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A Framework for Investigating Open Innovation Processes in ISD

Susan O'Neill, Kieran Conboy and Lorraine Morgan
National University of Ireland, Galway

The theme of this year's ICIS conference focuses on connectivity and collaboration. In Information Systems Development (ISD) these concepts are increasingly important as developing effective information systems is rarely a task that can be completed in isolation by a single co-located team. Connectivity and collaboration with a wide range of external sources of knowledge is required; a trend which is in line with the concept of *Open Innovation* - the flow of ideas into and out of an organization. The literature on Open Innovation (OI) uses a variety of definitions and focal points, which do not yet cohere into a useable analytical framework. This research-in-progress paper proposes an important and unique tailoring of a widely used ISD framework, Method-in-Action. By integrating the literature on OI, a conceptual framework has been developed which illustrates some significant aspects and factors which need to be considered when investigating open innovation process use in ISD.

Introduction

Today the development of effective information systems is rarely a task that can be completed in isolation by a single co-located team. Connectivity and collaboration with a wide range of stakeholders is required (Pouloudi 1999) as ISD teams can no longer afford to isolate themselves (Elbanna 2008) and need to include external sources of knowledge in the development process (Segelod and Jordan 2004).

This trend towards connectivity and collaboration is in line with what Chesbrough (2003) coined *Open Innovation*. Viewed through the simplest lens, Open Innovation (OI) is the flow of ideas into and out of an organization. A more formal definition describes OI "as systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with firms capabilities and resources and broadly exploiting those opportunities through multiple channels" (West and Gallagher 2006b p. 82). Factors such as increasing the speed of development, reducing cost and meeting customer demand are frequently cited as motives for implementing an OI model (Chesbrough and Crowther 2006; van de Vrande et al. 2009) –motives that are also highly relevant in Information Systems Development (ISD) projects, suggesting the potential benefits of an OI approach.

However, ISD is complex and operates in a turbulent environment with frequently changing requirements, dynamic skill sets and high levels of social interaction, all of which suggest that there are potentially unique challenges associated with the use of OI processes. Indeed in a recent study of the implications of OI in an agile systems development process, it was found that openness is often compromised by many factors, including a perceived competitive element and lack of transparency between business units (Conboy and Morgan 2011). In order to fully understand OI in an ISD context, it is necessary to take into account a wide range of aspects and factors which can influence the use of OI processes; so far, however, there has been little discussion about these in the IS literature.

The method-in-action framework, developed by Fitzgerald et al., (2002) takes into account the complex web of relationships inherent in the ISD process, and illustrates some significant aspects and factors that need to be considered, including the concept of method-in-action which refers to the actual method in use. Our research posits that the use of Open Innovation processes can be considered similarly complex, and also needs to take into account a variety of aspects. Tailoring the method-in-action framework to incorporate OI process use will allow practitioners and researchers to reflect on OI as a rich and complex process influenced by a number of components and their interactions.

Open Innovation in ISD

Today most information systems are not only conceptually part of a larger system, but are connected to and interact with other systems, possibly in a global network (Fitzgerald et al. 2002). The setting in which all computer-based IS were constructed 'in house' to meet an organization's specific predetermined 'requirements' has moved towards a more open approach where most IS are constructed from generic packaged software, often with the mandate to radically change an organization's structures and practices (Avgerou, 2003). These ISD projects are typically complex, require advanced skills, and are knowledge intensive; they are also well known for running drastically over-budget or failing altogether (Conboy 2010).

