Implementation of Systems to Support the Management of Research: Commentary from a UK University Perspective

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Authors' Note

We would like to recognise the contribution of various colleagues, too numerous to mention by name, who have contributed to the systems projects described in this paper.

Abstract

The increasing complexity and diversity of a typical portfolio of research awards coupled with advancing technology makes successful implementation and delivery of system benefits more challenging than ever. Moreover, the role of systems in knowledge management is a fundamental issue faced by all research active organizations. One of the principal drivers for introducing better systems should be to serve the academic mission and make life easier for researchers; yet most appear to perform conversely, perhaps sacrificing potential benefits to meet the requirements of administration. The principal challenge thus is to deliver a system that meets the needs of both academic and administrative communities. This paper provides a commentary on the experience gained within a research office following implementation of two systems (one pre-award, the other post-award) and identifies key elements for successful delivery. The paper contains suggestions, based on our experience, of best practices and techniques that research administrators might adopt to ensure a well-managed project and its implementation. It concludes how, post implementation, users may begin to derive maximum benefit from systems and points to the advantages that high-quality knowledge management can offer a range of stakeholders.

The Challenge from Technology

Introduction

The research sector is rapidly changing as universities pursue academic excellence and develop more complex research strategies to drive their organisation forward. Management of the typical research portfolio of grants and contracts is no longer straightforward, and the systems that underpin administrative processes are becoming increasingly difficult to design and implement. The characteristics of the average research administration system require increasingly complex project management structures and techniques in order to implement, so much so that attaining successful delivery and deriving maximum benefit are significant challenges. This paper reviews key areas of best practice and elucidates methods of deriving benefits from the implementation of new research systems.

Knowledge management is a difficult notion to define; indeed, the definition of "knowledge" itself is often the subject of debate. For the purposes of this paper, "knowledge" is considered to be derived from meaningful information and from the results of making judgements, connections and comparisons. Succinctly, it concerns valuable information and its use placed in a considered context. Knowledge management can be defined in similarly broad terms as the process by which an organisation captures and shares the collective knowledge of its communities. Furthermore, it is important to recognise that knowledge management has a broad and wide-ranging impact upon the organisation, touching people, culture, processes, technology, leadership and governance.

A successful knowledge management strategy should be closely aligned to the organisation strategy, to ensure that benefits are linked to the overall business goal. Close, well-managed relationships between corporate and knowledge management strategies are undoubtedly a powerful tool within an organisation. However, equally as important as recognising what constitutes the framework for a knowledge management strategy is the need to remember that not all information and knowledge is useful in every context. Selecting pertinent information and understanding that not all knowledge is worth knowing can focus strategy and avoid diluting benefits.

For research active organisations, achieving strategic goals and growth within the global economy has more often than not led to increasingly diverse and complex research portfolios. Research grants and contracts are a bigger and more competitive business for universities, bringing an increasingly higher volume of awards to the successful academics and their institutions, requiring increasingly higher levels of research support. However, with greater rewards emerge higher expectations in the form of bigger deliverables and more exacting professional management standards. It is in this context that the research organisation must establish a knowledge management strategy that maximises the benefits of an increasing research portfolio and supports the wider academic strategy.

Research organisations are talent industries that thrive on innovation and creativity. The challenge for universities is to ensure that knowledge management becomes embodied within the academic, management and administrative cultures to encourage fluid transfer of knowledge between people and systems. This paper recognises that knowledge management is concerned with many aspects of an organisation but chooses to focus on information systems and their delivery in a specific context. Information Technology (IT) is a key facilitator of

knowledge management and the medium through which valuable information can be stored, shared and managed. Paradoxically, however, IT systems can make knowledge management more challenging. A poor understanding of an organisation's knowledge and IT strategy can lead to systems that pose more challenges than solutions. To avoid this, and to implement a successful system, an organisation should seek to unite the people and knowledge it requires with the types of IT systems it intends to deliver. It is essential that systems and information connect with people and processes to support an organisation's mission.

