Bringing about Innovative Change: The Case of a Patient Flow Management System in an NHS Trust

Teresa Waring, Martin Alexander, and Rebecca Casey

Newcastle Business School
Northumbria University
Newcastle upon Tyne
NE1 8ST
teresa.waring@northumbria.ac.uk

Abstract. Bringing about innovative IT enabled change within organisations that have restricted funding and resources is a challenge currently facing hospitals in the UK National Health Service (NHS). This article explores an Action Research project which aimed to implement a Patient Flow Management System in an acute hospital in the North East of England. The project took place over a twelve month period and involved a number of stakeholders including nursing staff. The contribution of this paper is to recognise the importance of AR as an approach suitable for systems adoption and the need to 'know your stakeholder' and their culture especially when dealing with professional bodies.

1 Introduction

It can be argued that the UK National Health Service (NHS) does not have a glowing record of innovative change in their use of information technology to improve the effectiveness, efficiency and delivery of healthcare particularly in the hospital sector (NAO, 2011; HCCPA, 2011). The attempts at imposing large scale IT enabled change programmes on the hospital sector have been researched by a number of authors who have concluded for a variety of reasons both technical and social they are doomed to failure (Wainwright and Waring, 2000; Norris, 2002; Sauer and Willcocks, 2007; Brennan, 2007; Eason 2007; Currie, 2012). Nevertheless over the last twenty years successive governments have committed billions of UK tax payers' money to technology investment and infrastructure within the NHS with mixed results.

Today, like many across the world facing the current recession, NHS hospitals are tackling challenges that include reduction in funding, cutbacks, rising admissions, an ageing population and an increasing number of patients with complex, chronic and multiple illnesses. Attempting to address some of these challenges the 2012 NHS information strategy, *'The power of information',* aims to *'provide the NHS with a framework to enable local innovation, driven by a stronger voice for service users and citizens, and clear ambitions for the next decade'* (DoH, 2012). Whether this can be achieved is still to be determined but given the unprecedented fiscal constraints imposed by government on the NHS there is an expectation that local hospital trusts and providers may find it difficult to finance IS development as opposed to investing in healthcare services (Raleigh, 2012).

The aim of this paper is to explore how local hospital trusts can develop innovative solutions to their information needs in challenging times. Using Action Research (AR) a team at Town hospital in the NE of England implemented a patient flow management system (PFMS) during 2011-12. Utmost in their mind was stakeholder involvement and participation in the project. The main stakeholders who would be expected to work daily with the system and to ensure the currency of its data were the nursing staff who as a body are recognised to be slow to adopt IT in their workplace (Murphy, 2010). The paper focuses on the process of engagement and the issues which, in terms of stakeholder collaboration, challenge IS/IT staff. The outcome for Town hospital has been positive and the system has been rolled out across all wards. Yet there are still hurdles to be overcome including realising all the benefits promised by the system vendors. The paper begins with a review of the pertinent literature but is kept necessarily concise in order to devote sufficient effort to the AR project and its 'data generation' (Coghlan and Brannick, 2010). The contribution of this paper is to recognise the importance of AR as an approach suitable for systems adoption and the need to 'know your stakeholder' and their culture especially when dealing with professional bodies.

2   Literature Review

Innovation and innovative change are terms which have various meanings in different contexts. Amongst some of the more popular definitions are those shown in Table 1:

Table 1. Example definitions of innovation

Author	Definition
Moore (2005); Bessant (2005)	Explicitly reserve the term innovation for radical, permanent change and real breakthroughs. They prefer to use the term continuous improvement for smaller steps, while not judging one of the types to be superior to another
Hartley (2006)	Innovation represents a step change, or a disruptive change for the organization or service.
Rogers (1995); Mack et al. (2008)	Innovation "the adoption of an existing idea for the first time by a specific organization"
Buijs (2007)	Innovation is about coming up with and implementing something new.
Albury (2005)	Successful innovation is the creation and implementation of new processes, products, services and methods of delivery which result in significant improvements in outcome, efficiency, effectiveness or quality
Zhuang (1995)	The act of creation which is both new and unique. Moving outside of existing paradigms and finding new approaches lies at the innovation process including diffusion.

Within the UK public sector innovation has been occurring over the last twenty years but this mainly has been done in the context of 'purchase to innovate' where IT was seen as the main driver and big project change was the norm (Hartley, 2006; Kelman, 2005; Zouridis and Termeer (2005). This landscape has now radically changed to one faced with budgetary austerity and the increased drive for innovation focused on cost saving. In the UK NHS IT innovation has had mixed success and on

the whole authors have seen much of the work over the last twenty years as ineffective and in some instances as out- right failure (Wainwright and Waring, 2000; Clegg and Shepherd, 2007; Currie, 2012). Yet other forms of technology are being used throughout the NHS to support patient care and in many instances to save and prolong life. The question is why is IT different and why do stakeholders such as nursing staff continually experience difficulty with it or appear to resist its use in the workplace?

2.1   The Nursing Profession and IT

There is international interest in the nursing profession and IT. Generally IT is seen as being beneficial, inevitable and desirable for nursing and related healthcare (Levett-Jones, 2009; Lupiáñez-Villanueva, 2011). Authors have argued that nurse training should be improved, that use of IT should be a core competency for nurses (Willmer, 2005; Fetter, 2008) and that nurses should engage more in IT systems design when implementing new systems in their workplace (Hayward-Rowse and Whittle, 2006). Nevertheless there are studies which see IT as a barrier between the nurse and the patient (Royal Society, 2006) and others which recognise the slow up take of IT within the nursing profession (Murphy, 2010).

The Royal College of Nursing is concerned that the profession's attitude to IT has been seen as negative and has conducted research into this issue (e.g. 2006, 2007). These studies acknowledge and support the view that poor consultation and involvement in IT projects in their direct workplace is a major barrier to success.

In response to evident failure to exploit new IT, despite their ever increasing encroachment into normal day to day life, academics and management within the NHS have sought new ways of addressing the problem. Urquhart and Currell (2005) and Oroviogoicoechea et al. (2006) stress the importance of looking at how information is used, involving nurses at the core of design, rather than simply seeking to automate administrative processes. Using theories of change emanating from academics such as Lewin (1951) and Rogers (2003), Huryk (2010) has sought answers to the problem of nurse engagement in IT projects and has suggested that this phenomenon can be examined from the perspective that there may be barriers to change which are not related to technology or resources and suggests that failure to implement IT in the NHS is due to a slow rate of adoption. Table 2 provides a brief summary of the literature relating to barriers to innovative change in the NHS with a focus on the nursing profession.

