

C-CAP: Managing curriculum designs as knowledge assets

Briefing paper

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1. Technology-support curriculum design: background

Curriculum design is the process of developing a “total plan for learning” [1] in which consideration is given to the learning content students will be exposed to, the teaching and assessment methods to be used, and the academic rationale behind the curriculum [2]. Curriculum design in higher education (HE) is therefore a key “teachable moment” and often remains one of the few occasions when academics will plan and structure their intended teaching [3]. The Principles in Patterns (PiP) project was funded by JISC under its Institutional Approaches to Curriculum Design Programme [4] to develop new, innovative technology-supported approaches to curriculum design, approval and review. It is anticipated that such technology-supported approaches can improve the efficacy of curriculum approval processes at HE institutions, thereby improving curriculum responsiveness and enabling improved and rapid review mechanisms which may produce enhancements to pedagogy [4], [5] and present an opportunity for improving academic quality, pedagogy and learning impact [6]. Approaches that are innovative in their use of technology offer the promise of an interactive curriculum design process within which the designer is offered system support to better adhere to pedagogical best practice, is exposed to novel and high impact learning designs from which to draw inspiration, and benefits from system support to detect common design issues, many of which can delay curriculum approval and distract academic quality teams from monitoring substantive academic issues, e.g. [7], [8].

The rapid generation of new programmes of study, or the rapid adaptation of existing curricula, is also increasingly necessary. Institutions need to better respond to quickly changing academic contexts, the changing demands of employment marketplaces and the expectations of professional bodies [5], [9], [10]. Disciplines within the sciences and engineering appear to be particularly exposed to these pressures, with new technological or environmental developments increasingly necessitating the re-engineering of curricula or the rapid embedding of new skills [10], [11]. This scenario is also influenced by the globalisation of the HE sector more generally [12], [13] which, within the realm of curriculum design and approval, is placing additional pressure on institutions to devise specialist curricula designed to attract international students and/or suitable for delivery at international branch campuses [13–15]. Ensuring that high levels of academic quality are maintained also adds a further layer of complexity to an HE curriculum design and approval scenario that requires increasing levels of responsiveness and learning impact [5], [10].

The aims of the PiP project were to develop and test a prototype online expert system and a linked set of support materials that could: a) improve the efficiency of course and class approval processes at the University of Strathclyde; b) support the alignment of course and class provision with institutional policies and strategies, and; c) integrate the course and class approval processes into the corporate information environment. This prototype system – the principal technical output of the PiP Project – became the [Class & Course Approval System](#) (C-CAP) which has been adopted by faculties at the institution. An additional objective of PiP was to use findings from prototype testing to inform future practice and the embedding of the system at the University of Strathclyde. Findings were also intended to inform the HE sector more generally about the technology-supported approaches that can be deployed to improve curriculum design and approval processes.

At time of writing, faculties actively using C-CAP include the Faculty of Humanities & Social Sciences (HaSS) and the Faculty Science. The Faculty of Engineering has started piloting C-CAP and steps are being taken to promote use of the system within the Strathclyde Business School (SBS).

The purpose of this briefing paper is to highlight the role of C-CAP as a means of capturing the curriculum designs that are created and to stimulate discussion on the development of protocols, or of a policy framework, for governing their on-going management and reuse. The paper makes no assumptions about the issues surrounding the management of curriculum designs; rather its intention is to stimulate discussion on a number of related matters with a view to agreeing a coherent management strategy.

2. Managing curriculum designs as knowledge assets

2.1 C-CAP impact

At the inception of the PiP Project the curriculum design and approval process at the University of Strathclyde was largely undocumented and typified by difficulties in process and document management, low adherence to acknowledged best practice within some curriculum designs, poor alignment with institutional policies, and disparate institutional curriculum design practices [16]. The PiP Project focussed therefore on the development of a single online curriculum design and approval system (C-CAP), capable of managing and facilitating the curriculum approval process whilst simultaneously supporting academics in the process of curriculum design. Among the headline achievements were:

- Simplification of the curriculum drafting process
- Demonstrable improvements to approval process efficacy
- Improvements to process transparency, visibility and control
- Enhanced management of curriculum designs during the approval lifecycle
- Improved curriculum reviewing mechanisms and improved support for academic quality processes
- Creation of a central repository of curriculum designs as the basis for their management as “knowledge assets”, thus enabling reuse and sharing of designs and exposure of tacit curriculum design practice.

