QUALITY ASSURANCE OF WEB-SUPPORTED LEARNING: PROCESSES, PRODUCTS AND SERVICES

A Case Study at the University of Pretoria

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"Meaningful change is brought about by individuals taking action to change their own situations, and making their practice more relevant to those they are serving."

(McNiff, 1996, p.xv)

Keywords

quality assurance, self evaluation, web-supported learning, flexible learning, processes, products, services.

Acronymns

HEI	Higher Education Institution
HEQC	Higher Education Quality Committee
ICTs	Information and Communication Technologies
LMS	Learning Management System
QMS	Quality Management System
TLEI	Department of Telematic Learning and Education Innovation
UP	University of Pretoria
WebCT	Web Course Tools ®
WSL	Web-Supported Learning

Abstract

Quality is an elusive, ill-defined and much debated concept. In the field of higher education, we speak of 'best practices', 'quality learning interventions', 'design standards', 'quality instructional design', 'quality services and products' etc. How do we interpret quality in the field of e-learning and what practical suggestions will assist e-learning practitioners to continually improve their practice?

The case study described in this paper is a self-evaluation exercise in an e-learning service unit at the University of Pretoria. In this paper, the term 'web-supported learning' is used and implies the use of the Internet to enhance and support teaching and learning in a blended learning situation.

There are numerous dilemmas which complicate the 'web' of e-learning and hamper attempts to implement quality principles and practices in this field. One such dilemma is the universal tension between self-evaluation and external accountability (Vroeijenstein,

1995; Baijnath et al., 2001). Another dilemma is the difficulty in defining measures of the quality not only of our processes and services, but also of the teaching and learning aspects of online learning products.

This paper proposes a holistic approach to managing the quality of e-learning projects, with respect to processes, products and services to clients. The basis of the paper is a case study which implemented a formal, online Quality Management System (quality of **processes**) in e-learning at the University of Pretoria. With respect to the quality of e-learning **products**, the KEA (pronounced "key", as in "flea") model is proposed, based on a synthesis of findings from six well-known examples in the literature. The model presents a set of critical success factors for web-supported learning.

Quality of **service** to lecturers and students was investigated by means of e-learning experience surveys, which inform the feedback loop between product specifications and evaluation of web-supported courses, both formative and summative. The Lecturer Experience survey reports on a small sample of qualitative interviews conducted with 22 lecturers at the university. The Student WebCT Experience survey is administered to students at the end of each semester. A Frustration Index and a Satisfaction Index were calculated using the data from July 2003.

These measures are monitored each semester to provide management information, by quantifying the added value that an e-learning production and support unit contributes to the quality of teaching and learning.

1. Introduction

This case study presents a self-evaluation exercise carried out by the e-learning unit of the Department of Telematic Learning and Education Innovation (TLEI) at the University of Pretoria (UP), from 2001 onwards. Education innovation is a key strategic initiative at the university (University of Pretoria, 2002). TLEI is a service department, which assists and supports academic staff in education innovation projects.

TLEI adopted a quality policy, in line with ISO 9001 requirements for quality management systems (SABS, 2000). The quality policy is aligned with the vision and mission of TLEI and embraces principles of fitness for purpose, client satisfaction, cost effectiveness and continuous improvement of processes and functions.

Internationally, the term 'distance education' tends to be used synonymously with 'online learning', in the sense of 'technology-assisted distance learning'. The preferred term in this case study is 'web-supported learning' (WSL), which implies that the Internet is used as a supportive delivery medium to enhance and support the teaching and learning process. UP promotes a model of flexible, blended learning, which encompasses a range of electronic and face-to-face delivery mechanisms and support systems, using appropriate, cost-effective combinations of ICTs.

Who are the **clients** of an e-learning support unit and what are our **products**? The direct clients are academic staff who wish to adopt education innovations in the form of technology-enhanced delivery and facilitation of learning materials. The ultimate clients are the students who are the end users of the web-supported courses produced. The products are defined to be the 'learning opportunities', that is all materials, skills and professional expertise required to develop, deliver and facilitate a web-supported course or programme, in order to provide added value for students.

The research question for this case study is:
> **What practices contribute to improved quality of web-supported courses?**

2. Campus Infrastructure

The E-campus of the University of Pretoria is an electronic extension of contact teaching facilities, products and services. Student Online Services and Lecturers Online provide Internet-based platforms that enable students and staff to access an integrated educational environment from the campus or from their places of work or residence (TLEI, 2002). This infrastructure promotes asynchronous access to preparatory, remedial, reinforcing or assessment activities, as well as to administrative functions.

Learning management systems (LMSs) have emerged as one of many software systems available to deliver WSL. They are designed with a view to enabling enriched interactive educational communication on the Web, and to offer enhanced support to instructors and students as they use the Internet as a medium for learning. The University of Pretoria makes use of the commercially available LMS, WebCT (WebCT®, 2002). WebCT offers the following functionality:

- provides access to information and resources;
- establishes WSL communities;
- offers electronic assessment tools;
- allows student tracking,
- enables self-paced learning and off-campus access.