2.2   Diffusion of Innovation Theory and Its Relation to Healthcare

Within this healthcare research study, *diffusion of innovation* (DoI) is defined as programmes of change affecting the uptake of new technologies, working practices or behaviours within an organisation (Greenhalgh et. al, 2004). The study of innovative change and factors relating to its adoption are varied. The literature is consequently vast and has been the subject of a number of meta analyses and literature reviews (see, for example, Damampour 1991, Damanpour and Gopalarkrishnan, 2001; Granados et. al. 1997, Greenhalgh et.al., 2004, Mustonen-Ollila and Lyytinen, 2003, Schrijvers, Oudendijk and Vries, 2003). This research has been carried out within a large range of traditions, each of which has addressed the subject of innovative change within its own discipline, from different perspectives and with different objectives.

Table 2. Barriers to Innovative Change in the NHS

Barriers to innovative change	Source
The NHS does not have the capacity or structural readiness for change to happen.	Wainwright and Waring, 2000
The NHS is culturally and politically structured against change.	Redwood, 2000
Technology itself is opposed to the Cultural and Social norms associated with care giving.	Barnard, 2000
Nurses are not empowered to make the changes themselves, reducing the chances that innovative change will embed in individual organisations.	Hill and McNulty, 1998
Variation in outcomes for innovative change programmes derive from within individual organisations which are not receptive to new ideas.	Pettigrew, Ferlie and MkKee, 1992; Pettigrew, Woodman and Cameron, 2001
The NHS consists of micro-systems of culture and social structures which act against each other and act as a barrier to change.	Nelson et. al , 2002
Technology has not been adequately aligned to the work practices of nurses, preventing innovation in ICT.	Hughes, 2003; Oroviogoicoechea et. al. 2006
The NHS target driven culture, emerging over recent years, is altering behaviours and distracting staff away from improving service delivery.	Seddon, 2008

   The study described here has utilised the work of three sources Rogers (2003), Greenhalgh et al.(2004) and Mustonen-Ollila and Lyytinen (2003) as shown in Table 3. Rogers (2003) is seminal work developed in the 1960s and updated over time in response to new data and critique; Greenhalgh et al. (2004) looks at DoI within service organisations and specifically the NHS; Mustonen-Ollila and Lyytinen (2003) examine DoI theory as it relates to information systems process innovations.
   There have been several critiques of DoI theories. Some argue that innovation considered solely within the context of positive change is invalid (Greenhalgh et.al., 2004; Rogers, 2003; McMaster and Wastell , 2005; Berkun, 2010). It is seen as counter intuitive, as there are many examples of innovation, such as the wide scale use of DDT as an agricultural pesticide with its unexpected impact on the environment, which are profoundly negative (Berkun, 2010). This argument leads to the conclusion that observations of DoI on the basis of their inherent positive nature are, at best, incomplete and at worse misleading (McMaster and Wastell, 2005).

Table 3. Attributes of innovation affecting the rate of adoption from the perspective of the individual and organisation (adapted from Rogers, 2003, Greenhalgh et al., 2004 and Mustonen-Ollila and Lyytinen, 2003)

Attribute	Summary Description	Individual	Organisation
Relative Advantage	The degree to which an innovation is perceived better than the idea it supersedes	The user derives tangible personal benefit, such as reducing personal administration or making the job easier	The organisation derives tangible benefits such as increasing productivity or reducing administration costs
Compatibility	The degree to which an innovation is perceived consistent with the existing values, past experiences and the needs of potential adopters, similar to suitability	The innovation does not conflict with political, cultural, social or religious beliefs of the individual, for example use interferes with patterns of rest breaks.	The innovation supports organisational policies, strategies or corporate objectives.
Complexity / Ease of Use	The degree to which an innovation is perceived difficult to understand and use (inversely proportional)	Personal skills and capabilities support the innovation	Personnel development strategies are in place to develop a skilled workforce
Trialability	The degree to which an innovation may be experimented with a limited basis	The individual has access to the innovation and freedom to try it out	The organisation will tolerate experimentation and create opportunities for personal innovation
Observability	To what extend the innovation is visible to others	The individual can see the innovation in use	The organisation position the innovation in a visible location. There is a communication strategy

Early studies of change structured its process into distinct stages. Change models such as the "unfreeze, change, freeze" (Lewin, 1951), consider phases of development as distinct and manageable. Kotler's (1984) six stages of change, commonly referred to as the 'social marketing model' presents the pathway to change as controllable, manageable, linear and to some degree predictable. These models have been criticised as overly simplistic and not relevant to the modern world, as complex social interactions are considered to be more representative of reality (Morgan, 2006). Likewise Van de Ven et al. (1999) view change as often messy and organic, with much movement between initiation, development and implementation, punctuated by shocks, setbacks and surprises. A further criticism of DoI theory is the lack of empirical evidence supporting the efficacy of models and in particular there is insufficient research into how DoI theory relates to the degree to which an innovation is retained within a social or cultural system (Mustonen-Ollila & Lyytinen, 2003).

The context of healthcare has generated much interest in DoI theory. The tradition of 'evidence based medicine' has led some to call for 'evidence based management' within the NHS and this has become particularly popular with some clinicians (Sheaff et al., 2006; Hughes, 2003) who view DoI theory as a 'scientific' framework around

which managerial reform can be based. Berwick (2003) has proposed some recommendations that are believed will support innovations within healthcare:

1. Find sound innovations and support innovators
2. Invest in early adopters of the innovation
3. Make early adopter activity observable
4. Trust and enable reinvention.
5. Create space for change
6. Lead by example.

Thus it is against this background that the patient flow project was developed by Town Hospital as an essential innovation to support its strategic aims, within a context of a shrinking budget and rising costs.

3   The Context of the Study – Town Hospital and the Patient Flow Management System (PFMS)

Town hospital is a relatively small district hospital offering a large range of diagnostic and treatment health services to a population of approximately 160,000 living in the neighbouring areas. The hospital has an accident and emergency department, offering walk-in and critical care services for around 50,000 patients per year; has 18 wards and 4 operating theatres, providing approximately 10,000 surgical procedures each year. As well as surgery, the hospital provides support for 23,000 medical admissions per year and over recent years Town has seen a sustained growth in emergency activity with an increasing number of emergency admissions to the hospital.

