvement during the design phase of a voluntary IOIS. As outlined in Section 7.2, this thesis provides the theoretical foundation for future research in this area to identify effective practical methods organisational initiators can use. This section summarises practical recommendations arising from the study relating to methods which appeared to be effective for recruiting and maintaining SME involvement, and which ones organisational initiators should avoid. I do not claim the case study in this thesis is best practice in recruiting and maintaining SME involvement in the design phase of a new voluntary IOIS. Nonetheless, it is the first detailed empirical study, and it does suggest some practical insights based on comparing the approaches used by the CAs and DairyCo:

1. Both the CAs and DairyCo aimed to address the issue of SME heterogeneity by focusing on SMEs with a particular interest in EM when trying to recruit and maintain the involvement of SMEs in RA activities. Nonetheless, there was still heterogeneity among the SMEs targeted by the CAs, such as skill levels with
computers and the industry to which they belonged. DairyCo was able to recruit and maintain SME involvement more effectively than the CAs because DairyCo focused on a specific industry. This meant DairyCo did not need to persuade farmers from multiple farming industries with different EM and non-EM problems to take part. DairyCo also tailored their recruitment to farmers with low computer skills by emphasising how they could create basic property maps easier using the FPT than paper. A key implication of this study is that government stakeholders such as CAs perhaps should avoid recruiting SMEs into RA initiatives. Instead, government initiators of a voluntary IOIS aimed at SMEs from multiple industries should identify industry-specific parties which have a better understanding of SME needs regarding the IOIS, and which can tailor any methods of recruiting and maintaining SME involvement in RA activities.

2. The results of the study suggest State government resources were surprisingly limited in terms of investing in personnel needed to recruit and maintain the involvement of SMEs during the design phase of the voluntary IOIS. This finding offers further support for the previous recommendation that government initiators should avoid recruiting SMEs in RA initiatives. Instead, government initiators of voluntary IOIS may find it more effective to work with influential private sector organisations with more resources for such a project. The findings emphasise that this can require government initiators and the private sector to negotiate on mutually beneficial and common information needs the voluntary IOIS needs to address. For example, the CAs and DairyCo agreed to focus on a single EM-related problem of interest to DairyCo.

3. Both the CAs and DairyCo demonstrated the importance of identifying opinion leaders (such as the field officers and other farmers) who can recruit SMEs and maintain their involvement in the design phase. DairyCo believed they had been more effective at recruiting their farmers because their field officers and other opinion leaders (e.g. members on the board of directors) had more specialist knowledge of dairy farmers and their needs. This further emphasises the two previous recommendations that government initiators should avoid involving SMEs in RA activities directly, and instead involve respected, knowledgeable or
influential stakeholders who can play role as opinion leaders to do this on the behalf of government initiators.

4. The approach by DairyCo suggested that recruiting and maintaining SME involvement during the design phase might require focusing the voluntary IOIS on very specific interest types. Some informants reflecting on the CA approach to managing SME involvement confirmed they had been too optimistic about the information they could collect from SME farmers using the FPT. This suggests government initiators should avoid designing the voluntary IOIS with complex data focused mainly on satisfying their own information needs, and instead focus on SME needs. For example, DairyCo focused on one specific EM-related problem of interest to a number of farmers. This suggests initiators should, therefore, focus the design phase on a small number of high-value problems for SMEs, ensure the voluntary IOIS addresses these well, and then use this as the basis for expanding the capabilities of the IOIS over time. Another implication is that government initiators must compromise significantly on their optimistic information needs, focus on short-term gains, and work towards the longer-term.

5. Applying the concept of interest types from Boonstra’s framework, and the concepts of knowledge and persuasion from DOI theory, highlighted what appeared to be issues with how the CAs (and to a lesser extent DairyCo) designed their mass media communications to recruit SMEs. The CA approach was to list many interest types without any detail or persuasion tactics. This thesis did not aim to examine the effectiveness of the recruitment communications (only the types and what was said and how). Nonetheless, these appear to be useful for analysing the findings to identify practical recommendations relating to the effectiveness of communication channels used to recruit SMEs throughout the voluntary IOIS design phase. First, one recommendation is that mass media communications should be targeted based on SME profiles, and should specify two to three key benefits with an emphasis on persuasion or evidence why the IOIS will achieve those benefits. Second, interpersonal channels are likely to be more efficient than mass media for
recruitment during the specification stage when SMEs have little knowledge about the IOIS and difficulty envisaging their needs and how the IOIS might be of benefit. This suggests recruiters need to spend time educating SMEs about the IOIS, discussing the SMEs’ needs and determining if it will help the SMEs.