Lecturers may choose to utilize WebCT at various levels of complexity. Many lecturers begin by using web-supported components at the lower level of simply providing information and resources. Part of the change management role of TLEI is to provide training and support in facilitating effective, collaborative and meaningful learning on the web, so that lecturers may advance to more effective levels of web usage.
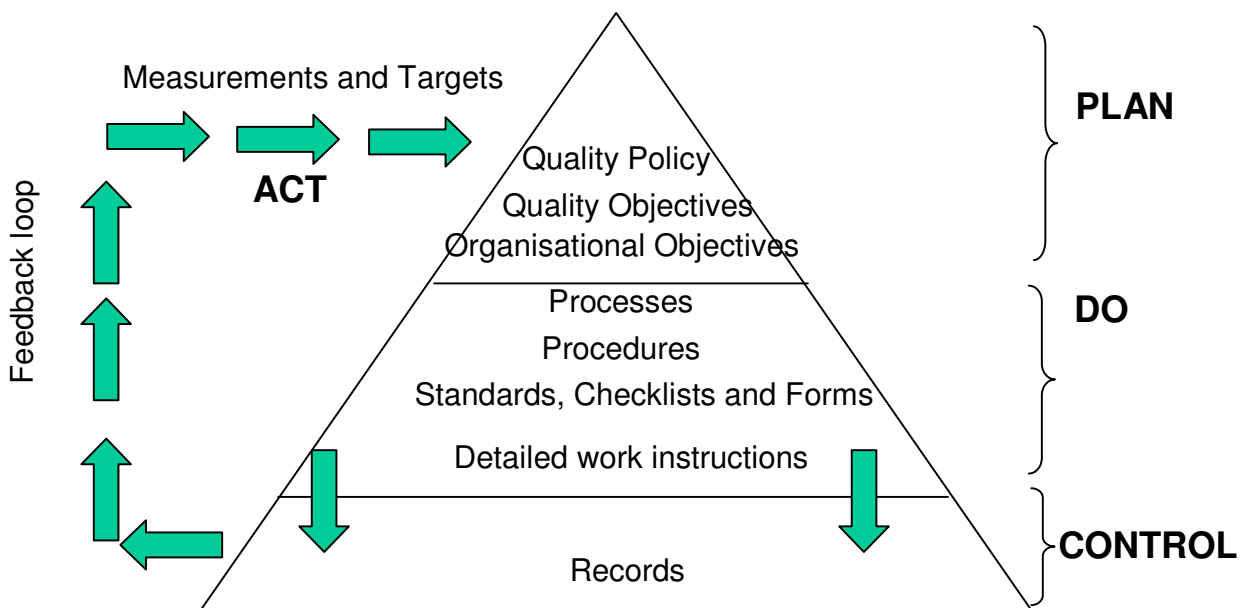
3. Quality Management System for WSL

A formal quality management system (QMS) for WSL was implemented and is currently being evaluated and refined. The SAQA definition of a QMS was adopted: "A quality management system is the sum of all activities and information an organisation uses to

enable it to better and more consistently deliver products and services that meet and exceed the needs and expectations of its customers" (SAQA, 2001, p. 9).

The system is informed by the Plan-Do-Control-Act cycle of Deming (Gabor, 1990), as well as the input-process-output theory of a process-based quality management system, as documented in the ISO 9001 standard for quality management systems (SABS, 2000).
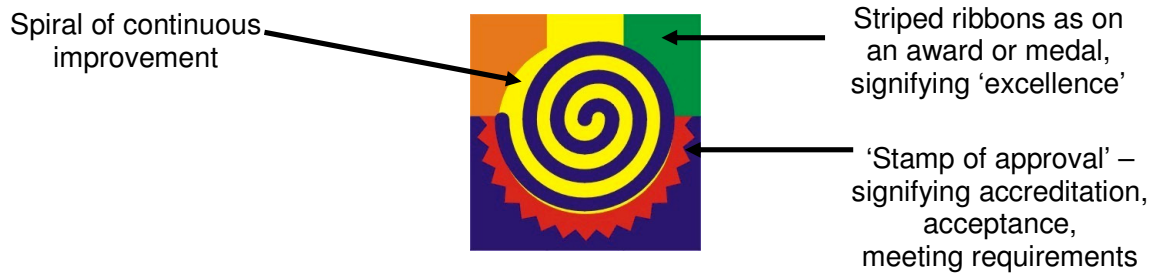
The specific interpretation of the Plan-Do-Control-Act cycle applied in this case study is illustrated in Figure 1.

