MAPPING IT INNOVATION IN FACILITIES MANAGEMENT

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SUMMARY: Over the past decade there has been significant growth in the facilities management (FM) sector resulting in a diverse and highly competitive marketplace. This marketplace engages contractors, in-house teams, suppliers, consultants and professional institutions. Many of these organisations have had to innovate to differentiate themselves from competitors. The subject of this paper is facilities management innovation. More specifically, it examines the introduction of information technology (IT) to support such innovations. Our understanding of how such innovations are brought about is scant. The intention of this paper is to examine the motivations and factors which have brought about 'information system' innovations in the sector based on an examination of a small but diverse collection of case studies. The study specifically considers the route by which the selected innovations came about and the way in which the innovation has diffused throughout the rest of the organisation. The IT innovations identified in case studies include whole life cost modelling, a content management solution, open book partnering, management information portal (fmNet), RFID technology, and capacity and capability planning. Taken together they characterise a sector that is using IT to codify and standardise information such that useful knowledge becomes widely dispersed.

KEYWORDS: facilities management, innovation, innovation diffusion, information technology, CAFM.

1. INTRODUCTION

This paper aims to provide examples of IT innovation in the facilities management (FM) sector. The intention is to determine the extent to which planned innovation is evident, as opposed to opportunistic or piecemeal innovation. The innovations considered in the paper's case studies reflect the considerable diversity of IT applications in facilities management. Moreover, through case study comparisons the paper assesses the extent to which innovations follow a particular innovation pathway through to fruition.

There exists a substantial body of research related to the use of information systems in facilities management (see for example, Calde *et al.*, 2002; Liu *et al.*, 1994; Schurle *et al.*, 1998; Cheng *et al.*, 1996). Amongst these is the work of Vanier *et al.* (1997) at the National Research Council in Canada who describes the 'Municipal Investment Planning' project, designed to improve the efficiency of maintenance operations. This encompassed enabling technologies such as computer-aided FM (CAFM), mobile computing and computerised maintenance management systems. Vanier *et al.* (1997, p.38) cite the benefits of introducing new information technology to this area as including:

- sound management of built assets;
- investment optimization on maintenance expenses;
- reduction of emergency interventions;
- life cycle analysis of investment decisions;
- evaluation of the risks and impacts associated with maintenance decisions;
- introduction of the IS0 9000 concept; and
- being in the vanguard of North American and European organizations; and development of local expertise.

Other advocates of information systems in facilities management include McAndrew *et al.*, (2005) who describe three different case studies. The purpose of these studies was to establish the state of play in terms of managing and tracking processes within the facilities management department of three different organisations. Lunn and Stephenson (2000) take the discussion further by considering the effects of discontinuous change and the resistance to such change in relation to FM automation. Financial reporting is a particular FM activity discussed in the work of Biddison (2005, p.164). The author suggests that the FM sector is 'pressured by fast growth and stringent new regulatory reporting requirements' and as a result is '…turning in increasing numbers to centralised systems of record that can track and manage all financial transactions.'

Other advocates of more diffuse usage in this area are Schriefer and Ganesh (2002, p.227) who consider that information systems empower FM executives, giving 'widely expanded access to market information [that] puts them in a more powerful position relative to other industry players'. However, despite the rhetoric and irrefutable logic put forward for using more sophisticated information systems in facilities management, adoption of such systems is, at best, piecemeal.

In order to understand why this is, our research led us to case studies that represented the exception rather than the rule: where innovative solutions had proven successful despite common factors inhibiting their use. By analysing the innovative process in each of these case studies it was hoped that some general factors might be identified that had enabled the innovations to flourish in each case.

