ALT-C 2010

"*Into something rich and strange*" – making sense of the sea-change

Conference Proceedings

Web-based collaboration in Higher Education: small steps towards adoption

Tim Neumann[1], Caroline Bell[2], David Flanders[3], Kit Logan[1], Sarah Sherman[4], Nick Short[2], Kim Whittlestone[2] |
[1]London Knowledge Lab, 23-29 Emerald Street, London WC1N 3QS, [2]Royal Veterinary College, University of London, Royal Veterinary College, Royal College Street, London NW1 0TU, [3]JISC Executive, Brettenham House (South Entrance), 5 Lancaster Place, London WC2E 7EN, [4]The Bloomsbury Colleges, University of London, Royal Veterinary College, Royal College Street, London NW1 0TU | t.neumann@ioe.ac.uk, d.flanders@jisc.ac.uk, k.logan@ioe.ac.uk, s.sherman@bloomsbury.ac.uk, nshort@rvc.ac.uk, kwhittlestone@rvc.ac.uk

This paper reports on the early adoption phase of Google Docs as a web-based collaborative tool across six institutions in a concerted effort. The adoption approach was based on a custom framework in order to focus on users and their actual needs, and the adoption was driven by a small project team as opposed to institutional managers. This study therefore reports on suitability and value of the custom framework and on issues of innovation adoption originating from the institutional periphery.

Users were reporting a high satisfaction with the tool, and findings show that the use of the tool enhanced collaboration significantly, in turn improving the quality of student learning. The main concern of this paper, though, is the evaluation of the custom adoption framework. This framework is based on the idea of not overwhelming users, instead introducing small, gradual steps with a technological innovation that is appropriate for their needs. Based on a review of existing adoption models, we attempted to address common issues of individual-based adoption models in our given context.

Overall, the framework was successful but needs adaptation. Concepts such as technological gaps do not always align to user perceptions. With some suggested adaptations, though, this framework can be used in similar scenarios.

Keywords: *changing tools, collaboration, Web2.0, uptake, adoption, innovation spread*

1. Introduction

This paper reports on the early adoption phase of web-based collaborative tools across six institutions in a concerted effort. The adoption approach was based on a custom framework in order to focus on users and their actual needs, and the adoption was driven by a small project team as opposed to institutional managers. We report on suitability and value of the custom framework and on issues of innovation adoption originating from the institutional periphery.

The motivation for the project was born out of the ambition to promote the use of innovative technology beyond a small group of early adopters and prepare the average user, be it a lecturer, student, administrator or researcher, for realising the benefits of new technological developments in the area of web-based collaborative tools. We therefore deliberately selected Google Docs as a tool whose use incurred no additional costs to users or their institution. Google Docs is a suite of three web-based office applications: a word processor, a spreadsheet application, and a presentation tool. Google Docs is accessed and operated through a standard web browser and has collaborative functions built in, allowing multiple authors to edit one document at the same time. The functionality of Google Docs complemented current institutional services, the tool displayed a potential of future integration with existing infrastructure, and it was identified as a good example of typical emerging functionalities. Also, users would be able to continue using this tool beyond the project lifespan, thus turning the study into a real-life scenario and potentially an actual adoption.

We pursued two main aims during the study:

1. Introduction of collaborative web-based tools to enhance current practices:
   This project aimed to help bridge gaps in the technical skills of our users, and to illuminate the impact of collaborative tools on the practice of various stakeholders at Higher Education Institutions (HEIs).
2. The trial of our adoption framework and its evaluation:
   We created our own adoption framework, building on existing work but adapted to our specific needs. This project provided an opportunity to apply this framework in practice and test its potential for similar initiatives.

2.   Background

This section explains the thinking behind the project ideas and locates our activities in the relevant field by making links to appropriate literature.

2.1   The need for collaborative tools

Lifelong learning is one of the most important skills to master, and one of the vital functions of HEIs is to help students grow and develop by keeping up to date with new learning methods and styles, catering to the learning experience of all individuals and addressing their individual needs. It makes sense for education at all levels to move towards greater use of collaboration, which according to Beckman (1990) has many advantages. These include reducing the stress of working alone for long periods of time, greater achievement through discussion of issues by people with differing opinions and making tasks appear less daunting by providing a collaborative environment. Learners also report that learning is more enjoyable when applications are user-friendly and when working in groups that are socialising. Franklin and van Harmelen (2007), too, stress the value of group work and social constructivism in developing effective teaching and learning environments.

