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Implementing Quality Standards for Knowledge-Intensive Organizations

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Quality standards are widely discussed and requested in particular in knowledge-intensive domains, such as the service industry and in particular education. However, no quality standard for this domain has gained a wide adoption or common acceptance yet. This paper shows a classification of quality standards. The classification supports decision makers as well as users to choose appropriate quality standards for their context. The context of this paper is quality development using Open Education Repositories. A focus is the implementation process taking barriers against quality management into account. We show a mix of methods and mechanisms to increase quality and to create quality based on trust. The paper shows a sample case study of how to combine different standards, combining quality aspects from an organizational, product- and user-driven point of view.

Keywords: Quality Standards, Organizational Quality, ISO/IEC 19796, Quality Adaptation Model, Individual Quality.

1 INTRODUCTION

This paper shows how existing quality approaches can be combined to fit the needs of an organization. Based on a classification of quality standards, a method to adapt quality standards to organizational needs is shown. Following this method, a case study for a combination of approaches for an Open Education Repository is shown.

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Knowledge-intensive organizations have to be increasingly competitive on the global market. In particular educational organizations, new requirements arise (Ehlers et al., 2005). However, there are currently no commonly accepted approaches for this specific sector (Kefalas et al., 2003). Many obstacles to achieve quality can be found in practice. Firstly, organizations have to choose a suitable approach from the variety of existing approaches meeting their needs and requirements. Secondly, the successful implementation depends on a variety of aspects to overcome typical barriers (Masters, 1996). Thirdly, quality becomes more and more user-oriented (Ehlers, 2004). In particular for Open Educational Resources (OER) (Pawlowski, Zimmermann, 2007) and community-based learning approaches, user-centered quality the aspect of participation is of vital importance. Currently, 64% of OER repositories use a quality policy (Tzikopoulos et al., 2007), however, the instruments and approaches are very different and not well studied regarding their success.

The main research question of this paper is how existing quality standards can be utilized and adapted by educational organizations. We address the question how to achieve high quality in a setting with rapidly changing resources and how to implement these as repositories and user-generated content are still a challenge in terms of quality (cf. Downes, 2007).

The paper outlines how quality approaches and standards can be classified and applied. The paper bases on a long-term research regarding the adaptation and individualization of quality approaches (Pawlowski, 2007). The approach of individual quality for organizations (Pawlowski, 2007) focuses on the adaptation of existing quality approaches to a specific context. To show the deployment process, the Quality Adaptation Model is introduced. The approach is illustrated in a case study to apply quality management in a large consortium for open educational resources and learning object repositories.

2 QUALITY APPROACHES AND STANDARDS

2.1 Quality Approaches for Knowledge-Intensive Organizations

Quality for knowledge-intensive organizations and in particular for educational organizations has become an issue of increasing importance in both researchers' and practitioners' communities. Quality can be understood in many different meanings and on different levels. As a basic definition, quality can be defined as "appropriately meeting the stakeholders' objectives and needs which are the result of a transparent, participatory negotiation process within an organization. Moreover in the field of E-Learning, quality is related to all processes,

products, and services for learning, education, and training, supported by the use of information and communication technologies" (Pawlowski, 2007).

A variety of approaches has been developed and implemented in different sectors such as Higher Education (Cruickshank, 2005), schools (Greenwood & Gaunt, 1994), in the E-Learning sector (SRI, 2003) or the service industry in general (Yasin et al., 2004; Douglas & Fredendall, 2004). All those approaches differ in various aspects, such as scope or methodology.

The variety of approaches differ in their scope, objective, or methodology (for a discussion of the variety, see Pawlowski, 2007). A typical classification (cf. Pawlowski, 2007) distinguishes the following three classes:

- *Process-orientation*: Quality is managed and / or assured during the development process of a product or service. The main idea of this class of approaches is to provide support to stakeholders in their daily operations. Process-oriented quality approaches do not necessarily guarantee the quality of the outcome (products / services) but provide a framework to achieve quality results. Examples are process guidelines how to develop E-Learning courses or how to develop a curriculum between partner universities.
- *Product-orientation*: Quality is understood as the characteristics of the outcome of an organization. Examples of products in the field of education are study programs, courses, E-Learning modules or curricula.
- *Competency-orientation*: Quality is managed by assuring that stakeholders involved in educational settings have certain competencies to achieve results. An example is the assessment of didactical or language competencies of a teacher / docent.