2. THEORETICAL PERSPECTIVE

In order to gain insight and elicit generalisations from our observations of the case studies, it was necessary to adopt an appropriate analytical model. This model would provide sufficient granularity to allow underlying mechanisms and phases of the innovation process to be identified. From this it would be possible to make comparative observations about the innovations selected. Many models of the innovation process have been proposed. These include Hage and Aiken (1970); Harvey and Mills (1970); Kimberly (1981); Rogers (2003); Sundbo (1997); Tidd *et al.* (1997); Van-de-Ven *et al.* (1999); Voss (1992); Wilson (1966); and Zaltman *et al.* (1973). Rogers' (2003) model provided a suitable level of simplicity for the purposes of the study although the model itself has been the subject of some criticism. Rogers proposed a model that consisted of a sequence of five stages as shown in Fig. 1; the first two of which are concerned with the 'initiation' phase of the innovation and the latter three with the 'implementation' phase.
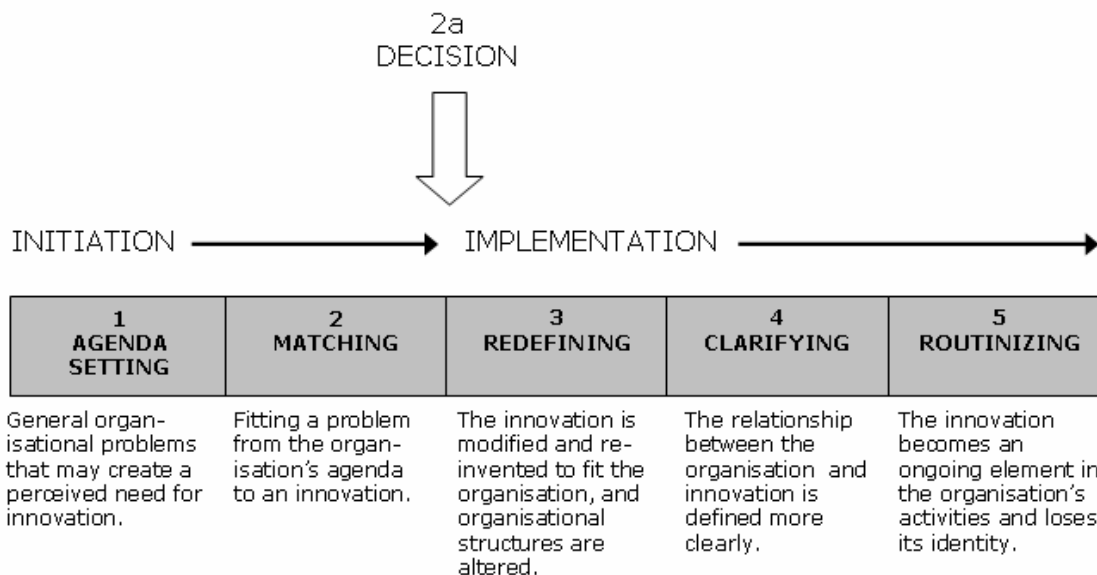

FIG.1: Model of the innovation process (after Rogers, 2003)

The first two stages, (1) 'agenda setting' and (2) 'matching' encompass information gathering, conceptualizing and the planning efforts leading to the adoption of an innovation. Described collectively as the initiation period, these two stages go from a general view of organisational problems where the need for an innovation is

identified, to the matching of an identified problem from the organisation's agenda with a possible innovative solution. The decision taking milestone (2a) is concerned with whether to adopt or reject the innovation and thus marks the end of the initiation period of the model.

The last three stages: (3) 'redefining/restructuring', (4) 'clarifying' and (5) 'routinizing' constitute all of the events, actions, and decisions involved in putting the innovation into use. In this implementation period, the innovation and the supporting processes will be expected to change to better fit the need. The innovation will be assimilated within the organisation and cease to be perceived as foreign at the end of this process.

Rogers does not consider his model to be fixed. The process may occasionally backtrack or skip one or more stages although he suggests "Later stages … cannot be undertaken until earlier stages have been settled, either explicitly or implicitly" (Rogers 2003).

3. LEVELS OF INFORMATION SYSTEM

Having chosen a suitable innovation model as the basis for our analysis, we attempted to classify the types of information system in our case studies. In general, an information system provides an organisational and management solution, based on information technology, in response to a challenge posed by the environment. This can be said of all of the cases examined in this study. The science of information systems is a multidisciplinary field covering both technical and behavioural approaches. By their nature, information systems are socio-technical constructs requiring substantial social, organisational and intellectual investment to make them work properly. Computer-based information systems combine organisational, human and technological considerations and resources to stimulate and support effective FM.

