A Framework for Virtual Seminar in Cameroon

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Abstract

"Brain drain" is a big problem in most countries in Africa. Many young people leave their home countries to begin or to continue a study in western countries. This results in a loss of important human resource capital for the development of their countries in Africa. This is particularly observable in academic institutions.

The increasing use of information and communication technologies and the constantly advancing process of globalization provide new opportunities for efficient interaction between Africans who live in the Diaspora and those living in Africa.

The hypothesis of this thesis is that through an optimized integration of technology, didactics and expertise gained from the African Diaspora, an efficient knowhow transfer solution from the Diaspora to African home countries can be created. This approach is introduced in the thesis as "Diaspora-based computer supported collaborative learning". The knowledge transfer process takes place within the scope of the didactical unit of a seminar involving a remote expert, students and a local supervisor/facilitator located at the student's university campus in Cameroon. While the remote expert takes the pedagogical and intellectual role and is in charge of the knowledge transfer among and to the students, the local supervisor helps to manage organizational tasks on campus. This approach is qualified as blended learning. It combines the effectiveness and flexibility of virtual learning with the simplicity of some organizational processes in face-to-face situations. From all didactic approaches used in academic teaching (lecture, labs exercise, seminar etc), the seminar with its different stages (announcement of a topic, search and use of literature, topic preparation, presentation and discussion, evaluation) and processes provides an appropriate model for efficient supervision of campus based students by a remote expert.

Quite a number of IT-systems employ the advantages of information and communication technology (ICT) for education and advanced vocational training. The transfer of technological development to a different societal context appears to be complex since technological developments are always embedded in a general societal context. The challenge lies in the design of an IT-system which considers the peculiarities of the societal context, e.g. Cameroon as an example of a sub Saharan African country. Field studies in technical faculties in Cameroon constitute the baseline for the problem analysis. Based on the results of these field studies, requirements for a solution have been formulated. The framework for the realization of virtual seminars developed in the thesis addresses the deficits of existing approaches and fulfills the requirements formulated in the field studies. The framework respectively conceptual solution consists of three parts:

1. A didactical model, which describes the aims and goals, the didactical accentuations and methods for the introduction and the realization of the blended virtual seminar model.

2. A process model, in which the range of possible organizational forms, the involved actors and their roles, processes and instructional sequences of the blended virtual learning seminar are described and specified.

3. A system architecture, which models and specifies the functional and technical environment for the realization of the blended virtual seminar. The proposed system architecture uses an extension of IMS LD and is independent of a specific eLearning platform.

A prototypical implementation of the conceptual solution consisting of guidelines and prepared resources (templates) for the realization of the blended seminar, the learning design of the
blended seminar and a prototypical technical environment for the execution of the learning design is provided. The framework is evaluated using methods such as interviews, questionnaire, cognitive walkthrough and analysis of components of the technical environment.
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1. Introduction

1.1. Background and Motivation

"Development" by the United Nations Development Program is described as a process which is more than improving the quality of life. Development includes improved standards in health and nutrition, the reduction of poverty, freedom, higher chances of equal treatment for all, and the enrichment of culture. For the realization of these aspects of development, education is an important prerequisite. With regard to education, the concept of "Open Distance Learning" (ODL) could play a key role in the training and education of people in developing countries and democratization of their societies. The "Brain Drain" is a big problem in most countries in Africa. Many young people leave their home countries to begin or to continue a study in western countries. This results in a loss of important human resource capital for the development of their countries in Africa. This is particularly observable in academic institutions. The increasing use of information and communication technologies and the constantly advancing process of globalization provide new opportunities for efficient interaction between Africans who live in the Diaspora and those living in Africa. Paradigms, such as the "African Diaspora Computer Supported Collaborative Working and Learning" proposed in this thesis, offer new approaches for the reduction of negative consequences of the brain drain syndrome. Through these approaches knowledge networks in virtual communities can be built and innovative cooperation possibilities between Africa and members living in the Diaspora can take place. Knowledge or expertise can be transferred to remote, isolated and disadvantaged areas. This is a possibility to convert the "brain drain syndrome" into a "back gain" effect. The knowledge, notably expertise, from African Diaspora\(^1\) can be returned to Africa.

The hypothesis of this work is that through an optimized integration of technology, didactics and expertise gained from the African Diaspora, a flexible and cheaper mentoring and knowledge-transfer process can be created. This process must match the local conditions predominating in Higher Education in Africa. It can solve part of the human resource problems experienced especially in scientific management in Higher Education in Africa.

Given the particularly weak technical and socio-economical context in most of the African countries (see [2.1]), the development of a socio-technical concept adapted to the local conditions needs to consider many important aspects, e.g., affordability, sustainability, flexibility, etc. The advantages of Open Source and Open Content models, which are - amongst others -

\(^1\)Accepted contemporary definitions of the African Diaspora include all Africans living outside the continent. These definitions invariably embrace two categories of the African Diaspora. First, the Diaspora Enslavement comprises the African descendants who were historically taken away from Africa by force. The above refers to the historic Diaspora whose establishment started in the 17th. century with the forceful capture and transfer of able-bodied Africans to the Americas, Europe and the Middle East. The second category is that of the Diaspora of Colonialism: This refers to those post-colonial Africans who went to parts of the world to escape the legacies of colonialism. It is also referred to as the "Second Diaspora". Initially, African emigration abroad was for further education, and while that remained a major imperative, it gradually broadened to include economic and security migration in search of a better and safer life (see \[Karinku, 2010\] )
1. Introduction

E.g., free access to knowledge, free usage and distribution of knowledge, offer the ideal basic conditions for constructing a cost-effective educational system fitting the local realities. The support for easy and simple portability of such a system to other similar countries, particularly in central Africa, is another argument for the use of Open Source and Open Content models.

1.2. Explanation of terms and boundaries

Amongst the different didactical approaches of virtual teaching in Cameroon, the group project respectively the virtual seminar with its implied different phases and processes appears as the best choice for using Diaspora expertise during supervision of students by a remote supervisor.