In developing a successful IT strategy, it is critical to understand the needs of a variety of users and ensure that the strategy is framed by the organisational strategic mission. Increasingly, organisations have multi-component, modular requirements for their systems, but this is coupled with the recognition that systems and technologies can fail to meet the users' needs. The challenge for an organisation is to deliver a system that can deliver the needs of all users in pursuit of achieving a common goal. The research sector is in no way excluded from this rationale. Indeed, the challenge of delivering effective knowledge management and IT systems is exacerbated by the complex nature of a typical research portfolio and the underlying research administration and management techniques. Moreover, the nature of the research environment is such that there is always the possibility of conflict when attempting to deliver a single IT system with a wide focus and user base. Managing the dynamic between the academic vision of a university and individual department needs, such as audit and accounting requirements, are significant challenges. To neglect this dynamic augments the risk of drifting from the mission behind a systems project.

It is the unique and delicate challenge posed by competing interests of the research environment that forces questions to be asked about the essence of research endeavour. What exactly is the nature of the business of research? Is it concerned with satisfying accountants, statutory requirements, administration, or the needs of funding bodies? Or is the purpose to develop academic and scientific excellence? Without answering these types of questions and maintaining a focus upon all types of users and their needs, a research organisation will fail to meet its strategic mission and fail to foster an effective knowledge management culture.

Case Study: Imperial College London

This paper provides a commentary on the implementation of research management systems from a research office perspective within the UK university sector. This example seeks to draw on the experiences of research managers and administrators to provide key elements for success, lessons learnt and methods for deriving benefit from combined IT and knowledge management strategies.

1. Background

Imperial College London was established in 1907 and is consistently rated in the top three UK universities. It is a world-leading, science-based university whose reputation for excellence in teaching and research attracts students (11,000) and staff (6,000) of the highest international quality. It embodies and delivers world class scholarship, education and research in science, engineering, management and medicine, with particular regard to their application in industry, commerce and healthcare.

Three years ago the college commenced a large-scale programme centred upon the people, processes and systems at

the core of its research support and administration. The vision behind this programme was to develop people and systems capable of supporting 'cradle to grave' research grant and contract administration and management, while reducing the administrative burden placed upon academics. The programme sought to provide research administrators with the support tools, both system and knowledge based, to ensure academics could concentrate on scientific research rather than bureaucracy. The programme was committed to deriving benefits from the systems pertaining to reducing data duplication, increasing operational efficiency and increasing management of information.

The college introduced two commercially produced information systems: a pre-award tool for academics and administrators, InfoEd Proposal Development (PD) and Tracking (PT), and a post-award tool, Oracle Grants, that nestled into an existing suite of Oracle finance modules. The intention was to integrate both systems seamlessly to support research application inception through to project termination and embed this within a culture that used information and knowledge creatively to further the organisational mission.

2. Key Elements for Success

2.1 Ask questions.

In implementing any project, whether it is IT related or otherwise, people need to understand why it is being carried out and what it hopes to achieve. A systems implementation project must define its mission. Particularly within a university, where stakeholders are often varied in their nature and needs, it is necessary to ask a number of questions and agree on the answers before contemplating the next steps. As research portfolios get bigger and more complicated, so do the systems that support them. A sensible starting point is for a research organisation to ask "big questions" of itself and to tackle the difficulties these pose head on. A few examples of the type of questions asked at the outset of the Imperial College implementation are as follows: What is the vision for this organisation, particularly in terms of scholarship? How will the system serve and benefit the vision? Why are we doing this project? What will we deliver at the end of this project? Who are we delivering the project outcomes to? Who will benefit and why? How much will it cost? What is the cost/benefit analysis – does it add value? What is the impact of undertaking the project on day-to-day business and staff? Where are the skills required to make this happen successfully?

Answers will invariably differ from one university or project to the next. However, it is possible to draw parallels from our project implementation that may be of use to other research organisations.

Setting a vision for a research systems project is critical for success, but a vision should not be situated in isolation. Understanding how the project fits into the wider framework of the organisation is a challenging exercise but an essential one to set a clear and cohesive framework for a programme of work.