7.4 Research limitations and future opportunities

This thesis has limitations inherent with the research approach (see Chapter 4) and associated data collection. The research findings are therefore limited in that:

1. I examined only one case study of the design phase of a new voluntary IOIS. This means the theoretical and practical contributions may only be applicable to similar new voluntary IOIS projects run by government organisations in which their aim is to involve SMEs directly in the design phase. It may also reflect the approaches used by Australian government organisations. Nonetheless, this is the first detailed empirical study of how an organisational initiator managed SME involvement in the design phase, and the first to identify concepts for analysing and describing this complex process. The thesis, therefore, provides a very useful foundation for future research. Future research can investigate whether the theoretical concepts I identified to make sense of my findings are useful in other contexts.

2. This study focused on examined the approaches used by a State government targeting rural SMEs, so that it is not clear the findings would apply to private sector initiators and/or to voluntary IOIS aimed at urban SMEs. This study did identify different approaches taken by the CAs (government) and DairyCo (private sector), but it did not aim to compare their experiences and the associated challenges. Future research, therefore, can address this limitation by exploring, for instance, if different or similar approaches used by private and public sector organisation initiators are effective for recruiting and maintaining rural versus urban SME involvement in voluntary IOIS design.

3. I do not claim the case study was best practice in managing SME involvement in the design phase of a new voluntary IOIS, so it is important
to interpret the practical implications from Section 7.3 with caution. I instead selected the case study based on the complexity of its design phase, and the attempts made by the initiator to involve SMEs directly. It highlights that involving SMEs directly is feasible (although challenging). Future research can build upon my work by using the theoretical concepts I identified from the literature to determine best practice approaches initiators can use. This could include interviewing SME owner-manager participants in the design phase to ensure that their perspective is included when identifying best practice.

4. I asked informants to recall how they were involved in recruiting and maintaining SME involvement during the design phase, and this means their recollections may not be complete or fully reliable. I have explained the techniques I used to minimise this limitation in Chapter 4 (e.g. collecting secondary documents for triangulation). Future research can address this limitation by using the theoretical concepts I identified from the literature to conduct studies of design phases carried out by organisational initiators in real-time, and to conduct action research.

5. I did not examine how initiator stakeholders (e.g. the Developer) conducted or executed the RA activities, such as details on how they executed a regional workshop. This was because the RA and IS development literature already provides a lot of insight into how to design specific RA activities. Nonetheless, it is possible that the internal execution of an RA activity could influence whether SME owner-managers decide to continue in subsequent RA activities. Future research can, therefore, include investigation of these details of RA activities and the impact these have on maintaining SME involvement during the design phase of a voluntary IOIS.

6. A final limitation of the study is that I only examined organisational initiator stakeholders who had direct responsibility (e.g. employed or co-opted) to recruit and maintain SME involvement in the FPT design phase. In other words, I explicitly excluded external stakeholders from the study, such as
other government and environment agencies, which were not directly involved in the voluntary IOIS design process. This is a limitation of the study because such stakeholders may have influenced how initiators and/or their stakeholders involved SMEs. Future research can explore how external stakeholders influence SME involvement in voluntary IOIS design projects.
Appendix 1 - Copy of Approval Letter for Ethics Clearance

30 March 2012

Dear Craig and Wahyudi

BL-EC 12-12 Stakeholder involvement in designing inter-organisational environmental information management systems

Thank you for submitting the above project for consideration by the Faculty Human Ethics Advisory Group (HEAG). The HEAG recognised that the project complies with the National Statement on Ethical Conduct in Research Involving Humans (2007) and has approved it. You may commence the project upon receipt of this communication.