**Figure 1: Elements of a Quality Management System
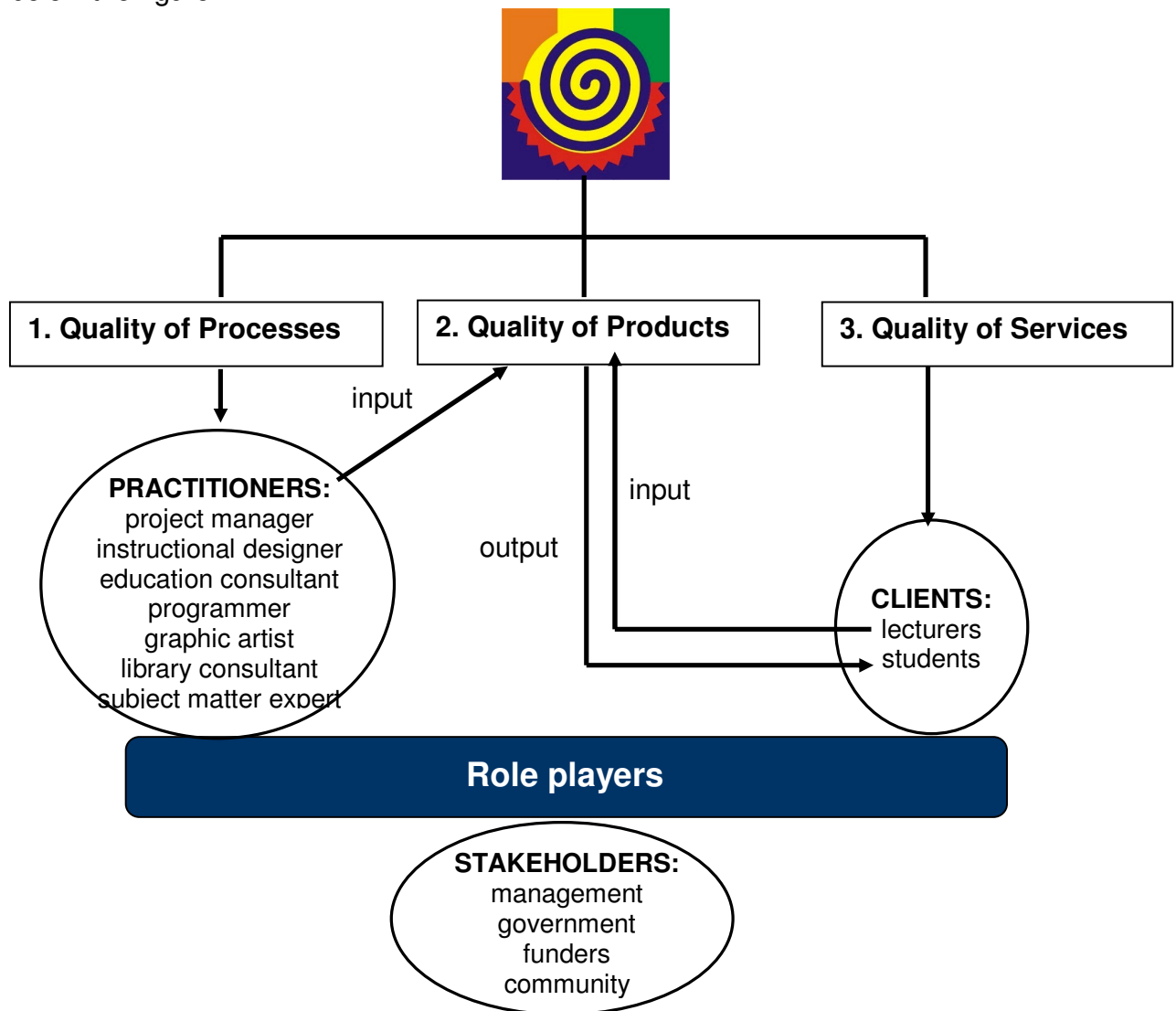(Boyd, 2001 - adapted from Waller, Allen & Burns, 1993)**

Figure 1 illustrates the cycle of planning, development, documentation, reporting, action and review of policy and procedures. The feedback loop illustrates the importance of collecting measurements in order to inform the cycle of continuous improvement. Measurements can take various forms (e.g. qualitative heuristics or quantitative metrics – Lowe & Hall,). In this case study, student and lecturer feedback are examples of measurements which contribute to the feedback loop.

Quality is an elusive and ill-defined concept and is difficult to interpret in the field of WSL. Terms such as 'best practices', 'quality learning interventions', 'design standards', 'quality instructional design', 'quality products and services' are common. For the purposes of this case study, a metaphor was conceptualized, which is a stylized synthesis of some perspectives of quality found in the literature (Figure 2).

Spiral of continuous improvement

Striped ribbons as on an award or medal, signifying 'excellence'

'Stamp of approval' – signifying accreditation, acceptance, meeting requirements

Figure 2: Metaphor for this case study

The construct of quality was subdivided into three components, namely Quality of Processes, Quality of Products and Quality of Services. This structure is shown in the conceptualization of the QMS (Figure 3). The interpretation of the system is given below the figure.

