

DEVELOPING NEW TECHNOLOGY IN FACILITIES MANAGEMENT THROUGH KNOWLEDGE ROLES

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Facilities management (FM) is a complex discipline involving diverse areas with various responsibilities in maintaining a building. The paper explores how knowledge impacts on the development of technology in this discipline and the role of knowledge in shaping the outcome of the technology. The paper uses service innovation theory to understand the development of technology. The study described in this paper is based on a two-year case study in an in-house FM department at a financial institution. The department is examining a ubiquitous technology in the form of Radio Frequency Identification (RFID) for security and workspace management. Ethnography methods were used in gathering data as the researcher formed part of the team who were introducing RFID. Critical Discourse Analysis (CDA) was used to explore how the technology was developed in two recorded workshops in the FM department. The research identified three knowledge roles: Intrapreneurial knowledge, Actors knowledge and Higher management knowledge. All knowledge roles are necessary in making the technology a relevant application within FM and within the organisation. The findings indicate that actors are necessary in developing how the technology should be used within their area; higher management knowledge is important in ensuring that the technology fits the overall strategy of the organisation and intrapreneurial knowledge was central for combining the knowledge from each role and applying it to the technology. This paper will advise facilities managers on how to organise technology development within the discipline. The study also had some implications on the innovativeness of FM.

Keywords: facilities management, service innovation, knowledge, critical discourse analysis.

INTRODUCTION

Facilities Management (FM) is a diverse area and involves various activities that provide services to an organisation. FM covers an extremely wide field of activities (Nutt, 1999), and the domain of FM is wider than what it has been in the past (Chotipanich, 2004). As FM is a service it falls under the characteristics associated with services – intangible, co-produced between firm and customer, perishable and experienced or heterogeneous (Dolfsma, 2004:321). The development of a service needs the participation of a wide range and well informed stakeholders (Roberts, 2001 in Mudrak *et al.* 2005). In introducing any change FM need to be aware of the organisation's capabilities, resources, and changing needs (Krumm *et al.*, 1999 in Mudrak *et al.* 2005). Introducing a technology that will change a FM service or introduce a new FM service into an organisation will need a vast array of knowledge in understanding the organisation's capabilities, resources, and changing needs.

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Service innovation theory is used to explore the introduction of new technology into FM. Sundbo's (1997) innovation decision model is used in this paper. There are four stages in the model – idea generation, transforming the idea into an innovative project idea development and implementation. The stage considered here is idea development. Sundbo (1997) defined the idea development stage occurring when a project group is established to develop the idea further. Introducing a new technology to FM require knowledge from various groups as services are co-produced, linked to the organisation's strategy and much of the knowledge required is based on experience. Knowledge from a variety of groups is imperative to shaping the technology to suit the needs of FM and the organisation as a whole.

This paper develops knowledge in terms of developing an idea with the idea being the technology of Radio Frequency Identification (RFID). It identifies three types of knowledge roles – intrapreneurship knowledge, actors knowledge and higher management knowledge. A case study at a financial institution that had its own in-house FM department was used to explore the introduction of new technology into FM. During this case study, two workshops were held to develop the technology to meet the needs of FM and the organisation. These workshops are used to explore the role of knowledge in developing technology for FM.

DEVELOPMENT OF IDEA THROUGH KNOWLEDGE

The initial idea to develop a technology for FM in an organisation may occur at the idea generation stage by an intrapreneur or intrapreneur(s). Kanter (1983) and Pinchot (1985) describe intrapreneurs as having entrepreneurial personalities but they are located inside an organisation and are proponents for maximising their activities. At the idea development stage a project team is established as it is impossible for the intrapreneur to develop the technology alone. Vermeulen and Van der Aa (2003) support the view that “the traditional “throw it over the wall” phenomenon where individuals work in isolation needs to be changed into an integrated development approach” (Vermeulen and Van der Aa, 2003:45). Knowledge from various groups is necessary to achieve this integrated development approach. Bessant and Tidd (2007) describe two different types of knowledge

5. Explicit knowledge, which can be codified, that is expressed in numerical, textual or graphical terms, therefore is more easily communicated
6. Tacit or implicit knowledge, which is personal, experiential, context specific and hard to formalise

This paper is interested in turning tacit knowledge into explicit knowledge as the knowledge that underpins new activities often comes from the organisation employee's experiences (Miles, 2003) and these experiences need to be made explicit in developing technology for an FM service.