As already mentioned, a variety of approaches has already been implemented in educational organizations – in some cases, generic quality approaches have been adapted to the field of education, in other cases, specific quality approaches have been developed.

Generic approaches such as ISO 9000:2000 (International Organization for Standardization, 2000) or EFQM (2003) are used to some extent in educational organizations (around 26% of organizations use a generic approach according to Pawlowski, 2007). The main reasons for this rather high usage are their acceptance, their wide popularity, and organizations' willingness to certify and promote quality, both internally and externally. For educational organizations, the effort to adapt those approaches is very high. Usually an organization has no domain-specific guideline to provide process descriptions of their educational processes. In spite of those difficulties, a variety of successful examples (e.g., Cruickshank, 2003; Barron, 2003)

show that it is possible to use and utilize those approaches in the context of learning, education, and training but the effort to adapt these standards is still high.

To avoid high adaptation efforts, *specific approaches* for the field of learning, education, and training have been developed. As already mentioned above, they differ in scope and methodology, ranging from quality management systems for education (BLA, 2005) to content development criteria (Leacock & Nesbit, 2007) or competency requirements (Ehlers, 2007). This also includes accreditation requirements or guidelines which combine process-, product-, and competency-orientation. Finally, a variety of related approaches for a specific quality objective exists. Those approaches are used to assure quality for very specific aspects, such as data quality or interoperability (cf. Currier et al., 2004; Ternier et al., 2008). An important approach for Open Educational Resources and Learning Object Repositories is user-driven quality assurance using recommendations based on user behavior and characteristics. This approach can provide quality statements when reaching a certain critical mass of users.

Another class of specific approaches incorporate instruments and mechanisms which implicitly address the issue of quality: *Ranking and recommender systems* aim at providing support to find resources according to the needs of individuals and organizations (Manouselis & Costopoulou, 2007, Manouselis et al., 2009). Relating this to our quality definition, this means that these instruments try to provide resources to fit the needs and requirements of stakeholders. These instruments are rarely seen as quality approaches. However, recommendation systems are frequently used in particular for OER repositories, around 43% use recommendation and ranking mechanisms (Tzikopoulos et al., 2007). A key instrument is a recommendation mechanism based on metrics (Duval, 2005, Vuorikari et al., 2007). It has been shown that these systems can be successfully used to fulfill the stakeholders' needs and requirements. This group of approaches can therefore be seen as promising to contributing towards individual quality.

In general, all quality approaches – generic, specific, and related approaches – can be helpful for educational organizations. However, several weaknesses exist: First of all, most approaches are not comparable, only expert users are informed on scope and applicability for a certain context. Secondly, the adaptation efforts for generic approaches are in many cases to high. Additionally, specific approaches are usually not widely used and not well known in the community (Pawlowski, 2007).

2.2 Quality Standards

Quality Standards are a specific class of approaches, being formally endorsed by a standardization organization, such as the International Organization for Standardization (ISO) or the European Standardization Body CEN. This means

that there has been a public debate and discourse on the approaches with a formalized consensus process. This can be seen as an expert evaluation process leading to a higher quality of the approach itself. Furthermore, quasi-standards are not endorsed by a standardization organization but have a wide public acceptance so they are perceived as standards for a certain community. It can be assumed that standards are perceived to have a higher value and acceptance than a non-endorsed approach in the corresponding community. The above mentioned classes of approaches (process-, product-, and competency-orientation; generic vs. specific) can also be used for quality standards. Examples are given in Figure 1.

Generic standards are domain-independent and have to be adapted to a specific context. The most used standard in this field is ISO 9000 (ISO, 2000). It is a generic standard for quality management of organizations. Because of its generic nature, the standard and its principles and methods can be applied to any type of organization. However, specific needs and specific characteristics for educational organizations have to be adapted with a high effort. As an extension to generic standards, stakeholder-oriented and related standards are used. *Stakeholder-oriented standards* provide support for specific groups to achieve quality by instruments such as guidelines or reference lists. *Related standards* do not cover