1. Quality of Processes

2. Quality of Products

3. Quality of Services

input

input

output

PRACTITIONERS:
project manager
instructional designer
education consultant
programmer
graphic artist
library consultant
subject matter expert

CLIENTS:
lecturers
students

Role players

STAKEHOLDERS:
management
government
funders
community

Figure 3: Quality Management System for Web-Supported Learning

The lower half of Figure 3 reflects the role players involved in the design, delivery, consumption and funding of web-supported courses. The groups of role players are indicated in the three circles. Stakeholders with an interest in the quality of WSL are management of the university, government quality agencies such as the HEQC and SAQA, funders who may contribute to development costs and the broader community, such as parents and employers. The stakeholders are indicated at the base of the figure.

The first component of the QMS is Quality of Processes. The team approach to instructional design is traditionally recommended (Gustafson & Branch, 2002; Smith & Ragan, 1993). Teams within the e-learning production unit in this case study typically consist of the practitioners indicated in the first branch of Figure 3. In order to formalize and streamline the quality of their practice, a detailed analysis of **processes** and **procedures** was undertaken (section 4).

The Quality of Products branch of the QMS considers the effectiveness of WSL opportunities and the added value that such **products** provide to students. The inputs to these products are the instructional design contributions of e-learning practitioners and the subject expertise of lecturers. The outputs are the resulting web-supported courses which are delivered to students. The evaluation of interactive learning systems is a well-established field (Reeves & Hedberg, 2003). A link has now emerged between *evaluation* and *quality assurance* (Savenye & Robinson, 1996). Six papers from the literature on quality in WSL were synthesized to produce a taxonomy that encapsulates the essence of quality WSL products (section 5).

The **clients** of an e-learning support unit at a higher education institutuion (HEI) are the lecturers and students involved in the creation, facilitation and consumption of web-supported courses. The quality of **service** to these clients needs to be monitored and continuously improved. Hence the third component of the QMS is Quality of Services. The instruments used in the case study to evaluate service quality are Lecturer and Student WebCT Experience questionnaires. Although covering various categories, both instruments include items on satisfaction with services and support received. The findings are summarised in section 6.

Each of the components of the QMS, together with their findings, is discussed in the sections that follow.

4. Quality of Processes

In July 2001 the e-learning unit contracted an independent quality assurance consultant to provide staff training and to facilitate the implementation of the QMS. A conscious decision was made not to seek ISO 9001 certification initially, but all components of that standard have been taken into account, so that the system will be adaptable to ISO 9001, should this be desired in future.

The first step in ensuring ownership and commitment of the practitioners involved in the QMS, was to provide training in the theory of quality assurance. The 'Introduction to Quality Assurance' workshop was presented to the TLEI management team in November 2001, and in small groups to all the members of the e-learning unit from November 2001 to May 2002 (Boyd, 2001).

The training workshops presented, among other things, the concepts of quality assurance and quality management systems, the hierarchical ideas of processes, procedures and work instructions, as well as examples of how to document procedures, such as narrative, flow charts, diagrams or tables. The workshops provided an opportunity for participants to voice their issues and concerns, and to make suggestions. This engendered ownership and involved everybody from a change management point of view.

The traditional ADDIE (Analysis, Design, Development, Implementation, Evaluation) instructional design model in use in the e-learning unit had generated a collection of documents, which were an intuitive attempt to streamline and improve processes and procedures. These included a Project Timeline, a Service Level Agreement, a Roles and Responsibilities document and Minimum Requirements for web-supported courses. The Project Timeline, based on the instructional design ADDIE model, became the major **process** for the QMS. It consisted at that time of 12 'boxes', each of which was workshopped and brainstormed into a fully documented **procedure**, as described below.

Traditionally, in designing and developing a QMS, one would complete each procedure, with its inputs and outputs, before going on to document the following procedure. This method is in keeping with the 'process chain', one of the basic elements of Total Quality Management (Macdonald, 1998). Due to time constraints in this case study, a rapid prototyping approach was adopted. Task teams were constituted to simultaneously document each procedure in the Project Timeline according to a template, example and self-evaluation questions provided by the QA consultant.

Teams collaborated with each other regarding their inputs and outputs, since most team members belonged to more than one task team. An automatic cycle of formative evaluation occurred naturally as they discussed and documented each procedure. Three steering team meetings were convened, at which all the pieces of the puzzle were put together to create a complete paper-based prototype of each procedure, together with its supporting documents such as checklists, guidelines, pro-formas and policies. These were later built into an online component of the QMS, using WebCT, the same LMS that delivers WSL products to students.

Each procedure is documented according to the following structure:
- the title of the procedure;
- an overview of the procedure;
- the objectives of the procedure;
- a list of numbered procedure steps;

- the responsibilities of all the role players;
- a list of supporting documents and outputs; and
- a footer giving document control data.

