Matching Needs – Application Service Providing for Asynchronous Learning Networks

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Abstract

Universities have severe difficulties in using e-learning applications successfully due to organizational problems to provide them. Providing a web-based learning environment is an enormous effort not only from the didactical and organizational perspective, but also from an administrative and technical point of view. In this paper we critically review the steps taken for making a web-based learning platform available to a broad public by developing a model for application service providing.

ASP in the university context is a different business than ASP between companies. A much more flexible relation between service provider and consumer needs to be established. We outline the necessary roles involved and tasks observed. As a result the paper proposes a process that focuses on organizational, technical and financial conditions, which must be investigated when undertaking a similar enterprise.

1. Introduction

In literature dealing with Information and Communication Technology (ICT) in education at university level, a discrepancy exists between expectations and the results achieved. We use ICT to support Asynchronous Learning Networks (ALN) facilitating project based learning [2], [3], [11], [16], [13]. In our experience, this discrepancy is based on two problems: first, its inadequate didactical inclusion and second, the technical and organizational efforts involved. In this paper we shall turn to the latter problem and suggest Application Service Providing (ASP) as one possible solution.

ASP should be understood as a form of IT-outsourcing where single IT functions are relocated to an outside company [1], [22], [19], [8], [9]. In this particular case, we refer to the operational aspects of learning software. There are a number of problems regarding the provision of an e-learning tool that can be solved by using an ASP model, e.g., 24x7 first level support, no expenditure in installation, and frequent (security) updates. The aim is to concentrate on its didactical application and, at the same time, release the university staff of the system's operational problems. But ASP at university level is different from ASP in economy. There are differences in the underlying business models and especially regarding the application service involved. Furthermore, in our experience ASP for universities cannot be established by a single negotiation represented through a contract with different service level agreements. ASP instead is a process taking place between the consumer and the provider to match their needs to constantly adapt for changing needs.

We will first, as a case study, take a look at CommSy [16], [13], [11], [10], a web-based application for communication and coordination support in learning and working groups. After a short introduction and the history of its development we will illustrate in detail which steps we took for its provision. Thus we will work out roles that are involved in the provision of CommSy. Second, we will suggest ASP as a solution to overcome the problems and requirements we detected by providing an e-learning tool at a German university. Universities constitute a unique context for ASP. We will propose a different business and organization model and take a look at related services, which are an important aspect in this field. Third, we are going to evolve a new perspective on ASP. Application service providing is perceived as an evolutionary process in which the involved people try to match their constantly changing needs. Fourth, an evolutionary approach will be presented that requires certain flexibility and regular reviews on the relation between provider and consumer. Finally, the conclusion will offer an outlook at what lies ahead and describes our next steps in developing CommSy and processing an ASP model to provide ALN in university contexts.

2. Providing CommSy for Asynchronous Learning Networks

CommSy stands for Community System and is a web-based application for communication and coordination support in learning and working groups. Since May 1999, we are in a constant process of developing CommSy in an interdisciplinary working group consist-

Proceedings of the 36th Hawaii International Conference on System Sciences (HICSS'03)
0-7695-1874-5/03 $17.00 © 2002 IEEE

ing of approximately 15 students and (scientific) staff members at Hamburg University, Department of Informatics [13], [7].

In this section we will outline the context in which CommSy will be employed, namely the Web-based project work in university education, the functionalities available, and a description of the basic technologies needed for CommSy. We will then describe four stages that are going to lead to our application service providing strategy. The description of our case is based on the use of diaries as a supplement to conventional methods of reflection on what actually happens and what could happen during the course of a project. We used diaries as a medium for the management of our development project in addition to our formal software documentation and user documentation (cf. [15], [16]).

2.1 CommSy

CommSy (*Comm*unity *Sy*stem) is a web-based system to support asynchronous learning networks [13], [12]. CommSy is intended to be used in closed working groups of 10 to 30 persons (students and teachers) for the period of one semester, but has also been used by self-organized communities of more than 200 students [18]. In informatics courses at the University of Hamburg we especially use CommSy to support project-based learning, i.e. in practical, problem-centered and activity-oriented educational settings.