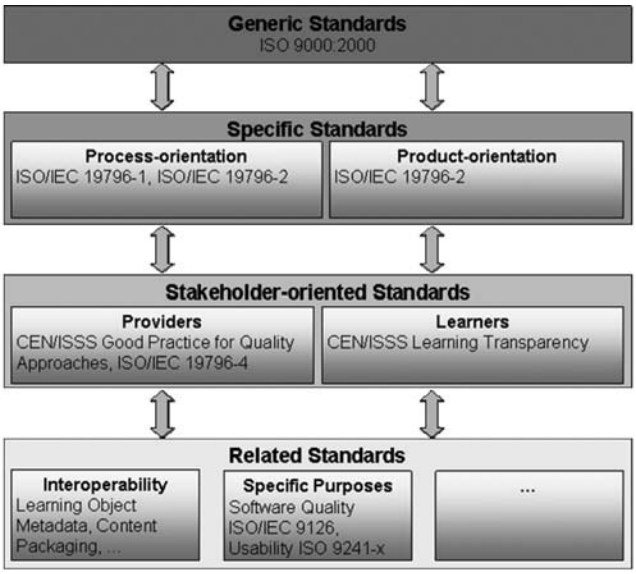

FIGURE 1
Classification and Levels of Quality Standards.

the whole scope of quality management or assurance but address specific aspects such as usability or interoperability.

As generic standards need a high adaptation efforts when implemented in educational organizations, *specific standards* for knowledge-intensive organizations have been developed, in particular for learning, education and training. A specific approach has been recently developed for the field of IT-supported learning, education, and training ("E-Learning"). The standard ISO/IEC 19796-1 describes a "Reference Framework for the Description of Quality Approaches (RFDQ)" (ISO/IEC, 2005). Such a reference framework represents basic general and educational processes. As a process-oriented approach, it does not guarantee the quality of certain products (such as curricula) but provides a guideline how to organize the process to develop educational products. It gives an orientation which quality aspects should be covered and how solutions for these aspects can be found. Thus, the RFDQ could be applied as roadmap to design and implement an adequate solution consecutively. The standard is, therefore, an instrument to develop quality in the field of E-Learning. It consists of three parts:

- Description scheme for quality approaches
- Process model as a reference classification
- Reference criteria for evaluation

The model covers the main processes of a typical educational organization, in particular it contains reference processes for the development of learning, education, and training. The description model serves only as a kind of information-base to provide a harmonized scheme to describe quality approaches (Pawlowski, 2007). Table 1 shows the main processes.

This standard is a promising candidate as it already has specifically defined processes and criteria for educational organizations and has been developed by stakeholders in the E-Learning community.

Currently, a second standard is being developed in the above mentioned subcommittee of ISO/IEC. ISO/IEC 19796-2 "Harmonized Quality Model" (ISO/IEC, 2008) is a standard describing requirements for both, process- and product-orientation. In particular, it covers the main areas of educational organizations as we as categories for the evaluation of educational products (Figure 2). This forthcoming standard is a promising standard for both, organizational and product quality.

As shown above, most standards require adaptation to a specific context. As an example, ISO/IEC 19796-1 is still a general framework, so it has to be extended

TABLE 1
Process Model of ISO/IEC 19796-1.

ID	Category	Description
1	Needs Analysis	Identification and description of requirements, demands, and constraints of an educational project
2	Framework Analysis	Identification of the framework and the context of an educational process
3	Conception / Design	Conception and Design of an educational process
4	Development / Production	Realization of concepts
5	Implementation	Description of the implementation of technological components
6	Learning Process	Realization and use of the learning process
7	Evaluation / Optimization	Description of the evaluation methods, principles, and procedures

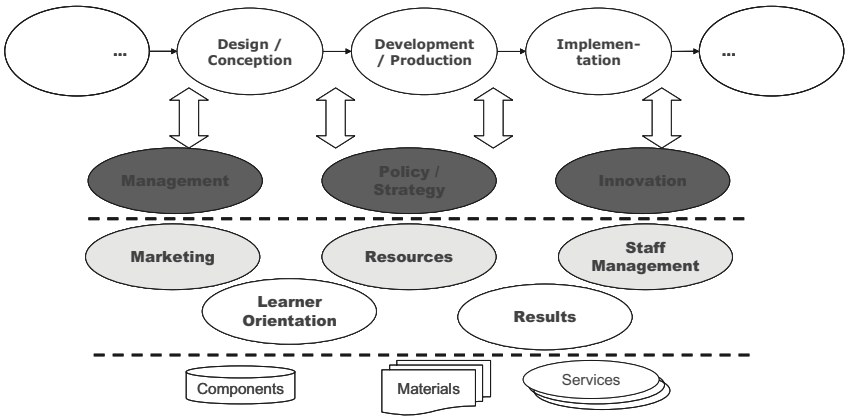

FIGURE 2
ISO/IEC 19796-2.