The need for creativity and innovativeness during this ISD process is increasingly being recognized in practice (Tiwana and McLean, 2005) indeed, creative and innovative activities are considered to play a pivotal role in all aspects of IS development, from requirements definition through program design (Cougar 1990). Newer methods of ISD such as agile methods, aim to provide more opportunity for innovation as they are less focused on rigorous documentation and more focused on people and processes. Agile approaches suggest that frequent interaction between individuals, and continually involving the customer in the development process, lead to the development of more innovative and hence more valuable information systems (Beck 1999; Schwaber and Beedle 2002). It is not just the customers that need to be involved; connectivity and collaboration with a wide range of stakeholders during the development process is becoming very important (Pan 2005; Pouloudi 1999; Pouloudi and Whitley 1997). Lyytinen and Hirschheim (1987) underline the importance of stakeholders by stating that fulfilling the expectations of relevant stakeholders is an integral part of IS project success. In addition,

other sources of knowledge such as consultants, suppliers, universities and trade fairs are frequently used (Segelod and Jordan 2004) and it has been suggested that ISD projects need to 'scan the open space of innovation and actively look for partners, competitors, and collaborators' (Elbanna 2008) as relying on a closed model of innovation is no longer appropriate.

This trend towards more open approaches during the development process is comparable to the open innovation model. Open Innovation describes the use of purposive inflows and outflows of knowledge to accelerate internal innovation, while also expanding the markets for external use of innovation (Chesbrough 2003). Using an open innovation approach, projects can be launched from internal or external sources and new technology can enter at various stages; in fact, useful knowledge is believed to be widely distributed and of generally high quality (Chesbrough 2006). While the term OI has not received much attention in the IS literature, there are many instances of the use of open approaches. For example, new inter-organizational systems such as Supply Chain Management aim to integrate key business processes from original supplier through to end user, providing products, services, and information that add value for customers and other stakeholders (Lambert and Cooper 2000). Outsourcing, peer production and co-operative development are other instances of an open approach as is Open Source Software development which is regularly used as an exemplar of Open Innovation (Morgan and Finnegan 2008).

The OI approach provides potential benefits to ISD. Studies in new product development suggest that using OI processes can have a beneficial impact on project performance. For example; management access to external knowledge significantly increases the likelihood of on-time completion of information technology projects (Mitchell 2006); project success relies on the development and management of strong ties with external knowledge networks (Nagarajan and Mitchell 1998); and, high performing development teams carry out more external activities and show higher frequency of communication with external colleagues than low-performing development teams (Ancona and Caldwell 1990; Ancona and Caldwell 1992). However, there are limits to its usefulness and not all companies possess the characteristics needed to benefit from OI (Gassmann and Enkel, 2004). ISD teams have to walk a fine line between budget, time constraints and functionality; too much openness could actually be damaging as suggested by the curvilinear relationship between OI and performance identified in Laursen and Salter's study (2006). The ISD team needs to ensure that the balance of openness is consistent with their goals and objectives. Consequently, the cost / benefit of OI processes should be analyzed and a conscious decision on when (and when not) to implement OI, and also what type of OI process to use, is required to reap the most benefit from this approach (Gassmann and Enkel, 2004).

Investigating the use of OI processes in ISD is important. Open innovation has become the umbrella that encompasses, connects, and integrates a range of already existing activities (Huizingh 2011) and understanding the underlying complexity of OI process use is necessary in order to help assist in identifying an appropriate approach for a particular ISD situation. This research intends to tailor a widely used ISD method-in-action framework, (Fitzgerald et al. 2002) to help understand the complex nature of Open Innovation and the use of OI processes in practice.

Tailoring the Method-in-Action Framework for investigating the use of OI Processes

The method-in-action framework (Fitzgerald et al. 2002) was derived from an intensive study of previous research on ISD, along with empirical research carried out over a number of years. Since its introduction, it has been widely used in the IS literature (e.g. Backlund 2002; Lang and Fitzgerald 2007; Lundell and Lings 2004) and has been validated as a framework that takes into account the highly complex nature of ISD today (Madsen et al. 2006). An important aspect of the framework is its recognition of the complexity of ISD as a fully dynamic dialectic system in itself. Each component of the framework contributes to the overall system; it is never possible to comprehensively define any of the components without taking the entire framework into consideration. The framework does not prescribe action, instead it makes it possible for practitioners and researchers to reflect on ISD as a rich and complex process influenced by all the framework components and their interactions.