Four main types of information system were analysed in the study, reflecting different organisational levels (Laudon and Laudon 1999):

1. Operational-level systems which support operational managers by keeping track of the elementary activities and transactions of the organisation. The principal purpose of such systems at this level is to answer routine questions and to track the flow of transactions through the organisation. Such information has to be easily available, current and accurate.
2. Knowledge-level systems support knowledge and data workers in an organisation. The purpose is to help the business discover, organise and integrate new knowledge into the business and to help the organisation control the flow of paperwork.
3. Management-level systems are designed to serve the monitoring, controlling, decision making and administrative activities of middle managers. The main question addressed by such systems is 'are things working well?'
4. Strategic-level systems help senior management tackle and address strategic issues and long term trends, both within the firm and the external environment. Their main concern is matching changes in the external environment with existing organisational capabilities.

4. A REVIEW OF CASE STUDY INNOVATIONS

A multiple case study approach was deemed most suitable. Information was primarily gathered through in-depth interviews, publicly available documentation and archival records. In order to corroborate the data collected through the interviews, action was taken, wherever possible, to collect or study on location the specific systems and routines that were mentioned.

All in all eight case studies were conducted, covering contractors, in-house teams, suppliers and consultants in the UK. The cases were identified following a wide-ranging invitation to organisations involved in facilities management to explain and explore an IT innovation they had undertaken. The case study innovations included in the study are summarised in Table 1.

TABLE 1: Profile of case study innovations by level

(Number) Case Study	Innovation Description	FM Provider/ In-House	Operational Level	Knowledge Level	Manage-ment Level	Strategic Level
(1) Acuity Management	Regulations knowledge base and scheduler	FM Provider		*	*	
(2) DSA Facilities Management	Information portal	FM Provider	*		*	
(3) Denne Group Limited	Work scheduling system	FM Provider	*		*	
(4) The Gale Company	Multimedia communication system	FM Provider	*	*		
(5) Nationwide	Radio-frequency tracking	In-House	*			
(6) University of Reading	Integrating and financial reporting package	In-House			*	
(7) Engineering Systems Inc	Whole-life costing model	In-House				*
(8) BT	Employee survey tool	In-House			*	

Four of these case studies represented innovations that were instigated by a third party FM provider. Four of the case studies involved in-house FM innovations. A summary of the innovations is as follows.

Case Study 1 – Acuity Management Solutions: This is a management company that provides a range of products in facilities management, project management and facilities consultancy. The firm has responded to the situation that most organisations have developed policies and regulations regarding health and safety in their workplace, but lack the ability to demonstrate that they are compliance with them. Acuity has addressed this problem by extracting tangible management tasks out of the legislation. This has enabled the creation of a library of tasks which they have used to create a management schedule with a determined frequency. The library of tasks include regulations regarding building services engineering, building fabric, cleaning and hygiene services, security services, environmental services, catering services. It also includes a general management reviewing capability covering resource, financial, client management and account director reviews. This information is then put into task management software which produces a scheduled management action plan for a particular building.

Acuity decided to use the CONCEPT system as the software tool to facilitate the development of the innovation; however any CAD or CAFM system could be used. The system is linked to the internet allowing the status of any audit to be verified.

Case Study 2 – DSA Facilities Management: The firm is a provider of numerous services including project delivery, building services maintenance and relocation management. At the time, their client had a variety of diverse legacy agreements in place with a number of different, often local, individual support companies. The client's senior manager had identified the potential benefits of bundled service solutions to support the various maintenance and operational requirements of their property responsibilities throughout the UK. fmNet is an

electronic management information portal designed by DSA to meet the specific contractual, statutory and operational requirements of their client. Although dealing with numerous fundamental FM issues, the system has been designed to be easily navigable appealing to all user levels including site engineers, helpdesk operators, project administrators and senior management. Linked to the internet, the information gathered in the portal is updated in real time, enabling facilities managers to react immediately to user needs. The portal itself provides the following capabilities:

- virtual library;
- performance monitoring;
- cost analysis;
- planned and reactive maintenance reporting; and
- hand-held technology integration.

The portal attempts to create a better and longer lasting relationship between suppliers and clients. More specifically, this management information tool enables constant communication of critical data to the client and provides facilities managers with highly detailed and planned reactive maintenance information.

