Overcoming Barriers to Successfully Implementing e-Learning: The Four P's Framework

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Abstract: - Some studies about e-learning report failure to latch on to the ICT superhighway and change teaching and learning in a substantial way. In this contribution, explanatory factors and solutions are studied by means of a review of research literature. The authors argue that many e-learning efforts fail because of bad policy making and barriers on the individual, organisational or broader societal level. Next, the authors suggest a framework for successful institution-wide implementation of ICT. It is based on four P's: problem, planning, policy and participation. Any e-learning initiative should solve an educational need or problem, the first P. Planning and policy refer to the cyclical process where an organization determines how and when e-learning implementation is to be carried out, communicated, supported and monitored. The authors present the different public documents and supportive actions, in order to stimulate e-learning within all curricula of an educational institution. Finally, participation is defined as 'the degree to which an organization or individual is able to form effective and efficient collaboration between all stakeholders to decide upon e-learning'. Ideally, this co-operation involves a transparant communication flow between teachers, students, administrators and policy-making bodies. The four P's framework could be used as a guide to assist policy makers to introduce sustainable e-learning or to adjust their existing e-learning strategies.

Key-Words: - e-Learning, Barriers, Institution-wide Implementation

1 Inhibitors to e-Learning Success

Several factors have been identified by different researchers as plausible causes for the slow uptake of ICT in education. Pelgrum reported in 1993 and 2001 on a worldwide survey among schools in twenty-six countries on the perceptions of educational practitioners regarding obstacles that seriously impede the realization of ICT-related goals. His reports list a top ten, with a mixture of material and non-material inhibiting conditions [1]. A summary of expert opinions gathered via in-depth interviews on the main barriers to the wide-spread acceptance of ICT can be found in Dillemans et al. [2]. With regard to Africa, the 'Report of the Technical Experts Meeting' offers an excellent overview of barriers to technology adoption [3]. After having followed a group of K-12 teachers for one year, Zhao et al. (2002) found eleven salient factors that significantly impact the degree of success of classroom technology innovations [4]. Each can be categorized in one of three domains: the Innovator (teacher), the Innovation (project) and the Context (school). Each interacts with the others and contributes proportionally to a certain adoption rate. Ertmer distinguishes between first- (incremental, institutional) and second-order (fundamental, personal) barriers that can halt teachers' efforts at any point in the technology implementation process [5].

In the present contribution a synthesis of the most often cited inhibitors to success in the research literature that are to be handled when heading towards e-learning or enlarging existing initiatives is presented. We have ordered the barriers in two clusters with similar subdivisions as in Sherry's integrated model [6]. The overview includes two broad categories of barriers, internal and external and three subdivisions, organization, technology and users. The first cluster indicates higher-level elements that define the environment in which the educational institution operates and which are able to impede ICT use: resources and vision. The authors point to the important role of an adequate national and regional infrastructure, an explicitly formulated and balanced policy and a fair distribution of resources.

The second cluster assesses the contribution of supportive strategies, structures and actions at the institute, access to and characteristics of ICT users' experiences, attitudes and skills. In a second phase the authors propose some theoretical and practical solutions. A new framework for successful institution-wide implementation of ICT is then introduced. It is based on four P's: problem, planning, policy and participation.

1.1 External Obstacles

1.1.1 Resources

Investment finance is vital for any e-learning intention. Enough ICT resources should be available and well distributed in order to shape a convenient e-learning environment within organizations. Non-adequate budgeting (systems) lead to poor or no ICT-based teaching and learning at all.

In the first place, resources are needed to build a satisfactory national or regional infrastructure with sufficient internet connectivity and telecommunications services to allow access on campus and at home. Not enough resources to purchase new products and update existing applications will stop technology adoption. This is also the case for aspects like high internet service providers fees, inadequate and irregular funding of ICT initiatives, non-reliable electricity supply, low-speed ICTs, unsatisfactory performance of ISP's, insufficient access points and limited bandwith [7].