Prior to 2012 Town hospital managed its occupancy of beds through a manual system whereby every ward had a 'whiteboard' on which the name of the patient in each bed was written. The whiteboards were maintained by nurses and frequently updated using a board rubber and whiteboard pen. When patients admitted via the emergency department required a bed on a ward, bed managers would telephone around the hospital to find out if there were any vacancies. With increasing quality targets, set by government, relating to waiting times and infection control the manual system was ineffective at delivering the required information. Discussions at hospital board level led to a potential solution being identified: an electronic patient flow management system (PFMS). This system would replace whiteboards with electronic interactive displays, linked to Town's computerised patient administration system (PAS). These displays would have the 'look and feel' of a white board and would show, in real-time, the location of every patient in a hospital bed. It would also allow the capture of the various treatments and interventions that had taken place for each patient. This project would represent a major innovation within Town in the management of a patient journey throughout their stay in hospital and offered several perceived benefits both for the clinician and the organisation as shown in Table 4.

The difficulty for Town was that it had a mixed record in the adoption and use of IT in the past. For example in 2001 Town implemented an innovative electronic patient records system which combined all of the main hospital departmental computer systems into one integrated electronic patient records system. Although the core patient administration functionality has been adopted, with notable success in business management areas, the system as a whole has failed to take hold in clinical areas.

Table 4. Individual and Organisational benefits

Individual Stakeholder Benefits	Organisational Benefits
Reduction in time associated with updating the whiteboard	Improved planning for discharge and reduction in bed occupancy
Automation of the administration of a patient admission to a ward and between wards.	Ability to control and audit the patient journey through the hospital.
Ability to use the system to pass information between clinicians in a controlled and auditable manner.	Access to better management statistics reports concerning performance of in-patient departments.
Ability to locate individual and groups of patients by condition, making it easier to plan targeted care	Reduction of inappropriate delayed discharges, reducing the cost of admitted care.
The discharge process can be made more efficient across the hospital, reducing inappropriate delays in discharge from hospital – better patient experience.	Ability to plan for specialist intervention teams to target conditions and reduce emergency admission.
Access to up to date and accurate information about the treatment and care providers within the hospital during an in-patient episode.	Reduce administration associated with patient flow management and save money through efficiency in patient administration.
	Ability to see the hospital bed population in real time.

Some consultants and doctors were openly hostile to the computer system, refusing to use the new technology. The PFMS was seen as a strategic project within the hospital and senior management were keen to see it adopted. They, therefore, provided one of the authors with an opportunity to conduct an action research project around the implementation process.

4   Methodology

Action Research has its academic origins in sociology, social psychology, psychology, organisational studies, education and health studies. The term Action Research (AR) has been in the vocabulary of research for quite some time now (Lewin, 1946, 1947; Chein, et al, 1948; Blum, 1955) and has continued to gain credence in management research mainly through the work of Checkland (1981) and others such as Warmington (1980); Avison and Wood-Harper (1990); Jonsson (1991); Kemmis and McTaggart, (1988) Perry and Gummesson (2004); Zuber-Skerrit (2002), French (2009), Coghlan and Brannick (2010).

A wide range of approaches to AR have emerged over time on how it should be conducted (see overviews by Coghlin and Brannick(2010); French(2009); Greenwood and Levin(2007); Flood and Romm (1996); Moggridge and Reason(1996); Reason(1994); Dash(1999)). Denscombe (1998) and Kember (2000) consider it important that AR leads to practical outcomes as well as theoretical knowledge, contributing to social practice as well as theory development and bringing theory closer to practice. Achievement of change, not just knowledge acquisition, as well as a rigorous process of data generation and analysis, is essential in AR. O'Leary (2005:190) describes action researchers as working on '*real-world problems*' at the '*intersection*' of the production of knowledge and a '*systematic approach to continuous improvement*' which she argues is part of management. AR is grounded in real problems and real-life situations.

4.1   The Methodological Process Adopted by This Study

In terms of a methodological approach the research team adopted the model utilised by Coghlan and Brannick (2010) which like other variants of AR is distinguished by a pre-step and four stages as shown in Figure 1. The pre-step is an important function in

defining the context and purpose of the research. Avison et al. (1999) point to the need for determination of power over the structure of the project and process for renegotiation and/or cancellation. 'Diagnosing' is a collaborative act and seeks to identify provisional issues. 'Planning action' follows on from the diagnosis and is consistent with it. Taking action implements the planned interventions and 'evaluating action' examines outcomes intended or otherwise and links in to the next cycle of action research.
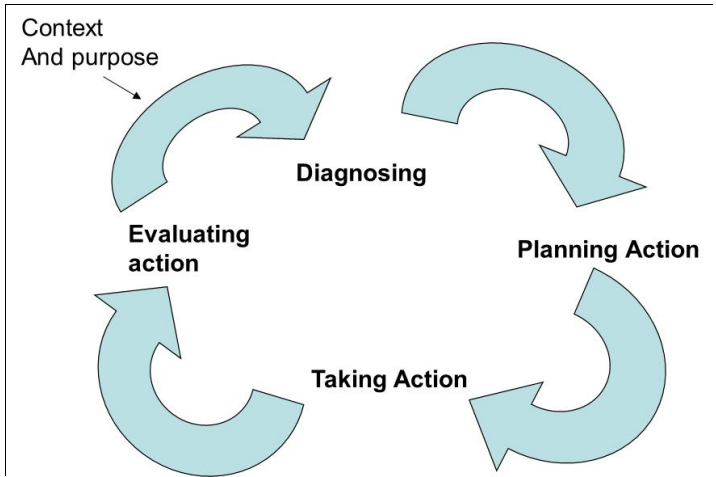
Fig. 1. The Action Research Framework used in this research

The study was designed around three action research cycles, two of which lasted approximately twelve months as shown in Figure 2. The first cycle was carried out prior to the system going live and it referenced theory based upon the diffusion of innovation (DoI) theory intended to maximise the rate of adoption of the system (e.g. Mustonen-Ollila and Lyytinen, 2003) as well as considering some of the research on the nursing profession and IT. The second cycle of AR was carried out post 'go live' and its purpose was to assess the effects of applying DoI theory and what lessons could be learned. Finally Cycle 3 explores how the benefits of the new system can in practice be completely realised bearing in mind the political, cultural and social difficulties associated with adopting IT which could be seen as an instrument of management control.