regarding specific context. This regards the adaptation for *specific stakeholders* as well as specific *quality aspects*. Recently, the CEN/ISSS Workshop Learning Technologies has developed guidelines for providers as well as learners for different aspects: A guideline for choosing appropriate quality approaches for organizations

(CEN/ISSS, 2007a) and finding appropriate learning resources (CEN/ISSS, 2007b). Those guidelines support specific quality aspects for specific stakeholders.

Finally, *specific quality objectives* have to be addressed depending on the context in an organization. As an example, interoperability can be seen as a specific quality objective. To achieve this, related standards such as Learning Object Metadata (IEEE, 2002) could be used. Further specific aspects could utilize standards from corresponding domains, such as ISO 9241 (cf. Bevan, 2001) for User Interface Design or ISO/IEC 9126 for Software Engineering (cf. Bevan, 2001). It is highly useful to validate whether similar standards can be transferred to the domain of education. However, this article focuses on the use of standards which are specific for knowledge-intensive organizations and education.

Summarizing the results, a variety of quality approaches is available currently for educational organizations. However, those have to be combined and implemented depending on the context and objectives of an organization. Therefore, an approach for the implementation is presented.

3 ADAPTATION OF QUALITY STANDARDS FOR OER REPOSITORIES

In the following, an approach to implement and adapt existing standards will be described. The adaptation process is presented and illustrated for the case of Open Education Repositories.

The *Quality Adaptation Model (QAM,* Figure 3*)* follows a process in four steps (Pawlowski, 2007). These steps are not performed iteratively but should be individually schedules. Context Setting covers all preparatory activities for the adaptation process. Model Adaptation contains activities to implement the reference model based on the needs and requirements of an organization. Model Implementation and Adoption means the realization and the broad use of the quality system. Quality Development means that quality systems should be continuously improved and further developed.

The focus of this paper is the choice and adaptation of standards for a specific context in a given setting.

3.1 Context Setting

The first phase initiates the quality development process and sets the context for quality development. It should ensure that quality development is launched and discussed in all parts of an organization. The organization's long term objectives, externally and internally, are contained in its vision, strategy, and

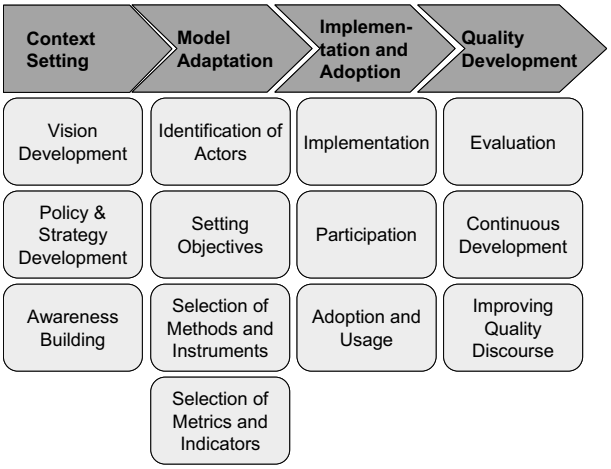

FIGURE 3
Phases of the Quality Adaptation Model.

policy. If an organization is committed to quality development, this should be contained in these statements. In most organizations, quality and specifically quality of E-Learning is not adequately represented. Therefore, the process to improve vision, strategies, and policies needs to be established (see Ittner, & Larker, 1997).

In the case of repositories, the organization is not always clearly defined – they are often run by consortia as results of projects. However, many stakeholders are usually involved. Therefore, it is necessary to include the main stakeholders. One form could be a quality management board. In any case, it is necessary to clearly define a quality policy which is continuously followed and validated.

Directly related is the process of awareness raising. Quality development will not be successful if it is a top-down regulation only. Quality development should be part of everyday operations and related to all activities. Therefore, all members of an organization should be aware of quality and its meaning for their personal actions. For the case of OER repositories, the context is different than in quality management process within just one organization. Awareness instruments should be available to all users, in particular as users only use the repositories for just a very limited time. On the methodological level, in addition to ex-ante quality assurance, continuous processes are needed as contents are added, changed and modified frequently (e.g., user-generated content). This means also that the quality instruments have to be different. Continuous, simple mechanisms (such as peer-reviews, rankings) should be promoted.