1.1.2 Vision

The absence of coherent national or regional ICT policies, plans and strategies (as well as political instability and/or a hostile social climate) could constitute a serious hazard to the use and development of ICT in education. The wide-scale implementation is halted when it is not carefully planned, explicitly formulated or underpinned by relevant actions. Remarks like 'fragmented policy, 'too much at once', 'lack of vision' and 'no communication' allude to these problems [8]. A similar critique about ICT policy making can be formulated at the educational institution level. Some organizations lack self-awareness, vision and/or leadership [9] and do not know how and when to respond to change, while others accord low priority to ICT use (in education). In many instances, the institute has not yet developed (or not throughly enough) a solid policy to cope with ICTs in their classrooms and beyond, at present and in the future (see for example, De Vos et al. [10]).

1.2 Internal Obstacles

1.2.1 Organization

Important concerns on the management level that stand in the way of a broad implementation: a wrong estimation of the complexity of introduction, insufficient knowledge of technological developments and possibilities, no adapted quality assurance systems for e-learning modes. Moreover, higher education institutions seem to experience difficulties with finding a balance between top-down and bottom-up strategies, in particular with involvement on all levels and spreading interesting in-house ICT experiments [11]. A considerable number of potentially valuable experiments do not lead to succesful adoption and diffusion on a large scale, to 'normal practice'. On the one hand, educators are not given enough incentives to deploy ICT activities, the institution has no human resource base to do so and/or a shortage of teaching personnel and/or the curriculum is too strict, leaving no space to adapt to new teaching and learning media [12]. On the other hand, staff efforts are often not rewarded or supported by the institution. Particularly the personnel policy (including schooling and in-service training), the reward systems, the quality and performance indicators (on the basis of which the institution is assessed and/or funded) have been insufficiently adjusted to educational ICT use [13].

1.2.2 Technology

Of course, technology adoption is problematic in cases where there is no offer of an adequate classroom infrastructure with machines, bells and whistles. Continued limited access to ICT in general, no money for new purchases and upgrades, an insufficient number of computers, low-quality e-learning hard- and software products and platforms or networking limitations can be major obstacles for both students and teachers [14] [15].

Not only failure of or limited access to technology determines the likelihood of acceptance. With reference to the medium that is introduced, we can point out different aspects that will either enhance or block its adoption. To start with, potential users should be aware of its existence and availability. In addition, negative perceptions of quality and quantity should be avoided [16].

A central notion in this respect is that technological innovations possess certain attributes or characteristics (e.g. *reliability*, see Butler and Selborn [17]), which will systematically effect individuals' beliefs and ultimately determine the ultimate rate and pattern of adoption. The more positive the user's perception, the faster the adoption.

1.2.3 Individual

We can point out a host of barriers, stemming from the users themselves, that inhibit the full-scale adoption of ICT. A negative attitude, anxiety, as well as a lack of knowledge and skills of the educators and students, combined with workload are identified as most serieus impediments [18].

No Time, Knowledge or Skills

First of all, academic staff experience a heavy workload. They have to publish, research, obtain funding, participate, write project proposals, meet and greet, communicate with the broad community, follow students and teach. A lack of time to learn to work and experiment with the technology, to rethink learning and teaching and develop customized didactics and planning are frequently reported (e.g. Onderwijsraad [19], Butler and Sellborn, Earle, Harasim et al., Jackson et al., Pelgrum [20]). According to different authors time is even the most important barrier for implementation success [21] [22] [23].

Secondly, technology users have to possess certain competencies. Without well-maintained computers, reliable local and wide area networks, no ICT-based education is possible. Without an idea of how to use ICT in education also [24]. To promote wide-scale implementation teachers and students should understand what a certain medium can do, especially within the curriculum. Unfortunately, difficulties in using or learning to use the technology seem to be an important problem [25]. These insufficient skills are often related to inadequate external and internal (in-service) training programmes [26]. Equally important to note is the trap of so-called 'technical paralysis'; the overwhelming negative feeling when one is not able to keep up with the speed in progress [27] or when one suffers from the ever-changing character of technology, new skills that are necessary to master and everlasting upgrades or updates of applications [28]. This phenomenon leads people to stop seeing the sense and value and, consequently, halt innovative behaviour.