Understanding what you hope to gain must be clearly defined from the outset. The experience of implementing both pre- and post-award research systems has led us to suggest that the number of stakeholder groups affected cannot be underestimated; a number of common ones are shown in the table below:

Table 1

Typical Stakeholder Analysis Encountered During Early Phase of the Project

Academic community • Principal Investigators • Collaborators • Research staff/ Fellows/ Post-doctoral researchers • Students	**Finance** • Financial Accounting • Financial Strategy • Statutory reporting • Accounts Receivable • Accounts Payable • Purchasing
Research support services • Research management and administration (central and devolved) • Academic departmental administration • Human Resources (HR) • Communications • Departmental finance	**Statutory** • Internal Audit • External Audit • Other statutory/government data returns • Customs and Excise
Funding bodies • Charities • Industry • Research Councils • Government Departments • European Union • Overseas agencies and organisations	**ICT** • ICT development • ICT support

A stakeholder analysis will assist in fully defining the needs and specifications of all stakeholders, which is key to systems success. This is as much an art as a science, and its importance cannot be understated. Moreover, we found that compiling the specifications as technical colleagues wanted was something alien to us (coming from a research office), and the learning curve was steep. However, it is essential that this document be full, robust and focused to ensure the system delivers what you, the user, require of it.

Knowing the project deliverables defines the project scope and provides a better chance of success. Interactions and dependencies between groups of stakeholders are also more clearly understood, thus minimising the extent to which particular stakeholder needs can be adversely affected by implementation.

Our experience is that answering these questions at the most senior levels of an organisation sets a framework within which a project structure can be clearly conceived and designed. Equally as important is to continually revisit these questions and answers as the project progresses. From this standpoint a project stands a much better chance of successfully meeting the needs of all stakeholders.

2.2 Set a project structure.

Imperial College favours the Prince2 project management methodology (Office of Government Commerce, UK) as its approach to delivering its new research information systems. Prince is a structured method for achieving effective project management that has evolved in the UK. It was first established in 1989 by the UK Central Computer and Telecommunications Agency as a standard to be used for all government IT projects and was subsequently modified as an approach to

project management for all projects. Since 1996 it has been a standard requirement that UK public sector projects are run using this version of the approach, Prince2.

Key Features of the Prince2 approach include: 1) a clear business case which sets out the aims of the project; 2) a defined and measurable set of "products" or results, together with the activities to achieve them; 3) defined resources (including financial and people requirements) linked to activities; and 4) an organisation structure with defined responsibilities to manage the project.