C-CAP’s focus on those aspects of curriculum design that are integral to good pedagogical practice and to high academic quality standards has reduced the bureaucratic burden normally associated with the previous state. This has simplified academic review and has delivered a system that is less likely to stifle innovation [17]. The curation of curriculum designs as “knowledge assets” in a central repository was also considered to support a number of key academic quality processes and better enable responsive curriculum design [18]. Data supported the view that C-CAP functioned as a platform from which to disseminate explicit and tacit curriculum design practice, and would maximise the value of institutional knowledge assets by enabling the reuse of curriculum designs.

2.2 Curriculum KM

The ability to share pedagogical designs is one aspect germane to the wider activity of knowledge management (KM) [19]; harnessing existing intellectual capital to support other organisational activities, whether this is to support the professional development of academics, make explicit curriculum design practice, or aid quality assurance. Along with the aforementioned examples, the reuse of curriculum design information is considered to support institutional efficiency and competitiveness, the importance of which has reflected the increased economic and operational pressures affecting the HE sector generally. Whilst many UK HE institutions are engaging in KM activities and recognise the importance of KM in improving competitive advantage [20], [21], it remains a relatively new development within the education sector and the overall institutional impact of KM activities is often limited by poor adherence to appropriate or coherent KM strategies [22]. Such limited success at HE has also been attributed to, among other things, the characteristics of academic staff, the academic culture, and the management structure and styles that tend to prevail in universities, all of which can stifle KM innovation [22], [23]; although it should be noted that this scenario is by no means peculiar to the UK, e.g. [24], [25]. As creators of knowledge, the silo-based approach to KM activity has often tended to prioritise the curation of research outputs and large-scale IT initiatives which do not necessarily facilitate KM [22], let alone the management of curriculum information and data.

There is greater recognition that UK institutions need to improve their ability to capture explicit and tacit knowledge to facilitate reuse and sharing, particularly within the area of curriculum design [26]. Some overseas institutions have already taken steps to include curriculum design within their wider KM strategies and activities [1], [27]. Wright [26] notes some of the typical approaches to managing explicit curriculum knowledge, such as creating repositories for assessments, interdisciplinary learning and curriculum improvements. C-CAP's creation of a central repository of curriculum designs, whilst helping to resolve some of the issues identified during an earlier phase of the PiP Project [7], appears to be a positive contribution to better capturing, managing and sharing the University's collective curriculum knowledge.

2.3 KM potential of C-CAP

The potential of a central repository of approved curriculum designs was considered by University stakeholders to be one of the most important changes to have been facilitated by C-CAP [28]. Its impact was also corroborated by qualitative benchmarking analysis [7]. In particular, stakeholders (e.g. academics, academic quality (AQ) teams, etc.) noted the following benefits:

1. Access to a broad range of curriculum designs to inform the development of new classes and/or courses by other academics and to support professional teaching practice.
2. Availability of all curriculum designs to improve transparency and move to a system that captures explicit and tacit curriculum design practice.
3. A "shared intelligence" about the quality of existing curricula and a tangible curriculum design and quality benchmark, e.g. access to the design of exemplar classes and courses against which new curricula could be compared.
4. The reuse of curriculum knowledge assets to contribute towards institutional competitive advantage.

In fact, analysis of the data exposed among stakeholders a latent cognisance of KM principles and the potential of these principles for transforming curriculum design. The management of curriculum designs as "knowledge assets" was considered to support a number of key academic quality processes and better enable responsive curriculum design. The repository would also provide a platform from which to disseminate explicit and tacit curriculum design practice, which would maximise the value of institutional knowledge assets by enabling the reuse of curriculum designs, thereby contributing towards institutional competitive advantage.