Resistance to Media Innovations

'Some people just do not like change', Harasim et al. wrote in 1997. 'Not all faculty are innovators when it comes to technology', Butler and Sellborn noted some years later [29]. History teaches that universities are the breeding ground for research and development of technological innovations but large psychological barriers to trying out and using ICT [30], a lack of interest, motivation and individual resistance to innovation prevail within large groups of educators and students. Veen et al. ascertained that personal beliefs and attitudes of staff and students can intervene with or perturb ICT initiatives [31]. In 2000, Evans and Nation indicated that teachers reveal a variety of attitudes towards the introduction and use of ICT: a) neutral, b) booster, c) oppositional, d) sceptic and e) transformationalist [32]. The fear of the unknown, the tendency to consider the existing situation as a good one, a feeling of solitude caused by a lack of support and knowledge, and a reluctance towards self-reflection can influence these intermixed attitudes [33].

What does it take to convert these barriers to facilitating factors in technology adoption and integration? We propose a framework for reflection and - more important – action, based on four P's.

2 The Four P's Framework

2.1 What is the Problem?

What can ICT offer to (higher) education as a solution for one or more existing problems or needs? How can it deliver and support the teaching and learning practice we pursue in our department, faculty or institution as a whole? Why, where and when (not)? These questions should be the starting point of any technology implementation process [34]. The more clear-cut the motive, the higher the chance for success.

We can distinguish three ways of educational use of ICT:

- ICT as a study object or learning about ICT;
- ICT as an assisting tool: this concept refers to learning with the assistance of ICT, the support of a wide variety of teaching and learning activities;
- ICT as a medium for teaching and learning which include any attempt at stimulating learning through ICT, the support of different teaching and learning processes.

A fourth, non-educational function can be added to this list. It concerns the use of ICT as a manager. This concept refers to the internet as a possible instrument for organisation, administration and management in education [35] [36] [37].

Before implementation it should be clear which ICT(s) is/are involved, and to what extent this choice is not too complex and triable, if it is compatible with users' needs and wants, and what observable advantage it offers in comparison to the existing system [38] [39]. In addition, the institution should decide on how to counter the obstacles that arise with a particular ICT use category or didactical approach. The extent to which certain identified barriers play a role for adoption success will depend on the level of existing adoption and is related to the above implementation goals. The added value of ICT is also different according to the particular implementation condition. As a consequence, one should assess whether there is 'dissatisfaction with the existing situation' and/or whether knowledge, skills and appropriate teaching and learning material are available in order to outline a balanced, realistic policy plan. Institutional and governmental policy should take these differences into account when considering strategies and deciding on infrastructure and other investments. If not, the discussions about barriers and solutions will be confusing; recommendations and policy action lines are less clear and lead sometimes to unrealistic expectations, to indifference in some cases, to resistance in others [40].

2.2 Policy

Broad implementation can be positively influenced by well-suited macro and meso level policies about education and ICT [41], support by key persons within the learning organization, and a broadly-accepted implementation strategy [42].

Supranational, national and/or regional bodies can stimulate e-learning by introducing new ideas, by providing a convenient legal framework and by means of financial and professional support. ICT integration should be labelled as one of the key priorities, and result in a definition of strategic goals and objectives. A combined 'Virtually Vanilla' and 'Web of Confidence' scenario seems to be the most appropriate governance framework [43]. In this, government acts as 'a friend with knowledge' towards education institutions, slightly regulating, but providing infrastructure and making investments into systems or procedures in order to ensure e-ducation for all.