In such a setting where students work in small teams on a preferably self-chosen task instead of attending regular classroom sessions, CommSy serves as a meeting place where students and teachers can discuss their work, show the progress of their work and exchange useful material. The design of CommSy presents several options relating to communication and management of information sources for the participants of an educational project. Each project room is exclusively accessible to members of a certain group. All participants in the system can announce news and meetings. The members have a small `homepage´ with their name, a picture and contact information. They can also form subgroups to work together on a specific task. The participants can discuss topics in the discussion forums, which they can structure according to their respective needs. Working material can be collected in a simple reference manager and put in context by attaching them to any other item (e.g. an announced event). A group editor is available for cooperative writing of HTML documents. Annotations can be made for every item entered in CommSy. CommSy incorporates the following two design principles:

1. Easy individual usage of CommSy: CommSy offers an adequate range of functions motivated by our pedagogical aims. Users are not confronted with an excess of functions like they can be found in other groupware systems. The different functions all have a similar dialogue structure. Once it is understood, it makes using the program easy. CommSy does without fancy layout features and thus enables a comfortable usage even with slow Internet access.

2. Responsible usage in cooperation: CommSy project rooms are exclusively accessible to members of a certain group, who need to register before entering. There are no anonymous postings. There is no concept of roles implemented into the software except for an administrator who has to put up a project room and provide access to it for group members. All settings are equally visible to all members. Each member of CommSy is allowed to do everything, and everybody can see everything. Especially, there is no distinction between students and teachers. Thus, communication takes place on a common ground basis.

Until winter semester of 2000/2001 CommSy was successfully applied and tested in educational projects mainly, but also in seminars and exercises at the Department of Informatics at Hamburg University. Additionally, we gained experiences in two courses at the Department of Educational Science at the same university and also at the International Women's University (ifu)[1] where CommSy has been applied in the project area 'information' for twelve project groups in a multicultural environment in summer 2000. Our efforts have received positive feedback from the students so far. The faculty members consider them as successful, too. Feedback gathered in plenary sessions and semi-structured interviews indicate that the software support strongly contributed to the success of the learning processes.

CommSy operates solely with commonly and freely available Internet technologies. On the user's side, a Web browser and familiarity with the Internet are the only prerequisites. On the server's side, an Apache Web server, combined with the PHP script interpreter plus a MySQL database are needed.

For a lasting distribution of CommSy, though, two tasks need to be followed up: first, software maintenance and development, and second, its provision for future users in university teaching.

For maintenance and development, we have evaluated different open-source license models regarding their suitability for the CommSy source code so far. While publication under open-source would certainly be of advantage for the continual development of the software, this is not likely to be an adequate model for safeguarding its broad availability in our opinion. Theoretically, anybody would be able to set-up a server running CommSy with their own hardware, but our previous experience shows that the mere provision of the basic technology as well as the installation, configuration and administration of a server demand a time input which

[1] As part of the project 'virtual ifu'.

cannot be rendered at universities, except in pilot projects.

In the following sections, we shall describe the necessary steps to make CommSy available and also the obstacles entailed.

2.2 Step 1: One-Project-Room Perspective

Step one (the provision of a project room) covers all the necessary efforts to form a single virtual project room. When interested parties required such a room, we attended to this by establishing each single one. In retrospective we call this the One-Project-Room Perspective. This way, several completely independent and simultaneously running project rooms were established. With this perspective, the technical maintenance multiplied with every new project room. In this section we shall review the necessary tasks in detail: which activities are necessary in the preparation phase, and which ones during the time of operation? We then try to offer an organizational view of the tasks by assigning *roles* to each of them [6]. These roles will show that typically a number of different participants are involved.

We adopted the term *role* from software engineering. They describe the context between tasks and persons and related tasks in projects. Responsibilities for a role may alternate between members during the project time. The roles can be used for emphasizing different perspectives. Roles are taken over by people: One person can perform several roles and several people can perform the same role. The assignment of roles to people can be fixed or vary. It is important, though, that the roles are clarified in the establishing phase.

When looking at the system components mentioned above, it can be seen that, in spite of it being a simple structure consisting of only four components, this infrastructure has nevertheless to be configured and adjusted to the users' needs.