Case Study 3 – Denne Group Ltd: The organisation provides construction, maintenance, joinery and mechanical services. The innovation in question is a partnered full, open book accounting service provision. The idea was developed because Denne realised that the housing sector lacks a good way of scheduling the work for its workforce. So, within the partnership arrangement, it was agreed that the client would provide the call centre and Denne would provide the IT solution to support it. This encompassed a work scheduling program and FM software. With the use of a data communication system all the workforce would carry PDAs so they could communicate data across the computer and the on-site data loggers. In this way, two different companies get to work together by exchanging information. When the housing company gets a call from a tenant, it enters this information. The system categorises the work in terms of type and priority of job to be done and who in the work-force can undertake it. The system looks at all the parameters and produces different appointments' slots from which the tenant chooses. Key performance indicators are also included in the system to enable the company to measure its work.

This capability has been developed by Denne in partnership with a social housing company. The implementation of this idea requires a fundamentally different approach in terms of responsibilities, processes and procedures. The key beneficiaries are the technical people working on site enabling improved organisation and management of their tasks.

Case Study 4 – The Gale Company, UK Limited: The company provides services in all aspects of real estate assignment. In 1999, the company obtained a contract to provide front-of-house and back-of-house services for GlaxoSmithKline's (GSK) new global corporate headquarters in Brentford, Middlesex. The relationship began when the internal fit out of the building was in progress. The Gale Company developed an idea known as the 'Content Management Solution' at GSK, which uses new plasma screens with dedicated digital feeds to enable information to be conveyed throughout their facilities. This would obviate the need for notice boards or phone messages. Using their networked multimedia solution, each plasma screen is able to receive independent multimedia feeds. This enables targeted, localized information to be relayed to various organizations and users within the building. The plasma screen program has evolved from initially humbled aspirations to more adventurous objectives, after recognizing the full potential of the technology. Working in collaboration with an American company specialising in software authoring, the innovation is now under further development.

Case Study 5 – Nationwide: The Property Services Department of Nationwide is responsible for all facilities management operations of this high street bank. This department is primarily in charge of the security, catering, cleaning and general maintenance of the internal aspects of the building. Other areas of this department deal with refurbishments, design, property management and general property maintenance. The 'RFID - Capacity & Capability' innovation seeks to replace the ageing security system of the buildings. The use of the RFID solution will not only enable better delivery of security services but will also enable the monitoring of equipment and people movement around the building. Through the use and deployment of RFID tags and readers additional business benefits can be gained based on the monitoring of movement around the building. It is envisaged that this will contribute to the strategic planning and general management of the building. The particular technology used in this innovation is a security application of RFID technology based on ultra-wide band technology.

Case Study 6 – The University of Reading: This higher education institution has developed a software tool that contributes to improve the administration of the day-to-day activities within the FM directorate. Developed to best fit the university's FM needs, the innovation enables standard controls over multiple existing operations, whilst providing a link with the university finance system. The bespoke software has been developed using an Access database with specified user requirements. The main pressure to initiate this idea was the Year 2000 compliance issue. The idea is considered a managerial innovation rather than a technical innovation, enabling greater operational efficiency and cost transparency.

Case Study 7 – Engineering Systems Inc: This firm has developed a bespoke 'facilities whole life cost modelling' system that estimates the life of a building's components and the overall life cycle of the building from the empty site through to occupancy, demolition and beyond. The tool takes into account the sustainability and cost of each component and from this information it enables estimation of future maintenance costs. The tool also calculates less tangible aspects of a design such as the aesthetic quality of a component.

Considered to be a strategic level system, the purpose of the tool is to make the financial connection between the cost of building the facility and the cost of running the facility. The information technology used in this system involves a simple application of an Excel spreadsheet, but using it to its full capabilities with macros embedded in the software. It allows a lot of connectivity between the cost model, as well as allowing sensitivity analysis to be performed.

Case Study 8 – BT: This firm has developed an effective way to determine employees' perception of their work environment. The survey tool that has been developed looks at employees' perceived dissatisfaction with the work environment, not only considering the quality of services but also the quality of the building in totality. The aim of the survey tool is to obtain a fundamental understanding of people's perception of their workplace and to provide a mechanism to redress feelings of dissatisfaction. The technology used to implement the survey is web based and it allows a report to be split into different sections. This enables a better understanding of the data collected by focusing on particular issues. By highlighting areas of tangible improvement in the workplace, the innovation seeks to turn employees from dissatisfied to satisfied users in a systematic manner. The survey method makes it possible to distinguish between the perceptions people have of the FM service provider from other factors such as the quality of the building.