3.2 Model Adaptation

The second phase regards the process of choosing an appropriate quality approach or standard and to adapt this according to the context. This phase covers four main aspects. First of all, the *relevant actors* for quality development should be identified. It is useful to involve actors of all departments and all staff groups in this process. Actors, acting as multipliers for their groups should be involved. They should be fully committed to supporting the quality development process. The outcome of this phase is a list of actors responsible for quality. Usually, this also leads to changed responsibilities and tasks and which needs to be agreed with all actors. Secondly, the *processes* relevant for an organization should be identified. E.g., for producers of learning media, only some sub-categories (such as design and production) might be relevant. As another example, for tutors only the learning processes would be relevant. Additionally, processes specific for an organization should be added. The main step of adaptation is the *setting quality objectives* for each process. Quality objective means that for each process it should be defined how quality results can be achieved (e.g., process "technical concept": "the objective is to develop a clear, unambiguous specification of technologies used which meet the users' needs and preferences."). The quality objectives for each process cannot be defined by just one individual – they are subject to a negotiation process and should be agreed on in consensus with the relevant actors.

In case of repositories, these processes are not always clearly defined. However, typical processes (collaborating, searching / adapting / publishing resources, evaluating, cf. Pawlowski & Zimmermann, 2007) can be related to quality and corresponding instruments.

Based on the objectives, *instruments and methods* should be identified and selected. In this context these are concrete activities to achieve, assure, or assess quality for the given objectives. Examples of those instruments are benchmarking, assessments or simply the use of questionnaires. Instruments to achieve the quality objective "24 hour availability of the support hotline" could be an assessment of the call center's staff, test calls, or technical monitoring. The selection of adequate instruments is crucial for the success of a quality system: these instruments need to be adequate for the quality objective, the effort should be small, and they should be well accepted by the participants. Therefore, it is useful to inform and train staff members in the use and interpretation of these instruments.

As shown in the background section, instruments differ from other educational settings as the contents frequently change, users are not involved on a regular base. Therefore, a selection of instruments should be provided by the repository

supporting this setting. A main idea would be to create trust between users, organizations and towards resources. For repositories, the following instruments can be taken into account:

- **Quality management and assurance – trusted organizations and individuals:** Generic quality management mechanisms can rarely be implemented as the organizational form, stakeholders and content frequently change. However, some mechanisms can be considered when a repository is set up or periodically. The most promising mechanism is the recognition of quality certifications of participating institutions to create trust (Cummings & Bromiley, 1996, Dirks & Ferrin, 2001,): This means that organizations and individuals would be considered as *trusted*. In the use process, resources from trust organizations or people have a high probability to have a certain quality level which can be additionally assured by regular sample evaluations.
- **Review processes – trusted resources:** For certain resources, reviews are a mechanism to assure quality by the user community. However, not all resources can be reviewed every time they are changed. So this would be a mechanism to create trusted resources (cf. Jøsang et al., 2007) which would have a higher reputation.
- **Rankings and recommendations – swift trust:** As shown in section 2.1, these semi-automated mechanisms can be used for quality purposes. The idea is to provide recommendations to fulfill the users' quality needs and expectations and to create short-term swift trust (Järvenpää et al., 2004). This mechanism cannot guarantee quality but increase the probability to achieve a certain quality level. Rankings also help to identify low quality resources. Samples for this class of quality mechanisms are shown in the case study in section 4.

The selection of instruments is the most crucial aspect for repositories. There is currently no widely accepted solution for quality mechanisms. However, it can be recommended to use a mix of ex-ante quality mechanisms and simple, continuous mechanisms to support individuals and organizations.

3.3 Model Implementation and Adoption

The choice and adaptation are the first part of the implementation in which usually only small groups of actors are involved. This does not mean that every staff member should know the full quality system, but they should be aware of quality objectives for core and related processes they are involved in. To establish participation, there should be opportunities for actors to influence, change, and

improve quality objectives and methods. Usually, the first implementation is done in representative test groups. Therefore, further users need to be involved and become familiar with the quality concepts to systematically broaden the use of the quality system. The outcome of this phase should be an implementation plan including activities to broadly adapt the model. In repositories, the process is ongoing. In most cases, the implementation is the repository's owners responsibility. However, it is recommendable to have users involved in the process of implementing quality mechanisms.