Within this context a seminar can be understood as a didactic approach in which students are introduced into scientific research through a supervisor and peer discussion. The concept of the seminar suggests the use of a blended\(^2\) approach. In doing so, the effectiveness and flexibility of eLearning, the benefits of face-to-face collaboration concerning the social aspect, and the simplicity of some organizational processes in eLearning environments can be combined. This approach can be qualified as "blended learning seminar". Most of the research projects in eLearning refer to the technical requirements of advanced European, North American, and East Asian countries and other similar countries. The approaches are based on the assumption that there is a geographic distribution of students in order to conduct the virtual sessions. In contrast to this, this thesis assumes that students are physically present at one place, i.e. in the university, while the support structures (supervision) are partially distributed. The reason for this assumption is that central African teaching suffers from deficits in supervision and coaching, which may be improved by tapping African experts living in the Diaspora.

Scientific works on the basis of socio-technical systems generally have an interdisciplinary dimension. The development of computer systems, in order to support the learning process, requires the research areas of computer science, psychology and pedagogy. Educational psychology as a sub-part of psychology deals with mental processes, which occur within an educational situation (the student, teachers, the pedagogical-stimulating environment and the media). Some results of this science are used in this thesis. In essence, however, the focus lies on two areas of computer science. Firstly, an emphasis is placed on the development of a technical concept to improve the process of learning in the case of virtual seminars. This contribution belongs to the field of cooperative systems. Secondly, another focus of the work is the development of a didactical concept for the realization of virtual seminars. This contribution belongs to the field of CSCL (computer supported collaborative learning).

1.3. Objectives

There are quite a number of IT-systems which employ the advantages of information and communication technology (ICT) for education and advanced vocational training. The transfer of technological development to a different societal context appears to be complex since technological developments are always embedded in a general societal context. The challenge lies in the design of an IT-system which considers the peculiarities of the societal context, e.g. Cameroon as an example of a central African country.

\(^2\)Blended learning is learning which combines online and face-to-face approaches with the help of information and communication media.
The aim of this work is the development of a framework for the realization of virtual seminars adapted to the local conditions in Cameroon. Cameroon serves as an example of a central African country is used to evaluate the improvement of the quality of virtual seminars. A case study in a technical faculty in Cameroon constitutes the baseline for the problem analysis and is used to identify the problems and the conditions for the realization of virtual seminars.

The proposed solution consists of the design of a socio technical system, respectively a framework for the realization of virtual seminar in which the range of possible organizational forms of virtual seminars, the involved processes and actors, and the resulting requirements on eLearning platforms is being described. The framework describes at an abstract level how the functional and technical requirements of the seminar environment can be met by making design decisions. The framework which consist of a social and a technical component must be independent from a specific eLearning platform. A learning environment fitting to the framework will be designed and a prototypic implementation of this environment will be provided. Guidelines for the realization of the model of developed seminar will be presented. The feasibility of the conceptual solution developed in the thesis will be verified.

1.4. Organisation of the thesis

In the introduction, the motivation for the work, an illustration of the present status of eLearning in Cameroon, the definition of important terms, and the objectives of the thesis are described. The problem and requirements analysis follows in chapter 2 with a presentation of seminars as a didactical approach, a description of the research method and the analysis of the current state of virtual seminars in Cameroon. Chapter 3 presents the state of the art for the realization of virtual seminars. Several didactical and organizational approaches and open source solutions for the support of virtual seminars are examined. The deficits of the existing approaches and problems identified in chapter 2 constitute the basis for the development of the conceptual solution, which is covered in chapter 4. The didactical model, the process model and the system design for the realisation of virtual seminars are described in this section. The implementation of a prototype of the conceptual solution based on open-source follows in chapter 5. The conceptual solution is evaluated in chapter 6. Requirements identified in chapter 2 are validated in this chapter. Chapter 7 closes the thesis. A summary of the thesis respectively the contribution of the work, a comparison of the state of the art with the solution developed in the thesis, open issues and further research perspectives are presented in this chapter.
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2. Problem and Requirements Analysis

2.1. eLearning in Cameroon

The tradition of distance learning in Africa is old, from the post colonialism time through institutions as the "Agence Universitaire de la Francophonie (AUF)" and the "commonwealth on learning". Nowadays, the recent development of information and communication technology (ICT) offers many opportunities to improve the process of distance learning, despite the lack of infrastructure in African countries. Many programs in the field of "eLearning" are being run in Central Africa. These aim at the digitalization and distribution of content, the augmentation of courses with online literature, discussion forum, and the communication with supervisors through electronic media. The majority of programs are offered by the technical faculty in partnership with companies (CISCO, MTN Foundation, and Local Operators) active in the areas of Information and Communication Technologies and the AUF. The CISCO foundation is one of the major actors and operates through the CISCO Academy Program. The AUF supports through its 'Centre Numerique Francophone (CNF)" in several countries, many eLearning programs in Africa amongst other the eLearning program in Bandjoun. Programs are developed generally by the university in cooperation with technical partners in order to handle the needs of the market. The program duration is generally one year, follows a hybrid approach and expects three or four annual presence meetings according to the infrastructure at the local site.

The first meeting aims to present the structure of the program, the supervisor and contact person and to become familiar with the eLearning environment. The second and third meeting aim to complete the intern-ship and work exercise, to write some exams and present the work. The last meeting aims to present and/or defend the last exam or work. The tasks related to the personal in charge of an eLearning program can be divided according to the following categories: production of content, digitalization and archiving of content, administration of the system, mentoring and supervision of the student and exams. Most of the eLearning systems are based on free and open source systems and architectures.

The didactical approach of virtual teaching in Cameroon includes the following activities:

- **Lecture:** The technical data of this activity is composed of a presentation of a topic based on text (office, etc.) or multimedia (audio, video, animation etc.) documents. Bibliography and web references complete the topic of the lecture. Exercises in the form of homework or self assessment are associated to different parts of the lecture or to the whole lecture to help the student gain a deeper comprehension of the topic.