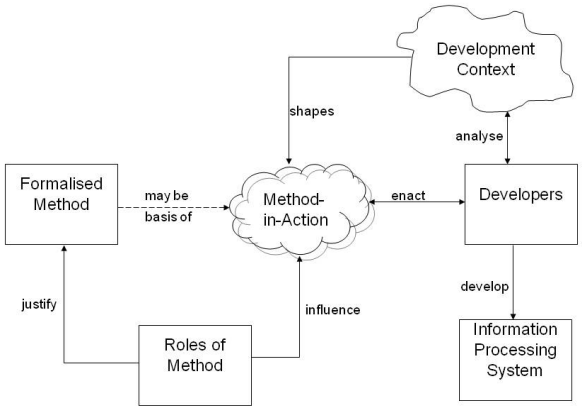

Figure 1. A Framework for ISD Method Use (Fitzgerald et al. 2002)

Many studies have focused on various aspects of the open innovation process, however, the internal process by which companies manage open innovation is still more trial and error than a professionally managed process (Gassmann et al. 2010). By taking a broad interpretation we suggest that 'OI process' use can be considered a subset of the 'method' in the original framework, thus the method-in-action framework can provide a basis for gaining an understanding of the OI-in-action and the way OI processes are used in ISD.

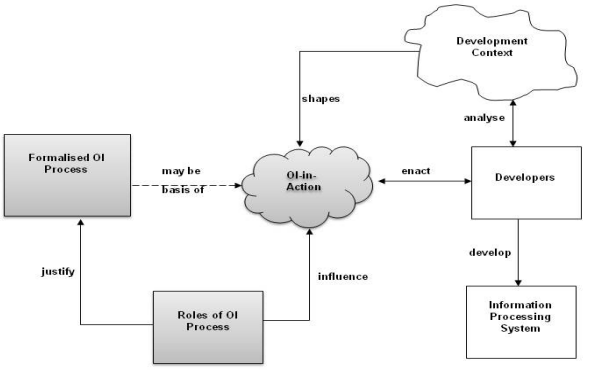

Figure 2. Tailored Framework for Open Innovation Process Use

Formalised OI Process

Analogous to the formally documented methods in the original framework, formalised OI process is intended to include any formally identified approach to using open innovation processes. *Formal OI processes* provide a basis to explore the types of OI process used within ISD. The OI literature suggests

that there are three main OI processes in use; inbound, outbound and coupled (Dahlander and Gann 2010; Gassmann and Enkel 2004). Organizations tend to focus on specific OI processes, for example inbound is more common than outbound (Chesbrough and Crowther 2006) and specific activities within these processes e.g. the search for and integration of external sources of knowledge (Laursen and Salter 2006). However, there is little known about the processes used in ISD. The importance of external sources of knowledge (Segelod and Jordan 2004) suggests that inbound OI processes are prevalent but outbound and coupled OI processes have not received much attention to date. It is also not clear whether OI process use is formally identified and planned or whether it is carried out on a more ad-hoc basis.

OI-in-Action

The method-in-action framework suggests that in actual development practice, formalised ISD methods are rarely applied as originally intended by their creators, although they may provide a template for guidance. Different developers will not interpret and apply the same method in the same way, even the same developer will apply the method differently in various development situations. In the tailored framework the method-in-action is replaced with the term *OI-in-action*, which signifies the OI processes actually being used. While the OI-in-action can be based on a formalised OI process; there may also be OI processes in use without a formalised basis – something that is depicted in the framework (see Figure 2) with the dashed line highlighting the fact that there *may* be a formalised OI process in place, but this is not essential.

Thus the *OI-in-Action* component of the framework ensures that ad-hoc OI process use is not overlooked. This part of the framework provides the basis for understanding a wide range of activities which can be considered OI while also taking into account the fact that where formalized OI processes exist they may not be used exactly as intended.

Roles of OI Processes

In the vein of the original, the tailored framework suggests that the roles of OI processes may not be straightforward. There are a set of *rational roles* which form part of the conceptual basis and rationale behind the use of OI processes, in addition to a set of political roles that OI processes may play. Reflecting on the various roles, along with the issues involved, contributes to the process of devising the OI-in-action. It is suggested that these roles can *justify* a formalised OI process, but equally they can *influence* the OI-in-action.