Knowledge through context

Individual knowledge can be reactionary to the context of the organisation and vice versa. Bessant and Tidd (2007) found that individuals learn within the context of the organisation, which in turn affect their performance in the organisation. Nonaka and Takeuchi (1995) argue “turning this individual knowledge from tacit to explicit knowledge that will eventually affect the performance of the organisation is done through a process of dialogue, discussion, experience-sharing and observation such knowledge is amplified at the group and organisational levels” (Nonaka and Takeuchi 1995 in Bessant and Tidd, 2007:190). It is in dialogue that ideas can be developed and

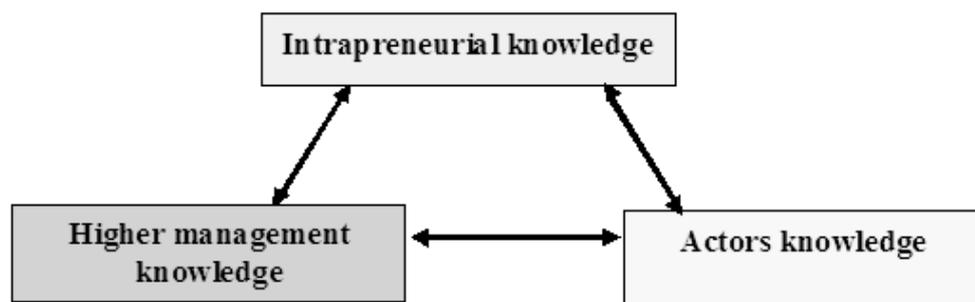
the tacit knowledge of actors involved in developing a technology can be accessed. The development of knowledge occurs in the interaction individuals have in an organisation and the interaction with other individuals. Sundbo and Gallouj's (2000) would refer to these individuals as 'actors'; "actors are persons, firms or organisation whose behaviour has importance for the service firms possibilities of selling services and therefore for their innovation activities" (Sundbo and Gallouj's 2000:22). Sundbo and Gallouj (2000) see the development of an as having the ability of creating a 'snowball' effect where one new idea leads to the generation of another through the interaction of various actors. Individual knowledge would appear to be influenced by the interaction of various actors and the organisation culture but the organisation culture is influenced by the decisions of higher management.

Higher management often make decisions that impact on the culture of an organisation through building various strategies and therefore influence the experiences of individual in the organisation. Sundbo (1992) found that businesses gear towards powerful management and not the bureaucratic hierarchy of Max Weber, which is a top down form of management. The direction is toward a goal-directed common behaviour, where management consists of guidance and communication more than the issuing of orders. Higher management define an organisational strategy and prefer to control the development of a service so that it doesn't steer away from the strategy of the organisation.

Modelling idea development

The development of the idea seems to be initially based on the knowledge of the intrapreneur who then needs to develop the idea the idea further. The further development of the idea is done through discussion and making the tacit knowledge of employees or actors in the organisation explicit. However, again in terms of innovation, higher management often influence actor's knowledge as they try and direct innovation to suit the strategy of the organisation. Therefore, in terms of developing knowledge for FM technology development, there appears to be three knowledge roles that interact to develop the technology, illustrated Diagram 1.

Diagram 1 Model of knowledge roles



The intrapreneur – The intrapreneur has thought of the initial idea, it is necessary to understand her/his knowledge of the newly developed service.

The actors – These are individuals that have been described by Sundbo and Gallouj as playing an important role in the development of the idea and therefore it is necessary to understand their views of the how they want to see the idea developed.

Higher management – Sundbo (1997) has described higher management as steering the project within the strategy of the organisation.

Introducing a highly technological solution to the diverse area of FM can be complex. Development of the technology for the application may come from actors who know the area of FM that they work with in but who are not technologically minded or from higher management who have an understanding of how a change in FM will impact the rest of the organisation. The intrapreneurial knowledge comes into play in brokering the knowledge between the needs and wants of the FM people and the capabilities of the technology system. The following will highlight how the model comes into play through the analysis of two FM workshops.

APPROACH AND METHOD

The paper aims at exploring technology adoption in FM through knowledge roles. A revelatory single case study was conducted in a financial institution. Yin (1994) claims that a single revelatory case study is appropriate when the researcher has an opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation. This researcher had an opportunity to observe and analyse the process of introducing a technology into FM in one financial institution over a two-year period which previously not been done. The opportunity arose during her employment in the case study organisation and the organisation's agreement to allow her to use data collected from the project for her PhD.