But there are more advantages to collaboration. Diana Laurillard's Conversational Framework (2002) for example highlights the value of collaboration to the learning process because it addresses vital feedback loops that help learners engage more deeply in refining their reflections and actions. Collaborative tools such as Google Docs can address large parts of this process: they can be appropriate for learning through inquiry, discussion, practice, collaboration and production and thus provide rich opportunities for engagement. The important issue, though, is to use these tools in appropriate settings and embed them in practical teaching strategies. These two aspects are at the core of our custom adoption framework.

Collaborative tools need not be restricted to learning. In other sections of HEIs, people co-operate on a range of activities, including administrative and research tasks. One significant feature of recent web-based tools is their ability to bring such different users together through collaborative working practices; however, one barrier to using technology, especially innovative technology, is the skillset of users: Marc Prensky (2001), for example, sees a generation conflict between digital natives and digital immigrants. But the new generation's confident use of technology, including multi-tasking, flexible and independent working, often does not sit comfortably with other users' more limited technical abilities, creating a challenge for institutions that want to adapt to learning and working styles fostered by new technologies (Dede 2005) to capture their benefits.

Interestingly, Prensky himself (2009) now advocates looking beyond his digital native typology and focusing on the development of Digital Wisdom to prepare ourselves for the future and not end up on the wrong side of an increasing digital divide. We argue that collaborative tools could go some way to helping users along this way, bridging the skills gap to some degree. Our project therefore sought to exploit this opportunity by identifying Google Docs as a tool that is simple enough to be used and shared by all stakeholders, because of its similarity to familiar less collaborative desktop-based tools. The addition of a web-based collaborative component would thus facilitate a small-step approach to becoming more confident with innovative technologies.

2.2 Innovation adoption

This section provides a background on existing research on innovation adoption that is relevant to this particular context.

In a substantial review of literature, Tornatzky et al. (1983) distinguish and discuss different innovation adoption process models, based on the observed assumption that innovation is a "process of many discrete decisions and behaviours that unfold slowly over time", which "involves social units at many different levels of aggregation" (Tornatzky et al. 1983). Innovation adoption can therefore comprise developments that are not always overt acts and that may proceed outside of the organisational consciousness (Eveland, Rogers, and Klepper 1977). A non-overt innovation adoption process, once identified, will thus face at some point the challenge of making itself known within the organisation.

The general models of innovation adoption processes are, according to Tornatzky et al. (1983), technology-source-centred models, which view the process from the perspective of the technological development, and user-centred models, which focus on contextualised applications and tend to start where the source-centred models end. The user-centred models can be further distinguished between organisation-based and individual-based models, depending on the focus of the analysis. The perspective adopted in this study is that of individuals at the early stages of a technological innovation adoption process. This is because we were working with a low number of volunteers, which hardly represents an organisaion-driven adoption.

The most widespread individual-based innovation adoption model is that of Rogers (2003). Based on a very substantial research analysis, he suggests the following five main stages of an adoption process, although he acknowledges that more or fewer stages may exist:

1. knowledge,
2. persuasion,
3. decision,
4. implementation, and
5. confirmation.

Other models (Hall 1973; Hamelink 1984; Havelock 1973) are conceptually not too dissimilar to Rogers' model, which was originally developed in the 1960s, and can be mapped with some variation onto his five stages.

This paper does not examine a complete organisational adoption process; instead it looks at initial contributing factors. This is what Rogers does by explicitly attaching his stages to a decision process, which he frames within prior conditions such as *previous practice, felt needs/problems, innovativeness and norms of the social system*. These are helpful prompts and therefore used as guiding ideas in this study, although in an adapted from. Adaptation is particularly important as Damanpour (1991) warns that innovation adoption process models should not be one-dimensional and not disregard organisational influences, as these influences will impact on the actions of an individual, who is always a part of and interacting with the organisation itself (Hofstede 2005).

Damanpour's warning is one of several points of criticism of individual-based innovation adoption process models. Rogers (2003) for example highlights a pro-innovation bias in most models, ignoring exit strategies in the case of failure; Levine's (1980) book on innovation failure in Higher Education and Conner and Patterson's (1982) eight stage model are notable exceptions. Roger criticises a lack of methodological rigour, leading to disengagement with objective observational procedures in most if not all models. Aboelmaged (2000) adds a narrow focus, or ignorance of a faculty- or institution-wide application, as well as a bias on instructional technologies, or ignorance of administrative innovations, as further criticisms. These criticisms are certainly valid for all stages that demand organisational commitment beyond the influence of a small number of individuals. And although we did not operate in this context, we took these as warnings into account, for example by including administrators as a stakeholder group.

