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ABSTRACT

In this paper we explore the notion of using organisational patterns in educational design for the development of e-learning centres. We are using patterns to discuss some of the key aspects concerning the implementation of an e-learning centre within an institution, with an emphasis on the purposes and pedagogical principles that will help to successfully support such an initiative. The research approach which informed our pattern development work includes use of a qualitative survey of a set of existing e-learning centres across Europe, looking at their philosophy and organisational structures. The paper advocates for the use of patterns as tangible resources, to guide educational design to assist in the setting up and maintenance of pedagogically informed e-learning centres.

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Introduction

Design patterns have been used in software engineering as a problem-solving approach to software design. They are considered valuable as a means to capture and present solutions to design problems (Avgeriou *et al,* 2003; Frizell & Hubscher, 2002). Initially originating in Alexander's work on building architecture and urban planning (Alexander *et al*, 1977), a pattern language is a powerful and simple way to help solve design problems. According to Alexander, a pattern is a solution to a recurrent problem in a context:

> '*Each pattern describes a problem that occurs over and over again in our environment, and then describes the core of the solution to that problem in such a way that you can use this solution a million times over, without ever doing it the same way twice.* (Alexander *et al*, 1977, p.x).

Goodyear *et al* (2004) draw upon the organisational and communication framework derived from Christopher Alexander's work in architecture on pattern languages to propose the use of patterns for participatory educational design work in higher education. Goodyear *et al* (2004) discuss using patterns in the design of networked learning environments, that is, environments for e-learning. They assert that designing for educational purposes is a complex task which can benefit from better tools and methods. Educational design work with current tools and methods, reveals difficulties in creating a balance between rigour and prescriptiveness and finding appropriate levels of

generality, such that solutions to problems are worthy of being shared (Goodyear *et al,* 2004). Guidelines on best practice in educational design can be vague and unsupported by research, often presented as handy 'tips and tricks', and often without sufficient underpinning theoretical and practical rigour. Guidelines can also be too tightly prescriptive and specified so that they are seen as relevant only to certain contexts or situations. In contrast, design patterns are intended to offer an alternative and flexible approach to design work that bridges between theory, empirical evidence and experience, and that help resolve practical problems in educational design. According to Frizell and Hubscher (2002) patterns can be more flexible than static templates and yet more concrete than abstract guidelines. Patterns are proposed as a means to offer guidance but without constraining creativity.

We have found in our work on design patterns that patterns need to be drafted, shared and critiqued through extensive collaborative moments: the information they present is not new or invented, rather it is derived from looking at examples of successful solutions (Frizell & Hubscher, 2002). Avgeriou *et al* (2003) assert:

> *'Patterns are not conceived in a big band but rather discovered or mined after numerous implementations of the same solution … usually by different people. It is a process of reverse engineering the systems that embed good design, in order to make that design explicit and to be able to communicate it to others.'*

This paper concerns the application of the pattern approach to an organisational design problem, namely that of setting up an e-learning centre. This has been an outcome of the EU Minerva funded E-LEN project which has created a network of e-learning centres and leading organisations to support a diverse constellation of e-learning centres around the world (E-LEN, 2005). Designing organisational patterns for educational organisations such as e-learning centres has benefitted from an analysis of established e-learning centres as successful solutions and from collaborative sharing and critiquing of these pattern examples. This paper is therefore offered to initiate discussions on design patterns and a pattern language for e-learning. The next sections of this paper focus on e-learning centres and our qualitative survey of a set of existing European e-learning centres before outlining our description of an organisational design pattern for an e-learning centre.

E-learning Centres

Our interest in e-learning centres focuses on the key aspects in the implementation of e-learning centres within higher education institutions, highlighting the pedagogical principles supporting such an initiative. An 'e-learning centre' is defined as:

> '..a unit established for serving the learning needs of students and staff within an institution, for the deployment of innovative curriculum pedagogy and state-of-the-art learning technology in real courses, and for the development of new learning technologies guided by theory and validated by observation of practice'.

(Zenios and Steeples, 2004)

As such, an e-learning centre has the enhancement of the instructional process as one of its key goals.