3.4 Quality Development: Improving the organization's performance

A Quality System must be continuously evaluated, updated, and improved to be aligned to new developments in an educational organization. Therefore the following steps are necessary. The Quality System should be evaluated at least on a bi-annual base. Specifically, it should be evaluated if the quality system has led to overall improvements in the organizations performance. Furthermore, the adequacy of methods, instruments, and metrics need to be evaluated. Based on this evaluation, improvement actions should be taken, such as the change and refinement of the system's components. Again, for this phase a broad commitment and participation is necessary to reflect the staff's opinions and attitudes toward the system. This should lead to a broad awareness and discussion on quality. For repositories, this is highly necessary, in particular, if the above mentioned recommendation mechanisms and rankings are used. The appropriateness of recommendations needs to be continuously evaluated and the mechanisms has to be improved.

As a summary, QAM provides the basic steps towards developing quality. For Open Education Repositories, such a model is of particular importance to plan the participation and involvement of users as well as developing and improving mechanisms to assure the quality of rapidly changing contents.

4 CASE STUDY

In the following, we will illustrate the use of the Quality Adaptation Model (QAM) in a setting of an Open Education Repository. We show the basic idea of the COSMOS quality model based on existing standards. We conclude with results from the users' perspective.

The **COSMOS project** (Sotiriou, 2008) is a European project which has developed a repository, tools and templates to improve the (re-)use of Open Educational Resources (OER) for science education with a particular focus on astro-

nomical resources. The challenge of OER projects and repositories in general is how to achieve and maintain quality of resources (cf. Downes, 2007) when these are freely available and being changed frequently by a community of users. Therefore, the following quality objectives are set:

- The quality of resources as well as didactical designs need to be assured by the stakeholders
- Validated, accepted standards are taken into consideration to incorporate existing experiences
- Quality mechanisms should be self-sustaining and easy to maintain
- All stakeholders should be involved and actively participating in the quality process
- The quality of the repository as well as resources should be continuously monitored and improved

Based on those basic quality objectives, it is necessary to find, adapt and implement standards fitting the needs of this context.

4.1 Context Setting

COSMOS' quality policy aimed at high-quality resources. As part of the strategy, a quality management group consisting of quality experts was installed, responsible for the continuous quality assurance process. Furthermore, it was decided that both, an initial ex-ante quality assurance as well as continuous mechanisms, should be part of the quality model. Besides this, *awareness raising* has been the most important issue. As in a typical European project, a variety of stakeholders is involved. In particular, a focus has been the awareness process for the future users, in particular teachers and teachers in training, who should be part of the quality assurance process: First of all, they participate indirectly by providing resources of a certain quality. Moreover, they contribute directly by reviewing and evaluating resources. This awareness raising was done by mainly face to face workshops with focus groups . The outcomes of this phase were the basic strategies regarding quality and initial discussions on quality with the focus groups. Finally, the *principle of trust* was a key element of our approach. Creating trust towards different entities (organizations, individuals and resources) was the main goal.

4.2 Model Adaptation

In our case study in COSMOS, we combined the steps shown above. In the beginning, the requirements were discussed with relevant stakeholders: teachers,

project managers, content providers and technical experts. Secondly, quality-relevant processes were identified using the standard ISO/IEC 19796-1. The main processes addressed are the design and development as well as the evaluation processes with a particular focus on the re-use and content adaptation processes.

Specific processes of the COSMOS repository and its use were identified. The main quality-relevant processes were 1) identifying the quality of newly published content, 2) peer-reviewing and marking reviewed content, 3) ex-ante evaluations from the stakeholder groups, 4) recognition of quality-assured organizations and 5) continuous quality assurance processes, such as peer-review and ranking processes. Based on those processes and requirements, we identified the main objectives and quality perspectives (Figure 4):

- **Quality of organizations and individuals:** Firstly, COSMOS decided to create trust through organizational and personal quality certification. Based on the ISO/IEC model, organizations and individuals can be evaluated and join the group of quality experts. The COSMOS quality management group was responsible for these evaluations. Individuals then serve as quality representatives. Because of their experiences and previous certifications (e.g., ISO9000, accreditations, quality marks) they are aware of basic quality mechanisms and can later certify materials using the COSMOS approach. It should be noted that existing quality certification s (such as ISO 19796-1 or quality auditing skills) were accepted to avoid redundant certification processes. Secondly,

FIGURE 4
COSMOS Combined Quality Approach.

active and committed users who have steadily submitted high quality materials can be awarded quality user status. This will enable them to act as quality representative within the portal.