Finally, we looked at Fowler and Scott's (2007) Users and Innovation Development Model (UIDM), which represents a bridge between user-centred and technology-source-centred models. This model's cyclical nature and comprehensive guidelines appeared to meet our project's methodological needs, so we incorporated its phases into our project and synthesised its ideas with those from the innovation models above to create our own framework.

2.3   Custom innovation adoption framework

For our framework, we used a STAIRS metaphor, which doubles as an acronym to highlight the involvement of different stakeholders: students, teachers, administrators, innovators, researchers, and support staff. The framework is based on four stages as explained below.

2.3.1   The Gap
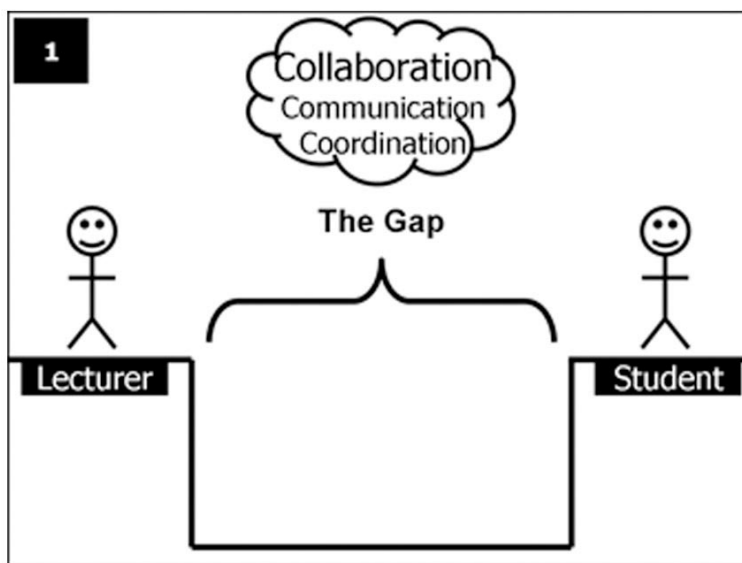
Figure 1. The Gap

The lecturer and student are separated by a technology gap. Whilst each might be happy using some forms of technology, such as office applications for the lecturer and social networks for the student, these different tools do not allow them to benefit from the potential to collaborate, communicate or co-ordinate. The labels Lecturer and Student can be exchanged to Researcher, Administrator, or any other role, depending on the context.

2.3.2   Steps
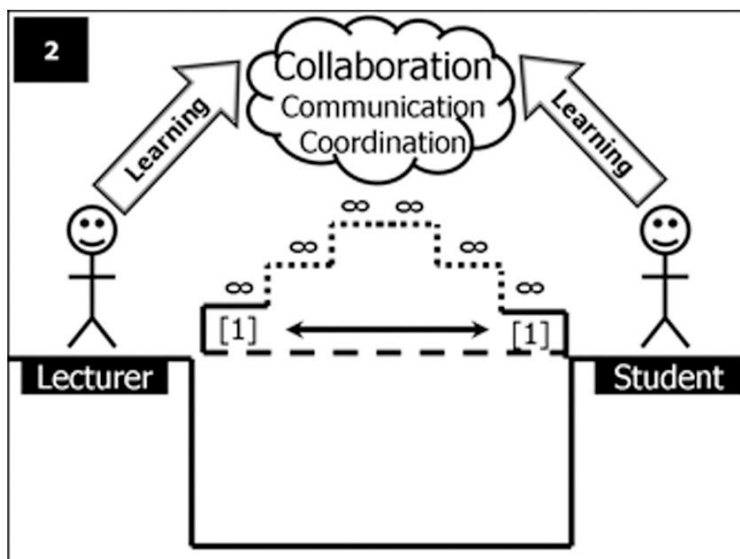
Figure 2. Steps

The initial step for each user should be small to ease the transition towards new collaboration processes, which makes some demands on the technology. The learning arrows represent the new potential to learn how to collaborate, communicate and co-ordinate whilst the horizontal arrow depicts the opportunity to bring users with different skills and understandings closer together through technology.