- **Exercise:** The implementation of exercises depends on the eLearning environment. Usual forms of exercises are multiple choice texts, filling Blank, true - false, matching etc. Homework is edited using a text editor (office program) and the result may be any document, which can be viewed or edited by corresponding tools.

- **Lab exercise:** The labs are designed on the basis of videos or animations or even interactive experiences. The student must repeat the experience shown in the video or animation using the required equipment. Some experience can be made at home if the required equipment is accessible. In other case the experience takes place in a certified center of the program.
2. **Problem and Requirements Analysis**

Lab exercises are software projects with source code of a program as the final result.

**Group project, thesis:** These activities aim to introduce or deepen some theoretical concepts, to improve the teamwork on the one hand and on the other hand to test the capacity to handle a scientific topic. The student must be able to work independently with bibliography, to do the research on the topic, to summarize the results of the research in a report and to present the result of his work. The learning processes in this approach are similar to virtual seminars in Europe.

On an abstract level, the modules of the eLearning program in Cameroon are organized in courses unit. Typically, a course unit combines several didactical approaches described above. The seminar as didactical approach, which are in focus of the thesis will be described in the following sections.

### 2.1.1. Seminars in Europe, particularly Germany

Long ago, seminars were designated to educational institutions of all kinds. In the middle ages, ecclesial schools having the focus on teaching and educating the future priests were called seminar. Therefore, the word gradually got the notion of a preparatory institution for the clergy. Since the Council of Trent (1545-1563) which enacted the obligation of such institutions to all bishops, the concept "seminar" obtained an official designation.

The current meaning of this term as an educational concept was developed until the beginning of the 20th. century. The classic seminar takes place in the campus based universities. Typically, a course unit combines several didactical approaches described above. The seminar as didactical approach, which are in focus of the thesis will be described in the following sections.

- Choose a topic
- Search and work with literature on a topic
- Write a seminar paper
- Prepare and hold a presentation

The evolution in the field of ICT offers new teaching possibility for distance learning characterized by high flexibility in terms of time and geographic distribution. Educational content can be delivered virtually any time and anywhere. The virtual seminar as a special form of seminar can be understood as a didactical concept that affords the interaction between a learning community of distributed students and a supervisor using modern ICT to overcome the constraints of place and time. The didactical concepts in virtual seminars are emulating the models of classical seminars and have a high variability. Grounded on the historic development related to the university-context several didactical methods based on the classical seminar can be used in virtual seminars. [Schulmeister and Wessner, 2001, 266-267] presents several methods for the realization of seminar.

Another particularity of virtual seminars is the facility to improve self organized learning forms, constructivist learning environments and communities of practice (cf. [Wenger, 2010]; [Brown et al., 1989]).

[Mason, 1998] proposes a model for the classification of virtual seminars on an abstract level according to the tutorial support and the transmission of content. Mason distinguishes three models constituting a broad spectrum referring to the emphasis on content transmission and learning support in a virtual seminar. While the content and support model tries to detach
Table 2.1.: Didactical methods for a seminar (see Schulmeister and Wessner, 2001 266-267])

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Discussion</td>
<td>Means a relatively varied approach: for example the &quot;wise-men&quot; seminar from Bernath, 2000 135-148 or form of panel discussion among peers while the participants are being constrained to writing and &quot;listening&quot;.</td>
</tr>
<tr>
<td>Conference</td>
<td>Offers a dazzling variety of possible forms: a presentation is followed by one or more units of discussion. Telephone or video conferencing as other types of discussion forums with a few participants is also possible.</td>
</tr>
<tr>
<td>&quot;Post Session&quot;</td>
<td>Is a variant form of the conference model. It is the presentation of projects, in which the participants go from poster to poster and ask questions to the owner of the poster.</td>
</tr>
<tr>
<td>&quot;Bazaar&quot;</td>
<td>Have similarities with the poster session. Here, the participants present a kaleidoscope of more or less independent topics, similar to the classic seminars in the human sciences.</td>
</tr>
<tr>
<td>&quot;Ant Colony&quot;</td>
<td>Defines the main task of the participants as active search or execution of tasks: the students act as &quot;water carrier&quot; or &quot;worker bees&quot;, which collect documents and knowledge from the internet and other sources to develop several aspects of a topic.</td>
</tr>
<tr>
<td>Project Seminar</td>
<td>Is based on the independent choice of topics by the participants. The type of project depends on the work process during the seminar. Either there is a strict division of labour within the seminar session and each participant deals with a predefined task, or all participants carry out the steps of the seminar process as a collective group (see Hines et al., 1998 133-138]).</td>
</tr>
<tr>
<td>Workshop</td>
<td>Organizes the learning and teaching processes in several groups with similar or identical tasks. Workshops are characterized by a high proportion of self-experience. The tasks are being performed immediately during the workshop without additional external research or preparation and follow-up phases.</td>
</tr>
<tr>
<td>Tutorial</td>
<td>are small groups consisting of attendees and a lecturer, who in most of the cases is an advanced student. Tutorials are being enabled within the seminar through pair-learning or trainer-trainee relations. Besides, through tutorials, lecturers try to give the students either an outline about a certain topic or specific details about a topic.</td>
</tr>
</tbody>
</table>
2. Problem and Requirements Analysis

these aspects from each other the integrated model combines these two aspects with each other.

**Content + Support Model:** This model relies on the separation into the course-content (which is probably delivered in print or possibly now as a course package on the web) and the tutorial support (which in its simplest form is delivered by email or alternatively done via computer conferencing). Students use the content to produce their seminar paper and presentation. The model supports the notion of relatively unchanging content materials which can be tutored by other teachers than the content authors. Considering the virtual seminar as a whole, the online component respectively the interaction represents no more than about 20% of the students’ study time in this model. Where the seminar content consists of structured web pages, the division into content to be mastered and engagement in discussions is sometimes reduced. This model is most convergent to classical seminars.