4.2   Involving the Clinical Staff and Generating the Data

Stringer (1993:35) suggests that an authentic socially responsive AR methodology must enable participation, acknowledge people's equality of worth and is most effective when it facilitates significant levels of active involvement, provides support for all stakeholders to learn and deals personally with people rather than with their representatives or agents.

In adopting a participative approach to AR the project team actively and ethically encouraged the hospital staff to be participants in the research. Consistent members of the AR team were the allocated IS staff and the Director of Information Services and during the research period a number of other clinical staff participated in the research at appropriate times. The project team were also keen to engage other stakeholders and this

was reflected in the data generating methods used in the various cycles of the AR as shown in Table 5.
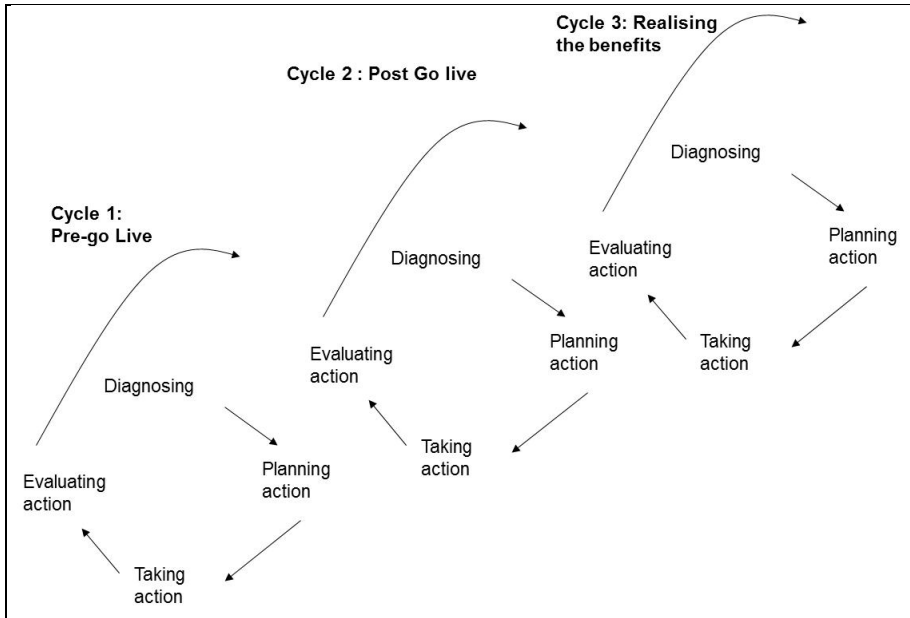
Fig. 2. Cycles of Action Research at Town Hospital

Table 5. Data Generation Methods

Cycle	Data Generation Methods
Pre- going live	Document analysis e.g. hospital strategy, minutes of meetings, emails, project journals Interviews with hospital staff Observation in the workplace (wards) Project meetings Workshops Project meetings
Post going live	Document analysis e.g. hospital strategy, minutes of meetings, emails, project journals, performance data. Interviews with hospital staff Ward visits Questionnaire, statistical analysis Workshops
Realising the benefits	Meetings with senior team Observation on wards Training plans Interviews with staff

Coghlan and Brannock (2010) argue that it is more appropriate to discuss data generation rather than data collection because AR data exists through engagement with others and attempts to collect data are themselves interventions.

4.3 Quality and Rigour in Action Research

Reason and Bradbury (2001) argue that AR should not be judged by the criteria of positivist science and requires its own criteria. Good quality AR should be explicit in developing a praxis of relational participation, should have practical outcomes, should engage in significant work and should result in significant change. Rigour in AR refers to how data are generated, gathered, explored and evaluated, how events are questioned and interpreted through multiple AR cycles (Reason, 2006)

The next section outlines the action research project undertaken at Town hospital and answers the three questions posed by Coghlan and Brannick (2010): *What happened*?; *How do you make sense of what happened*?; *So what*?

5 Data Generation – What Happened?

Before the AR cycles were enacted a participant AR team was assembled and this consisted of a project manager (PM), two application development officers one of whom was a nurse (ADO1 and ADO2), and one of the authors of this paper (AU).

5.1 Cycle 1 – Pre- 'Go Live'

*Diagnosis***:** Recognising the past record of IT implementation in the hospital the first step in the cycle of AR was to consider pertinent issues around clinical engagement and possible theoretical approaches offered by DoI. The priority for the AR team was identifying the stakeholders in the PFMS and establishing how stakeholder engagement could be achieved across the hospital. (AU) brought to the discussion the DoI theory and it was clear that some of what was written did not translate easily into practice for the hospital. Members of the AR team believed much of what was presented was too complex and insufficiently IT focused. The team decided that the range of attributes offered by Mustonen-Ollila and Lyytinen (2003) around factors affecting the rate of adoption that related to the individual could be subject to immediate action. Thus the factors of relative advantage, compatibility, complexity, trialability, observability, reinvention, own testing, technological infrastructure, opinion leaders and change agents were considered strong candidates for developing tactical interventions to improve adoption of the system.

Following this analysis the team also constructed an 'issues log' which was intended to identify major issues that might arise from adopting this process. One issue that caused the most concern and discussion was the concept of 're-invention'- where users of the innovation adapt it to meet their individual perceived needs (Rogers, 2003; Greenhalgh et al., 2004). If the system was set up to meet individual stakeholder perceptions of their needs there would be a long 'wish list' not linked to corporate objectives resulting in chaos. On the other hand if there was no consultation and the system was imposed then stakeholders may be dissatisfied leading to lack of system use.

Planning: Recognising that the hospital was bound by NHS requirements to use a mandatory project management methodology (PMM) when implementing any form of IT the AR group had to think creatively within these parameters. Stakeholder consultation was planned and desired adaptations would be considered during the 'go live' period. There was agreement that as far as possible stakeholders should have the freedom to adapt the technology within the bounds of the system design. The hospital decided that a pilot implementation on a limited number of wards would allow for evaluation.

A workshop was organised by the AR team and the development team where the various aspects of the DoI theory was considered and planned action developed for each of the proposed relevant attributes (Mustonen-Ollila and Lyytinen,2003). These included:

- Creation of a 'sand pit' system
- Delivery of 'open' training sessions in wards
- A programme of ward visits
- Structured walk through of process flows with the key stakeholder groups
- Development of a communication strategy for the project.