An e-learning centre can offer the following kinds of services: (i) support of academic staff, working with subject specialists to design and set in place the e-learning infrastructure for a course; (ii) development of e-learning courses, modules or programmes; (iii) production of new knowledge about e-learning; (iv) defining requirements for best e-learning practices and individualised e-learning approaches; (v) provision of pedagogic and technical e-learning solutions, suitable for innovative use in a variety of educational settings; and (vi) helping build next generation e-learning tools and services.

There is a strong rationale to identify established good practice in the implementation of e-learning. Firstly, organisations entering the e-learning field need to learn about the know-how, best practices and rules of thumb for implementing e-learning. Despite the progress made recently in the use of information and communication technologies (ICTs) in education, many institutions and organisations thinking of taking the step to implement electronic learning environments, face the problem of not knowing where to start from or what to do. According to Garrison & Anderson (2003) e-learning presents enormous opportunities and risks: thus there must be more than a fragmented approach.

We argue e-learning centres have a critical, central role in the systemic take-up of e-learning.

Secondly, e-learning is a growing market and a field of rapid continuous development throughout the world. The labour market requirements of the new knowledge economy are forcing higher education to extend the skills of students in respect to knowledge work, information handling and information and communication technology (ICT) skills. To make effective use of e-learning methods, and to meet these changing educational needs, groups of universities and other educational and training organisations will have to find ways of identifying and sharing best practices, collaborating in the exchange of experiences, tools and materials, etc.

A third reason is the need to establish more e-learning centres and enhance existing ones. Higher education institutes and training centres have started to establish e-learning centres: to serve the learning needs of students; to aid faculty and staff in the deployment of innovative curriculum, pedagogy and learning technologies in real courses; and to develop new learning technologies guided by theory and validated by observation in practice. This is happening across Europe, though at very different rates of progress. Furthermore existing e-learning centres need to adopt best practices, in order to enhance and adapt to constantly changing e-learning demands.

Therefore, we regard the design and implementation of e-learning centres as such major tasks that they warrant careful planning and preparatory activity. The development of

organisational design patterns to assist in the design and implementation of e-learning centres is key to maximising the potential of an e-learning centre. The value of using design patterns in the development of e-learning centres is placed also in their potential as instructional tools. As Goodyear *et al* (2004) suggest, patterns have a teaching or developmental function, by being written in ways that help the reader understand enough of a problem and its solution and enable them to adapt the pattern to their own purposes.

Survey of E-learning Centres

To understand more about key aspects and issues facing e-learning centres, we undertook a qualitative research study of seven established e-learning centres based in higher education institutions across Europe. We looked at the administrative, managerial, pedagogical, technical, research and developmental characteristics of these e-learning centres. The survey examined the common issues faced and the ways in which problems are resolved among established e-learning centres. Seven aspects were used to create a framework for the survey questionnaire and these were: a centre's services and activities; its resources, including its staff; the administration and management of an e-learning centre; the quality assurance mechanisms in place; success stories and problem areas within centres; and growth and future plans.

Data were collected primarily through telephone interviews with leaders of e-learning centres, using a structured set of questions. As part of the data collection, the web sites

for each of the participating e-learning centres were also examined. The data from the interviews, questionnaires and web sites has been analysed around a set of thematic questions. We have identified a number of interesting themes, namely: the range of purposes and services provided by an e-learning centre; the role of research within the centre's activities; the organisation of the e-learning centre's work around projects; and the diversity of staff roles and responsibilities within an e-learning centre.

In exploring purposes and activities, we focused on the aims and objectives of the e-learning centres, that is the goals and mission set out by the head of the centre or its staff. We looked at where research into e-learning would figure in the aims and achievements of the e-learning centre. We looked too at the centre's role in innovation in teaching and learning since the implementation of an e-learning centre within an institution is still regarded as an innovative step, suggestive of an interest to support teaching and learning in new and innovative ways. The relationship between the level of research remit and the organisation of work within the e-learning centre was explored indicating a continuum between attempts to develop learning-driven technology solutions in collaboration with academics and broader integration of e-learning into curricula. Our analysis sketched the roles that staff undertake to meet demands upon the centre as well as the skills and competences required for these roles. A typology of kinds of e-learning centre began to emerge, based around the purposes that respondents identified to us for an e-learning centre.