The figure of eight on each step indicates that this progression uses the iterative UIDM model to build on existing understanding of the users to help identify the appropriate technologies to make this progression.

2.3.3 Development
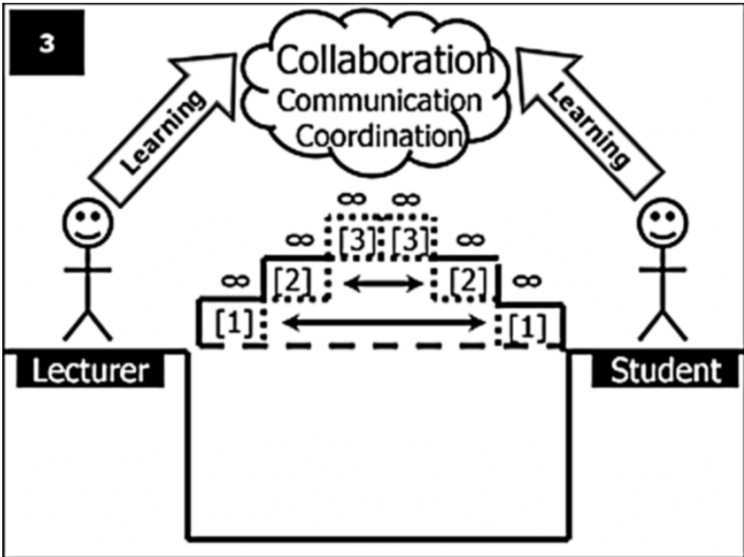
<div align="right">*Figure 3. Development*</div>

By encouraging users to take small development steps, we aim to encourage users and thus enable them to take the next steps with collaborative technologies, building on previous experience. For example, a user who has started to work with Google Docs is likely to feel more confident to take the next step in using other technologies, for example wikis.

2.3.4 Institutional Integration
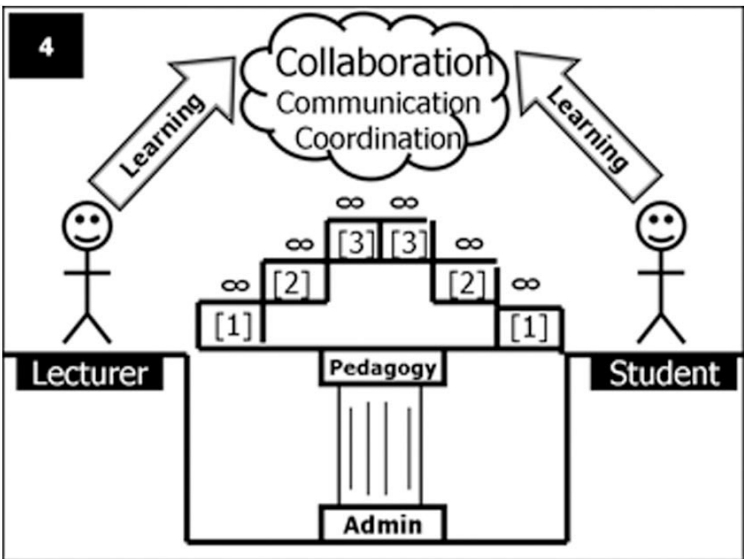
<div align="right">*Figure 4. Institutional Integration*</div>

The final support mechanism for this project is the engagement of a wider spectrum of institutional stakeholders. This includes engaging the support departments within each of the institutions to adopt the technology on an institutional level. The pillar above represents the institutional integration and signifies sustainable use of the technology.

3. Methods

The work in this project was organised into five main phases, which are briefly described below to provide context. This paper, though, focuses on the evaluative aspects of our adoption framework, for which most other data collected during the project has only indirect relevance. The five project phases were:

1. Background research: A large-scale institutional questionnaire survey to learn about technology use by different stakeholder groups.
2. Technological development: Small developments integrated Google Docs into our Virtual Learning Environment.
3. Demonstrator pilots: Seven independent pilots across six institutions represented individual small-scale adoptions and formed the core of the project.
4. Evaluation: Pre-pilot interviews, continuous engagement with the pilots, and post-pilot questionnaires and interviews provided us with a rich set of data.
5. Dissemination: A comprehensive dissemination strategy was also used to raise awareness and trigger post-project adoption.