The approval period is for three years. It is your responsibility to contact the Faculty HEAG immediately should any of the following occur:

- Serious or unexpected adverse effects on the participants
- Any proposed changes in the protocol, including extensions of time
- Any changes to the research team or changes to contact details
- Any events which might affect the continuing ethical acceptability of the project
- The project is discontinued before the expected date of completion.

You will be required to submit an annual report giving details of the progress of your research. Failure to do so may result in the termination of the project. Once the project is completed, you will be required to submit a final report informing the HEAG of its completion.

Please ensure that the Deakin logo is on the Plain Language Statement and Consent Forms. You should also ensure that the project ID is inserted in the complaints clause on the Plain Language Statement, and be reminded that the project number must always be quoted in any communication with the HEAG to avoid delays. All communication should be directed to katrina.fleming@deakin.edu.au

The Faculty HEAG and/or Deakin University Human Research Ethics Committee (HREC) may need to audit this project as part of the requirements for monitoring set out in the National Statement on Ethical Conduct in Research Involving Humans (2007).

If you have any queries in the future, please do not hesitate to contact me. We wish you well with your research.

Kind regards,

Katrina Fleming

HEAG Secretariat
Faculty of Business and Law
Appendix 2 - Plain Language Statement for Interviewees

PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: Participant

Date: ……

Full Project Title: Stakeholder involvement in designing inter-organisational environmental information management systems

Principal Researcher: Dr Craig Parker (email: cparker@deakin.edu.au, phone: 03 9244 6924)

Student Researcher: Wahyudi Agustiono (email: wagustio@deakin.edu.au, phone: 03 9244 6100)

Associate Researcher(s): Professor Tanya Castleman and Dr Rodney Carr

You are invited to take part in this research project being undertaken by Wahyudi Agustiono as part of his PhD degree under the supervision of Dr Craig Parker, Professor Tanya Castleman and Dr Rodney Carr from Deakin University. This study aims to identify effective practices in how diverse stakeholder groups in a supply chain coordinate and interact when designing Inter-Organisational Environmental Information Management Systems (IOEIMS) for use by Small and Medium Enterprises (SMEs) suppliers. This study is timely given increasing demands on supply chains by consumers, advocacy groups and government entities to enhance and substantiate their environmental performance. Successful IOEIMS and environmental initiatives depend on balancing the competing interests of various stakeholder groups.

We have invited you to participate in this research project because you have valuable experience associated with the development of IOEIMS_Name. If you decide to participate, please contact the Student Researcher directly using the contact details provided above.

Your participation is completely voluntary. Once you have read this statement and agree to participate, please sign the attached consent form. You may keep a copy of this Plain Language Statement. Participation in the project, involving an interview at a time and place of your choosing, will take around an hour. The types of questions that you will be asked include:
Can you describe the role you and your organisation played in the development of IOEIMS_Name?

What were the critical stages in the process of developing IOEIMS_Name?

What organisations were involved in each of the IOEIMS_Name development stages? How would you describe the effectiveness of the roles played by each of these organisations?

We will record and transcribe the interview. Identifying information will be removed from the transcript to protect your privacy and confidentiality. All data will be stored in electronic form securely for a minimum period of 5 years after final publication. Access to the data will be restricted to the research team.

You may decide to stop the interview at any point. If you take part and later change your mind you are free to withdraw at any stage by filling out the attached revocation of consent form. Data collected to date will be destroyed but once we have removed identifying details from the data we cannot withdraw your data. Your decision not to participate or withdraw will not affect your relationship with Deakin University.

We plan to publish the results of this research in academic and industry publications. These publications will not include your identifying information because these will have been removed prior during data processing. Reports on the project’s results will be available on the web and we will email you the link to this.

Approval to undertake this research project has been given by the Human Research Ethics Committee of Deakin University. If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact: The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au. Quote project ID BL-EC 12-12.

If you require further information or if you have any problems concerning this project, please contact Dr Craig Parker or Wahyudi Agustaino via the contact details provided above.
PLAIN LANGUAGE STATEMENT
AND CONSENT FORM

TO: Participant

Date: ......

Full Project Title: Stakeholder involvement in designing inter-organisational
environmental information management systems

Reference Number: BL-EC 12-12

I have read, or have had read to me, and I understand the attached Plain Language
Statement.

I freely agree to participate in this project according to the conditions in the Plain
Language Statement.