The absence of any central repository (or "single source of truth") of approved curriculum proposals and descriptors - something that C-CAP resolves - was identified as a serious impediment. Lacking a definitive source of approved curriculum information created problems when curricula were scheduled for periodic review as pulling together the latest versions of all relevant curriculum information was often unachievable. Curriculum information had often been subsequently updated by a number of different actors and updates were not always recorded, tracked or shared among relevant stakeholders. This also had implications for proposals that may have been re-introduced into the approval process as reviewers often encountered difficulties in understanding how, for example, a class contributed to an the overall course (programme) because definitive and up-to-date information on the course was unavailable.

3. Issues for consideration

Knowledge production and exchange within the context of C-CAP means that curriculum design is no longer an individualistic concern. It is collaborative and participatory. Clearly there are a number of benefits to be enjoyed by better managing, sharing and re-using the curriculum designs captured via C-CAP and stored in its central repository. It is therefore essential that an appropriate KM policy

framework accompanies their long term management [5], [25]. Such a framework was a key recommendation of the PiP Final Evaluation Synthesis Report [18].

Some of the areas that such a framework should seek to formalise could include – but are not limited to:

- Technical management of curriculum designs, aligned with data and knowledge held in other corporate systems as appropriate
- Protocols for design adaptation and resubmission to the approval process
- Information lifecycle management, including consideration of regulatory requirements
- Policies regarding their reuse and sharing
- Procedures for the selection and promotion of exemplar designs
- Policies to foster institution-wide promotion of the repository and C-CAP adoption

The above list of framework discussion points merely highlights potential problem areas, as identified during PiP Project evaluation activity. These problem areas may, with further discussion among relevant stakeholders, be found to be unthreatening and/or may require no action; or new alternative problem areas may be identified. It nevertheless appears worthwhile to establish the problem landscape.

The wide remit of such a policy framework necessitates involvement from a wide range of stakeholders, including the AQ teams, Directorate of Strategy & Policy, Education Strategy Committee, Information Management (also covering Information Governance & Compliance), and Archives, as well as those responsible for managing C-CAP technical infrastructure.

Technical management of curriculum designs and corporate system alignment

It is clear that the long term management of curriculum designs is accompanied by various technical ramifications. This may include consideration of the technical resources required to maintain continued access to the C-CAP design repository, the technical steps needed to facilitate digital preservation (were it to be considered necessary), and procedures for backup or disaster recovery, etc. Owing to the open and non-proprietary data format used to store curriculum designs (i.e. XML), adherence to digital preservation best practice [29] has been maintained, thus supporting the accessibility of designs in the future. Good practice nevertheless requires consideration of future migration requirements. This might include consideration of any proprietary extensions, options for managing and manipulating the designs in the absence of current software support tools such as SharePoint and InfoPath, backwards compatibility, appropriate technical documentation, etc.

Technical management may also include the technical measures required to facilitate some of the areas below, such as the functionality necessary to support sound lifecycle management or enable curriculum design adaptation. How curriculum data can be reused and support other corporate systems – over and above KIS – also requires exploration.

Design adaptation and resubmission protocols

The ability to rapidly modify existing curriculum designs to better incorporate lessons learned, respond to the needs of stakeholders (e.g. student feedback, adaptation to reflect changes in industry, etc.) or to improve the educational rationale or overall design, is an important factor motivating technology-supported curriculum design approaches. It has been highlighted as a critical KM strategy, contributing to a university curriculum that demonstrates improved quality, that is more up-to-date and is more responsive [27]. Improving the straightforward opportunities for adaptation is also important to minimise the inevitable risk of teaching delivery deviating from approved designs. This remains important not only to ensure consistency and equity in students' academic experiences, but to ensure curriculum data reused for reporting or recruitment is accurate and reflects reality.

Matters pertaining to the adaptation of existing designs for their resubmission into the approval process (e.g. for the purposes of periodic review, updating aspects of approved designs, etc.) have been discussed informally with some faculty AQ teams and potential approaches have been proposed. These have yet to be implemented in C-CAP. The C-CAP team was initially optimistic that system rules could be devised such that only major changes to designs (e.g. change in learning outcomes or assessments) would necessitate re-entry of that design into the approval processes; however, current consensus among AQ teams is that almost all changes to designs require human oversight. Any process for achieving this can nevertheless be facilitated by C-CAP.