Therefore, for the set-up phase we need to involve people with experience in Web server configuration, database administration and script language configuration. It is equally helpful if some of the respective infrastructure already exists or has already been applied with a certain amount of previous experience. Given such an environment it is realistic that the set-up can be done in one or two workdays. Still, our experience tells us that a start-up time of about a week or two has to be allowed for because only then the effects of a series of decisions taken in the set-up phase can be properly assessed.

Each computer used for running a project room had to be prepared by the *hardware and/or network administrator* to allow network access and ensure provision of the necessary components. Typically installations were done on different machines or on the same machine but with separate configurations. This means that the set-up of the web-server, the script language interpreter, the database and their configuration had to be done for each project room. For future reference, we call this work software installation, which was performed by a person taking on the role of a *software administrator*. An additional configuration had to be done on the project room (project room configuration). This was also the responsibility of the system administrator due to the necessity of editing the configuration file. Setting up the CommSy project room is called software configuration, which was performed by a *CommSy administrator*.

The settings for the project room configuration had to be communicated between the CommSy administrator and the host of the room. Work mainly done by the role of a *teacher* is that of facilitating in addition to inviting people and providing initial material. In this context people invited can best be described by the role *student*.

In summarizing we distinguish five different roles (hardware/network administrator, software administrator, CommSy administrator, teacher, and student). Most of the administrative work and some of the moderation work was done as a favor for the people asking. Some work was not done at all, like continually saving backups, cleaning up file space, or security checks.

The dilemma was that each new room required a complete set-up involving most of the administrative roles. Unfortunately, people able to do the work were hard to find. In addition, it was an inefficient procedure, which involved lots of tiresome tasks. The overall system architecture was not scaleable, in that it consumed huge amounts of resources. In total, the system is hard to administrate (e.g. installing updates) when dealing with many instances of the community system.

2.3 Step 2: Institutional Perspective

The dilemma of the One-Project-Room Perspective led to the second perspective where a single technical system can handle several project rooms. This we will call Institutional Perspective. The necessary technical alterations were made primarily in an effort to utilize CommSy for the International Women's University. The implementation of the whole community system and the alterations made in each step were performed by teachers or students. Their role in this process is called *software developer*.

The effort comprised using a single database for all project rooms, using the same source (file tree of scripts) for all project rooms, which implied adding a parameter to the URL, moving from the concept of storing the configuration in files to that of using the database, and providing a web-based interface for editing the configuration.

This addressed the problem of installing multiple, possibly different, copies of the community systems. After that, a new project room was only a matter of entering a new initial configuration into the database.

This allowed the teachers to maintain a project room on their own, except for administrating the users, which was still left to the software administrator.

As more work is accumulated in configuring the system, the role of software administrator gets more influential and creates a heavier workload. Also, the hardware of the server needs to offer higher performance because hosting a larger number of rooms creates demands in memory, processor speed, file space, and network bandwidth. Another aspect is the fact that questions concerning the server need to be asked on an organization-wide range, because one server is shared with a number of organizational units or even organizations. Resources needed for each project room add up and accumulate to significant demands on time and money needed.

While creating this perspective to solve the dilemmas of the first perspective, new dilemmas arise: How to inform people about an update on a large scale and coordinate the timing? Work can no longer be done on a favor basis. How to decide when to say "yes" and when "no"? Work accumulates and becomes significantly time-consuming and more visible. At which point is this work not feasible any longer? Having the URL of a specific server confused users of other organizations. How can the URL be neutralized? How to address the increased needs in hardware resources?

In this perspective role assignments changed and activities slightly moved within the roles placing emphasis on different tasks. The hardware and software administrator role no longer subsumes a large number of people but focuses on tasks of load balancing and resource allocation. As set-up becomes easier, more rooms are created implying that the software administrator has to create accounts more frequently. The CommSy administrator's tasks in contrast shift to more logistics work as updates need more planning.

2.4 Step 3: Provider Perspective

The third perspective developed when the second perspective's provision reached its limits. The technical expenditure, time spent on talking to teachers and users became insurmountable in a university context. An external organization was looked for to take over these tasks. The third perspective therefore is called Provider Perspective. As a consequence the system had to be developed further to make it administrable through a consistent interface after installing it on a powerful server.

We decided to look for a partner in the private sector who proved to be competent in the Internet business and who, at the same time, is to some degree university-related. We chose a German startup company established in 1997 that later on merged with a larger European enterprise during work on our project.