5. ANALYSIS OF INNOVATIONS BY STAGE

5.1 Stage 1 – Agenda setting

In Rogers' (2003) model, 'agenda setting' refers to the identification of a general problem within an organisation that may prompt an innovation. As such, it is a dual process consisting of (1) the identification of needs and problems and their prioritisation within the organisational strategy and (2) the continuous search of the organisational environment to locate an innovation that could help solve the problem. Innovation in organisations often seem to be driven less by problems than by solutions, so 'answers often precede questions' (Rogers 2003). This stage is often seen as the most difficult to manage and organise, being a creative stage in which ideas cannot be structured in a predetermined way.

In all of the case study innovations this stage was characterised by continuous scrutiny of the market and the firm for innovative ideas that could solve their clients' or end-users' needs. Innovation was driven by a desire to differentiate their services from competitors. Another motivation was the desire to build long term relationships with customers and clients by responding to specific needs. It was commonly seen that this tailored approach made it difficult for competitors to replace and copy their service in a like-for-like way. This enabled the case study firms to build a personalised relationship with their clients.

The Gale Company's approach towards providing an innovative service to the new GSK headquarters' building was to look to other industries for new ideas. The existence of a similar system in shopping malls in the US inspired an innovation champion. He noticed that the US system was using plasma screens to display information with varied content in an interactive way.

Engineering Systems Inc stated that the main pressure stimulating the new idea to arise within the context of their company was the organisational strategy, because it was moving towards the through-life capability approach of delivering the service rather than selling parts of the service.

BT felt the pressure to come up with innovative ideas on how to measure the employees' perception of the workplace following major changes in the company. A new CEO was appointed whose aim was to improve employees' perception of the workplace.

The development of information systems could be problematic. One reason is that the time and cost factors to develop an information system are very difficult to determine, especially in large projects. Acuity stated that the time put into reviewing the health and safety legislation (and time means money), which enabled it to create a library of tasks and supporting infrastructure, was perceived as one of the main barriers for the future development of the idea. However, after investing time and money in this first client, it managed to have a competitive advantage that would provide it with sufficient confidence that the client would remain loyal.

Major changes within their own organisations were not seen as a prime motivator for FM providers. Clients and end users were regarded as the main source for making the firm come up with new ideas. Major changes in the clients firm's structure often prompted the strategic, innovative approach. However, Engineering Systems Inc. felt that behavioural changes within its own organisation contributed to the further development of the whole life cost modelling capability that would then help them meet their future business needs.

Some organisations taking part in the study admitted that the idea itself was not brand new: rather the innovation stems from the way in which it is tailored to work in a different sector with its peculiarities. In the case of the engineering organisation the tool was developed in partnership with an organisation having the capability it lacked. This arrangement enabled it to restructure the modelling tool to best fit the defence and aviation context (it works in) but also an international context. The findings suggest that whilst most of the innovations were non-technological in nature, they were dependant on technology to enable the innovation to develop. Usually, this involved further refinement of existing 'off-the-shelf' software. DSA suggest that technology is the way forward, as people (in particular facilities managers) need instant access to information in order to provide the best service available.

The fmNet idea originated as part of DSA's business evolution, its culture and its belief that IT was the way forward. However, a major problem is the difficulty of managing the organisational change associated with a new system. Although building a new system demands a process of planned organisational change, this does not mean that change can always be planned or controlled. Once DSA won the contract, the main challenge was to ensure that facilities managers from 28 sites had interpreted the contract and the tender documents accurately. The new idea was a total change for the people working in the FM sector, so when introduced it encountered resistance primarily from those who had been working for the client for many years. However, once facilities managers accepted the change it became the normal way of working. Considered to be a 'bottom up' innovation, it had to find the employees within the client organisation who would support the idea and would make others implement it.