Ethnography methods are used in the case study. The researcher was directly involved in implementing the technology but also observed the social groups involved in the innovation process. Burawoy (1991) describes ethnography as participant observation and 'what distinguishes participant observation is the study of people in their own time and sociology, studying the subject in their "natural habitat" as opposed to the "unnatural" setting of the interview or laboratory' (Burawoy, 1991:1). Participant observation enables access to information/data in its natural environment, which is not always possible for a researcher entering an organisation 'cold' – not knowing the participants of the study. The researcher can become familiar with the social groups or community of the study. However, Burawoy (1991) points out that one of the criticisms of being a participant in the project is that the researcher may be influenced by personal views built up from interactions with participants in the study.

For this paper, two workshops were observed and recorded with the use of a dictaphone. The recording of the workshops proved useful as it captured the flow and the atmosphere of how the meeting occurred and any tensions that emerged. The researcher was present in both workshops but as a participant of a meeting in the role of employee, it was difficult to be aware at all times of important aspects of the meeting and capture the atmosphere through note-taking. The recordings give a clear indication of the tone and interactions that were apparent throughout each meeting.

The recorded workshops were analysed through the ontological position of critical discourse analysis (CDA) which is underpinned by constructionism. Fairclough and Chouliaraki (2002) see CDA as being both as theory and as method. Fairclough (1995) explains that it is the term 'critical' implies making visible the interconnectedness between concepts and practices. Gee (1999) refers to discourse analysis as being how people make statements based on the time and space of what they know about an event or subject - they make statements based on their situational knowledge. The use of CDA in this analysis attempts to examine the tensions, relationships and the underlying meanings of what individuals perceive as reality.

CASE STUDY BACKGROUND

The case study is situated in an in-house facilities management department in a large financial institution. The facilities management department wanted to introduce Radio Frequency Identification (RFID) into eleven administrations buildings varying in size, the largest with a capacity of 2400 people. RFID works on a networked system; a RFID tag contains information, which can be read by a RFID reader/transponder and transported to a database, which can then make use of the information (Garfinkel and Holtzman, 2006). The FM department wished to use RFID for access control. They wanted to place an RFID tags into the identity cards of employees and place readers at entrances and at secure points around the building.

The FM department saw added benefits for volume and capacity studies. They saw that the information from the security system could also be used for finding out the actual numbers of people using the buildings by time/day/month/year. They also wished to place readers at key decision points around the building in order to understand what areas were being over or under used in the building.

The two workshops analysed in this paper were made up of facility managers from different areas. The first workshop was based within security, occurred in February 2007, and was requested by security to find out how they could assist in developing the technology for security area. The group were responsible for the security, services, contractors and maintenance of the institutions' buildings and branches.

The second workshop was based within workspace management and occurred in March 2007. The context of this workshop was that the researcher was working on scenarios of the types of reports that she believed would be useful for volume and capacity studies. The researcher wished to consult the space managers on their views of the usefulness of the data set to their work and get ideas of other data that they wished to have.

FINDINGS

The findings are divided into the previous identified roles – intrapreneurship knowledge, actor's knowledge and higher management knowledge. The following section explores the knowledge role in the context of the workshops and the differences that occurred in each workshop.

Intrapreneurship knowledge

In the context of this study, intrapreneurial knowledge means more than just having a good idea but developing that good idea based on knowledge prior to the project and the continuous development of that knowledge during that project. In the two workshops, Terry the project manager and intrapreneur of the idea explains the technical possibilities RFID. In the security workshop, he speaks of the design of the RFID system.

Terry: ...the other element is that we are also proposing to put tags on laptops... The system will work on in as much as my tag will be associated with my laptop tag and if the two go out together – it is not an issue. If Connor walked out with my laptop, there would be an alarm... And that can be linked to CCTV, to immediately video that incident as it happens, so if you've got camera pointing in the right direction, you can pick those incidents up. So that how I, how we built the system to make it work.

(Security workshop February 2007)

Terry is speaking from the role of an intrapreneur and during the dialogue he refers to two discourses: technicalities of the system and application of the system. The technicality of the system is referred to as he mentions tags, laptops and CCTV as these are objects that enable the security system. The applications that Terry refers to such as, “if Connor walked out with my laptop, there would be an alarm”, is done so that security people understand the application of the technical capabilities in terms that are familiar to them.