Taking Action: The idea of creating a ***'sand pit'*** system was new to the hospital and generated some concerns. The purpose of a 'sand pit' environment was to 'play' with the system and allow users to try out new ways of working thus making the system more visible (Rogers, 2003). However, the system was largely un-configured, offering the possibility that the users would see any bugs or system set-up problems. The project development team, more familiar with a formal project management approach, were concerned that users would develop a negative impression of the software. Nevertheless the 'sand pit' environment was made available in March, 2012, two months prior to going live with the patient flow system.

Availability for training is always an issue for clinical staff because of shift working, the transient nature of the staff, and the need to call on 'bank' nursing staff (qualified nurses who can be called in at short notice to meet work demand). In the past Town hospital trained its staff in controlled classroom environments with planned lessons and defined objectives. However, it was not possible to provide this type of training within the available timeframe. Therefore the plan was for trainers to go to the wards at set times and wait for nursing staff to attend in situ with an 'open' agenda of training. In practice the trainers did have a planned structure for system training but had to be flexible to users' needs.

The project development team visited wards, usually in quiet periods, to assess the physical layout of the wards and the possible location of the proposed technology. They also took time to discuss the forthcoming system implementation and this was commented on by nursing staff who previously '*had never seen as many IT people on the wards'*.

Specific workshops were held with stakeholders to discuss the process flow models developed by the project analysts. These workshops challenged staff understanding of the 'as is' system and the 'to be' system. The hospital uses a formal documentation called UML process diagrams (Kratochvil and McGibbon, 2003) and this was shared in the workshops with the stakeholders.

The stakeholder analysis identified all of the potential groups who might have a vested interest in the PFMS. These included nurses, ward managers and clerks, junior doctors, consultants, the hospital board of directors, the IT team, the clinical intervention teams, clinical business managers, HR staff, modern matrons, infection control team, the vendors, A&E staff, the PAS supplier, system administrators and the information governance team. A detailed communications strategy was developed which contained the information required by each group, who would provide the information, how frequently it would be provided and the best method of communication to each group.

Evaluating the Action: The final stage of Cycle 1 involved reflecting on the outcomes of each action taken. The data generated was achieved through a series of meetings involving structured focus groups and opportunity sampling of staff feedback on the process. Formal meetings were recorded and focus group workshops were recorded in a structured manner. During this cycle data from ten focus groups and eighteen workshops were obtained and analysed. There was clear evidence of extensive stakeholder engagement. However this had led to many requests for changes to the system to suit individual needs, reflecting the concerns outlined by Greenhalgh et al. (2004). Stakeholders also identified issues around potential abuse of the system:

- Individuals looking at data they would not otherwise have access to.

- Management using the data to performance manage the nursing staff

- Individuals falsifying data entry for their own benefit

Politically, a ward being able to see the bed occupancy levels of another ward was challenging for staff and appeared to be an issue primarily about ownership and control of information.

The use of DoI theory had been seen to be useful and although not much different from the traditional approach the hospital might have taken it allowed more focus on the stakeholders. However, for some of the development team this had a negative effect as stimulating stakeholder expectation put pressure of the scope of the project. Thus going into Cycle 2 the AR team decided the following:

1. They would promote the concept of controlled and progressive change in dealing with user requests for change.
2. Issues relating to confidentiality and misuse of the system would be openly discussed with the senior management of the hospital.
3. The use of contentious performance related data, such as 'expected discharge date' would not be strongly promoted and the use of these functions would be accessed at a later date.
4. Senior management would not use the system to 'spy' on wards in early months of implementation and management reporting functions would be used in consultation with other stakeholders.

5.2   Cycle 2 – Post 'Going Live'

*Diagnosing***:** The issues raised in the previous cycles were fed into Cycle 2 which was intended to ensure that the system went live with as little difficulty as possible.

The AR team wanted to explore what the key success factors (KSFs) might be and to what extent applying DoI had affected the rate of adoption. The team determined tests that would provide evidence that implementation of the system had been positively affected compared with expected outcomes. Table 6 outlines the KSFs:

Table 6. Key Success Factors

Key Success Factors as determined by the AR team
The system was used by all target areas, with no significant areas or populations refusing to use the system.
The system was used in excess of 90% for the management of patient flows in target areas.
Stakeholders/users were aware of the trial system and had actively used the system prior to going live and response to the system was positive.
There was demand to install the system in other areas of the hospital
Use of the system was not reduced due to concerns over confidentiality.

Planning Action**:** The roll out onto the pilot wards was planned and alongside this the measurement of the KSFs. The AR team decided to obtain evidence in two ways; first the take up of the system would be explored by carrying out a reconciliation of ward activity recorded in the core patient administration system (PAS) and the activity recorded in the new patient flow management system. In theory if the system was used as intended in real time, data from the PAS system would reconcile exactly with the data in the PFMS. The AR team considered the issues of performing a qualitative study of user responses to the PFMS in a busy hospital environment where ethically they could not compel individual stakeholders to participate in interviews. It was decided that the 'response to the system' study would be carried out by researchers attending the pilot wards and inviting willing participants to participate in an interview, an approach described by Arksey and Knight (1999) as 'opportunity sampling'.

Taking Action**:** The PFMS went live on all medical wards on the 15th May 2012. A month after live operation the analysis of system usage was started. The analysis showed rapid uptake of the system from going live to the 15th July, 2012 with excess of 99% of all activity tracked in the system within the first week of operation. This was considerably greater than expected from previous experience of similar projects conducted in Town Hospital. Having established that there was a rapid uptake of system use, a further analysis was conducted to identify the number of live user accounts in the system. This revealed that 43% of issued user accounts were in active use over the analysis period. This was worrying as there was a suspicion that PIN access codes were being shared among staff.

During the analysis period 20 interviews were conducted with stakeholders. These included nurses (13), ward clerks (2), ward manager and deputy ward manager (2), occupational therapist (1), ward housekeeper (1) and nurse practitioner (1). This covered all of the main roles present in a ward care setting. The development team then met to identify key themes that had emerged from their interviews.

Evaluating the Action**:** Themes identified in the work of Rogers (2003),Greenhalgh et al. (2004) and Mustonen-Ollila and Lyytinen (2003) were used to explore whether the PFMS had been successful   and are presented below:

'*Relative advantage*' was a theme to which 45 extracts of data were attributed and this was further sub-divided into 'personal advantage' and 'wider advantage'. Interviewees perceived that the system provided benefits for them individually in that it

reduced their workload on the wards (e.g. by not having to regularly update and re-construct white boards with patient information) and it provided them with up to date information. Few interviewees identified benefits to patient care and five out of the twenty interviewees stated that the manual system using the whiteboards had not stopped and was running in parallel with the PFMS.