The procedures form the backbone of the online component of the QMS and are available as *pdf* documents, together with links to their relevant supporting documents. There is an interactive site map to enable users to view the entire process and to make use of hyperlinks to navigate among the procedures and their supporting documents.

The QMS (Figure 3) in this case study has improved the quality of processes, due to the depth of the self-evaluation exercise which formalised and documented all processes, procedures and supporting documents used by the e-learning practitioners in TLEI.

5. Quality of Products

Six papers from the literature were reviewed to give an overview of the benchmarks, tools and frameworks proposed by the respective authors:

1. Criteria for WebCT® Exemplary Courses (Graf & Caines, 2001)
2. Twenty four benchmarks (Institute for Higher Education Policy, 2000)
3. Quality indicators (Barker, 1999)
4. Seven Principles (Chickering & Ehrmann, 1996)
5. Ten Keys (Alley, 2000)
6. Pedagogical framework (Herrington et al., 2001).

Each of the above studies approached the notion of quality in WSL from different perspectives and under different conditions. These particular studies were selected since they are based on extensive research projects in Canada, the USA and Australia, some of them on a large national scale. The full description and analysis of each of the six studies is given in Fresen (2004).

Critical success factors for quality WSL were synthesized into the 'KEA' (pronounced *key*, as in *flea*) taxonomy (see Table 1): **K**ey factors, **E**xogenous factors and **A**ssumptions. Key factors are key pedagogical aspects, such as communication and interaction. Exogenous factors are those factors which are important to the resulting quality of the WSL product, yet are beyond the control of instructional designers in an e-learning support unit. Assumptions are those factors which are so critical that without them, WSL would not be sustainable.

The factors in the KEA taxonomy are based on six categories: institutional, lecturer, student, technology, instructional design and pedagogical factors. These categories are shown on the vertical axis in Table 1. The K-E-A classification is shown on the horizontal axis in Table 1.

Table 1: The KEA taxonomy of critical success factors for quality web-supported learning products

Category	Key factors (K)	Exogenous factors (E)	Assumptions (A)
Institutional Factors		• Commitment from management • Student advice and consultation • Class size • Programme Evaluation	• Technology plan • Technology Infrastructure
Technology Factors			• Reliability • Accessibility • Availability • Accuracy of student records • Programming support • Technical support for lecturers Technical support for students
Lecturer Factors	• Interaction with students • Frequent and constructive feedback to students	• Academic qualifications • Professional training in education • Evaluation of lecturer competence in e-learning • Workload	• Computer skills • Motivation / commitment • Hands-on system training
Student Factors	• Communication with fellow students • Time management / time on task	• Learning style and preferences • Workload	• Computer skills • Motivation / commitment • Hands-on system training • Learner control over time, place, pace
Instructional Design Factors	• Co-operative learning • Student engagement • Higher cognitive levels • Rich learning resources • Interactivity • Enhanced student motivation		
Pedagogical Factors	• Specified learning outcomes • Clearly stated expectations • Optimal assessment strategies • Respect diverse talents and styles	• Curriculum composition • Relevance, accuracy and currency of content	• Learner-centered • Outcomes-based

The KEA taxonomy is a holistic synthesis of broader institutional issues and well as more detailed teaching and learning factors, all of which affect the quality of WSL products. It should be noted that such critical success factors play an important role in enhancing the quality of **all** learning experiences, not only WSL. This is good news for lecturers, students and e-learning practitioners alike, and confirms the philosophy that good pedagogy and sound design are the foundation of any teaching and learning experience, regardless of the delivery medium (Clark, 1994; Ragan, 1999).

6. Quality of Services

6.1 Student feedback

The importance and relevance of soliciting student (client) responses to learning situations is well documented in the literature (Ramsden, 1991; Clark, 2000; Randall, 2002). It is an integral part of both the formative and summative evaluation of any learning intervention and is Level 1 in the four level evaluation model of Kirkpatrick (1994). The **procedure** of obtaining client satisfaction feedback from both students and lecturers was formally documented as part of the summative evaluation procedure in the QMS.

In April 2001, the field of student feedback was researched and a student evaluation survey for WSL was developed using ideas from Hannafin & Peck (1988) and Ramsden (1991): the WebCT Experience Survey. The survey was programmed in a shareware software package and implemented on Student Online Services, the campus-wide portal from where students access their web-supported courses. Completing the survey is a voluntary activity for all students with at least one web-supported module. Since 2002 the survey has been administered at the end of each semester, namely in July and December. The following response figures were recorded for 2002 and 2003.