The survey identified four distinguishable purposes or orientations for e-learning centres as follows:

- Type A: having a support or service role in the use of e-learning for teaching and learning

- Type B: having a support of innovation in e-learning role

- Type C: having an e-learning course development role

- Type D: having a research on e-learning role

These purposes of an e-learning centre can be developed into specific organisational design patterns. We have developed one pattern based around the first orientation identified for an e-learning centre, that of being a support centre for e-learning. The pattern makes use of the e-learning centre survey .

In presenting a pattern for a support role e-learning centre, its overall purpose needs first to be set out. The pattern needs to identify the different kinds of centre activity and the ways of organising those activities. The pattern needs to identify the kinds of issues faced and the pitfalls to avoid. In the next section, we focus on the e-learning centre type, in which the centre has its central role in supporting the use of e-learning for teaching and learning.

Organisational Design Patterns for E-learning Centres

Alexander's work offers arrangements for solving recurrent problems in design which have an impact in people's lives and psychological well-being. The aim of his work is to make people feel alive and human by finding solutions to their problems in relation to their environment and surroundings. In his pattern addressing the problem of what is the best kind of window, for example, he explains their importance as connection to the outside, temperature regulator, etc. *'Pick those which are easy to get to, and choose the ones which open into flowers you want to smell, paths where you might want to talk, and natural breezes'* (Alexander, 1977, p.1102). This example encapsulates his views on 'quality without a name' which is related to ascribing value. Alexander's position is explicitly value-laden and his view has been influential on networked learning designs in terms of encouraging us seeking to nurture and create convivial environments. (Goodyear *et al,* 2004).

Practically, design patterns consist of a number of standard elements which have been drawn from Alexander *et al* (1977) but were adapted for our purposes in educational design. A pattern is made up of components but has also to be seen within the framework of the pattern language. A pattern normally begins with a 'Name' followed by the 'Context' for the pattern (where the pattern fits within a pattern structure). The 'Problem' is next stated, followed by some 'Analysis' of the problem. A 'Solution' is presented, drawing upon known solutions. Finally, 'Related Patterns' are named, that is patterns that are integral to or directly associated with this pattern.

In developing an e-learning centre, patterns can help us to create innovative centres because they provide guidance without being overly prescriptive. Evidence from our survey reveals the multi-disciplinary and multi-skilled character of teams working in an e-learning centre, a feature which makes the use of patterns even more effective in helping us to communicate and critique design problems: in order to share understandings and to reach consensus.

Next, we present our initial draft for an organisational design pattern for setting up an e-learning centre which has a support or service orientation as its key purpose.

A Pattern for an E-learning Support Centre

Name: An e-learning centre having a support or service role in e-learning teaching and learning

Context: Strategy for teaching, learning and assessment; Strategy for e-learning; E-learning management.

Problem: Institutions of higher educaiton wish to set up support services as a centre to support academic staff across the institution in their deployment of e-learning for teaching and learning.

Analysis: Institutions of higher education need advice about e.g.: best ways to set up an e-learning centre; about the resourcing needs; where the centre should be placed in the institutional infrastructure; what kinds of staff are needed and with what skills; and ways to organis and prioritise the centre's work. The design efforts should focus on the creation of organisational forms of e-learning centres which favour the emergence of convivial working relationships both within and outwith the e-learning centre.

Solution:

The solution seeks to address the following aspects: vision, risk assessment, educaitonal principles, infrastructure, infostructure, support services, budget and resources, a research and development framework and benchmarking.

Vision: The centre's vision needs to create alignment between pedagogy and technology but also to interface with research in e-learning. This kind of e-learning centre has the enhancement of the instructional process as central to its goals. This includes that the staff will normally work with subject specialists to design and set in place the e-learning infrastructure of a course. This infrastructure includes eg learning materials study guides, specifications for individual and group learning tasks and the various ICT tools needed by the learners and teachers. In this e-learning centre a broad range of skills is required among staff to achieve the centre's aims and objectives. For students the centre's activities can support flexible patterns of learning such as increasing support to part-time learners, encouraging learners to work more independently and be more creative; and widening access to resources.