Pilot leaders were identified by learning technologists across institutions and participated on a voluntary basis. We aimed to involve all partner institutions and relevant stakeholder groups and ran the following seven pilots:

Pilot	Institution	Description
A	Royal Veterinary College (RVC)	RVC AHEMS Reviews First year veterinary students created and edited among themselves a database of farm placements to share their experiences.
B	Royal Veterinary College (RVC)	RVC Library Spreadsheets Library staff created a database for book suggestions and orders. All students and staff at two campuses were asked to contribute.
C	London International Development Centre (LIDC)	LIDC Membership Administrators built up a shareable database of academics working in the area of international development.
D	School of Oriental and Asian Studies (SOAS)	RSS Portal PhD students created a Research Students' Society (RSS) portal for the SOAS website to help with their research and planning by collaboratively compiling information for different research stages.
E	The School of Pharmacy	Medicine's Profile Exercise First year students created, edited and shared group information on drug variables as a part of a mandatory exercise.
F	Birkbeck College	Easy PC Learning Lecturers and Biology students explored new ways of collating data in real time to carry out collaborative learning.
G	London Knowledge Lab	Collaborative Research Environment Researchers built internal and external team websites to collaborate on research projects.

Table 1. Demonstrator pilots

To evaluate the suitability of our adoption framework, we interviewed the pilot leaders of the six pilots A to F and reviewed the use of the technology for pilot G through usage statistics. The analysis of the data focused on two broad areas. Firstly, we were looking for evidence statements related to functionality, management, and experience. Secondly, we asked the pilot leaders directly about the suitability of our adoption framework, which was introduced to them before the start of the pilots. In addition to this, general satisfaction and usage levels were occasionally used for triangulation purposes.

4. Discussion

The first part of this discussion briefly presents some user responses to the technology, and the second part reviews our adoption framework in light of feedback from our users.

4.1 Response to the technology

All the pilot leaders regarded their pilots as being successful and would repeat their pilot or keep it going. However, a greater measure of success was evident in how all interviewed were more positive about using collaborative technology: users were either prepared to consider other collaborative technologies or to improve other areas where they could be made applicable.

Actual success factors can be grouped into four categories:

1. Engagement with new technologies
2. Better content understanding
3. Higher efficiency
4. Idea generator

4.1.1 Engagement with new technologies

While none of the pilot leaders had prior experiences with Google Docs, they all reported that the cross over to Google Docs was an easy transition. Some of the pilot leaders commented about the lack of features in comparison to their desktop application, but also were more interested in how the technology could help the process, not in the actual technology itself. In this regard the collaborative nature of Google Documents exceeded their expectations.

Even though our pilots had different requirements, pilot leaders reported that the tool met most of them. All pilots highlighted ease of access as a key feature and outcome, as well as location-independent access of the data. In this respect, the tool was preferred to existing institutional services, such as network drives as plain storage for data to be used with client-based local applications. Five of the seven pilots wanted the ability for multiple individuals to access and edit a document at the same time, a functionality they did not have access to before. Consequently, the tool was regarded as excellent for collaboration, with 83% out of 150 student participants of pilot E wanting to use the tool again for collaborative writing.

4.1.2 Better content understanding

We were initially surprised to find that pilot leaders in pilots A, D, E and F reported a number of successes in relation to student learning, especially in pilots A and E, where the same activity was simply transferred from face-to-face to online, with only very minor changes in the activity design. In the case of pilot A, the style, immediacy and ease of access of the reporting created by the technology encouraged students to be less guarded about their experience reports on placements and allowed staff to understand and identify teaching needs that were not previously regarded as a learning issue. In pilot E, submitted work showed a deeper level of understanding about the role of pharmacy, which was also a result of better group work: in the face-to-face mode, it was sometimes left to one person in a group to do the work, whereas online, all students were contributing.

While the improvements are attributable to the technology, the potential to achieve similar levels of engagement and understandings was there before and could probably have been unleashed by different tutor interventions. But technological factors fulfilled some of these functions; therefore it can be argued that, even though the tool may not directly facilitate learning per se, it helps optimise the conditions for learning to occur.

4.1.3 Higher efficiency

Pilot participants reported that the use of the tool resulted in general reflections of their work processes. This is a typical function of any change, for example a change of teaching methods: changes force people to rethink their approaches and make conscious decisions. The success factor that technology can offer is efficiency, i.e. the identification of more productive processes.

Some efficiency gains can indeed be attributed to the technology. In pilot F as an example, the tool allowed students to edit a common document directly at the time of data collection instead of in between lessons, resulting in substantial time-saving and an instantaneousness that did not exist before. The other pilots reported that the collaborative features allowed them to distribute tasks more easily, and that less work on managing individual contributions was required.