Engineering Systems Inc. recognised that the credibility of the tool was perceived to be the main barrier to the fruition of the idea. The tool was met with a high degree of scepticism from the users mainly because of the extended time frame. The innovation seeks to model the building and to estimate the (whole life) cost over ten years. At this stage the organisation decided to pilot the idea in one of its buildings to demonstrate the accuracy of the tool. The idea meant challenging the way facilities managers were operating the building. The result of the pilot indicated that substantial savings could be achieved. By making use of the internal magazine and the organisation's web site to promote the accuracy of the tool, end-users and facilities mangers started to believe in the new idea, thus motivating them to change their way of working.

Rigidities within the organisation hosting the new idea have held back the development of innovations. Novel ideas are sometimes difficult to justify, and even more when the innovation's direct cost is high (OECD 1996). Denne carried out a pilot contract with a small housing firm that would enable it to gather data to be used for future contracts. This helped it validate the innovative approach in the housing sector which has a reputation for being rigid.

5.2 Stage 2: Matching

Matching is the stage 'at which a problem from the organisation agenda is matched with an innovation, and this match is planned and designed' (Rogers 2003). A conceptual matching between the new idea and the organisational problem occurs in order to assess how well they fit. The likelihood of the innovation solving the problem is tested in practice by envisaging the benefits and possible problems this innovation might encounter

when implemented. If the innovation matches the organisational problem the decision to proceed with the new idea is taken. As a result, decision makers will commit to the implementation of the innovation in principle. In contrast, if the innovation is found to be a mismatch with the problem, the innovation will be rejected and the process terminated.

In this stage the innovation and the organisation invariably make adjustments to better fit the solution with the problem. From the analysis of the case studies these adjustments, if any, were undertaken in consultation with professional bodies. They provided the necessary information that would enable the best future implementation of the innovation. Nationwide has taken this stage one step forward, by putting in place a knowledge transfer partnership arrangement (KTP) with the University of Reading. This arrangement will not only benefit the organisation in terms of the data collection, but will also benefit the university.

The outsourced FM providers' case studies revealed that new ideas are being developed in direct consultation with the client through a partnership arrangement. This has prevented potential mismatches between the innovation and the organisations involved and has allowed the identification of well matched solutions. Denne managed the matching between the idea and its client through a partnership arrangement. This prevented the duplication of work and contributed to a better fit of the new idea in the particular sector.

The in-house FM providers presented their new ideas internally to gain acceptance from potential users prior to the implementation decision. The feedback from customers was similarly adjusted to suit the needs of the organisation. However, lack of customers' responsiveness has added to the difficulty in meeting their needs. BT, in their aim to gain employees satisfaction indicated that the lack of people response to the survey made it very difficult to evaluate the data. Not until BT managed to prove the usefulness of the responses did people start to take it more seriously.

Organisations involved in the study have attempted to measure the anticipated benefits of the innovation. Some organisations undertook formal studies to predict the future outcome. However, most of the organisations followed an intuitive approach in predicting benefits. Engineering Systems Inc. took an entrepreneurial view by considering the new idea to be an extra service they wanted to provide to their customers and that the fitness of the idea would be intuitively handled. In contrast, BT created a prototype in an attempt to determine the feasibility of the new idea, as it was considered to be essential to clarify information gathering requirements. The testing was also carried out to prevent misinterpretations. While analytically-oriented people may have a clear picture of the information they want to collect, customers can misinterpret the survey's questions.

5.3 Stage 2a: Decision-making milestone

The decision point is the final part of the initiation phase. From Rogers' model, this decision period is considered to be a discrete demarcation between two phases, the initiation and implementation period. However, it can be argued that the decision to support or reject an innovation can be taken at any stage of the process if unacceptable drawbacks are encountered. Van-de-Ven *et al.* (1999) argue that, whatever the efforts made to initiate new ideas, these efforts can be unexpectedly derailed by internal or external factors affecting the organisation during the initiation period.

Service provider organisations involved in the study consider this stage to be the point where the contract is awarded. Usually, clients had not been systematically involved in the innovation process until this point. In the case of BT, the acceptance of the prototype corresponded with the decision point.

In the case of Nationwide, the commitment to the innovation had to be tackled in a slightly different way. The pervasive technology to be used in this innovation needed full consultation and acceptance by the executive management, the staff union and internal interested parties in order to be implemented.