- **Quality of materials:** For selected materials, COSMOS can offer to assess and certify quality. We use the approach of the ISO/IEC 19796-2 standard (ISO/IEC, 2008). This certification cannot be required for all materials but only for top-level quality materials as a unique characteristic.

By this combined approach of accepting existing quality standards (e.g., ISO 9000, ISO/IEC19796-1 and ISO/IEC 19796-2), we assure organizations as well as materials have a basic quality. On top of that, we introduce related quality approaches. This part is not based on quality standards but on user-centered quality. We introduce rating and peer-reviewing systems to assure quality continuously.

4.3 Model Implementation and Adoption

In COSMOS, we decided to implement our quality approach in a step-by-step approach (see Figure 5). The main reasons for this are the different competencies and objectives of stakeholders.

In the first phase, the focus was awareness raising regarding quality. By online discussions and workshops, users started to pay attention towards the issue of quality and to raise their quality concerns.

The awareness phase was followed by providing guidance instruments and simple quality mechanism. We chose an approach giving responsibility for quality to the users. For this purpose, we provided firstly a developers guide and a user

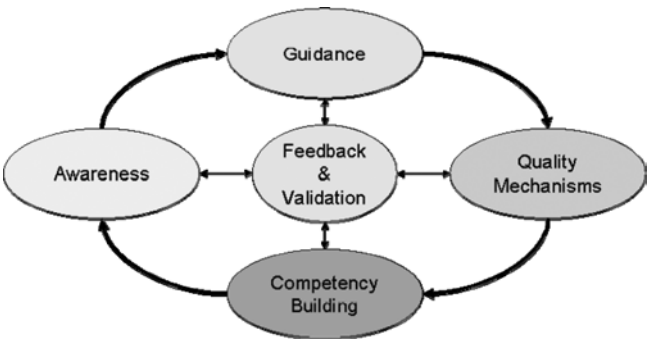

FIGURE 5
COSMOS Quality Process.

guide, based on the quality criteria of ISO/IEC 19796-2 and on the user guides of CEN/ISSS (CEN, 2007a, 2007b). Secondly, ex-ante evaluations were implemented. A quality board was selected to review selected resources which were considered as important for the community. However, this process cannot be realized continuously outside a project due to the lack of resources. Therefore, peer-review and commenting mechanisms were installed and highly used. Additionally, ranking mechanisms were implemented: Top rated resources, most contributing users, most re-used resources. As a further mechanism, we developed recommendations based on the context (e.g., subject domain, type of educational institution, age group) and trust towards users, organizations, and resources. Figure 6 shows the quality elements within the portal.

In the long term, we aim at continuously developing quality competencies of the stakeholders. This means that the self-responsibility of assessing resources and recognizing quality approaches will be increased.

4.4 Quality Development

The COSMOS case study has shown that the phases of the Quality Adaptation Model are a useful orientation for the implementation of quality standards. In our

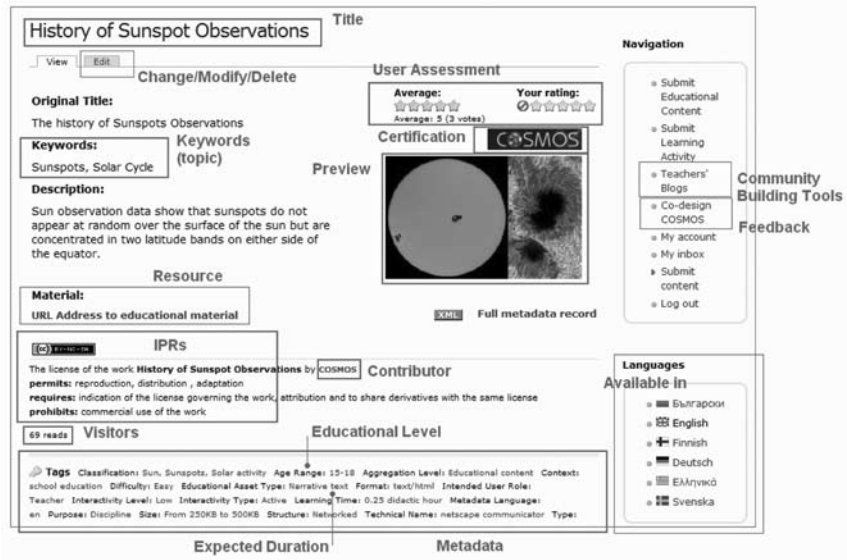

FIGURE 6
COSMOS quality mechanisms (Sotirious et al., 2009).