A public CommSy server [21] is the logical outcome in this sort of cooperation so that this service can be offered to many individuals. Necessary technical extensions are, among others, instant creation of new project rooms, the storage of several project rooms in one database, a safety concept, and the autonomous administration of a project room via a web interface.

To further develop the system we as software developers first of all chose the necessary single steps for advancement. These were then implemented in university projects. This again led to the installation on the target system, carried out jointly by us and the software administrator of the application service provider who then took over the role of the CommSy administrator. In addition, the application service provider developed an advertising concept as well as a redesign of their homepage in order to integrate the CommSy project rooms into their portfolio. We issued two sets of HTML pages where information about CommSy project rooms can be viewed. One set contains, besides to information on how interested parties can obtain a project room on the application service provider server, annotations about the philosophy, design and functionalities of CommSy. These pages were prominently positioned on the provider's homepage. The second set of HTML pages explains networked project work as the didactic concept on which CommSy is based plus recommendations for the introduction and moderation of a project room.

To set up a project room by merely "pressing a button", interested parties need to fill in a small questionnaire. The use mediator of the provider is automatically informed about the request and will check the request. In most cases the room will be activated and the applicant receives an e-mail acknowledgement including access information. From now on the room and its description are publicly listed. All further steps are left to the teacher.

After some time the teacher will be invited by the use mediator to participate in a special project room (Presenters CommSy) to stimulate the exchange of experience. The Presenters CommSy is a central part of customer counseling. It gives room to exchange of experience among teachers as well as with software developers, application consultants and use mediators. Utilization advice and problems already located are discussed and published. In particular the software developers wanted to qualify the use mediator and the application consultant for an independent operation and counseling.

The everyday system administration was handled by the hardware and/or network administrator, software administrator and CommSy administrator of the application service provider. Interventions necessary from time to time (like updates for example) are still being carried out by us - the software developers themselves. The roles of the use mediator and application consultant had

completely been handed over by the developers to the company from the very beginning. A step-by-step withdrawal of the software developers was envisaged.

Apart from the success of running a software which has been developed in a professional manner in a university context, another – negative – experience should be mentioned, too. The implementation of the intended support concept has, under the given circumstances, been unsatisfactory. From the provider's side there was neither disposable manpower nor did the provider see the necessity for it. Beyond that, running the software could not be financed on the basis of banner ads alone and a well-planned sponsoring concept could not be established. In the end the provider did not take up the roles use mediator, application consultant and CommSy administrator anymore, so that we as the software developers had to take on these roles again, to ensure that CommSy would not end up as a dead duck. Finally, we canceled the contract with the application service provider.

To sum up this experience we are going to arrange the tasks of provision we detected while the cooperation with the application service provider to the mentioned roles:

- *Hardware and/or network administrator*: The hardware and/or network administrator must assure that the server runs without problems and is accessible via the Internet.
- *Software administrator*: The software administrator must maintain the server software: operating system, web-server and database-server. If necessary s/he must install updates.
- *CommSy administrator*: The CommSy administrator must install the CommSy project room server, set up the database table structure and fill it with initial standard content. It is their obligation to configure the CommSy server. In use s/he must install updates of the CommSy server. Another task is the supervision and maintenance of data storage on the CommSy server with regard to disk capacity, data back-up, and virus checks.
- *Use mediator*: The use mediator provides the first level support for all end-users with didactical problems. Especially for the teacher the use mediator must first of all establish a CommSy project room and inform participants about the registration process. S/he must activate the project rooms and then inform participants about ways of application of the CommSy and its integration in the respective didactical context. Therefore s/he must help with the preparation of the CommSy project room, give examples for initial content, post strategies for a continuous project room moderation and give suggestions for result editing in CommSy. For all end-users s/he should organize an exchange of experience and evaluate the system's use with qualitative methods for further development of the project rooms.
- *Application consultant*: The application consultant is the first level support for technical and use problems. S/he should offer use training and a hotline. The application consultant should also evaluate the use of the CommSy project rooms with quantitative methods for further development of the project rooms.