The aim of the second workshop with space managers was based on building a database for workspace management part of the technology development. Again Terry takes an intrapreneur role and gives a synopsis of his own knowledge based on what he has learnt through the course of the project. In this workshop Terry focuses on the discourse of application of the technology rather than the technicalities of the technology.

Terry: ...And for you guys how often is a door used which will give you some idea of how many people are going in that area; is there an evaluation that you could do on meeting spaces there because people are dwelling there for so long or not so long...

(Space management workshop March 2007)

Terry speaks to the space planners in reference to the technology by focusing on a discourse of application of the technology. He refers to possible situations of how space could be evaluated with the technology. Like the security workshop, he speaks in terms that they would understand 'meeting spaces' and 'dwelling' but he does not make any reference to the technicalities of the system as he had done in the security workshop.

Actors Knowledge

Actor's knowledge is the knowledge of those most affected by the technology as they need to be consulted to ensure the technology that is being implemented is relevant in their area. In order to develop a technology for FM, the intrapreneur needed to speak to the FM team most affected which was security and workspace management. The facilities managers in both workshops have a lot of knowledge based on their experience of working in the organisation. While this knowledge is tacit as it is based on their experience within the organisation and within their job role, the workshops was an opportunity to make this tacit knowledge explicit to the intrapreneur.

In the security workshop, the group speak from discourse of experience referring to their own practice knowledge of security. In this workshop, the security managers are accepting of Terry's ideas but as the workshop progresses and more dialogue is exchanged they begin to see problems with some of Terry's ideas. One of Terry's suggestions was to replace security guards at entrances with turnstile barriers. The security managers go into a discourse of scepticism of the idea while Terry goes into a discourse of defence. One security manager, Connor, envisions the future RFID system as being vulnerable to a security breach by relying only on barriers at entrances. He is supported by another manager, Pat, who refers to how guards provide a 'visual check' where with barriers 'electronically isn't visual'. During this exchange of views on the problems of replacing guards with barriers, Terry becomes more defensive as he continuously refers to the current security system stating “the same as the current system” suggesting that he did not see anything wrong with his ideas as he based them on the current security system. However, another security manager, Keith, feel that is the real issue that ‘that is exactly the point’. Keith feels that the new system

should be different to the current security system. In the end Terry is persuaded by what is being said to him and sees that it is necessary for him to get 'the bigger picture' of what could happen if he decided to go with unmanned guards at entrances. It is the underlying discourse of conflict that emerges through the discussion of guards and barriers that highlights an issue in the current security system and could be addressed in the new security system.

In the workspace management there was no discourse of conflict as seen in the security workshop. The prime discourse was that of confirmation of ideas and therefore there was no real development on from what has been established by the intrapreneur. At one point Eugene, a space manager, tries to contribute to the meeting by stating that he believed it would be useful to have an RFID reader for each meeting room. This is not a new idea for Terry as he came up with this idea previously - 'when did I first propose that'. Terry continues by mentioning how Eugene and he proposed it years ago. Eugene admits that it has been proposed 'several times, it's getting closer'.

The main issue in the workspace management workshop was that there was very little interaction or development of ideas and all the ideas mentioned mostly originated from Terry the intrapreneur. The workshop came more of a discourse for reporting or updating forum rather than a discourse for development of the technology. Terry tried to encourage further ideas but overall the discourse for the workspace management workshop compared to the security workshop was strained and unenthusiastic.

Higher management knowledge

Higher management knowledge was important for the development of the technology within FM. FM must work in the strategy of the organisation, which is mainly set by higher management. Sundbo (1997) described how higher managers try to control and guide the process of innovation but he also found that it was rare that they were the innovator themselves and were dependent on other members of the organisation to drive innovation. The higher management referred to in this study is the chief executive, head of the department and those on the executive committee in the organisation who approve projects. Higher management were not part of either of the workshops but they still influenced the decisions made in the security workshop but had little to no impact on the workspace management workshop.

The security workshop highlighted the discourse of power that higher management had related to the development of the technology. The head of department of the FM department, Rob, was influential in bringing the project through the to approval system of the executive committee. While Terry is the intrapreneur of the idea and project manager, Rob directed him on areas of the project that he wanted emphasised. Terry mentioned that the head of the department, Rob, wanted him to provide options to the executive committee. Terry implies that he has no option but follow the instruction given to him by Rob. A discourse of frustration is apparent at the power that the head of department has over the project. The security manager main concern was to have a new access control system and he did not think that the executive committee would want several options of what the system can provide and will only consider one option. He wanted this one option to be an RFID system for security alone rather giving the option of an RFID system for security with the added benefit of space management studies.