Wider discussion is required to identify the institutional and regulatory implications of such an approach - if any - were it to be adopted. This may also include the requirements of any future Enhancement-led Institutional Review (ELIR) [30] [31] of the University of Strathclyde and the fulfilment of auditing requirements, e.g. evidence of quality assurance, curriculum enhancement, etc. On these matters there is clearly a conceptual overlap with broader responsibilities of lifecycle management (see below).

Lifecycle management

The importance of curriculum designs as intellectual assets and their centrality to on-going academic administration is such that appropriate information lifecycle management policies are required. The current C-CAP system context is advantageous and conducive to such management:

- Appropriate descriptive and administrative metadata describing curriculum designs is captured by C-CAP (e.g. title, author, date of creation, date modified, etc.)
- C-CAP enforces version and status control
- The platform used (SharePoint) supports document management system functionality

A policy to determine when designs can be considered “semi-active” or when they can be deleted or preserved [32] requires agreement. Whilst the technicalities of preservation are highlighted above, the administrative steps required to facilitate preservation should be encompassed by a comprehensive lifecycle management policy. For example, designs that could be considered as entering a “final outcome” lifecycle phase might be worth preserving for evidential purposes or for historical record, or because they retain a certain asset value. This latter issue might particularly be the case for designs pertaining to academic areas known to evolve at a slower pace, or topics that frequently remain static over long periods of time (e.g. research methods). Such designs are likely to be conducive to reuse for many years. Legal requirements may also be significant here since designs are likely to remain outside the public domain but nevertheless remain publicly accessible through Freedom of Information (Fol) requests. The “active use” issues that could arise may relate to the fulfilment of legislative requirements, such as Fol [33]. Relevant here is consideration of the procedures for fulfilling Fol requests and how curriculum designs might be repackaged for this purpose.

Design selection and promotion

The potential of C-CAP to transform curriculum design practice quality and inform professional practice was a significant finding of the evaluation activity [28]. For many stakeholders C-CAP offered a “shared intelligence” about the quality of existing curricula and a platform from which to disseminate explicit and tacit curriculum design practice across the institution. Selecting and promoting institution wide access to exemplar curricula was therefore identified by stakeholders as an important function of C-CAP and resonates with the historical aims of the PiP Project [34]. “Identifying and disseminating good practice” was also noted by the ELIR report as something which the University could improve [31].

The technical steps required to promote specific designs are relatively trivial; however, design selection requires reflection by faculty officers, AQ teams and other relevant stakeholders, such as the Education Strategy Committee. Suitable criteria and procedures for rule-based design selection need to be formalised. This would likely entail consideration of what constitutes a “good” design (e.g. demonstrating adherence to pedagogical principles, coherence of design, assessment strategy, etc.) but would also seek to formalise the practical procedures of selection, e.g. how often should selections

occur, responsibilities, etc. Whilst it will be desirable to promote particular designs across the entire institution (e.g. designs of exceptional quality, including those that have attracted external accolades), it may also be of merit to offer faculty specific designs in order to increase the relevance of exemplars to these communities.

Promoting exemplar designs is not always linked to improving the academic or pedagogical rigour of proposed curricula, or exposing explicit or tacit curriculum design practices; it can also assist academics capture the necessary evidence to better “pitch” the business case required for their new curricula. As in the wider HE sector, the University is adapting to changing economic circumstances and the increasing marketization of the HE sector by mandating a clear business case from the authors of new curricula, prior to the submission of a full course proposal. This business case must be accompanied by appropriate evidence (e.g. evidence of market appeal, an analysis of how the proposed course fits within the University’s or Faculty’s wider academic portfolio, etc.). Whilst academic matters remain of paramount importance to the curriculum approval process, the new emphasis on the financial and business implications of curricula is something which the academic participants have found disorientating [28]. Consideration might also be given to the promotion of exemplar course proposals that not only demonstrate how best to encapsulate the business case but reveal excellence in a number of areas (e.g. academic content, marketing strategy of course, etc.).