Risk assessment: Attention must be payed to the likely pressures on centre staff of how best to use their limited time to meet the increasing demands for their services. All the centres of this kind will be under pressure to demonstrate that they are meeting the aims and objectives of the centre especially to meet the demands from academic staff to develop and support them in running e-learning courses. Centre staff need to be aware of the mismatches in, or unrealistic expectations as more academics want to make use of e-learning. There is also a need to encourage a sense of ownership for, and commitment to, e-learning developments especially at the faculty and at departmental levels. Centre leaders also need incentives to keep centre staff with scarce skills in place, also suggesting the need to pull skills together so that centre staff can cover for each other. Funding resources are typically allocated in time-limited ways to e-learning centres eg, by placing centre staff on fixed-term contracts. Evaluation of the centre's work need to consider the wider contextual factors influencing take-up and sustained development of e-learning.

Educational principles: An e-learning centre needs to have a clear pedagogical framework that identifies and specifies the pedagogical beliefs and values that underpin all aspects of the centre's work and development activities. The centre team need to be able to identify common values and beliefs about learning in order to take a principled approach to their design and support of e-learning. This will encourage building good pedagogy into all design and development processes (Steeples, *et al.,* 2002) and foregrounds the need for systematic attention to pedagogical issues in design of e-learning.   A key role of an e-learning centre must be to support the development of e-

learning skills in institutional staff. The development of staff skills in faciliatation and management of online learning environments is essential. There is also a need to develop student skills in learning gaining the ability to learn in less passive and more interactive ways. The e-learning centre can assist learners and academic staff by providing the necessary guidance and support. Specialist skills and expertise are also clearly needed among the staff working within the e-learning centre. Team. Staff with skills and understading that bridge between pedagogical and technological areas will be most valued.

Infrastructure: An institutional strategy for e-learning is critical. Centre staff will need clear lines of reporting and the centre needs to have a clear and appropriate place in the institutional structure. There needs to be a sense of fit with the institution and its teaching and learning strategy. A strategic approach is essential to ensure e-learning has the best possible chance to succeed, because of the complexity of stakeholders and variables in the mix. While many HE institutions have a strategy for teaching and learning in place, the extent to which they take account of learning mediated through technology, is much more piecemeal. An e-learning strategy is needed to give a forward vision for the institution, to help internal collaboration and to help align pedagogical, business and organisational processes (Ford *et al*, 1996).

Infostructure: Systematic production and project management processes are critical within the centre, to ensure complex e-learning developments are properly funded and not under-resourced. This is especially true of expensive multimedia projects that commonly take much longer than anticipated. It is important that the e-learning centre

activities are not trapped or bounded within limiting projects. There is a danger in staff spending their time insmall-scale developments with no planning for the longer-term use of learning technologies beyond the funding period. This will diminish the opportunities for embedding and sustaining the development and for creating possibilities for reuse and adaptation to other teachning and learning situations across the institution.

Support services: The centre needs to have links and and working relations with associated support services to ensure consistency, current awareness and the smooth integration of services across the institution eg linking into student support services, the library, staff development and audio-visual services, etc.

Budget and resources: The centre requires a budget for both staff and resources, which may be derived from top slicing across the institution. Many centres are initially allocated funding for a limited period during which the institution monitors the success and impact of the centre's work, before committing to long-term support.

Research &Development Framework: It is important to note that while this kind of e-learning centre may have research as part of its activities, the research orientation is not in the foreground of its mission. However, 'research is necessary to remain current and innovative […] a research framework is imperative and must be built upon how people learn, how new tools support and assess learning goals and what […] organisational structures support these gains (Garrison and Anderson, p.108).

Benchmarking: Consistency in the quality of support across all users with the systematic handling of queries is likely to be a real and ongoing challenge. The systematisation of work processes, allowing tracking of progress and resources is suggested. These processes need to be designed to meet minimum quality standards.

Alexander has pointed to cohenence and relatedness as a fundamental way to view the world and as a core element of pattern development when thinking about design:

> *'In short no pattern is an isolated entity. Each pattern can exist in the world, only to the extent that is supported by other patterns: the larger patterns in which it is embedded, the patterns of the same size that surround it, and the smaller patterns which are embedded in it'*. (Alexander p. xiii)

Our pattern of an e-learning centre having a support or service role in e-learning gives some information needed to solve the problem of setting up a centre to support academic staff in their deployment of e-learning in a general and abstract way and containing essential advice on how to reach a solution. Within our pattern, however, smaller patterns exist which have been developed to seek clarity to specific problems. We have identified three smaller patterns which deal with problems found in setting up an e-learning centre and have developed them as follows:

A Pattern for Uses of Technology Promoted by an E-learning Centre

Name: Uses of technology promoted by an e-learning centre

Problem: E-learning centres need to find ways for technology to be used efectively and efficiently to enhance and augment teaching and learning

Solution: If the centre's work is to be exciting, stimulating and forward looking, it is important not to use technology simply as a substitute media for traditional teaching and learning functions. To do so would be to miss the opportunity presented by technology for more innovative kinds of teaching and learning support. There is a need to pedagogically re-engineer courses to take account of new characteristics when technology is used and related learner needs. For example the use of technology provides the centre with the ability to support teaching and learning operating both on and outside campus and for academic programmes to reach geographically dispersed beneficiaries.

A Pattern for the Organisation of Human Resources and E-learning Centre's Work

Name: Organisation of human resources and e-learning centre's work

Problem: E-learning centre human resources need to be allocated in a timely way towards support of academic staff and development of e-learning projects.

Solution: The growth and increase in activities within an e-learning centre can lead to an increase in immediate but primarily technical kind of problems, often requiring immediate responses by staff. Centre staff need to be aware of the very real danger of them becoming a technical help desk service. Mechanisms for keeping up with technological developments must be considered. Much of this kind of centre's staff time is likely to be spent on one-to-one consultancy work in developing applications and learning resources through collaborative projects with academic staff and helping staff in using ICT tools for teaching and learning purposes. The centre encourages academics to be more creative in their teaching and finds ways to inspire learners and improve quality of teaching. It is typical that academic staff initiate much of this kind of centre's work, that is, that centre's activitities are often determined by users ie 'bottom-up driven'. Other academic-related activities are likely to include staff development work including running e-learning workshops and away days on the use of learning technology with some evaluation work on existing applications also likely. It is likely that a major part of a centre's work is primarily organised around projects, which could be funded through a 'competitive proposal process'. The process can be useful to help the centre prioritise its actions and to signal its role in selective, quality development activity.

A Pattern for Strategic Development

Name: Strategic development

Problem: E-learning centres need to be part of a broader e-learning strategy within the institution

Solution: Senior managers must be centrally involved in the development of an e-learning strategy and the implementation of an e-learning centre. Senior management can promote the purposes and work of an e-learning centre to help give it a high profile within an institution. Senior management need to grasp the significance of developing and using technologies for teaching and learning. Integral to an institutional e-learning strategy is the need for an institutional infrastructure to be in place, allowing students and tutors to readily access electronic resources and support. The institutional e-learning strategy also needs to align organisational structures to centrally locate the e-learning centre, particulary in terms of its management, reporting mechanisms and quality assurance processes. Staff need to be aware of likely user perceptions that an e-learning centre has a technological focus rather than a pedagogical one.The organisational location of the centre and the line management is influential in this regard.

Alexander has distinguished between mature and immature patterns using asterisks to signify the level of maturity. Mature patterns have been proven reliable from years of experience and research. This distinction can be useful in an area such as e-learning where many of the processes and practices of a new emerging field are quite innovative and time is required to allow patterns to mature (Baggetun et al., 2004; Bartoluzzi, 2004). The patterns suggested in this paper have been developed following Alexander's

approach in architecture of observing what works well and constructing a pattern out of a good example. From this perspective we have surveyed existing e-learning centres looking for examples of good practice. These patterns have been shared within a group of experienced practitioners in the field of e-learning and e-learning centre staff. Feedback has been used to further refine the patterns.

Conclusion

A major goal of most educational organisations today is to infuse technology throughout the instructional and administrative dimensions of the organisation. This has required not only the development of new levels of ICT knowledge and skill by academics and administrators, but has also resulted in changes in the role of the learning technology specialist and led to the formation of institutional e-learning centres.

We have presented in this paper a draft pattern for an e-learning centre with an orientation towards supporting staff and students across the institution in their use of e-learning. The construction of the pattern is derived from the e-learning survey analysis. This paper aims also to assist people in identifying key concerns in setting up an e-learning centre,. It suggests useful pedagogical approaches and identifies the kinds of issues faced and the pitfalls to avoid. We are aware it may be regarded as operating at too abstract a level. We believe further work needs to be done to further validate the pattern:eg through discussion of ways of making it more tangible and practically-useful..

Acknowledgements

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