**Wrap around Model:** This type defines virtual seminars which consist of tailor-made materials (study guide, activities and discussion) wrapped around existing materials (textbooks, CD-ROM resources or tutorials). This can be categorized as a 50/50 model because the online interactions and discussions occupy about half of the students’ time, while the predetermined content occupies the other half. This model tends to favour a resource-based approach to learning, giving more freedom and responsibility to the students to interpret the course for themselves. The tutor’s or teacher’s role is also more extensive than in the first model, because less of the course is pre-determined and more is created each time the course is delivered, through the discussions and activities. Real-time online events are sometimes featured in this model (as well as in the next). As technology improves, these events will include video and audio features.

**Integrated Model:** The third model is at the opposite end of the spectrum from the first. The virtual seminar consists of collaborative activities, learning resources and joint assignments. The heart of the seminar takes place online through discussion, accessing and processing information and carrying out tasks. The contents are fluid and dynamic as they are largely determined by the individual and group activity. In a sense, the integrated model dissolves the distinction between content and support, and is dependent on the creation of a learning community. Real time communication, in some cases initiated by the participants, might be video-, audio- or text-based and would support small group activities and tasks.

2.1.2. Seminars in Cameroon

The description of the seminar is restricted to technical faculty, which are in the focus of the thesis. The seminar as an independent didactical activity is not common in institutions of higher education in Cameroon. The didactical approach, the aims and the organization of a seminar depend on the academic level of the student, the infrastructure and the human resources available in the university.

Referring to the didactical approach described in the table 2.1 the workshop and tutorial approach are common for the organization of seminars for bachelor degree students. The approach of a project-seminar is quite common to students at higher levels (i.e. master’s degree). Another usual didactical approach with processes similar to the seminar for students in higher level is the bachelor or master thesis. The major difference to the seminar is in the supervision. Generally, a final thesis has an individual character in terms of supervision in contrast to the classical seminar, which is characterized by a high interaction and dependency between a group of learners and a supervisor.

The lack of human resources is a crucial problem of academic institutions in Cameroon. This
problem affects the relation and the interaction between the participants and the supervisor in a seminar. The huge numbers of participants assigned to a supervisor don’t allow for an individual monitoring and good supervision of the different steps of the seminar. This fact limits the project-seminar to a classical homework instead of a didactical approach in which the supervisor attends to the student in the analysis, comprehension, self critic and presentation of scientific work.

As in Europe, the seminar work is mainly based on bibliography research (comparison and analysis) using libraries and accessible references. The absence of libraries in Cameroon confines the work on bibliography to analysis of relatively unchanging and beforehand prepared materials. This fact has an effect on one of the didactical goals of the seminar: instead of work based on finding and using current literature to produce a paper, the project seminar aims to analyze a prepared text, summarize it and present the result.

A typical course in institution of higher education in Cameroon is split in the following didactical units:

1. A lecture divided in many chapters
2. Exercises related to the respective chapter of the lecture
3. Project seminar related to the main topics of the lecture
4. An exam, held at the end of the lecture

The project seminar takes place within the course and aims at deepening the comprehension of some aspects of the lecture. It consists of the following parts.

- A theoretical part as an introduction with a slide presentation
- A practical part with a demonstration as the result of a lab exercise
- A discussion session.

In terms of workload in hours related to the European credit transfer system (ECTS), the project seminar generally represents 20 to 30 %, the frequent exercises 20 to 30 % and the final exam 50 % of the entire course.

The current virtual seminars in Cameroon exceed classical seminars through flexibility in term of space and time. The approach in most of the eLearning programs in Cameroon is similar to Europe and is based on the assumption that there is a geographic distribution of students in order to conduct virtual sessions. The virtual seminars in Cameroon simulate the process of a classical seminar and require the interaction of many actors in different steps of the process. The actors and their roles can be characterised as follows:

- **The person in charge of the study program:** He defines a framework for the realization of the seminar. The time, goal, evaluation mode and the integration in the curricula and many other details are defined in the data-sheet of the seminar.

- **The participants:** Participants work on a topic either alone or in a group of two or three persons.

- **The supervisor:** The supervision of the seminar can be viewed from several perspectives. From the perspective of time and space and the interaction with the student (synchronous or asynchronous), most of the eLearning programs pursue the strategy of
a complete virtualization of the process. The supervisor and the students are located at different places. The responsibilities of the supervisor during the seminar characterize another perspective. The attribution of the roles described below depends on the human resource capacity at the university. The following roles can be assumed by single or different persons.

- **Expert**: The expert has the know-how on the topic and generally proposes the topic. He controls the quality of the work and ensures that the report and the presentation of the work meet the required standards. An expert can be internal or external depending on the purposed topic. If the topic is developed in cooperation with an external industrial company, an external expert in collaboration with a university lecturer supervises the seminar and ensures that the requirements from the industry are being met. The topics, which are proposed from a university lecturer, are supervised by the person in charge of the eLearning program.

- **Coordinator or facilitator**: The coordinator respectively facilitator organizes and coordinates the work during the seminar. Some tasks can be delegated to the participants, e.g., to create protocols of chat sessions, etc.

- **System administrator**: He is responsible for the technical aspects of the seminar, e.g., configuration of the workspace, support for technical questions during the seminar.

In most of the eLearning programs in Cameroon, one person assumes the three roles described above, because of the lack of resources. The organization and supervision of the several processes are centralized at the supervisor of the seminar. The constructivist goals of eLearning with the students taking the responsibility for constructing knowledge, learning, and playing an active role as knowledge seekers have not been achieved.

### 2.1.3. The Seminar concept used in this thesis

The virtual seminar concept used in this thesis is based on the theoretical concepts for the realization of virtual seminars in Europe, particularly in Germany, and the experience of one university in Cameroon in the field of eLearning (see section 2.1). The "FernUniversität in Hagen", Germany, as most of eLearning programs in Cameroon assumes that there is a geographic distribution of students requiring virtual or blending seminar. However, in many cases students in Cameroon are in fact physically present at one place, i.e., at the university.