Keith: I am concerned purely on one area, which is this. If we don't get a decision which people want more information on and spend all that money in one go or whatever – you are actually jeopardising something that is quite important. We have to replace the cardkey.....if we keep bolting things into this project with all due respect to Rob [Head of department], that is what Rob is asking us to do, it keeps growing to some extent and it is going to be difficult for other people

(Security workshop February 2007)

The security team have the support of higher management but it would seem conditional of having the added benefits. Therefore, while the system is being introduced was primarily based on a security need but this need is further supported by the added benefits. In other words the project is supported by the added value that is often seen as a “watchword” in FM projects (see Alexander, 1997).

In the workspace management workshop, higher management are only mentioned once and this refers to the underlying discourse of power that is seen within higher management. Terry mentioned in the workshop that he was finding it difficult to get support from the technology department. One space manager, Eugene, used the phrase 'my mate George', George being the chief executive of the organisation, suggesting the power that the chief executive has in getting departments to support projects. This reference to higher management does not have a direct impact on workspace management but was used as a discourse of empathy with Terry's difficulties rather than having any real impact on workspace management plans.

DISCUSSION

The knowledge roles explored were intrapreneurial, actors and higher management. Each of these knowledge roles interacted with each other in the case study in order to develop the technology for the organisation. In terms of idea development, Sundbo (1997) appears to focus on outputs i.e. developing a prototype and examining market opportunities. However developing the idea, as Bessant and Tidd (2007) rightly pointed out, is about acquiring knowledge. While the intrapreneur may develop the idea further input is necessary from the actors of the innovation (Vermeulen and Van der Aa, 2003 and Miles 2003). The case study highlighted there needs to be a series of dialogues, discussions and observations in order to make tacit knowledge explicit for organisational use.

Various discourses were apparent in each workshop. The intrapreneur explained the technology through the discourses of application and technicality. There was an undercurrent discourse of conflict apparent in the security workshop when the actors knowledge became apparent but the actors knowledge in the space management workshop was one of confirmation. The lack of conflict seen in the workspace management workshop supports the view that when “conflict is too low, individuals and groups may lack motivation or interest in their tasks, and meeting are about one way communication or reporting, rather discussion and debate” (Bessant and Tidd, 2007:195). The lack of conflict led to little development of the technology in the workspace management workshop where as there was much more debate in the security workshop that did assist in the development of the technology. However, this lack of debate in the workspace management may have some implications for the innovativeness of FM where it is necessary to ensure there is an interest in the innovation in FM to ensure that there is debate and therefore development of an innovation or in this case technology. It was clear from the case study that higher

management knowledge was important in developing the technology but the input of higher management comes from a discourse of power. This discourse of power led to a discourse of frustration for at least one security manager as he felt they did not understand the importance of the technology for security.

There were specific areas of knowledge that was common to each knowledge role in both workshops. Specifically, the intrapreneur knowledge mainly came from his knowledge of the technology capabilities and the application of the technology for both areas. He spoke of what technology was available and how the technology could benefit both areas. Actor's knowledge was based on their experience within the organisation and on the job. Higher management knowledge was based on strategy, organisational agenda and was influenced by internal and external events. Overall, the knowledge roles highlighted the relevance that the technology would have in the organisation.

CONCLUSION

FM is a wide and varied discipline and therefore introducing change is complex. As with other services FM depends on the experience of others and is co-produced with the wider organisation. Knowledge is necessary for the introduction of any change in FM as a change should meet the needs of the FM managers but should also be suitable for the needs of the organisation. This paper was based on Sundbo's (1997) innovation decision model that falls within service innovation. The main stage of interest was that of idea development. In order to develop an idea it is necessary to acquire knowledge.

Bessant and Tidd (2007) agree that organisation knowledge is made up of the individual and groups of individual knowledge but this knowledge is also reactionary to the context and culture of the environment. The culture of the environment is influenced by strategy, which is decided by higher management. Hence in terms of developing innovation or a technology there needs to be some level of interaction between the intrapreneur, actors and higher management to access their knowledge. The two workshops were used to demonstrate how this interaction occurred and were compared to understand the level of impact that this interaction and development of the technology through knowledge roles.

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