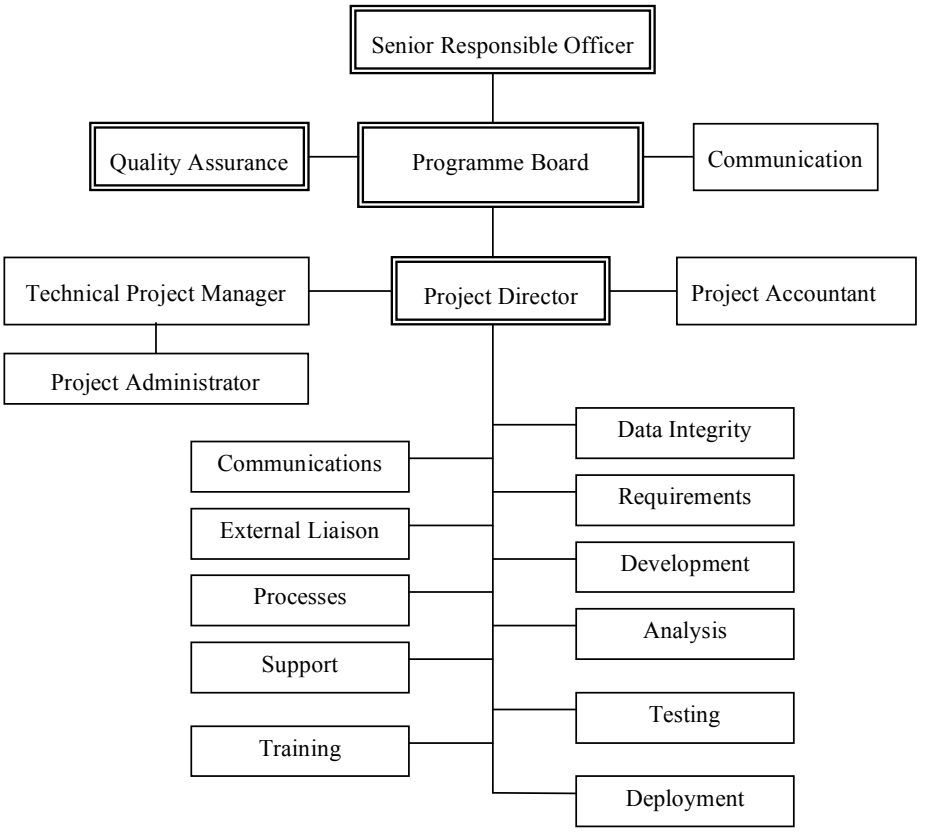
Typically, these features are captured in a set of project documents against which aims and progress are monitored, risks identified and managed, and changes to aims or activities controlled. However, it should be noted that Prince2 procedures may vary according to the type of project and organisation implementing the project itself. Also, some aspects of project management are well covered by other well-proven methods, including people management techniques, generic planning approaches and methods for controlling budgets. Prince2 is a coherent set of project management concepts and processes that provides a minimum set of requirements for a properly run project. The approach fully recognises, however, that any given project may require individual tailoring of particular aspects of the Prince2 methodology.

Leadership and buy-in from the uppermost levels of management within Imperial College were essential in driving and coordinating the entire programme. To this end a programme board was established to include key senior stakeholders. The Programme Board itself was chaired by the Senior Responsible Officer (in Prince2 terms), a critical role to which ownership of the work programme is attributed and which has ultimate responsibility for delivery.

The Programme Board, among other responsibilities, provides strategic guidance in areas of organisational, IT and knowledge management. Through this cohesive senior management structure, the information systems implementation for both InfoEd and Oracle Grants was project managed with the intention that they were delivered on time and on budget, with maximum benefits to the college.

At the project level it was important to establish a Project Director and Technical Project Manager for each system implementation and to ensure communication with the Programme Board. However, equally critical were the composition and leadership of key areas of project work – or "project workstreams." Workstreams carefully composed from key stakeholders can prove to be a valuable source of research knowledge and, when harnessed within a well-managed project, should lead to a system that effectively supports administrative and academic needs. It was also our experience that workstreams form a number of activity hubs within the project structure where knowledge is shared and documented by different stakeholders for the benefit of both project and organisation. The very nature of workstreams encourages the development of key relationships between organisational areas and communication networks. Both projects employed the use of workstreams and sought to involve a wide range of stakeholders, including principal investigators. This type of framework encourages communication between departments and units and enables the project manager to understand dependencies and process flows within an organisation. Ultimately, this should help ensure the project results in more accurate and timely system deliverables. The project structure adopted is shown in Figure 1.

Figure 1. Project Hierarchy



Accompanying the project structures at Imperial College, and in line with Prince2 methodology, is a Project Initiation Document (PID), which forms the crucial document against which a project is executed, governed and measured. In constructing a PID, the project is setting out in document format its purpose, approach and objectives. The PID should act as a valuable reference point for the project manager and team and function in conjunction with a project plan to monitor progress.

Universities have a variety of stakeholders with many competing requirements from prospective systems. In constructing a PID, it is imperative to pay attention to the audience and ensure that roles and responsibilities are clearly understood within the project structure. Ownership and accountability for deliverables are key to successful implementation of a system, and empowering individuals with the opportunity to shape their requirements leads to a more consultative process. Stakeholders--such as research support services or academics for example --should be aware that they are representatives for their particular area and, as such, have a responsibility to communicate the consultation process beyond that of the immediate project vicinity.