In order to allow the extension of the support structures (e.g., supervision, coaching), this thesis proposes their distribution at different levels (technically and organizationally) and locations. The stakeholders in the process and their roles are derived from the experience of one university in Cameroon in the field of eLearning. To improve the quality of virtual seminars in Cameroon, the following changes are proposed:

- The integration of knowledge from the Diaspora (Expert, Community of practice, etc.)
- The adaptation of the concept of supervision taking into account distributed remote experts address the lack of local expertise
- A local supervisor to support the local students, e.g., in organisational tasks

This blended approach combines the effectiveness and flexibility of eLearning with face-to-face communication and the simplicity of some organizational processes in eLearning environment. The distribution of the supervision process with the integration of the knowledge...
notably the expertise from the African Diaspora can optimize the process and solve part of
the human resource problems Cameroon is facing nowadays. This approach can be qualified
as a "Blended Learning Seminar".

This proposal acknowledges the lack of infrastructure and human resources in Cameroon.
Referring to the lack of infrastructure on the one hand and to the accessibility and availability
of remote expertise on the other hand, the proposed model of virtual seminar uses a high
level of asynchronous interaction for the virtual aspects of the seminar (supervision, feedback
of supervisor, discussion, presentation, etc.), particularly between the participants and the
remote expert.

The seminar proposed is grounded on constructivism and 'connectivism' learning model
(see 3.1.1). They focus on the needs and the responsibility of the learner and interactions
among stakeholders supported by computer networks. One of the main didactical objectives
of the seminar is to support the learner in the acquisition of scientific insight, besides the
presentation and the discussion of the results of a scientific work, in other words to educate
future scientists. The intended instructional goals of the model are:

- Learning how to gain access to scientific work respectively literature;
- Improving the ability to read, understand and summarize content in the scientific texts;
- Learning how to write a synopsis/resumé/abstract of a scientific text;
- Learning how to discuss the presented research results and outcomes;
- Improving the social skills (collaboration, cooperation, rhetoric competences, teamwork,
etc.)

The achievement of these goals requires a high level of mentoring respectively support in
the different steps of the work. The target audience are students independent of their level in
classical institution of higher education with low ICT infrastructure.

2.2. Research method

The research method of the thesis follows a linear process, which consists of four major steps:

1. Problem analysis: In a preparatory phase, an initial model of virtual seminars, which
addresses a range of possible organisational forms, involved actors, and processes, has
been modelled. Empirical studies were conducted in order to analyze the state of the
art of virtual seminars in Cameroon respectively the conditions for the realization of
virtual seminar and the technical environment provided in institutions of higher educa-
tion in Cameroon. A classical and a virtual seminar has been observed and interviews
with several stakeholders involved in the process of a seminar were held. Appendix G
presents the guideline for the interviews. Based on the analysis of the results of each
study, requirements for a solution to improve the quality of virtual seminars have been
identified.

2. Design of a solution: This step is based on the list of requirements and the deficits
of existing approaches. The conceptual framework for the realization of virtual seminar
in Cameroon consists of three parts:
2. Problem and Requirements Analysis

a) The didactical model, for the introduction and the realization of the virtual seminar in Cameroon.

b) The process model, in which the range of possible organizational forms of the virtual seminar, the involved actors, processes and interactions are described.

c) The conceptual system design, which describes at an abstract level the functional and technical requirements of the seminar environment. This system design is described independently of a specific eLearning platform.

3. The prototype implementation: The conceptual system design and the process model of the framework provide the basis for the development of the prototype. The prototype was implemented on an open source learning platform, which satisfies the requirements identified in the requirements analysis.

4. The validation and evaluation: The fulfilment of the requirements for the socio-technical system (didactics and technology) are being validated on the basis of methods such as Interviews, questionnaire, cognitive walkthrough and analysis of components of the technical system which provide features to solve problems addressed by specific requirements.

2.3. Analysis of virtual seminars in Cameroon

This section presents the analysis of virtual seminars in at the IUT-FV in Bandjoun. Based on the assumption that several dimensions of culture can influence the success of the realisation of virtual seminars, the first subsection presents briefly the cultural context in Cameroon. The presentation of the technical platform used within the scope of the eLearning program in Bandjoun follows as a prerequisite for problems respectively requirements analysis of virtual seminars in Bandjoun covered in the subsequent subsections.

The analysis focuses on the following aspects:

- Basic requirements for the realisation of an eLearning program in Bandjoun
- Process of virtual seminars in Bandjoun from an instructor’s and administrator’s view of the eLearning platform
- Process of virtual seminars in Bandjoun from student’s view

2.3.1. Cultural context

An analysis of the decolonisation process of France in contrast to England since the twentieth century and their neo-colonialism policies helps to understand the nature of the educational systems of the countries of central Africa. Various researchers have analysed the contrast between French and English policies in education (see [White, 1996] and [Kelly and Kelly, 1998]). Generally speaking, they have characterised French policy in Africa as assimilationist in character and aimed at the creation of an elite cherishing metropolitan values: a "Black Frenchmen". Conversely, British practice has allegedly emphasised the notion of "cultural adaptation", the adjustment of metropolitan institutions to local political and social organisations and the creation of a group of educated Africans, who at the same time would be rooted in their own culture. The contrast between French and British policies not only concerns the extent to which the products of the schools conform to metropolitan values, it also
2.3. Analysis of virtual seminars in Cameroon

implied differences in the pattern of educational diffusion between the two sets of colonial territories (see [Cligne and foster, 1964, 191-198]).