Table 2: Number of respondents to the Student Feedback Survey

	2002		2003	
	Sem I	**Sem II**	**Sem I**	**Sem II**
Number of respondents[1]	386	1 476	4 650	1 130
Total number of WebCT students[2] (approx.)	10 000	14 000	17 000	20 000
Response rate	3.86%	10.54%	27.35%	5.65%

The findings from Semester I 2003 are reported here. A wealth of data was gained from the questions designed to provide information such as browser usage, access to technology and usefulness of library resources. The most encouraging findings were

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[1] These are distinct individuals, since the survey was offered via a single link on Student Online Services and completed once by each individual WebCT student who chose to participate.
[2] These are distinct individuals, according to their student numbers.

that 75% of technical problems were resolved within 24 hours and 66% of students found 'anywhere, anytime' learning to be convenient. Valuable information was volunteered in the open questions, which ask for positive points, negative points and suggestions for improvement.

The questionnaire measures more than service and support to students. Items were written according to the following categories:
- technical adequacy and technical support
- educational support (supportive resources and training)
- affective domain (feelings and emotions of students)
- interactivity (use of the communication tools in WebCT)
- perceived learning.

The first three categories were used to generate a Frustration Index (FI) and the last two categories were used to generate a Satisfaction Index (SI). These indices reflect respectively student frustration or satisfaction with their WSL opportunities.

The findings for the Frustration Index are shown in Figure 4. The percentage of respondents is on the vertical axis and reflected as a percentage on each bar. The levels of the frustration index were grouped according to the categories Low, Moderate and High. These are shown on the horizontal axis.
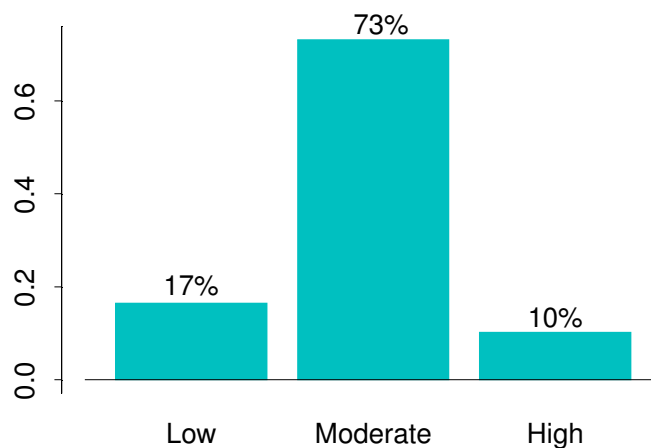

Figure 4: Levels of the Frustration Index

The Frustration Index shown in Figure 4 indicates that 83% of respondents experience moderate to high levels of frustration in their web-supported courses. This figure is rather high – efforts will need to concentrate on reducing levels of student frustration.

The Frustration Index was investigated in further detail to ascertain the contributing factors. The following factors contributed to student frustration with WSL:
- insufficient computers available on campus
- insufficient printing facilities available on campus
- extent of technical difficulties experienced

- inadequate student training in WebCT
- an impersonal learning experience
- slow response from classmates
- feelings of annoyance and/or stress.

The findings for the Satisfaction Index are shown in Figure 5. The percentage of respondents is on the vertical axis and reflected as a percentage on each bar. The levels of the satisfaction index were grouped according to the categories Low, Moderate and High. These are shown on the horizontal axis.
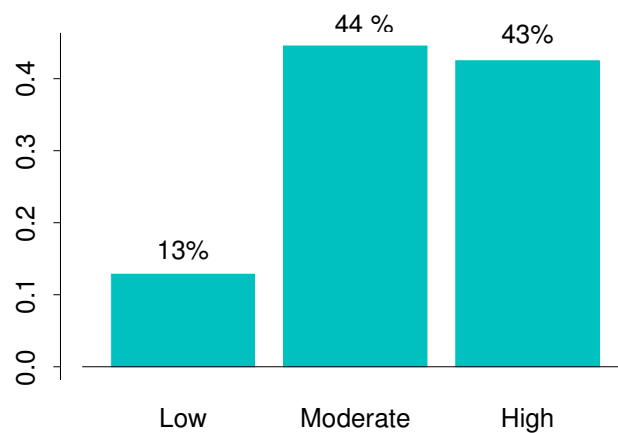
Figure 5: Categories for the Satisfaction Index

It can be seen from Figure 5 that only 43% of respondents experience high levels of satisfaction. Improvement efforts will concentrate on increasing this statistic.

The following factors contributed to the Satisfaction Index:
- feeling comfortable communicating via online tools
- feeling more freedom to express oneself than in a traditional classroom
- learning from the contributions of other students
- promoting one's ability to work as a team or group member
- promoting one's ability to plan one's own work
- experiencing an enriching learning environment.

Some of the qualitative responses to the open question about **positive** aspects of WSL highlighted the need for lecturer commitment and involvement, as seen from the sample of student comments given below.

- Discussions with the lecturers and students.
- Contact with lecturers improved.
- Communication with lecturers is made easy.
- Can contact lecturers online.

- The online web has a great impact towards our learning.
- I learned to communicate more to the point and concise.
- It helped me to interact with my fellow student mates and lecturers.
- Learning is best communicating with other people.
- Long distance interaction between lecturer and students.
- Lecturer's and fellow students' contributions.