Clearly defined deliverables should be included within the PID and agreed to and signed off on by the project team. Sufficient time should be allocated to

carefully consider the milestones necessary to achieve success, and deliverables should be both specific and timely. The Imperial College approach was to allocate each deliverable to a specific project workstream and assign a responsible owner, workstream group and deadline. Deliverables were then allocated a unique reference number and cross-referenced with the project plan in an approach that was found to greatly assist the project manager in identifying the critical path to success while ensuring accountability across workstreams.

2.3 Promote project engagement and interaction.

The experience of implementing systems such as InfoEd Proposal Development and Tracking and Oracle Grants has illustrated that research administration and systems are increasingly complex in their nature. Imperial College's experience was that securing active stakeholder engagement and dedicated business resources became critical to the success of research system projects. Research administrators in this project indicated that they required bigger, more intricate tools than initially expected to support their often complex administration scenarios. It was therefore, more difficult for project staff distanced from day-to-day operations to ensure that requirements and nuances are captured successfully. We recognised that staff members did not always have sufficient time or skills for the project workstreams they were assigned to, particularly during busy periods in their day-to-day jobs. It should also be remembered that one of the biggest stakeholders was the research support service division, which was also greatly affected by the overall programme of work. These systems would have a huge impact on the way that research support services carried out their day to day job and supported the academic community.

It was decided that dedicated business resources were critical to the success of the college's systems implementation; therefore a cadre of systems "Superusers" were assigned to each of the InfoEd and Oracle Grants projects to support requirements and testing workstreams. The superusers were selected from within Research Services teams, and the role was intended to ensure that business expertise became focused on project work for sustained periods of time. It is essential that superusers located within the business unit and specifically from within the core stakeholder group. The benefits to the project were immediately recognisable, with a greater range of business specifications and more thorough User Acceptance Testing (UAT) across a range of scenarios. Indeed, the engagement of key research administrators acted as a conduit for knowledge transfer back and forth between the Research Services teams and the systems projects and later assisted in facilitating training and embedding systems users within the research support area.

The challenge in supporting the superuser model adopted by Imperial College is the need to backfill those superusers seconded to projects for one or more days per week. Moreover, it is important for (senior) research and project managers to make realistic assessments of the impact of these absences. Research Services offices are busy environments, often under pressure to deliver effective support to the academic community; moving staff from within such teams to focus entirely on project work can have an adverse impact on daily functions. Effective and increased communication to manage academic and other support services expectation, together with "clever" resource management, should help minimise the impact during periods when research administration teams are missing key members.

Encouraging business participation in systems implementation, through workstreams and superusers, should ensure that stakeholders are actively engaged and focused upon their responsibilities as part of the project teams. It is also important to note that projects to establish IT research systems are not IT projects per se. In other words, projects should be driven by the customers; encouraging active and dedicated participation from academics, research support staff and other university areas is an approach worth considering. Managing good relationships between IT colleagues and IT vendors is essential within project structures, to ensure a balanced lead on direction.

3. Lessons to be Learned

Imperial College encountered a number of problems and learned some valuable lessons. If the project team were to ask: "Would we do anything differently next time?" the answer would be yes. The process of implementing new systems was a steep learning curve for those of us from Research Services: the college delivered a successful project whilst learning key lessons for the future.

3.1 Continual revisiting of the programme mission.

In the hectic schedule of events that fuels the project "juggernaut" on its critical path, it is easy for the project team to lose sight of both the project goals and organisational mission. Particularly within the university sector, the typical research portfolio poses challenges in managing complexity, accountability and constrained funding. Information systems are expected to serve a number of stakeholders and satisfy accounting, reporting and audit needs, many of which are essential. The challenge facing us was to ensure that the mission (focussing on relieving the academic community of administrative burdens) was not forgotten in the day–to-day development of requirements and system specifications.