According to the French policy, the educational system has been designed to alienate the elite and the mass. This system does not promote the spirit of self-reflection and creativity. The "colonial school system and spirit" is still present nowadays not only in primary and secondary schools but also in institution of Higher education. The didactical content of many programs are designed in France and the books are also being published there. Students grow up in a behaviorist’s model of education with the teacher in the role of almighty and authoritarian and autocratic know-how owner and with out-dated books generated in a colonial system. The fear and the respect for the teacher particularly in rural area is accentuated by local traditions, which emphasise the respect for elders. These facts contribute to increasing the gap between teachers and students. Another heritage of the colonialism is the taboo of lecture and writing, which embrace a long tradition of orality. The lack of libraries joins a political context hostile to the emergence of critical intellectual elite and which does not make real efforts to reform the educational system. Many conditions (access to literacy, critical reflection on literacy, reading and writing a report, etc.) necessary for the success of virtual seminars are not being fulfilled.

The development of cable TV and internet in the last years contributes to a change of mentalities. The accessibility of information respectively the contact to foreign countries contributes to the emancipation of the society. The new generation of students is open to the world and very curious. Internet does not only serve communication. Both, students and teachers use internet for educational purposes. The potential of internet relating to free access to information, the actuality of content and the respective costs, convenience and low costs for communication, offers new perspectives in a social context characterised by high unemployment and poverty. Internet technology becomes generally accepted because of the multimedia character of information in the internet (audio, video, animation, etc), which fits the oral and interactive culture and traditions.

2.3.2. Technical platform for the realisation of eLearning

This subsection presents the learning platform Claroline used at the IUT-FV in Bandjoun as a prerequisite to the problem respectively requirements analysis on infrastructures and on the process of virtual seminar, which will be presented in subsequent subsections. The presentation of the learning platform is based on documents available on the homepage of the learning platform project (see [Karlovcec et al., 2005]; [Docq et al., 2006]; [Claroline, 2010] and [Lebrun, 2004]) and other technical documents of the support team in Bandjoun (see [Nkenlifack and Fogue, 2010]). Claroline is an open source eLearning and e-Working platform supporting teachers (lecturers, supervisor, etc.) to build effective online courses and to manage learning and collaboration activities on the web. Its principles respectively learning model, which motivated the design of the platform, are presented below followed by a general description of the functionality of the platform.

2.3.2.1. Principles and learning model of Claroline

The Claroline platform pursues a constructivist model. Lebrun (see [Lebrun, 2005]) identified five major aspects which are important for the eLearning process and which provide the basis

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1thought and its verbal expression in societies where the literacy (especially writing and print) are unfamiliar to most of the population
2. Problem and Requirements Analysis

![Learning model and Claroline](Lebrun, 2005)

Figure 2.1. Learning model and Claroline. This model is in concordance with M. Merrill’s ‘first principles of instruction’ (see [Merrill, 1994]):

1. Learning is facilitated when students are engaged in solving real problems (information and motivation)
2. Learning is facilitated when prior knowledge is activated and questioned in new contexts (information and motivation)
3. Learning is facilitated when new knowledge is explicited, demonstrated and justified (information, activities)
4. Learning is facilitated when new knowledge is applied by the learners (activities, products)
5. Learning is facilitated when new knowledge is integrated into the learner’s knowledge (products and motivation).

Figure 2.1 illustrates the interrelation of these principles. In the centre, the three rectangles are inspired by the constructivist approach: briefly, information is transformed into knowledge by the student’s activities and this new knowledge feeds the following process (systemic loop). This process is enabled by motivational factors and sustained by interaction (from the environment - functional interaction) or by other students and by teachers.

2.3.2.2. Functionality of the platform

The Claroline platform is organized around the concept of spaces related to a course or a pedagogical activity. Each course space provides a list of tools that enable the course manager to create learning contents, manage training activities and interact with the students.

The following subsections present briefly the architecture and the core functionality of the platform.
2.3. Analysis of virtual seminars in Cameroon

**General infrastructure:** Claroline is based on a Linux, Apache, MySQL, PHP (LAMP) architecture on the server side. The client is a standard browser running on Linux, MacOS or Windows platform with a Java Runtime Environment plug-in.

**User administration and Access rights management:** The authentication on the platform uses a user-name and a password. The system provides four default profiles for users:

- **Anonymous:** S/He is a simple internet user without authentication on the platform
- **Guest:** S/He can visit content on the platform. S/He is authenticated but not registered for a course.
- **User:** S/He is registered for a lecture and is authenticated on the platform and for the course.
- **Responsible:** S/He is the person in charge of a course.

A user can have several or all of these roles and may move from one role to another. The system supports an external authentication by a configuration-file or with a single sign-on procedure based on CAS.

Access rights management is based on a hierarchical model with a super administrator and several user profiles or groups of users. Depending on the users rights, several activities can be performed on the platform.

**Course Tools:** The course tools are the primary tools to manage learning activities on the platform. Several tools such as exercise, wiki, communications, etc. can be attached to a course. Various settings such as the course language and the course access policy (public, private, etc.) can be configured. The course manager can access different statistics related to a course.

**Exercise tools:** These tools allow the course manager to create online exercises composed of a list of questions. The following kinds of exercises are supported:

1. Multiple choice
2. True / False
3. Fill in the blanks
4. Matching

An exercise consists of a list of different types of questions referring to the same subject or the same chapter of a course. The score of students registered to a course is stored and visible for the course manager in the course statistics.

**Assignment tool:** The assignment tool is a publication area for students. The course manager can create one or several assignments, where the students will be able to publish their work.

Several assignment sessions (different zones of publication) can be created, each one having different objectives or requirements. A publication can be a file or a text, or a text and a file. Publications can also be made by a group instead of a single user. Students have the ability to modify their work after submission, and the course manager can give them feedback about their submissions.

**Communication and cooperation tools:** By default, Claroline supports synchronous communication through chat rooms and asynchronous communication through forum, internal
2. Problem and Requirements Analysis

message and pin board. The system provides a plug-in mechanism for the integration of an external module for a conference system. The users can be organized in groups and a workspace can be allocated to a group. The following tools can be allocated to a workspace:

- Wiki
- Document management
- Chat
- Forum.