6.2 Lecturer feedback

Lecturer feedback was not formally gathered until 2004. During January 2004, pilot interviews were conducted with a group of 22 lecturers across various faculties, to obtain feedback from lecturers who have been involved in WSL for at least one year. The interview schedule was the Lecturer Experience and Satisfaction Survey, a mix of structured and open questions.

The factors which contribute to lecturer satisfaction with WSL are a sense of security which needs to come from technical reliability and technical support. Some strong reaction emerged with respect to major upgrades to the IT infrastructure, which occurred at the beginning of 2004. Despite timely notification, the extensive technological changes resulted in uncertainty and frustration among lecturers.

Staff and student training were mentioned as vital to ensuring the quality and success of WSL. Online communication and interaction were recognized as providing benefits in the teaching and learning situation, but organizational and administrative advantages are more practical and quicker to achieve. Several responses reflected the difficulties with respect to the human element – getting the commitment of lecturers and motivating and encouraging students to participate in WSL.

Many positive comments were elicited on services rendered by TLEI, for example:
- I really enjoyed working with the team. You people make ME look good!
- Polite, knowledgeable, quick turnaround time, bends over backwards for clients.
- I am amazed every day by the outstanding, enthusiastic and helpful manner in which TLEI encourages, supports and leads us.
- Organised, involved, quick feedback provided.
- The instructional designer really helps us tremendously – she is a valued team member.
- I believe that the instructional designers do not receive adequate recognition for their hard work!
- You were always a phone call away – thanks for that.
- The dedication and outstanding support of staff members are highly appreciated.
- I have always had excellent service. The instructional designer is always willing to help and always extremely positive.

The responses to the Lecturer Experience survey can be summarised as being overwhelmingly positive. There was strong agreement that the e-learning component adds value to the learning experience for students. Excellent support and service from TLEI are valued by lecturers. Where there were reservations or qualifications to statements, these could be explained by the type and level of WebCT usage in a particular department. Some respondents indicated that they would like to refresh their knowledge of WebCT and engage in the use of WSL at deeper and more interactive levels.

7. Summary

This case study is based on the practice of the e-learning support unit at the University of Pretoria and focuses on improving the quality of WSL for the benefit of all role players.

Policy and practice were integrated into a quality management system (QMS) for WSL, which focuses on Quality of Processes, Quality of Products and Quality of Services (Figure 3). The clear cycle of planning, implementing, monitoring, reflection and action is shown in the Quality Management Triangle (Figure 2), based on the classic Plan, Do, Control and Act cycle promoted by the quality expert W. Edwards Deming (Gabor, 1990). This approach forms the theoretical framework of the QMS.

The quality of **processes** in the e-learning unit was improved through a self-evaluation exercise, which applied standard QA theory to formalising, streamlining and documenting each of the procedures in the Project Timeline, the instructional design model followed by e-learning practitioners. An online component of the QMS ensures that team members have easy access to current versions of all the procedures and supporting documents and new team members may study exactly how things are done in the unit. At a later stage, the online QMS will provide an auditable system for external quality assurance.

The quality of **products** in the QMS is based on the KEA taxonomy (Key Factors, Exogenous Factors and Assumptions) shown in Table 1. The KEA taxonomy classifies critical success factors in terms of institutional, technology, lecturer, student, instructional design and pedagogical factors.

The quality of **services** was measured in terms of client feedback from students and lecturers, using Student and Lecturer WebCT Experience surveys. The overall findings were positive: students value the flexibility of WSL and lecturers value the service provided by the e-learning support unit. However, overall levels of student frustration are too high and levels of student satisfaction are too low. Improvement efforts will concentrate on improving these statistics.

8. Conclusions

In considering the umbrella concept of quality assurance of WSL, the following practical suggestions emerged from this case study:

- Focus on self evaluation as an exercise in continuous improvement and the quest for excellence.
- Develop a conceptual framework applicable to your particular situation, that captures a clear cycle of planning, implementation, evaluation, reflection and action.
- Implement a quality management system to continuously refine and improve your internal processes and procedures.
- Categorise and optimize factors which affect the effectiveness (quality) of the learning opportunities (products) offered.
- Consider the needs and feedback of clients at both ends of the teaching and learning endeavour, namely lecturers and students. This provides a feedback loop and measurements to inform your quality cycle.

Any approach to quality assurance should provide measurements to quantify the value contributed by an intervention or activity. The quality management system implemented in this case study formalizes internal processes and procedures and provides various measures to evaluate the effectiveness of WSL products and services provided to lecturers and students. These measures provide management information and some evidence to substantiate the return on investment made by the management of the university in their vision for e-learning. The measures also provide evidence of self evaluation activities, with a view to continuous improvement and possible later auditing (Fresen & Boyd, 2003, p. 18).