In particular, the post-award administration of research grants and contracts is invariably focused upon the management of financial data. While this is certainly a key aspect of a post-award system, it should not be the sole purpose. It is our experience that failure to place research (in terms of academics and research support) at the forefront of the stakeholder community risks placing the organisation at the mercy of its systems rather than placing the systems in service to the users. As well as continually referring to the project mission, it was also important to continually update the stakeholder community with progress. To this end, the implementation team produced project newsletters and roadshows for research administrators and academics. It was important to keep stakeholders engaged and informed of progress. Helping college communities to understand why systems were being implemented improved the receptiveness of some stakeholders, which underlines the fact that change and its impact on morale, should not be underestimated. Often a change imposed is a change opposed, and good communication should be high on any project agenda.

3.2 Involvement of dedicated, skilled research staff.

The contribution of excellent, skilled IT people together with research administrators and managers was key to the project. Seconding members of Research Services teams to the project structure and ensuring that dedicated expertise was at the disposal of the project management had a hugely successful impact on implementing InfoEd Proposal Development, Proposal Tracking and Oracle Grants. There are two key themes that deserve attention: ensuring (1) that seconded staff have appropriate skills

and the ability to cope with a potentially steep learning curve and (2) that they are involved from an early stage in the project.

Ensuring dedicated project expertise will often be at the expense of the first line research support. Moreover, the needed people are likely to be among the most skilled, and sometimes more senior, individuals within the team; this situation encourages an organisation to carefully consider the value of project deliverables and the size of the challenge. Our view is that highly skilled and experienced research staff provide vital expertise to the project process and often the size and complexity of projects are underestimated.

Bringing extra resources to the projects focused primarily on final system implementation when User Acceptance Testing (UAT) and sign-off was of major importance. However, involving Research Services staff earlier in the project timeline would have benefited development of the requirements and specification processes; staff would also have realised earlier the impact of the proposed changes to systems and processes. It often happens that changes to office processes must be made to correlate with new systems; tackling this area earlier in a project saves time, effort and confusion. It is also important to note that UAT is naturally set within the context of requirements; involving research administrators in the end-to-end process of defining requirements and then testing them gives rise to tighter, more efficient progression and buy-in.

3.3 Maintaining a business focus.

Both systems were implemented to serve research and academic needs. A key challenge faced by these projects, however, was to maintain a business focus on the processes and not allow the project to drift into the realm of simply "becoming an IT project." To preserve a research perspective, it was our experience that "research customer" and "technology supplier" roles for user and IT developers, respectively, are clearly defined. The dynamics between such roles are finely balanced, and from the perspective of this case study, a lack of user input coupled with unguided IT involvement can cause a project to lose end-user perspective.

Clear communication among IT vendors, internal IT staff and users is important to the successful delivery of new systems, and technical relationships need to be cultivated carefully. Like many universities, Imperial College is a complex organisation that requires complex systems; the challenge is to work effectively with in-house technical "experts" to communicate business requirements in a format to all users in ways that they can understand and act on. Research administration, in particular, is becoming increasingly difficult to understand for those who are not part of that endeavour. By developing close relationships with our technical colleagues, based on mutual respect, it is possible to deliver successful research administration systems. Those of us in research support should not have to "hide" behind the efforts of IT colleagues (because a lot of the language and requirements appear alien); rather, we should all learn from each other.

Encouraging active input from stakeholders and maintaining a firm grip on the project direction will ensure that decision making within the project structure is more informed and the outcomes better understood. This in turn makes it easier for IT colleagues and vendors to concentrate on technical details and development. From the experience of the project team in the Imperial College case study, it was apparent that the projects

became overly IT-centric and drifted from the mission when focus was diverted. When this occurred, decision making either stalled or was deflected into a strictly IT perception of the project and IT personnel did not clearly understand the needs of users. A user-led systems project with solid IT relations would appear to be an effective model for ensuring that informed decisions are delivered in a timely manner and ultimately assuring that the project stands an improved chance of contributing to the organisational mission.