I have been given a copy of the Plain Language Statement and Consent Form to
keep.

I am aware that the participation in this study is entirely voluntary and may quit the
study at any time.

I agree to allow an audio recording of the interview for the research project.

I am aware that I may refuse to answer certain questions or withdraw the consent
that information I have provided be used.

The researcher has agreed not to reveal my identity and personal details, including
where information about this project is published, or presented in any public form.

Participant’s Name (printed) .............................................................

Signature ................................................................. Date ..............................

Please mail or fax this form to:

Dr Craig Parker
School of Information Systems
Faculty of Business Law
221 Burwood Highway, Burwood 3125, Victoria, Australia
Phone: 03 9244 6924

Fax: 03 9244 6928
Revocation of Consent Form

Date: ……

Full Project Title: Stakeholder involvement in designing inter-organisational environmental information management systems

Reference Number: BL-EC 12-12

I hereby wish to WITHDRAW my consent for to participate in the above research project and understand that such withdrawal WILL NOT jeopardise my relationship with Deakin University.

Participant’s Name (printed) ………………………………………………………

Signature …………………………………………………………………..Date …………………

Please mail or fax this form to:

Dr Craig Parker
School of Information Systems
Faculty of Business Law
221 Burwood Highway, Burwood 3125, Victoria, Australia
Phone: 03 9244 6924

Fax: 03 9244 6928
Appendix 3 - Example NVivo Data Coding

Table A.1 provides an extract of my NVivo data coding to identify stakeholder types who recruited SMEs into requirements analysis (RA) activities. The example shows how I identified that CA and DairyCo field officers (who were also users of the FPT) were the main stakeholder types who recruited SMEs into the first and second FPT evaluations respectively. I had already identified the major design phase stages (specification and development) based on my analysis and interpretation of interview transcriptions and various FPT project documents (second level Node). I had already used this process to identify broad RA activities (third level Node) involving farmers.

**Table A.1: Extract of data coding to identify stakeholders who recruited SMEs**

<table>
<thead>
<tr>
<th>1st level Node</th>
<th>2nd level Node</th>
<th>3rd level Node</th>
<th>4th level Node</th>
<th>Interview/secondary data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder types who recruited SMEs</td>
<td>Development Stage</td>
<td>First FPT evaluation</td>
<td>CA field officers</td>
<td>... then the system was built. SpatialCo build the system. Then tested it with, we trained some extension officers to use the system, and then they worked with farmers, farmer groups in CA1, CA2, CA3 and CA4 regions. [Manager_CA1/Thesis Interview]</td>
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<tr>
<td></td>
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<td>So they, individual extension officers, were promoting the use of the FPT and working with groups during that time. [Manager_CA1/Thesis Interview]</td>
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<td>So the way that was organised is that, as I said before, we had four CAs involved in the consortium, each of those CAs identified a group of farmers who were interested in being involved in the trial. And each of the CAs put up one or two of their staff, who would be trained in how to use FPT and who would work with their group of farmers. [SpatialCo_Manager/Thesis Interview]</td>
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<td>Well, yeah we did because we worked with three you know some experienced extension officers and they had their existing farmer networks, so they contacted farmers [DLR_Researcher/Thesis Interview]</td>
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<td>I told them about the tool and offered them free training, so individual and group training, and really, the fact, it</td>
</tr>
</tbody>
</table>
sold itself, nearly, just about. So, by just making people aware of it and what its capacity was, people signed up... I think I've been lucky here because we've had very active EA groups, so I've tapped into those. [CA2_Field_Officer/Thesis Interview]

Second FPT Evaluation DairyCo field officers

[Name of DairyCo field officer] rang us up. It sounded interesting and we thought we might get something out of it. [SME_Farmer3/FPT evaluation report]

Initially we engaged with the farmers that had an interest in environmental stewardship and they were the easy. They were already interested in those sorts of things so they were happy to engage with it. [DairyCo_Field_Officer1/Thesis Interview]

We invited farmers [into the FPT evaluation] by a number of means, personal written invitation, phone calls, flyers delivered directly to farm, field services newsletter articles, DairyCo's newspaper articles. [DairyCo_Field_Officer1/Thesis interview follow-up]
References


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