case, we have focused on the implementation and usage of existing quality standards which were described in the second section. The case study is limited in a way that the long-term effects regarding the given quality objectives have not yet been evaluated. The continuous quality development will therefore be continuously improved and validated.

4.5 Evaluation of the quality approach

We evaluated the approach in a study with the key user group, teachers ($n = 36$). Those users had a variety of technical skills and most of them were aware and interested in the quality of resources as well as of organizations (Figure 7).

Users have perceived the approach positively in our evaluation. They have acknowledged the mechanisms and actively participated in peer-reviews and rankings. In particular, the relation of quality and trust became evident. Users explained that quality is based on how they trust different entities. In our interviews we identified the following aspects regarding trust (Sotiriou, 2009, Clements & Pawlowski, 2009):

- 79% of the interviewed trusted materials that came from an organization that has a good reputation. This proves the COSMOS Quality strategy part of giving the 'COSMOS' Quality certificate to the best resources.
- 71% trusted resources which had been evaluated by colleagues or scientists on the field. This proves COSMOS quality strategy on creating a group of Quality Representatives (Scientists on the Field) who evaluated the resources coming into the repository.

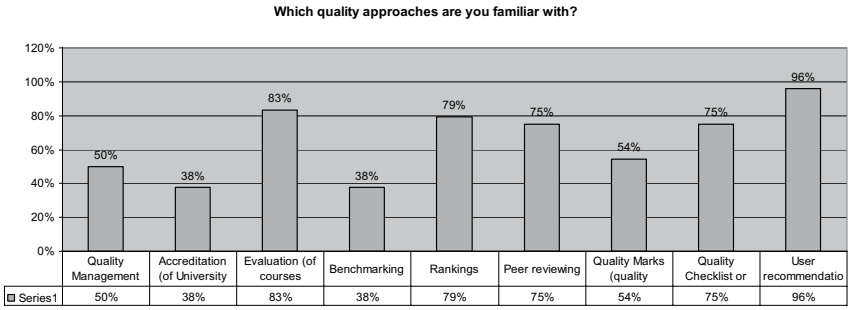

FIGURE 7
Quality Awareness and Familiarity (Sotiriou et al., 2009).

- 38% of the interviewed people trusted materials that had received good rankings. Cosmos Quality strategy served this set of users by allowing them to rank resources by giving them stars.
- 50% of the interviewed looked at the download ratings and how often the resource had been used by others when it comes to quality.
- 67% trusted resources, which came from an organization with a quality certificate.
- 50% trusted resources which were interoperable with their own Learning Management Systems.
- 46% trusted the full metadata records attached to a resource.

Overall this study proves that different users have different kinds of quality strategies and instruments as well as different perceptions and needs when judging the quality of the educational content. About 40% will be happy to trust simple user-based mechanisms such as rankings. However, another user-based method peer-reviewing is much more highly appreciated function. We also found out that about half of the people wanted to judge the quality of the resources themselves to be sure of their quality.

The study has shown that our approach of relating quality and trust in connection with guidance and simple mechanisms has been feasible and successful. However, some well-known quality mechanisms (like organizational certification) still should be considered. However, the idea of recognition of external quality certificates can substitute own certifications or assessments.

5 CONCLUSION

In this paper, we have discussed quality for Open Education Repositories. Based on an initial classification, we discussed which approaches and instruments can help stakeholders to identify appropriate quality approaches for knowledge-intensive organizations. Secondly, the Quality Adaptation Model was introduced, in particular for the adaptation of approaches for repositories. It supports stakeholders in the selection and implementation process regarding quality standards. The model was illustrated using a case study approach. It was shown that the model helps stakeholders to organize the implementation process and to choose adequate standards for their context. The mixed approach of the recognition of widely accepted standards as well as simple mechanisms (such as rankings, reviews, recommendations) was proven to be successful for the presented setting.

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