Reuse and sharing policies

Harnessing existing intellectual capital is an underlying principle of KM and contributes to organisational competitive advantage [35]. The benefits of adopting similar strategies in the management of curriculum designs were discussed in [section 2.2](#). Data from C-CAP may be reused to service reporting requirements, such as the institutional Key Information Sets (KIS) return [36]. Perhaps more significantly, as the C-CAP repository of curriculum designs grows it is anticipated that technical functionality will be added to facilitate the sharing and reuse of designs by academics.

A typical use case might be an academic who wishes to design a new level one class on social theory. Upon searching or browsing the C-CAP repository s/he discovers an existing class, “Interdisciplinary social theory”, used as part of a different degree course. Although the intended class covers different intellectual content, there is considerable overlap and, in addition, the academic finds the assessment strategy of the existing class to be innovative and worthy of repeating in the new class. Using C-CAP functionality, the academic selects to begin curriculum design using the existing class as a template (i.e. “Interdisciplinary social theory”). The academic can therefore use the existing class as a basis for designing the new class, keeping (or reusing) features of the existing class.

Anecdotal evidence from evaluation and the C-CAP embedding activity tends to suggest that most academics are receptive to this way of working. Many accept the desirability of reusing designs where possible, not only to design and approve new curricula more rapidly, but as a means of maximising existing intellectual capital. However, like the issues surrounding design adaptation and resubmission, consideration needs to be given to the extent to which new designs could or should replicate existing ones. For example, should staff be permitted to reuse entire designs as templates and submit them for approval with minimal adaptation, thus potentially resulting in the re-review of curricula which have already been approved and contributing to unnecessary workload; or should reuse demand a reasonable level of adaptation? If replicating an existing design in its entirety is likely, should that design be referenced, or should departments simply make better use of existing classes where minimal change is required?

Fostering institution-wide promotion and adoption

The potential of a central repository of curriculum designs has been highlighted in [sections 2.2](#) and [2.3](#). Policy framework issues for the practical use of the repository have also been noted above. However, the University of Strathclyde currently lacks an institutional strategy or policy on KM. Whilst the institution is by no means unique in this respect [24], [25], there are domestic [37] and overseas

institutions [1], [27] that have developed mature KM strategies designed to improve competitive advantage by better managing – and harnessing – intellectual assets. This lack of institutional KM focus influences the broader question of C-CAP's institutional adoption and the promotion of its central repository.

The real potential of improved KM in curriculum design management will only be realised if all designs are created using C-CAP and thereby deposited into the central repository. Currently, however, adoption of C-CAP by faculties is voluntary. Institutional policies on curriculum design also remain fluid, enabling wide disparity in curriculum design practice [31]. Whilst this affords faculties significant freedom, the lack of a prescriptive institutional policy or strategy with regards to curriculum design could undermine the likely benefits to be accrued by fostering a central repository. The resulting incomplete inventory of curriculum designs would compromise the ability of curriculum data in C-CAP to be reused for reporting (e.g. KIS, ELIR, AQ monitoring, etc.), or reused for other information requirements (e.g. University website, prospectus, student records system, etc.). It would also limit the potential of C-CAP to contribute to the improvements in professional practice likely to be associated with design sharing and would contribute little to improved curriculum responsiveness. It is also worth referring to C-CAP's potential in responding to concerns raised by the University of Strathclyde ELIR report [31] with respect to institutional variation in curriculum design and approval, something which institutional adoption of C-CAP would ameliorate.

Discussion is therefore required on how best institutional adoption of C-CAP could be promoted in University policy. This may also include discussion of design management as part of a wider institutional KM strategy.