Engineering Systems Inc. recognised that although the innovation was going to provide an extra service to the client, the client was not in a position to recognise this benefit. At this point the client was focused on calculating the cost of the building construction, but would not consider the cost of running the building once finished. After clarifying the benefits from using the tool, the client was able to accept the need for it.

In the cases studied, the innovation champion invariably had a senior management role within the company. For the outsourced FM provider, this person was often the managing director. This reflected the amount of freedom this person needed to exercise in taking major decisions associated with further maturing the innovation.

However, other key actors were also involved in taking the decision. Support from members of the board of directors was required for in-house FM managers.

Although some form of intellectual property or patent protection might have been expected for the innovations studied, not all the organisation taking part in the study had considered this issue. This is, in part, linked to the degree of newness that the innovation has, linked in turn to the business strategy of the organisation developing the idea. Usually, when a partnership arrangement had been followed, confidentiality agreements and exit strategies were already in place. In one particular case of in-house provision, an intellectual property right agreement was signed between the client and the consultant. In this case, the in-house FM team was interested in solving an internal problem which the organisation had and was not interested in selling this new 'product' to other companies. With this agreement, the consultant had the right to sell this idea to other clients. There were instances of strategic methods being used to protect the innovation. This was carried out by the use of security protected codes and non-disclosure agreements between parties involved in the process.

5.4 Stage 3: Redefining/restructuring

At the refining and restructuring stage, Rogers (2003) suggests that the innovation starts to lose its foreign characteristic and starts to fit the specific organisational need or problem. A trial period usually characterises the beginning of this phase. The trial enables a detailed analysis of the innovation's performance in a smaller, protected environment where adjustments can be made in a dynamic way.

The study suggests that outsourced FM providers' new IT innovations often need to be implemented speedily. As a result they lack the time to test or pilot the innovation before roll-out. One of the reasons for this omission is that the service provider is committed to applying an innovation immediately after winning the contract. Once the contract has been signed the client often expects an immediate implementation of the innovation. However, the innovation has often not been trialled or tested in a controlled context first. Instead, the innovation typically undergoes further changes and adjustments in the field. This could have been dealt with during a trial period causing less disruption.

Acuity argued that the type of innovation it developed was not suitable for trialling. It was implemented from day one, though under constant review, due to changes in health and safety legislation. However, there has been a period of 'settling-in' that has involved internal adjustments to support compliance inspections.

In contrast, the in-house FM innovation is more often characterised by the use of a trial period when major changes to the innovation and/or the organisation occur. However, from a negative perspective, the requirement for a trial period can also indicate a lack of confidence by the organisation towards the in-house team, which will have to use this trial period to prove the effectiveness of the innovation. BT carried out a three-months' trial with a sample of customers. After the trial period, various adjustments to the survey had to be made. This mainly related to the reformulation of some of the questions so that the customer could better understand them.

The University of Reading argued that due to the time scale there was a limited piloting period. It was a case of incremental implementation, carried out on a piecemeal basis. Consequently, the innovation experienced continuous evolution based on available funds. The university underwent a standardisation of business processes throughout the project necessitating changes.

During this stage the innovation and the organisational structure was observed to change in all the cases studied. If the innovation came from in-house FM, individuals within the company typically regarded it as familiar and compatible and hence found it easier to accept the new idea. In contrast, innovations diffusing into the organisation from a third party FM organisation demanded a more flexible approach and had to undergo a good deal of re-invention.

5.5 Stage 4: Clarifying

Rogers (2003) describes the clarifying stage as being characterised by the widespread adoption of the innovation, where a broader spread of people became familiar with the innovation. This period usually succeeds the trial period. This stage can exhibit side-effects if the innovation has been implemented too rapidly in the absence of a trial. However, in general during this period, people start to derive real benefits from the innovation and start asking questions such as: how does the innovation work? Who in the organisation will be affected by it? How does it affect me? It is important to have a predetermined way to inform users about the innovation and to

prepare them for the change. As the people in an organisation talk about an innovation, they gradually gain an understanding of it and can contribute to its acceptance. The case studies indicated that innovation champions usually play an important role in this respect. They were typically responsible for making sure that the relevant information about the innovation had been communicated to users.

In some of the case studies, predefined steps were taken to inform the users about the innovation. This often reflected the kind of innovation that was being implemented, which in some cases required an informed user. In the Engineering Systems Inc. case the organisation decided to present the project to some employees as part of the educational awareness process to explain the extent of the idea.