2.5 Step 4: Current State – Consolidation

The insufficient alignment of goals for providing CommSy – the missing financial success versus the need of continual support – led to the failure of the cooperation with the external provider as reported above. Currently, we consolidate our experiences in order to strategically plan our next steps to offer CommSy as an e-service to a broad public.

So far, we have investigated three steps towards the lasting provision of CommSy as a platform for asynchronous learning networks. Undertaking these steps, we have identified the following success factors for the provision of a learning platform for universities:

- The respective system must be configurable to match the organizational needs of a university;
- Universities have to adapt their organization to the character of the support learning platform; and
- People using the system need to be trained: students as well as teachers.

Technologically, the current CommSy-server can administer any desired number of project rooms with a practically unlimited number of users. Room information as well as information collected in the rooms is kept in a database. From there, websites are dynamically generated upon page request, i.e. each page builds up from the database contents at the very moment of request. Scripts ensure that users can only view the information that belongs to their respective project rooms.

CommSy project rooms have been actively used on the publicly accessible server in Germany (and some other European countries) in about 250 cases and with about 3,000 users since April 2000. At the moment, we concentrate our development and evaluation efforts on our own CommSy server within the Department of Informatics at the University of Hamburg. There are currently 28 actively used CommSy project rooms with approximately 1,100 accounts in existence.

Organizationally, the requirements for the broad usage and provision of a system like CommSy in university education vary considerably in contrast to the requirements met by typical companies presumed in the ASP business. The actors involved have to acquire a number of qualifications to provide and use the system. It requires a new form of didactics as well as the ability

to handle the introduced technologies. In particular, the expected constant availability of the system (24x7) in connection with a short response time in case of problems puts a tremendous pressure on the actors. Therefore the provision of the system requires a considerable amount of resources and money that have to be covered. In total, we have identified the following roles that have to deal with the reported requirements:

- *Hardware and/or network administrator;*
- *Software administrator;*
- *Software developer;*
- *CommSy administrator;*
- *Application consultant;*
- *Use mediator;*
- *Teacher;*
- *Students.*

The experience gained from the steps taken so far leads us to the question of what might be the right model for ASP. Universities seeking for electronic services providing web-based support for learning cannot be implemented immediately and without extra efforts, but have to be thoroughly developed over time.

3. Application Service Providing

In our experience, end-users or – as they are called in ASP literature – consumers want technical and didactical support, short response time and a constant availability any place and any time (24x7) due to their use habits. At a university, most of these things cannot be guaranteed. Even the computer center at this particular university cannot meet these requirements. Application service providing seems to be a solution.

"ASP allows companies to access application software on remote servers using the Internet. Through ASP, application software is 'rented', i.e. customers make regular subscription payments to ASP rather than buying software and installing it on their own computers. ASP's customers are relieved of the burden of maintaining software – a large benefit for companies with limited or overtaxed Information Technology (IT) personnel" [2].

The advantages of ASP can be summed up as follows:

- World-wide access;
- 24x7 accessibility;
- Fast and scalable employment;
- Low calculable costs (Total Cost of Ownership);
- End-users keep their focus on their core business;
- Easy integration into any operating system;
- Access to high-quality applications;
- Fully functional scope of customary applications;
- Maximization of own IT resources;
- Latest technology;
- A central data management.

It therefore makes sense to think about ASP for an application for asynchronous learning networks, e.g. CommSy, at universities and to watch out for a suitable model, but ASP for universities highly differs from ASP in economy. In the following section, we discuss the differences in the organization of ASP and related services at (German) universities.

3.1 How to Organize ASP at Universities?

Gillian et al. present an ASP player model that named several firms that can be partners of or real application service provider [8]. The roles identified match the tasks fulfilled by the respective companies. To characterize an ASP organization model we prefer these roles, because tasks are not firmly assigned. We can handle the organization model in a flexible manner when we develop a business model for ASP at universities.

In our organizational model we divide the roles in three major roles similar to Balasubramanian et al. [1]: *customer*, *application service provider*, and *independent software vendor*.

In our case the customers are German universities. Within the customer's organization we found two roles during the evolution in providing CommSy: the *teacher* of a course (in the majority of cases university professors or lectures) and the *students*. These roles are the end-users.

The provider represents the following roles: *hardware and/or network administrator, software administrator, CommSy administrator, use counselor, application consultant.*

While providing CommSy we detected one role within the independent software vendor: the *software developer*.