According to Valcke, Collis and van der Wende [44] the macro government should prioritize:

- Networking, inter-institutional and public-private collaboration;
- Financial measures to enable support (e.g. staff training) and standardization actions
- Involvement of existing umbrella organisations to promote innovations;
- Development of internal and external quality assurance cycles and national asessment and monitoring;
- Redefinition of innovation project tenders with regard to educational innovation based on ICT.

National research and development programmes or a national or regional institution committed to ICT-based education can play an important role in this context. Such initiatives can either kick-start ICT developments or give them extra impetus and steer them in a certain direction.

The education institute's context can have a considerable impact on innovation. Best results are acquired when allowing scope for bottom-up initiatives within the institute's framework, rather than by a fully top-down implementation strategy [45]. Four aspects are of central importance: a) the educational policy and related ICT policy, b) the centralized organizational arrangement to support ICT integration; c) the ICT infrastructure, and d) the social climate, the degree to which innovators are encouraged through effective leadership, incentives, and rewards [46].

Institutionalized policies and procedures should regulate in the first place technology purchases and access. Secondly, finances are needed to install institutional support, together with initiatives committed to (re)training and expertise development [47]. Everyone should be connected, and have at least up-to-date hard- and software at work, and on campus. To avoid technoparalysis the university should help with installing and updating material on a regular basis. Moreover, a systemic integration of technology requires an up-to-date view on the existing needs and a good programme development or selection [48]. In addition to the question 'what's the problem?' policy should evaluate the transferability of emergent practices when heading for broad-scale adoption. Useful are the conclusions of experiences with previous pilot projects.

Valcke listed some other crucial meso-level priorities [49]:

- Collaboration within the education institute
- Focus on scalable initiatives;
- Extrapolation of administrative and technical outcomes of ICT projects;
- Establishment of internal quality control mechanisms;
- Provisions for human resource management (e.g. new job profiles).

In all policies, plans and communication the potential benefits of ICT use for educational purposes should be emphasized but without losing the notion of reality and presenting utopian scenarios of change and improvement.

2.2.1 Support

In an environment where there is good and enough technical and human man-power support e-learning projects have a higher success rate, even if they are extremely innovative and distant from the school culture. Moreover, if there is adequate access, support and training, teachers are more motivated to experiment [50]. A supportive teaching and learning environment should include: a) flexible, well-trained and responsive supervisory and technical staff, b) a group of translators within a centre of professional development, with people who are able to help a teacher understand and use technologies for his or her own purposes [51], c) a cell of expertise and/or a research centre with e-learning experts in pedagogical, technical and organisational issues and d) a forum for disseminating models of effective practices. More programmes about technology integration in education could be necessary [52] and students can provide help with troubleshooting and just-in-time technical assistance [53].

2.2.2 Training

Preparing teachers to integrate technology in the classroom employs many learning experiences and resources. In general, before someone is technologically skilled, he/she will pass six phases. Russell names them: awareness, learning the process, understanding the application of the process, familiarity and confidence, adaptation to other contexts and creative application to new contexts [54]. Hence, not only techniques should be at the centre of attention, appropriate didactical tips and hints are often required more.

2.3 Planning

In order to integrate e-learning within all curricula of an educational instititution, a strong realistic framework established by the governing body via strategic planning and management should be in place [55]. It refers to a continuous, cyclical determination process that can take place at various levels within an institution. The main objective is to judge short-, mid- and long-term goals, expressed in clear outcomes and effects, within a sphere of participation and agreement. In order to carry out these aims, certain actions are to be foreseen and adequate resources must be allocated.

This process has four main phases: 1) research, brainstorming and choice-making, 2) documentation and dissemination, 3) implementation and 4) monitoring [56]. In general, the first stage, will generate three key documents: the Mission Statement, the Strategic Plan and the Operational Plans. Each has its particular time-scale and is linked with a particular policy level. Those involved in the achievement of the targets need full access to the plan(s).