3.4 Remembering post-implementation support.

Implementing research systems does not end at the point of "go-live." It is critical to ensure that a post-project resource is agreed to support system users, at least in the short to mid term, and particularly around areas of training, further testing and first-line user support. A valuable lesson learned by this project is that research administration systems are expected to handle significantly complex setups. Academics demand, and rightly so, that both systems and research administrators are ready to support their needs immediately upon go-live. It is at this point that the benefits from seconding staff to a systems project and, in the case of Imperial College, building a group of Superusers become increasingly apparent. The process of embedding a knowledge management culture within the organisation, specifically within research administration, takes on greater significance as project participants take key learning experiences back to their teams to use in "real-life" scenarios with academics. This is increasingly important for multi-campus universities, such as Imperial College, where academic and research support teams are spread out geographically and knowledge gaps can develop if superusers are not positioned at every location.

Similarly, it is likely that a post-implementation programme will be necessary to care for teething problems or enhancements. Again, superusers act as a valuable resource for requirement focus groups or testing and this can benefit post-implementation development that might arise. Similarly, entirely new programmes of work, that might arise unanticipated, can benefit from knowledgeable superusers that are already in place, thus minimising the impact of resourcing projects with inexperienced or less knowledgeable staff members. Using experienced research administrators as interchangeable vehicles for knowledge between projects and their day job, with realistic management of backfill, is a powerful tool in enabling an organisation to maximise benefits from challenges.

4. Starting to Derive Maximum Benefits

Following any system implementation an organisation should be able to clearly demonstrate value-added for both stakeholders and the organisation. It is important to look at the original aspirations of the project against what has actually been delivered and assess ways in which benefits can be maximized. In our case, it was important to recognise that a systems project does not finish at the go-live date.

Post-implementation, phased releases--packages of additional functionality--were put in place to begin to build upon the new system from the base level that had been initially implemented. The core project team were retained for a significant time following implementation; similarly, superuser expertise continued to be utilised to aid particular areas of ongoing system improvement. Training, supplemented by sustained superuser involvement, helped to ensure that research administrators did not feel isolated or ill-equipped following

new developments and were able to support academics and complete their normal work processes effectively. It is also important to ensure staff have the capability and confidence to identify additional refinements and problems in this early stage and the project should encourage this interface.

It is apparent that real benefits can be derived from a carefully designed system once it is in place. At the outset, benefits appear abstract and intangible, and it is difficult to foresee all the possibilities; however, after implementation users begin to see the added value. Success can breed success in project management and systems implementation; a robust and credible system that is widely used can begin to form a vital network for the transfer of information and thus management of knowledge. Encouraging stakeholder engagement throughout the entire implementation process and post implementation adds substance to this framework, embeds a network of knowledgeable people, and starts to develop a knowledge-management culture.

In summary, we suggest that organisations follow these key points to facilitate a successful implementation: 1) define a clear vision or mission for the project; 2) maintain project focus and don't lose sight of the objective(s); 3) implement a robust project management structure to allow the right people to make the right decisions at the right time; 4) ensure appropriate user-control over the project and invest in skilled, dedicated people; 5) do not underestimate the size of the project or the impact of other considerations on the mission; 6) do not underestimate the value of communication; 7) understand the importance of the post-project phase and look to maximise benefits; and 8) ensure to engage all stakeholders.

Conclusion

Changes of systems are a big commitment for all concerned. By appropriate planning and project management, it is possible to minimise the pain and increase the benefits from these ventures; system projects are hard work and it is important to celebrate success regularly. Implementation of a new system should be seen as enhancing the academic mission and viewed as an integral component of knowledge management in an organisation. Their value comes when information creates a knowledge base which can be used to drive future strategy – it helps us to understand our activities and relationships and hence make better informed decisions. The greatest challenge is to use this knowledge in an innovative way that begins to dynamically fashion the culture of an organisation. In this way, the ethos will change from one that often cites organisations as being at the mercy of systems to one that embraces them.

References

Office of Government Commerce, UK. (2005). *Managing successful projects with Prince2*.