So, in our case we are the independent software vendor and German universities are the consumers. The questions who the application service provider will be remains? And how will an ASP business model for universities look like?

To generate an ASP business model for universities it is certainly important to look at the application service provider: what firm can take on which role, and how can these firms work together [19]. But it is more important to look at the university as a consumer because a university – at least in Germany – is different from any company.

Universities want to integrate e-learning tools in their higher education but as independent software vendor and teachers (functioning as service providers) we observed that universities do not have the resources ([13], p. 3-4) to provide them. ASP is a solution for many problems regarding the provision and use of an e-learning tool in a university context. However, a selection of ASP [13] does not take place at German universities.

First of all, members of universities are not in funds. There are disproportional organizational barriers to overcome for educational staff to get funding for only, e.g. a single CommSy project room. In addition to that, German universities do not raise tuition fees so that students cannot pay for it either. This leaves the central management of the university, who can pay for the provision of an e-learning tool, but the management is generally not in funds, too. There are some exceptions: i.e. the University of Stuttgart [20] places money at the disposal of educational stuff to use e-learning tools. Another way to finance the provision of e-learning tools is to gain sponsors, who pay for the provision and are named publicly. Unfortunately, currently it is difficult to find someone who is willing to finance web-tools in total through advertisements.

Another important aspect in the ASP relation is credibility ([9], p. 204ff). A consumer must build up trust in the application service provider because the consumer is required to store critical information on a rented server. A university is a conglomerate of nearly autonomous organizational units. An application service provider must win the trust of almost all organizational units that will use the application. Therefore, it is essential that the application service provider as the "single point of contact" ([9], p. 71) for the consumer knows how a university works. That is especially important for the roles of use counselor and application consultant ([4], p. 157f). They account for the single point of contact. So it is advantageous for an applications service provider in a university context to be a university spin-off, stemming from the same context ([9], p. 225).

Realizing an application service providing model successfully in a university context takes more than only providing software. The application service provider must also offer related services. This is done not only to expand the portfolio, but also to meet the demands of the consumer ([9], p. 67). Especially didactic consulting ([7], p. 6) is essential when dealing with universities.

3.2 Related Services

Application service providing comprises a number of services on different levels. As the technical and financial level are obvious there are also services related to end-users, which have to be combined with the technical services.

Common ASP literature agrees that required services include training, administration services, and customer support [19], [2], [9], [22]. Each can be negotiated regarding the quality-of-service level, the costs, the availability, and so on. Most of these characteristics correlate with each other.

Even though the product is standardized, the relation between consumer and provider must include a service of constant customization: "it is unlikely that ASPs will avoid the issue of customization, as customers will demand integration […]" ([19], p. 8). The service provider must choose its product in a way that allows for customization and offer adapted services for realizing the customization process.

In addition to a core set of application and services "[…] potential ASP customers are demanding additional services such as management, operations and integration of applications" ([19], p. 6) as a result of their effort in customizing the offer to their needs.

In outlining a specific framework of services that suit the university context, we can be more precise in what ASP must be for asynchronous learning networks. These services include but are not limited to end-user support, facilitating an entire server or a single project room, and training teachers as well as students.

End-user support aims at all people using the system. These can be students having problems accessing their respective project-room or teachers in trouble uploading necessary work material. Support can be provided by online discussion forums, lists of frequently-asked-questions, email and enhanced by a (toll-free) hotline or even an on-campus help desk. The skills needed for providing support range from simple operating system knowledge, and browser usage to CommSy philosophy.

By facilitating a certain project-room designated for teachers a process, which can be characterized by "train-the-trainer", is supported. This service is necessary to introduce new teachers to the typical tasks a host performs when initiating a new project room. It also includes actions on stimulating the usage of project rooms as it depends on giving an example in use by the specific host. Moreover, the facilitation process enables an exchange of experiences, which is a tremendous service to the community of hosts. The skills necessary for moderating place their focus mainly on the use of CommSy and its established use-patterns. In addition, they require standard knowledge about Internet applications and formats (such as PDF, JPG) to provide consultation on document exchange.