2.3.1 The Mission Statement (5-10 years)

This public document briefly describes the key characteristics, values and aspirations of the university and 'the essential philosophy and raison d'être of the institution' [57].

It should give a general direction of the university and provides an overall framework for at least five years within which the planning process will further operate: it 'sets the tone for the more detailed plans which follow' [58].

2.3.2 The Strategic Plan (3-5 years)

The Strategic Plan is a (semi-)public document that translates the Mission Statement into specific aims and aspirations by subject area or by activity (such as admissions, teaching and learning, quality, research, staffing, or estates) and should be reviewed on a regular basis.

It is based on a broad analysis of the present position and context. It includes a schedule of the overall and detailed planning and responsibilities for implementation, monitoring and reviewing, along with an indication of resources available and feasibility of the plans. For particular issues the Strategic Plan may refer to further (operational) plans.

2.3.3 The Operational Plan (1-2 years)

This term refers to the more (confidential) detailed practical working plan, either subject-based, theme-based or both. Operational Plans include objectives and targets specific to particular organizational units and activities to reach within a period of one or two years. Ideally, they should be reviewed and updated on an annual basis in the light of achievement and changing circumstances. In general, an Operational Plan contains the following key features:

- SMART (specific, measurable, achievable, relevant, timely) targets;
- Milestones or interim targets/steps;
- Responsibility indications: who (persons, group, committee) is responsible for the achievement of a particular target.

Operational Plans should be integrated and directly related with resource allocation. This requires effective line-management whereby activity-based plans are worked out for immediate execution by different decision makers on different levels or via interaction before final approval and implementation between those responsible for implementation and the overall planning committee [59].

2.3.4 Leadership and Culture

For an effective implementation leadership, either *responsive*, *managing* or *initiating* [60] and an awareness of the institutional culture is needed, including an appreciation of the core values, attributes and beliefs of the organization. In order to guide adoption behaviour school leaders 'must be informed and focused, but also sensitive to the environment; leadership must also create new opportunities as well as reacting to changing circumstances' [61]. Such is characterized by effective change and project-management.

2.3.5 Dissemination, Implementation and Monitoring

It is essential that the various plans or summary publications be fully disseminated amongst interested parties through all levels within the organization using as many communication channels as possible, both off- and online. Horizontal and vertical communication across the institution is crucial to achieve positive staff morale and to ensure each individual member is aware of his or her responsibilities in delivering the overall institutional objectives. On implementation, ad hoc systems devised and put in place very late in the process are unlikely to command respect and acceptance.

In the final stage, monitoring, the institution has to assess progress made towards achievement of the targets put forward and has to revise plans, including the introduction of new or amended targets. Information that can be used for this purpose : a) data from studies, b) project progress reports, c) monitoring reports on return plans and d) management cost accounts [62].

2.4 Participation

Given the above it is important to make a concerted effort to build up an e-learning environment and policy. Next to appropriate organizational structures and arrangements (e.g. planning-driven transparant resource allocation and accountancy), participation is crucial to get policies accepted and make change possible. The entire innovation environment should be aimed at when deciding, planning and communicating: 'This involves communicating a shared vision among all stakeholders, taking advantage of multiple channels of diffusion' [63].

In order to land in a 'comfortable zone' for ICT integration, a bottom-up approach, involvement in policy development and certainty about the responsibility and execution of policies is needed. In this context, middle management is assigned a key position for regulating and facilitating innovation and change [64]. Such collaboration should not be restricted to one's own educational level, university or geographical location. Partnerships between schools, colleges and universities within or outside their particular country are also interesting means for establishing long-lasting ICT use.

3 Conclusion

In this contribution it was made clear that many e-learning efforts fail because of bad policy making and barriers on the individual, organisational or broader societal level. The authors suggest a framework for successful institution-wide implementation of ICT, based on four P's: **p**roblem, **p**lanning, **p**olicy and **p**articipation. This could be used as a guide to assist policy makers to introduce sustainable e-learning or to adjust their existing e-learning strategies.

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