4. References

- [1] S. Agrawal, P. B. Sharma, and M. Kumar, "Knowledge Management Framework for Improving Curriculum Development Processes in Technical Education," in *Convergence and Hybrid Information Technology, 2008. ICCIT '08. Third International Conference on*, 2008, vol. 2, pp. 885–890.
- [2] J. B. B. (John Biggs, *Teaching for quality learning at university.*, 3rd ed. / by John Biggs and Catherine Tang. Maidenhead: Open University Press, 2007.
- [3] P. Bartholomew and J. Everett, "Socio-technical ramifications of a new approach to course design and approval," presented at the JISC Innovating e-Learning Online Conference November 2011, 2011.
- [4] S. Knight, "Institutional approaches to curriculum design," 2012. [Online]. Available: <http://www.jisc.ac.uk/curriculumdesign>. [Accessed: 29-Feb-2012].
- [5] JISC, *Managing curriculum change: transforming curriculum design and delivery through technology*. London: JISC, 2009.
- [6] L. McGill, "Curriculum innovation: pragmatic approaches to transforming learning and teaching through technologies. Transforming Curriculum Delivery through Technology Synthesis Report," JISC, Bristol, 2011.
- [7] G. Macgregor, "Principles in Patterns (PiP): Evaluation - WP7:39 Evaluation of impact on business processes," 2012. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/ProjectReports/WP7-39processimpact.pdf>.
- [8] G. Macgregor, "Principles in Patterns (PiP): Evaluation - WP7:37 Evaluation of systems pilot - Phase 2: User acceptance testing of Course and Class Approval Online Pilot (C-CAP)," 2012. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/ProjectReports/WP7-37-2useracceptance.pdf>.
- [9] J. I. Zajda, *International Handbook on Globalisation, Education and Policy Research: Global Pedagogies and Policies*. Springer, 2005.
- [10] C. J. Desha, K. Hargroves, and M. H. Smith, "Addressing the time lag dilemma in curriculum renewal towards engineering education for sustainable development," *International Journal of Sustainability in Higher Education*, vol. 10, no. 2, pp. 184–199, Oct. 2009.
- [11] D. Bourne and I. Neal, "The Global Engineer : Incorporating global skills within UK higher education of engineers," *Engineers Against Poverty / Development Education Research Centre*, Institute of Education, London, 2008.
- [12] S. L. Robertson, "Corporatisation, competitiveness, commercialisation: new logics in the globalising of UK higher education," *Globalisation, Societies and Education*, vol. 8, no. 2, pp. 191–203, 2010.
- [13] S. L. Robertson, "Globalising UK Higher Education," Centre for Learning and Life Chances in Knowledge Economies and Societies, London, 2010.
- [14] J. E. Lane, "Importing Private Higher Education: International Branch Campuses," *Journal of Comparative Policy Analysis: Research and Practice*, vol. 13, no. 4, pp. 367–381, 2011.
- [15] S. Wilkins and J. Huisman, "Student Recruitment at International Branch Campuses: Can They Compete in the Global Market?," *Journal of Studies in International Education*, vol. 15, no. 3, pp. 299–316, Jul. 2011.
- [16] D. Cullen, J. Everett, and C. Owen, "The curriculum design and approval process at the University of Strathclyde: baseline of process and curriculum design activities," 2009. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/ProjectReports/PiP%20Baseline%20October%202009.doc>.
- [17] J. Everett, "Principles in Patterns (PiP) : Institutional Approaches to Curriculum Design Institutional Story," 2012. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/ProjectReports/PiPinstitutionalstoryJuly2012-1.pdf>. [Accessed: 16-Nov-2012].
- [18] G. Macgregor, "Project evaluation synthesis (WP7:40) - Principles in Patterns (PiP): Final evaluation report," 2012. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/ProjectReports/WP7-40finalevaluationssynthesis.pdf>.
- [19] T. H. Davenport and L. Prusak, *Working Knowledge : How Organizations Manage What They Know*. Harvard Business School Press, 1998.