When innovations did affect the end users, staff training, feedback sessions and other informing methods were used. The use of feedback reports from end-users were typically used to further improve the innovation.

In the case of Denne, the main issue was that under European TUPE legislation they were required to retain the workforce already working for the former contractor. These individuals had to be retrained to fit the new way of working and were instrumental in enabling this transition period. As part of the retraining process Denne decided to arrange meetings with the work-force as a group to discuss any problems arising from the change.

Acuity provided a full training program to FM managers before implementing the innovation. This enabled the company to explain the 'why' of the idea to the users. There was some resistance from the FM perspective, with individuals questioning why they needed this time-consuming training process. At this stage, it was important to have the client's support to enable implementation of the idea.

5.6 Stage 5: Routinizing

This last stage of Rogers' (2003) model is reached when the innovation has become part of the organisation's regular activities. The innovation process is complete at this stage and the innovation loses its novelty. The success of the innovation can be evaluated at this point including the degree of 'sustainability'. Sustainability in this context describes the degree to which an innovation continues to be used following initial attempts to implant the innovation.

This stage is not as simple and straightforward as it might seem at first glance. One important factor to be taken into consideration is the amount of people involved in the innovation process. If many people are involved in the process of designing, discussing and implementing an innovation, its sustainability over time is more assured. In contrast, if the innovation decision is taken by a few people within the organisation, with reliance on authority, then the sustainability is at risk if those players leave the organisation. Added to this, the degree to which an innovation continues to be re-invented by adopters will influence the innovation's sustainability. This is because, as the adopters take the opportunity to implement changes to the innovation, they become more inclined to take ownership of the innovation and continue to be involved with it.

From the case studies, it has been found that the time taken to adopt an innovation is typically short (between six months to one year from 'agenda setting' to 'routinizing'). This was often achievable because the innovation met a well-tailored need within the organisation or because it originated directly within the organisation. In some case studies, the routinizing stage was not recognised as such, being perceived as occurring transparently within the clarifying stage.

The study has found that companies measured the success of their innovations not only in terms of financial performance, but also in relation to other performance criteria such as competitiveness and quality. The financial measures identified included not only profitability, but also the attainment of cost targets and the degree to which costs were lowered.

Denne identified that the key organisational features that lead to the innovation's success were based on having the support of the director of the organisation who had the time and the authority to implement the new idea, but who also had the determination to do things differently.

6. CONCLUSIONS

The ultimate test of the success of an innovation is its effect on a company's profits. However, in the case of outsourced FM, it is difficult to measure this in direct financial terms as the sector is usually providing a service to its clients. The contribution is in the form of 'value adding'. One way in which outsourced FM organisations

were observed to assess innovation success was in terms of the extended duration of the contract with their clients. Building closer relationships with clients will enable a better understanding of their needs and therefore contribute to longer lasting relationships. Reaching performance specifications and fulfilling customer requirements were the dominant considerations for both in-house and third-party FM innovations.

For Denne, the challenge in making the innovation succeed was the cultural differences that existed between it and its clients. Engaging organisations from very different sectors contributed to the difficulty of a partnership arrangement. Being a commercial organisation, Denne is able to take decisions and implement them more quickly than the housing sector which is, in a broad sense, a social organisation.

When organisations taking part in the study were asked about approaches that could have further improved the innovation, Acuity mentioned that the estimation of the change process period required was one of the main challenges it faced when putting the innovation into practice. A more structured way of managing this process could have benefited the implementation period.

Engineering Systems Inc. felt assured that the innovation 'facilities whole life cost modelling' has helped to increase the recognition of the added value facilities bring to the organisation. The implementation of this innovation has provided it with the ability to look at the facilities in a business sense rather than in a functional way.

As a general conclusion, the application of Rogers' (2003) model to FM innovation provided a unique insight into the commonalties and differences in approach that exist within the FM sector. IT innovations are often portrayed as purely technical undertakings. The case studies reveal that the social and organisational factors are as important as the merits of the IT innovation itself. The use of pilots, the engagement of product champions, senior-level support and user-training are all essential determinants of an IT innovations success in the FM sector.

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