Document management: Documents are organized using the files and folders metaphor as it is done in the Windows operating system. The following functionality on a document are provided:

1. File/Folders: create, copy, edit, rename, delete, upload and download files, show and hide files.
2. Comment on a file. The comment can be modified.
3. Add a link as internal or external resource to a document

The platform provides a notification mechanism, which highlights the modifications occurring on a file or on folders.

Calendar and Event notification: The scheduling of tasks is managed by the calendar of the platform. Only the supervisor of a course can add events to the calendar. An event is defined by a title, a description of the event and deadlines for the beginning and the end of the event. The events assigned to a student or a group of students appear on the personalised workspace of the student.

Monitoring and control of Students: Claroline provides a tool for tracing the participation of students in a course. The system logs several activities on the platform. Also, the submitted and downloaded documents, the participation in the forums and the wikis and the time spent on the platform is logged and helps the supervisor to build a participation profile of the student at the end of the course.

Persistence: The data on the platform is stored in a MySQL database and on the web server. The communication tools in the platform are persistent. Chat sessions can be recorded and saved, forum threads, internal messages and pin board are saved on the database. The system does not provide a mechanism to work off-line and synchronise off-line work with a server later.

2.3.3. Basic requirements of eLearning at the IUT-FV in Bandjoun

Subsection 2.1 introduced the eLearning program at the IUT-FV. The strategy (Blended Learning, virtual learning, etc.) in the university, the didactical approach of the program, the organisation of courses and the organisation of human resources in charge of the program were presented. Subsection 2.1.2 presented the seminar as didactical approach within the scope of the eLearning program in Bandjoun. We will analyse in this subsection the basis requirements for the realisation of an eLearning program which may include virtual seminar in Bandjoun respectively Cameroon.

The analysis aims at identifying problems for the implementation of an eLearning program taking into account the existing infrastructure and the availability of experts respectively
2.3. Analysis of virtual seminars in Cameroon

lecturers in Bandjoun. Furthermore, requirements on solutions supporting the successful implementation of the eLearning program will be formulated.

The identification of problems is based on open and semi-structured interviews with people involved in the eLearning program in Bandjoun. By reformulating problems as needs to be satisfied by a solution, several requirements will be derived.

The method of the interview can be qualified as 'open' and 'semi-structured' (see Mayring, 2002 and Kromrey, 2006). The 'openness' relates to the possibility for the interview partner to speak about the important aspects of the topic. "Semi-structured" refers to a previously prepared list of questions or topics that will be asked (in any order) in the interview. This ensures that all issues will be discussed. The communication style respectively the behaviour of the interviewer during the interview can be classified as soft. A "soft" communication style tries to build a relationship based on trust between the interviewer and the interviewee by demonstrating his sympathy for the interviewee (see Grunow, 1978). This will create a relaxed and open atmosphere so as to obtain most of the information without an influence on the respondent. In the preparatory phase of the interview, the interviewer first presented the context of the analysis to the interviewee with a brief introduction of the thesis (background and motivation, objective. See 1.1 and 1.3). Afterwards, the project seminar in Germany was described as an independent didactical activity with its expectations (see 2.1) and lastly the approach for an improvement of the virtual seminar process in Cameroon pursues within the scope of the thesis (see 2.1.3) was presented. Questions were formulated as follows:

1. What is the status quo in Bandjoun?
2. Which problems occur?
3. Which solution is proposed?

This structure helps in the interpretation of results to analyse the status quo in Bandjoun, to identify problems and to organise requirements for a solution into user requirements (requirements formulated by the interviewee) and deduced requirements (requirements deduced from the answers by the interviewer).

This interview was videotaped as a window media file movie and lasted two Hours.

The interpretation of the interview was based on a summary content analysis according to Mayring. The aim of this approach is to reduce the collected material and data by maintaining its essential content through abstraction (see Mayring, 2008). The first step consists of a transcription of the material usually saved in audio or video format. The second step is the "generalization". The paraphrase must now be extended to a general abstraction level. The working hypotheses determine the level of abstraction. That means the paraphrase is generalized in a way to keep a direct relation to the assumptions. A reduction on the paraphrase takes place at the end so as to summarize the core idea in categories. The resulting categories can now be interpreted in the context of the problem and the interview groups can be compared with each other (see Mayring, 2008).

The guideline of the interview focused on the problem of infrastructure within the scope of the eLearning program in Bandjoun (see Appendix G).

Measures of the analysis were organised as follows:

**Communication and computing infrastructure**

1. Is the power supply sufficient for the operation of an eLearning program?
2. Problem and Requirements Analysis

2. Which characteristics do the telecommunication networks have?

3. What are the capacities of the computer equipments and how is it configured?

4. How the internet access in Bandjoun is and which characteristics does the connection have?

Information infrastructure

1. How good is the access to literature respectively the condition of libraries?

Learning infrastructure

1. What were the main criteria for the choice of the platform?

2. How is the availability of experts in Bandjoun for the eLearning program?

The interview was conducted with five peoples representing the complete team and different levels of responsibilities within the eLearning program at the IUT-FV:

1. The person responsible for the eLearning program. He is the head of the department of computer science at the IUT-FV. He is responsible for the eLearning program, coordinates the strategic orientation of the program and the human resources.

2. The person responsible of the curricula. He assists the head of the department in his daily tasks and organizes the curricula of the eLearning program at the IUT-FV. Also, he is an instructor of the eLearning program and supervises some modules or courses of the program.

3. The person responsible for the supervision of students. He supervises and assists the students in different modules of the program. Besides, he is the contact person for students.

4. Two persons of the technical staff. The manager of the technical staff was assisted by another member of his team. They are responsible for the administration, support and development of the platform.

The presentation of the interview answers respectively the results of the analysis follows a defined structure. First, the status quo of the basic conditions for eLearning in Bandjoun is presented followed by problems related to these conditions and lastly requirements for better solutions are formulated. The presentation of the results follows the sequence of questions described in the interview guideline. Requirements are organised in user requirements (requirements formulated by the interviewee: U.R.) and derived requirements (requirements deduced from the answers by the interviewer: D.R.).