The extent to which the system was '*compatible with the culture*' of the stakehold-ers was a theme which was drawn out and 48 extract of data were grouped under this theme. Confidentiality of patient data is very important on wards and interviewees expressed concern about access to data beyond that which was possible using the manual whiteboards. Interviewees were anxious that managers might use data to con-trol ward staff in ways that currently does not happen.

In terms of the emergent theme '*simplicity of use*' most interviewees found that the system was on the whole easy to use and this had been a factor that the AR team per-ceived had contributed to the rapid rate of adoption of the PFMS.

The interviewees were asked about the use of the 'sand pit environment' set up to address the '*trialability*' of the system. It was indicated they enjoyed 'playing' with the system and that this opportunity developed user confidence. The AR team consi-dered this a positive response given the technical difficulties encountered in installing the temporary system and the limited time it was available. The conclusion was that this factor could have influenced the rate of adoption but it was not possible to gauge to what extent.

Entering the 'going live' phase the AR team were keen for the system to be '*visi-ble*' to all stakeholders. Most interviewees were using the PFMS and knew others around them who were using the new system. Yet seven interviewees stated that there were significant areas where the system was not being used. This required further investigation.

When asked about how the PFMS could be amended or improved the theme '*adaptation*' drew a number of suggestions and it was clear that stakeholders had been actively using the system and adapting it to their daily work. It was perceived that interviewees were engaged and thoughtful about how some small changes might im-prove it.

6   Discussion

AR is well recognised as an IS research method and is seen as highly relevant in the context of IS development (Avison et al., 1999). Nevertheless, conducting AR projects which involve substantial change or innovation within organisations can be challenging (Van de Ven et al., 1999). This section considers the meta-learning that has emerged from the project that has not only contributed to the local knowledge within Town hospital but also contributes to the IS methodological and IS develop-ment knowledge within the academic area. Coghlan and Brannick (2010) suggest that this meta- learning comprises 'premises', content and process. 'Premises' consist of '…*unstated and often non-conscious assumptions which govern attitude and beha-viour* '(p26). 'Content' relates to '.. *the issues, what is happening*' (p25) and 'process' relates to '..*strategies, procedures, how things are being done*' (p 25).

In terms of premises it is important to recognise that all the Town IT development staff have worked in the NHS for some time and have been inculcated into a public sector mind set: the proprietary project management methodology (PMM) used in systems development or adoption; the belief that clinicians resist change and will not take part in new systems development; the NHS and Town have a poor track record in systems acquisition and innovation in general. The AR project had to work with these premises and to develop new belief systems. This was done through inviting the AR team to access knowledge outside their normal area of expertise by exploring academic literature from nursing theory as well as DoI theory relevant to their situation. Understanding the nurse stakeholder became very important in this project. The AR team and the development team spent time on wards understanding nurse culture and then exploring what might work in terms of getting their engagement in the PFMS project. It became very clear that nurses do not resist change as long as the change benefits patient care and their role within the hospital. Thus within a healthcare environment taking an interdisciplinary approach to stakeholder knowledge is important in projects which have had a poor track record in implementing systems involving clinicians.

Many of the development team linked the PMM to poor implementation of systems in the hospital and believed that an AR approach could not work within these constraints. This assumption was challenged through finding ways of aligning DoI theory with some of the stages of the PMM. Once again the team were asked to think creatively about how the system could be introduced into the hospital in a way that satisfied nurse stakeholder needs first and then addressed management needs. This was very important to the success of the system as only by nurses engaging daily with the PFMS and ensuring the data was accurate would management be able to get the information they needed to make more strategic decisions.

The 'content' or issues of the meta-learning from the AR project relate to what happened. AR is often messy and non-linear. It can be highly stressful at times especially when researchers are closely involved. Berwick (2003) in a US study suggested ways of supporting DoI in healthcare. This AR project adopted some of the suggestions by identifying a pilot area for the PFMS, investing in training and development of the staff on the wards, communicating the progress of the pilot to the rest of the hospital and providing space and resource for the change. One of the AR team led the pilot. Nevertheless adjustments had to be made and the pilot lead faced challenges to the project from within his team and from a number of sceptical nurses. AR acknowledges this need for flexibility and applauds recognition of problems. The issues are important and need to be dealt with, not ignored and using this approach stands in stark contrast to the PMM used in Town.

The 'process' of carrying out the AR was done in a systematic manner by identifying the AR cycles early on in the project. The most difficult part of the research and the project in general was identifying the academic literature that would be of interest and relevant to a group of multi-disciplinary staff all of whom had their own epistemological and educational traditions. This was not an approach they had used before in systems acquisition though a number of nurses had used AR and evidence-based medicine in their professional work. The AR needed a champion within the hospital who was convinced that this was beneficial for the organisation and who was committed to seeing the project to an end. This individual, (AU), led the project throughout

and ensured that the senior management of Town were kept informed of the work, issues and outcomes. AU also instigated a post-implementation review of the pilot project to inform the full roll out of the PFMS. This was unusual in Town but has helped to embed knowledge within the organisation.

In terms of quality and rigour in this AR project the research conducted here has ensured that the approach taken has developed praxis of relational participation, has been guided by a reflexive concern for the practical outcome of implementing the PFMS, has involved a plurality of knowing and has resulted in sustainable change (Reason and Bradbury, 2001). The AR team have demonstrated how there was engagement in the AR cycles, how the project was exposed to critique and how different views of what was happening were accessed. The team used scholarly theory, rigorously applied it and have reflected on the appropriateness of that work (Reason, 2006).

7   Conclusion

The' benefits realisation' cycle of this project is still underway and the intention is to provide information to support senior management decision making as well as support for other clinical stakeholders such as doctors. It is clear that the doctors could gain benefits from the system with discharge plans, discharge letters and with hand overs at the end of working shifts. Yet doctors are a difficult group of stakeholders to work with. As was discussed above a better understanding of the doctor stakeholder is needed in order to enable engagement on this project. Patients would also benefit from some of the facilities in the PFMS as their individual care plans can be tracked and treatment targeted. It is clear that patients are rarely consulted on how IT can improve their care and there are often assumptions made about this. Town are keen to involve patients and are researching ways of doing this. It is our intention to report on this work at a later date.