4.1.4 Idea generator

Our pilot participants, both pilot leaders and students or other stakeholders, came up with new ideas how to use the tool under investigation or which tool to tackle next. The process of getting to know a new tool triggered a range of ideas that can be grouped under the following headings:

- future developments and further refinements of the current pilot;
- use of Google Docs for other things;
- use of other Web 2.0 tools;
- dissemination and encouraging other staff members to use the tool.

The fact that all pilot leaders had thoughts about new possibilities is a clear indication that they had been happy enough with their current experience to consider taking it further forward and to also consider alternative applications. In relation to our adoption framework, this appears to confirm the suitability of our small step approach, although the exact nature of the steps is debatable, in the light of the data below.

4.2 Review of the STAIRS adoption framework

It was very noticeable from responses that although pilot leaders had been informed of our STAIRS framework, they had not really considered it for their original pilot design. This was not entirely unexpected, as the overall project staff were the main users of the framework and used it to engineer the pilots and guide them in the spirit of the framework. The pilot leader feedback, however, is invaluable in determining whether or not the ideas of the framework were reflecting the pilot experiences appropriately. We therefore asked pilot leaders to comment on all four stages of our STAIRS framework.

4.2.1 The gap

All leaders were able to identify a gap or gaps that their pilot had been able to bridge, but the true nature of the gap or gaps were only identified in hindsight. Using the technology gap as an example at the start of the demonstrator pilots appears to have been confusing and forced some individuals into a mindset.

Pilots B, F and G did not find the gap concept helpful or applicable. They felt that any gap between users would be an artificially constructed idea: they focused more on the functional components of the technology as opposed to concentrating on differences in skills. The other four pilots found the gap concept quite appropriate, although interpretations as to what the gaps were that needed bridging were very diverse.

This shows that our initial concept of attempting to bridge a skills gap with technology was too naïve for the various contexts of our pilots. Replacing the gap metaphor with more abstract *needs* or *purpose* concepts would be more applicable and, most importantly, more flexible, as all of our pilots had very different requirements. The concept of *addressing needs* would have worked for all pilots, including those who did not identify a gap, but used technology to improve their practices, and thus reach higher levels, which begs the question whether the step concept was appropriate.

4.2.2 The Steps

All pilots found the concept of *steps* and *stepping up* useful. Google Docs was perceived as a first small step, as it was relatively simple, so that everybody could use it and move to the next step of being collaborative. However, a comment by pilot leader D neatly summarises the fact that the steps aspect of the STAIRS framework is not limited to keeping the technology simple:

> "... the steps model can work but it's not just one set of steps. There are many different sets of steps for many people according to their aims."

This lecturer thus calls for a flexible definition of steps. None of the pilots however saw the step concept in a wider innovation adoption context and preferred to relate the steps concept to personal development goals. Yet the appeal of the small step concept as a whole can be useful for taking away fear of innovation and change by making the new tools less daunting – steps are digested more easily than leaps.

4.2.3 Development

The development concept was the strongest point of our metaphor. The ease of use of the new tool encouraged participants, including students, to engage further: not only were they interested in using the same tool in the future, but a significant number of students, about every eighth, spontaneously used other Google Docs or similar applications.

However, pilot leaders and, to a lesser degree, other participants expressed the desire to be shown how the technology can be used to help them in new ways. This emphasizes the need for staff in learning technology or learning and teaching support roles. The time investment from such staff need not be high and can certainly be streamlined by running group sessions or producing best practice examples, but the availability of staff who understand lecturer needs, can suggest solutions and provide inspiration is crucial.

4.2.4 Institutional integration

The issue of institutional integration uncovered some strong opinions. Three pilot leaders, only one of them with more advanced technical skills, reported that institutionally provided tools were sometimes not appropriate for the tasks at hand, and they occasionally infringed institutional policies to access tools that met their needs. Such behaviour puts institutions under pressure to provide services that meet the purpose and to regularly review their policies in order to balance the needs of staff with technological requirements which can be perceived as restrictive.

Overall, the use of Google Docs was in line with institutional policies. One of the main issues was the availability of support: for the duration of the project, our team provided ample support to staff and students. Support beyond the project, though, depended on the willingness of technical support staff or learning technologists, with the exception of one institution, which was in the process of adopting Google Apps across the whole organisation. For this institution, our project provided the first step towards a full roll-out of the Google Docs component.