Training comprises the use of CommSy in actual project contexts: getting to know all features of CommSy and learning about typical ways of using them. Training of end-users may be performed by teachers or may explicitly be done by skilled trainers. In either way, training material needs to be provided and constantly reviewed. Also, the material and its application needs to be customized to local needs. The skills necessary for use mediators include facilitating techniques, as well as CommSy usage and the background information about the didactical use context.

In total, the related services outlined above supplement the pure technological and formal part with the necessities of the use-context.

4. Evolutionary Approach

Application service providing is on one hand providing a unified set of services for other organizations and thus from the economic point of view reducing costs. On the other hand the offered services need to be adjusted to the actual needs of the customer. As we have described above, the specific set of services addresses the universities' context best.

However, most provider-consumer relations rely on standardized and fixed contracts that do not allow for the type of flexible and rich relation described. We argue that a more flexible approach in ASP should focus on the relation as a process rather than on a fixed contract, thus looking not only at the transaction costs of single actions but on competences, needs, and negotiation.

We therefore favor an evolutionary approach that starts with an ASP relation as outlined in section three. As conditions change over time, repeated reviews on the relation between provider and consumer need to be organized. A contract should offer regular intervals for incorporating changes into the contract. Moreover, it must be flexible and open to changes.

A promising approach are so-called "mixed contracts" which accommodate for changes: "Mixed contracts begin with detailed requirements and after three to five years, these requirements become 'loose'; the idea behind this is to allow for the contract to be longer term, but also adapt to the changing needs of the client and exploit new efficiencies and technological capabilities" ([22], p.4). Nevertheless, the context of universities demands a higher frequency of changes as well as a higher flexibility regarding the customization, as universities consists of autonomous units.

The necessary process should allow constant communication between university and service provider. The process must therefore comprise feedback from the field of usage (teachers and students), university administration and the provider's roles. Relevant actors in the negotiation process are the application service provider, the university, and the independent software vendor. By including the software vendor changes to the software beyond configuration may be demanded.

Subject of negotiation appear on all levels of ASP. On the provider's side this includes quality-of-service in customer support (first level support), reach ability and availability, coverage of training, size and capacity of the application and hardware.

The ASP contract still has a binding character even though its parameters are not as fixed as they are in conventional contract schemes. This is achieved by periods of fixed parameters and the process included, which gives regular intervals for revising the conditions. With this basis available, the encountered needs and characteristics of the university context for asynchronous learning networks could be properly addressed while at the same time establishing a stable relation between contract partners.

5. Conclusion and Future work

Universities have severe problems in providing e-learning applications successfully due to organizational problems. Application Service Providing is a promising answer to this problem. Nevertheless, ASP in the university context is a different business than application service providing between companies. A much more flexible relation between service provider and consumer needs to be established.

We described our steps towards application service providing for asynchronous learning networks. Coming from both software development and teaching, we tried to provide CommSy via an external application service provider. This failed because the well known and often discussed ASP models do not exactly fit in the university context. We identified major differences in organization and business model and especially in related services. The solution therefore is presented on the process level, allowing for freedom and institutionalizing recurring adjustments. ASP must be treated as an evolutionary process in which the roles involved periodically match their needs to develop an ASP model that satisfies all role's needs.

In the future we will conduct further research on the process model and the development process of the e-learning application. Both processes have to be aligned with the university context. We will therefore try to establish an open-source-like development process as well as an exemplary outsourcing relationship. Both, the development process and the ASP relationship, should then evolve over time.

To investigate the latter in more detail, we are currently working on a concept for hosting e-learning applications in different settings. The outcome of this effort should be a multi-dimensional array of parameters that then can be compared to the organizational setting observed at partner universities. The concept should offer a set of possibilities for ASP and CommSy that we will evaluate by pointing out conditions, advantages and disadvantages. In doing so we are looking for a new application service provider to begin and implement an ASP process to provide CommSy for the University of Hamburg permanently.

Acknowledgements

Christiane Floyd, Horst Oberquelle, and Arno Rolf were extremely generous with their time and support. Anne Stephan and Bettina von Stockfleth helped us tremendously to produce a readable text in English. Special thanks go to our students and colleagues who helped us to develop CommSy. Funds for conducting some of the research reported here came from the "Zu-

kunftsinvestitionsprogramm" of the German Federal Government.

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