References

Albury, D.: Fostering Innovation in Public Services. Public Money & Management 25(1), 51–56 (2005)

Arksey, H., Knight, P.: Interviewing for Social Scientists. Sage, London (1999)

Avison, D.E., Wood-Harper, A.T.: Multiview - An exploration in information systems development. Blackwell Scientific, Oxford (1990)

Avison, D.E., Lau, F., Myers, M., Nielsen, P.A.: Action Research. Communications of the ACM 42(1), 94–97 (1999)

Barnard, A.: Alteration To Will As An Experience Of Technology And Nursing. Journal of Advanced Nursing 31(5), 1136–1144 (2000)

Berkun, S.: The Myths of Innovation, 2nd edn. O'Reilly, Farnham (2010)

Berwick, D.M.: Disseminating Innovations in Health Care. Journal of the American Medical Association 289(15), 1969–1975 (2003)

Bessant, J.: Enabling Continuous and Discontinuous Innovation: Learning From the Private Sector. Public Money & Management 25(1), 35–42 (2005)

Blum, F.H.: Action Research - A Scientific Approach? Philosophy of Science 22(1), 1–7 (1955)

Brennan, S.: The biggest computer programme in the world ever! How is it going? Journal of Information Technology 22, 202–211 (2007)

Buijs, J.: Innovation Leaders Should be Controlled Schizophrenics. Creativity and Innovation Management 16(2), 203–210 (2007)

Checkland, P.: Systems Thinking, Systems Practice. Wiley, Chichester (1981)

Chein, I., Cook, S.W., Harding, J.: The Field of Action Research. The American Psychologist 3, 43–50 (1948)

Clegg, C., Shepherd, C.: The biggest computer programme in the world...ever!': time for a change in mindset? Journal of Information Technology 22, 212–221 (2007)

Coghlan, D., Brannick, T.: Doing Action Research in your own organization, 3rd edn. Sage publications, London (2010)

Currie, W.: Institutional isomorphism and change: the national programme for IT – 10 years on. Journal of Information Technology 27, 236–248 (2012)

Damanpour, F.: Organizational innovation: a meta-analysis of effects of determinants and moderators. Academy of Management Journal 34, 555–590 (1991)

Damanpour, F., Gopalarkrishnan, S.: The Dynamics of the Adoption of Product and Process Innovations in Organizations. Journal of Management Studies 38(1), 45–65 (2001)

Dash, D.P.: Current Debates in Action Research. Systemic Practice and Action Research 12(5), 457–492 (1999)

Denscombe, M.: The Good Research Guide for Small Scale Research Projects. Open University Press, Buckingham (1998)

Department of Health. The power of information: Putting all of us in control of the health and care information we need (2012), http://informationstrategy.dh.gov.uk/about/the-strategy/ (accessed September 27, 2012)

Eason, K.: Local sociotechnical system development in the NHS National Programme for Information Technology. Journal of Information Technology 22, 257–264 (2007)

Fetter, M.S.: Curriculum Strategies to Improve Baccalaureate Nursing Information Technology Outcomes. Journal of Nursing Education 48(2), 78–85 (2008)

Flood, R.L., Romm, N.R.A.: Emancipatory Practice: Some contributions from Social Theory and Practice. Systems Practice 9(2), 113–128 (1996)

French, S.: Action research for practicing managers. Journal of Management Development 28(3), 187–204 (2009)

Granados, A., Jonsson, E., Banta, H.D., Bero, L., Bonair, A., Cochet, C., Freemantle, N., Grilli, R., Grimshaw, J., Harvey, E., Levi, R., Marshall, D., Oxman, A., Passart, L., Raisenan, V., Reus, E., Espinas, J.A.: EUR-ASSESS project subgroup report on dissemination and impact. International Journal of Technology Assessment in Health Care 13(2), 220–286 (1997)

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O.: Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. The Milbank Quarterly 82(4), 581–629 (2004)

Greenwood, D., Levin, M.: Introduction to action research: Social research for social change, 2nd edn. Sage, Thousand Oaks (2007)

Hartley, J.: Innovation and its Contribution to Improvement: A Review for Policy-makers, Pol-icy Advisers, Managers and researchers (2006), http://www.communities.gov.uk/documents/localgovernment/pdf/151336.pdf (accessed October 24, 2012)

Hayward-Rowse, L., Whittle, T.: A pilot project to design, implement and evaluate an electronic integrated care pathway. Journal of Nursing Management 14, 564–571 (2006)

Hill, S., McNulty, D.: Overcoming Cultural Barriers To Change. Health Manpower Management 24(1), 6–12 (1998)

House of Commons Committee of Public Accounts The National Programme for IT in the NHS: an update on the delivery of detailed care records systems (2011), `http://www.publications.parliament.uk/pa/cm201012/cmselect/cmpubacc/1070/107002.htm` (accessed: October 20, 2011)

Hughes, R.: Clinical practice in a computer world: considering the issues. Journal of Advanced Nursing 42(4), 340–346 (2003)

Huryk, L.A.: Factors influencing nurses' attitudes towards healthcare information technology. Journal of Nursing Management (18), 606–612 (2010)

Jonsson, S.: Action Research. In: Nissen, H.E., Klein, H.K., Hirschheim, R. (eds.) Information Systems Research: Contemporary Approaches and Emergent Traditions, pp. 371–396. Elsevier Science Publishers, North Holland (1991)

Kelman, S.: Unleashing Change: A Study Of Organizational Renewal In Government. The Brookings Institution, Washington (2005)

Kember, D.: Action learning and action research: Improving the quality of teaching and learning. Kogan Page, London (2000)

Kemmis, S., McTaggart, R. (eds.): The action research planner, 3rd edn. Deakin University Press, Victoria (1988)

Kotler, P.: Social Marketing of Health Behaviour. In: Fredericksen, L.W., Solomon, I.J., Brehoney, K.A. (eds.) Marketing Health Behaviour: Principles, Techniques and Applications. Plenum Press, New York (1984)

Kratochvil, M., McGibbon, B.: UML Light: How to specify your software requirements. Cambridge University Press, Cambridge (2003)

Levett-Jones, T., Kenny, R., Van der Riet, P., Hazelton, M., Kable, A., Bourgeois, S., Lux-ford, Y.: Exploring the information and communication technology competence and confidence of nursing students and their perception of its relevance to clinical practice. Nurse Education Today 29(6), 612–616 (2009)

Lewin, K.: Action Research and Minority Problems. Journal of Social Issues 2, 34–46 (1946)

Lewin, K.: Frontiers in Group Dynamics: II. Channels of Group Life; Social Planning and Action Research. Human Relations 1, 143–153 (1947)