9. References

Alley, L. 2000. *Ten keys to quality assurance and assessment in web-supported learning.* [Online]. Available WWW: http://www.worldclassstrategies.com/papers/keys.htm. (Accessed 25 Feburary 2002).

Barker, K. (1999). *Quality guidelines for online education and training*. [Online]. Available WWW: http://futured.com/form/pdf/english.pdf (Accessed 28 June 2004).

Boyd, L.G. (2001). Introduction to Quality Assurance. Workshop for the Department of Telematic Learning and Education Innovation at the University of Pretoria.

Chickering, A.W. & Ehrmann, S.C. (1996). Implementing the Seven Principles: Technology as Lever. *AAHE Bulletin*. [Online]. Available WWW: http://www.aahe.org/technology/ehrmann.htm. (Accessed 10 June 2004).

Clark, R.E. (1994). Media will never influence learning. *Educational Technology Research and Development*, *42*(3), 21-29.

Clark, R.E. (2000). Evaluating distance education: strategies and cautions. *The Quarterly Review of Distance Education*, *1*(1), 5-18.

Fresen, J.W. (2004). *In search of factors contributing to the quality of web-supported learning in higher education*. Doctoral thesis under preparation. University of Pretoria.

Fresen, J.W. & Boyd, L.G. (2003). Caught in the web of quality. Paper presented at the *7th Oxford International Conference on Education and Development*, 9-11 September 2003, Oxford, England.

Gabor, A. (1990). *The Man who discovered Quality*. New York: Times Books (Random House, Inc.)

Graf, D. & Caines M. (2001). WebCT Exemplary Course Project. Paper presented at the *WebCT User Conference, Vancouver, Canada, 23-27 June 2001.* Available at http://www.webct.com/exemplary/home.

Gustafson, K.L., & Branch, R.M. (2002). What is instructional design? In R.A. Reiser & J.V. Dempsey (Eds.), *Trends and Issues in instructional design and Technology.* New Jersey: Merrill Prentice Hall.

Hannafin, M.J., & Peck, K.L. (1988). *The Design, Development and Evaluation of Instructional Software*. New York: MacMillan.

Herrington, A., Herrington, J., Oliver, R., Stoney, S. & Willis, J. (2001). Quality guidelines for online courses: the development of an instrument to audit online units. Paper presented at the *18th annual Australian Society for Computers in Learning in Tertiary Education 2001 conference*, Melbourne, Australia.

Institute for Higher Education Policy. 2000. *Quality on the Line. Benchmarks for success in internet-based distance education.* Washington: The Institute for Higher Education Policy. [Online]. Available WWW: http://www.ihep.com/PR17.html. (Accessed 28 June 2004).

Kirkpatrick, D.L. (1994). *Evaluating training programs: the four levels*. San Francisco: Berrett-Koehler.

Lowe, D., & Hall, W. (1999). *Hypermedia and the web. An engineering approach.* Chichester: John Wiley & Sons.

Macdonald, J. (1998). *Understanding Total Quality Management in a week.* (2nd Ed.) London: Hodder & Stoughton.

McNiff, J. (1996). Introduction. In Lomax, P. (Ed.) *Quality Management in Education: Sustaining the Vision through Action Research.* London: Routledge.

Ragan, L.C. (1999). Good teaching is good teaching: an emerging set of guiding principles and practices for the design and development of distance education. [Online]. Available WWW: http://www.educause.edu/ir/library/html/cem9915.html. (Accessed 28 June 2004).

Ramsden, P. (1991). A performance indicator of teaching quality in higher education: the Course Experience Survey. *Studies in Higher Education*, 16(2), 129-150.

Randall, J. (2002). Quality Assurance: meeting the needs of the user. *Higher Education Quarterly*, 56(2), 188-203.

Reeves, T.C., & Hedberg, J. (2003). *Interactive learning systems evaluation.* New Jersey: Educational Technology Publications.

SABS (2000). *South African Standard: Quality management systems – requirements.* Pretoria: South African Bureau of Standards.

SAQA (2001). *Quality management systems for ETQAs.* Policy document. Pretoria: SAQA. [Online]. Available WWW: http://www.saqa.org.za/structure/nqf/docs/quality_assure.pdf. (Accessed 28 June 2004).

Savenye, W.C., & Robinson, R.S. (1996). Qualitative research issues and methods: an introduction for educational technologists. In Jonassen, D. (Ed.). *Handbook of research for educational communications and technology.* London: Macmillan.

Smith, P.L., & Ragan, T.J. (1993). *Instructional Design.* New York: Macmillan.

TLEI (2002). *Annual Report.* Department of Telematic Learning and Education Innovation. Pretoria: University of Pretoria.

University of Pretoria (2002). *Strategic Plan 2002-2005.* Pretoria: University of Pretoria.

WebCT [®]. (2002). Web Course Tools. Commercially available Learning Management System for web-supported learning. [Online]. Home page: http://www.webct.com.