- [20] A. Slater and R. Moreton, "Knowledge Management in Higher Education: A Case Study in a Large Modern UK University," in *Advances in Information Systems Development*, W. Wojtkowski, W. G. Wojtkowski, J. Zupancic, G. Magyar, and G. Knapp, Eds. Springer US, 2007, pp. 371–382.
- [21] H. Hayes, "A Scottish enlightenment," *Library Management*, vol. 28, no. 4/5, pp. 224–230, May 2007.
- [22] D. Cranfield, "Knowledge management and higher education: a UK case study using grounded theory," 31-Jan-2011. [Online]. Available: <http://eprints.soton.ac.uk/191855/>. [Accessed: 21-Jun-2012].
- [23] D. Cranfield and J. Taylor, "Knowledge management and higher education: a UK case study," *The Electronic Journal of Knowledge Management (EJKM)*, vol. 6, no. 2, pp. 11–26.
- [24] J. Tian, Y. Nakamori, and A. P. Wierzbicki, "Knowledge management and knowledge creation in academia: a study based on surveys in a Japanese research university," *Journal of Knowledge Management*, vol. 13, no. 2, pp. 76–92, Mar. 2009.
- [25] D. Blackman and M. Kennedy, "Knowledge management and effective university governance," *Journal of Knowledge Management*, vol. 13, no. 6, pp. 547–563, Oct. 2009.
- [26] H. Wright, "Tacit Knowledge and Pedagogy at UK Universities; Challenges for Effective Management," *Electronic Journal of Knowledge Management*, Jul-2008. [Online]. Available: <http://www.ejkm.com/volume-6/v6-1/v6-i1-art5.htm>. [Accessed: 21-Jun-2012].
- [27] P. D. Aggarwal, R. Kiran, A. K. Verma, and Dr, "Enhancing Curriculum and Research in Higher Education with a Strategic use of Knowledge Management," *Global Journal of Management And Business Research*, vol. 11, no. 12, Dec. 2011.
- [28] G. Macgregor, "Principles in Patterns (PiP): Evaluation - WP7:38 Impact and process evaluation - Piloting of C-CAP: evaluation of impact and implications for system and process development," 2012. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/ProjectReports/WP7-38pilotevaluation.pdf>.
- [29] Digital Preservation Coalition, "Preservation Management of Digital Materials: The Handbook," *Digital Preservation Coalition*, 2008. [Online]. Available: <http://www.dpconline.org/advice/preservationhandbook>. [Accessed: 09-Nov-2012].
- [30] T. Q. A. A. for H. E. (QAA), "Enhancement-led Institutional Review (Scotland)," 15-Jun-2012. [Online]. Available: <http://www.qaa.ac.uk/InstitutionReports/types-of-review/Pages/ELIR.aspx>. [Accessed: 26-Oct-2012].
- [31] T. Q. A. A. for H. E. (QAA), "Enhancement-led institutional review: University of Strathclyde," 2010. [Online]. Available: http://www.qaa.ac.uk/InstitutionReports/Reports/Documents/RG636a_Strathclyde.pdf.
- [32] JISC, "JISC infoNet - Information Lifecycle infoKit," *JISC infoNet*, 2012. [Online]. Available: <http://www.jiscinfonet.ac.uk/infokits/information-lifecycle>. [Accessed: 26-Oct-2012].
- [33] Scottish Information Commissioner, "Scottish Information Commissioner - Your guide to the Freedom of Information (Scotland) Act," 2012. [Online]. Available: <http://www.itspublicknowledge.info/home/ScottishInformationCommissioner.asp>. [Accessed: 26-Oct-2012].
- [34] C. Owen, "PiP Project Plan," 2009. [Online]. Available: <http://www.principlesinpatterns.ac.uk/Portals/70/pip%20document%20library/pip%20project%20plan/PiP%20Project%20Plan%20v5.0%20Public%20Version.doc>.
- [35] T. H. Davenport and L. Prusak, *Working Knowledge: How Organizations Manage What They Know*. Harvard Business Press, 2000.
- [36] HEFCE, "KIS - Key Information Sets - HEFCE," 2012. [Online]. Available: <http://www.hefce.ac.uk/whatwedo/it/publicinfo/kis/>. [Accessed: 12-Sep-2012].
- [37] University of Edinburgh, "Knowledge Management Strategy Group Home Page," 2012. [Online]. Available: <http://www.committee.kmstrategy.ed.ac.uk/>. [Accessed: 09-Nov-2012].