Lewin, K.: Field Theory in the Social Sciences. Harper, New York (1951)

Lupiáñez-Villanueva, F., Hardey, M., Torrent, J., Ficapal, P.: The integration of Information and Communication Technology into nursing. International Journal of Medical Informatics 80(2), 133–140 (2011)

Mack, W.R., Green, D., Vedlitz, A.: Innovation and Implementation in the Public Sector: An Examination of Public Entrepreneurship. Review of Policy Research 25(3), 233–252 (2008)

McMaster, T., Wastell, D.: Diffusion – or Delusion?:Challenging an IS research tradition. Information Technology & People 18(4), 383–404 (2005)

Moggridge, A., Reason, P.: Human Inquiry: Steps Towards Emancipatory Practice. Systems Practice 9(2), 159–175 (1996)

Moore, G.: Dealing with Darwin: How Great Companies innovate at every phase of their evolution (2005), `http://www.dealingwithdarwin.com` (accessed November 5, 2012)

Morgan, G.: Images of Organization. Sage Publications Ltd., London (2006)

Murphy, J.: Nursing and Technology: A Love/Hate Relationship. Nursing Economic 28(6), 405–408 (2010)

Mustonen-Ollila, E., Lyytinen, K.: Why organizations adopt information system process innovations: a longitudinal study using Diffusion of Innovation theory. Information Systems Journal 13, 275–297 (2003)

National Audit Office. The National Programme for IT in the NHS: an update on the delivery of detailed care records systems (2011), http://www.nao.org.uk/publications/1012/npfit.aspx (accessed October 20, 2011)

Nelson, E., Batalden, P., Huber, T., Mohr, J., Godfrey, M., Headrick, L., Wasson: Microsystems in Health Care, Part 1: Learning from High-Performance Front-line Clinical Units. Journal on Quality Improvement 28(9), 472–493 (2002)

Norris, A.C.: Current trends and challenges in health informatics. Health Informatics Journal 8, 205–213 (2002)

O'Leary, Z.: Researching Real-World Problems: A Guide to Methods of Inquiry. Sage Publications, London (2005)

Oroviogoicoechea, C., Elliott, B., Watson, R.: Review: evaluating information systems in nursing. Journal of Clinical Nursing 17, 567–575 (2006)

Perry, C., Gummesson, E.: Action research in marketing. European Journal of Marketing 38(3/4), 310–320 (2004)

Pettigrew, A., Ferlie, E., McKee, L.: Shaping Strategic Change. Making Change in Large Organizations: The Case of The National Health Service. Sage, London (1992)

Pettigrew, A., Woodman, R.W., Cameron, K.S.: Studying Organisational Change and Development: Challenges for Future Research. Academy of Management Journal 44(4), 697–713 (2001)

Raleigh, V.: The information strategy: a transformation in health and social care information on the way? The Kings Fund (2012), http://www.kingsfund.org.uk/blog/informationstrate_1.html (accessed September 24, 2012)

Reason, P.: Three Approaches to Participative Inquiry. In: Denzin, N.K., Lincoln, Y.S. (eds.) Handbook of Qualitative Research. Sage, Thousand Oaks (1994)

Reason, P.: Choice and Quality in Action Research Practice. Journal of Management Inquiry 15(2), 187–203 (2006)

Reason, P., Bradbury, H.: Handbook of Action Research: Participative Inquiry and Practice. Sage Publications, London (2001)

Redwood. H.: Why Ration Health Care? : An international study of the United Kingdom, France, Germany and public sector health care in the USA, CIVITAS: Institute for the Study of Civil Society, London (2000), http://www.civitas.org.uk/pdf/cs08.pdf (accessed March 20, 2012)

Rogers, E.M.: Diffusion of Innovations, 4th edn. Simon and Schuster, New York (1995)

Rogers, E.M.: Diffusion of Innovations, 5th edn. Simon & Schuster, New York (2003)

Royal College of Nursing. Nurses and NHS IT developments : Results of an online survey by Nursix.com on behalf of the Royal College of Nursing (2006), http://www.rcn.org.uk/__data/assets/pdf_file/0009/78714/003079.pdf (accessed: March 12, 2011)

Royal College of Nursing. Market Research Report : RCN EHealth Study (2007), http://www.rcn.org.uk/__data/assets/pdf_file/0015/111552/003166.pdf (accessed: March 12, 2011)

Royal Society. Digital Healthcare: The impact of information and communication technologies on health and healthcare. London: Royal Society (2006), http://royalsociety.org/Digital-healthcare-the-impact-of-information-and-communication-technologies-on-healthcare/ (accessed: March 12, 2011)

Sauer, C., Willcocks, L.: Unreasonable expectations – NHS IT, Greek choruses and the games institutions play around mega-programmes. Journal of Information Technology 2, 195–201 (2007)

Seddon, J.: Systems Thinking in the Public Sector: The failure of the reform regime and a manifesto for a better way. Triarchy Press, Axminster (2008)

Sheaff, R., Pickard, S., Dowling, B.: Is Evidence Based Organizational Innovation a Delusion? In: Casebeer, A.L., Harrison, A., Mark, A.L. (eds.) Innovations in Health Care: A Reality Check. Palgrave Macmillan, New York (2006)

Stringer, E.T.: Action Research, 2nd edn. Sage Publications (1999)

Urquhart, C., Currell, R.: Reviewing the evidence on nursing record systems. Health Informatics Journal 11(3), 33–42 (2005)

Van de Ven, A.H., Polley, D.E., Garud, R., Venkataraman, S.: The Innovation Journey. Oxford University Press, Oxford (1999)

Wainwright, D.W., Waring, T.S.: The information management and technology strategy of the UK National Health Service: Determining progress in the NHS acute hospital sector. The International Journal of Public Sector Management 13(3), 241–259 (2000)

Warmington, A.: Action Research: Its Methods and Its Implications. Journal of Applied Systems Analysis 7, 23–39 (1980)

Willmer, M.: Promoting practical clinical management learning: the current situation about Information and Communications Technology capability development in student nurses. Journal of Nursing Management 13, 467–476 (2005)

Zhuang, L.: Bridging the gap between technology and business strategy: a pilot study on the innovation process. Management Decision 33(8), 13–21 (1995)

Zouridis, S., Termeer, C.J.A.M.: Never the twain shall meet. An oxymoron: innovation in government. Public Administration 7(8), 13–23 (2005)

Zuber-Skerrit, O.: The concept of action learning. The Learning Organization 9(3), 114–124 (2002)