Pilot G went a different route and implemented Google Apps as a department initiative for 90 staff members. The take-up was swift and healthy, even though sustainable support has not been implemented into the departmental plan to date. Yet low administrative requirements, exemption from product charges as an educational institution, and the ease of use of the technology helped this department establish a collaborative research environment service that is now used on a regular basis, thus providing evidence that some adoptions of modern cloud-based technologies, where application services are hosted on external as opposed to institutional servers, can be realised on a small scale, complementing core institutional services.

5. Conclusion

This study provided insights into some of the factors affecting early stages of an adoption process, which focused on Google Docs as an example of web-based collaborative tools. Based on a synthesis of literature on individual-based adoption models, the project team developed its own STAIRS framework to guide users taking the first step of engaging with an innovation. Specific aspects of the framework focused on skill development, use of an appropriate tool for the task at hand, and realising the benefits of collaboration to not only enhance learning, but improving processes in general.

Overall, the users of the technology were very satisfied with most aspects of their use, leading to one actual adoption at an institutional level, one adoption at a departmental level, and individual pockets of continual use, although this use was outside of institutional contexts. The successful use of the innovation with only minor technical issues also prompted the wish of further engagement with this and similar tools.

The STAIRS framework provided generally adequate guidance, although some of the concepts were not relevant to end users. While some of the original ideas had to be rejected, there does appear to be a modified STAIRS framework that can be applied and used for future projects. This suggests that a specific technology champion is required as support person to help projects select the technologies they need (the first step), which in turn allows the desired collaboration to occur (a natural step). An important elaboration of this would be the addition of a second step to address individually defined desired outcomes, and that is a pedagogical step which allows the collaborative technologies to be used in the right way.

6. References

Aboelmaged, G. M. 2000. Researching Information Technology Adoption Process in Higher Education Institutions: A Rational for Applying Individual-Based Models. Paper read at *2000 IEEE International Conference on Management of Innovation and Technology,* 12-15 November, at Singapore.

Beckman, M. 1990. Collaborative Learning: Preparation for the Workplace and Democracy? *College teaching*:128-133.

Conner, D. R., and Patterson, R. W. 1982. Building Commitment to Organizational Change. *Training and Development Journal.*

Damanpour, F. 1991. Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators. *The Academy of Management Journal* 34 (3):555-590.

Dede, C. 2005. Planning for 'neomillennial' learning styles: Implications for investments in technology and faculty. *Educating the net generation:* 226-247.

Eveland, J. D., Rogers, E. M. and Klepper, C. 1977. The Innovation Process in Public Organizations. *Ann Arbor: University of Michigan.*

Fowler, C., and Scott, J. 2007. The User Innovation and Development Model Guide. *Chimera, University of Essex,* Essex.

Franklin, T., and Van Harmelen, M. 2007. Web 2.0 for content for learning and teaching in higher education. JISC *www. jisc. ac. uk/media/ documents/programmes/digitalrepositories/web2-contentlearningand-teaching. pdf.*

Hall, G. E. 1973. A Developmental Conceptualization of the Adoption Process Within *Educational Institutions.*

Hamelink, J. M. 1984. Integration of Technology. *Performance and Instruction* 23 (2):26-27.

Havelock, R G. 1973. *The change agent's guide to innovation in education.* Englewood Cliffs, N.J.: Educational Technology Publications.

Hofstede, G. J. 2005. *Cultures and Organizations: Software for the Mind:* McGraw-Hill.

Laurillard, D. 2002. *Rethinking university teaching: A conversational framework for the effective use of learning technologies:* Routledge.

Levine, A. 1980. *Why Innovation Fails: The Institutionalization and Termination of Innovation in Higher Education:* State University of New York Press.

Prensky, M. 2001. Digital natives, digital immigrants. *On the horizon* 9 (5):1-6.

Prensky, M. 2009. H. Sapiens Digital: From Digital Immigrants and Digital Natives to Digital Wisdom. *Innovate: journal of online education* 5:9.

Rogers, E. M. 2003. *Diffusion of Innovations:* Simon and Schuster.

Tornatzky, L. Eveland, J. Boylan, M. Jetyner, W. Johnson, E. Roitman, D. and Schneider, J. 1983. *The Process of technological innovation: reviewing the literature.* Washington, D.C.: National Science Foundation.