Development Context

The *development context* is considered the foundation of information systems development, and the importance of awareness and a detailed understanding of the context is emphasised as a vital part of the original method-in-action framework. The tailored framework acknowledges the importance of the development context and aims to explore aspects of the context and also the relationship between context, technology, culture and change to consider whether they *shape* the OI-in-Action, as suggested by the arrow in Figure 2.

Developers

As with the original framework, the term is used in its broadest sense and is intended to cover the multiplicity of stakeholders, system users, analysts, designers, programmers, clients and problem owners. The importance of the developer is emphasised in the framework, with a number of developer-related factors considered including the capabilities of individual developers, commitment & motivation, learning over time, knowledge of application domain and developer autonomy.

OI processes are merely frameworks and the ingenuity and ability of the people involved is imperative if they are to be effective. There are many references in the literature surrounding the capabilities of the people involved; the importance of absorptive capacity (Cohen and Levinthat 1990; Dahlander and Gann 2010; Elmquist et al. 2009) along with other competences such as the ability to codify and share knowledge with external entities (Gassmann and Enkel 2004), the use of internal 'champions' who can interact effectively with others (Chesbrough and Crowther 2006), flexibility of internal resources (van de

Vrande et al. 2009) and the notion of 'relational capacity' to build and maintain relationships with partners (Gassmann and Enkel 2004). Developer factors are thus potentially highly important and are taken into account in the tailored framework in the manner in which the developers *analyse* the development context and uniquely *enact* the OI-in-action to *develop* an information processing system.

Information Processing System

The method-in-action framework stresses that the information processing systems being developed are not all alike. It identifies a number of *families* of systems based on dimensions such as system purpose criteria, system complexity criteria, solved v. unsolved problem contexts, unique v. standard and shifting and drifting. The family resemblance makes it possible, despite the uniqueness of each system, to use knowledge from earlier open innovation initiatives. These families are therefore important, as the differing characteristics of each family serve to affect the OI-in-action that will be needed to develop them.

Next Steps

Similar to the original method-in-action framework the intention is that the tailored framework will be used as a tool for analyzing and understanding different forms of OI process use within an ISD context. The use of OI processes in ISD lacks empirical evidence, and this framework will provide a means to structure the analysis and understanding of OI process use, without having to go into the all the details of the complexity of each new approach (Fitzgerald et al. 2002).

The research is in its early stages and to date has focused on theory building and the tailoring of the method-in-action framework for OI use. As part of a larger empirical study, it aims to validate the framework in a number of ISD settings. The framework components will be used as the basis of the study, providing a rigorous way to investigate the factors and interactions that influence the use of OI processes in practice.

The study will use a multiple-case design, aiming to provide a meaningful and stark comparison. In keeping with the original ISD method-in-action framework, this research intends to validate the framework using a number of current ISD scenarios. The scenarios will include open sources software development, ERP development and web development. In the original context these scenarios were chosen based on the fact that they represented new forms of practice and at the same time challenged the common and traditional understanding of ISD. These scenarios also use open approaches to development and by incorporating these new directions into our framework, we can validate the use of OI processes in these newer ISD scenarios, while also bearing in mind the complex nature of the ISD itself.

Conclusion

While there are a wide range of papers and books published on the concept of Open Innovation, these use a variety of definitions and focal points which do not yet cohere into a useable analytical framework. We proposed an important and unique adaption of a widely used ISD framework, Method-in-Action. By integrating the literature on open innovation, a conceptual framework has been developed which illustrates the nature of open innovation, and highlights some significant aspects and factors that may need to be considered, including the concept of OI-in-action.

The focal point of this research is the use of OI processes in ISD, the 'OI-in-Action'. There is a trend towards open approaches in ISD, but to date there is little empirical evidence of the use of OI processes, or the factors which impact this use. This research-in-progress is part of a larger study which aims to investigate the factors and interactions that impact the use of OI processes in ISD, in order to better understand the underlying complexity and thus help assist in identifying an appropriate approach for a particular ISD situation.

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