The following notation is used to formulate a requirement:

1. Code or ID of the interview (I1)


3. Textual description

4. Example: I1 U. R. 1: all system components must be able to run on hardware with low performance
2.3. Analysis of virtual seminars in Cameroon

Communication and computing infrastructure

The power, the telecommunication network, the computer equipment and the internet access are analysed under the communication and computing aspect.

**Power:** In Cameroon, like in many other countries in Central Africa, frequent power failure is a major problem. The principal source of energy is a water dam and its capacity depends on the various seasons. Particularly during the arid season the breakdowns of electricity in Bandjoun are frequent and can last for several hours. The IUT-FV uses a standby set for critical services, especially the services hosted on the servers in order to ensure their accessibility any time.

*Under conditions describe before, the conception of an eLearning system at the IUT-FV in Bandjoun must deal with the instability of the power supply and the frequent breakdown*

**Telecommunication network:** The GSM network is a widely spread telecommunication network and covers more than 30% of the country. Almost all villages are covered by the GSM network and almost every student and supervisor at the IUT-FV has a mobile phone. The majority of the eLearning programs in Cameroon include the program in Bandjoun are founded and developed in collaboration with big telecommunication operators e.g. MTN and Orange. These operators are important actors in the field of eLearning in Cameroon. Unfortunately, this potential is not being used to improve the quality of eLearning.

*Since the GSM network is more wide-spread than the internet and almost all operators are active in the field of eLearning, the use of the GSM network to overcome connectivity problems can be formulated as requirement.*

**ComputerEquipment:** Computer equipment is sponsored by CISCO system and consists of a computer pool for students, two servers, and an internet connection with several routers. The computer pool consists of approximately thirty desktop computers with 450 to 600 MHz. processor, 64 to 254 Mbs. of RAM, 20 - 40 Gbs. hard disk. Each computer has one monitor and multimedia accessories (sound card and headset) for internet communication. These computers are interconnected in a client-server intranet architecture built on Ubuntu Linux. A Linux server with a capacity of 1,2 GHZ. and 2048 Mbs. of RAM hosts the eLearning platform. Another server with the same characteristic is configured to ensure the accessibility of the services in case of failure of the central server. Most of the stakeholders involved in the eLearning program in Bandjoun have access to a second-hand computer either in a computer pool or as a personal computer. The low performance of the available computers represents a big challenge for the operation of an eLearning system. The financial plan of the eLearning program does not include the renewal of the equipment as priority.

*The low capacity of computer hardware in rural area needs to be considered for the conception of an eLearning program in Bandjoun. All system components of the eLearning system must be able to run on hardware with low performance.*

**Internet Access:** The CISCO Academy campus at the IUT-FV uses a VSAT internet connection with various rates. The downstream capacity ranges from 128 to 256 Kbs. and the upstream capacity from 64 to 128 Kbs. Computers in the pool are interconnected using a client-server architecture based on Ethernet. Some Wireless Local Area Network (WIFI Hot-spot) access points are available on campus. The bandwidth of the internet network is low and the connection is very slow during certain times of the day. Online applications which require a high bandwidth are executed very slowly with a big delay. The alternative for
students is to work online in a cyber or internet café. The bandwidth in a cyber café generally ranges from 32 to 128 Kbs. It is sufficient for simple applications like internet research, instant messaging, mailing but not enough for some applications as video streaming and download of big documents, since these actions afford a lot of time and resources, depending on the size of the documents and applications. Another problem in the internet café is the configuration of the computer equipment in terms of software and hardware. A typical internet client in a cyber café is a desktop computer with 300 to 450 MHz processor, 64 to 128 Mbs. of RAM, 20 - 40 Gbs. hard disk running under Windows 98 or NT with a 15 inch monitor. Some of them have audio-video headsets for internet communication. The 'internet café' owners prohibit the installation of additional software on the computer. Some cyber cafés offer the possibility to work online with your own notebook for additional fees.

Regarding to the network infrastructure (bad and unstable connection, lower bandwidth) and the accessibility to the internet in rural area, concepts which afford an efficient work without need for continuous online connection to the internet was formulated a requirement by the head of the department in Bandjoun.

I1 U. R. 4: Work without need for continuous online connection to internet

**Information infrastructure**

Access to literature, which is an important issue for institutions of higher education particularly in an eLearning context, represents a big challenge in Bandjoun. Bandjoun as a sample of a city in a rural area is characterized by the lack of libraries and even the few existing libraries are very poorly equipped. Most of the available books are out-dated and many libraries do not even allow borrowing the books.

The availability of actual literature and the access to this content needs to be supported by the eLearning system.

I1 U. R. 5: The availability of literatures and the access to its must be supported by the eLearning system.

The use of internet in Bandjoun is limited to basic services such as mail, surfing, chat, etc. The evolution of the internet technology in the last years, e.g. possibilities related to WEB 2.0 to enhance creativity, information sharing and collaboration is not enough integrated in the eLearning processes in Bandjoun. This fact is due to the lack of adapted infrastructures for solutions, which require high standard (communication and computing) infrastructures.

The use of new and innovative internet technologies in the context of eLearning so to enhance creativity, information sharing and collaboration is needed.

I1 D. R. 6: Use of new and innovative internet technologies to enhance creativity, information sharing and collaboration.

The accessibility of scientific works done by students in Cameroonian respectively African university is very difficult although, many researches in these universities are done and available.

I2 D. R. 7: Concepts to improve the visibility of scientific work performed in institutions of higher education in Cameroon are needed.

**Learning infrastructure**

Asking the head of the department what the main criteria for the selection of the platform were, the following arguments were presented:
2.3. Analysis of virtual seminars in Cameroon

1. Open source license model and the resulting advantages: The costs related to the acquisition and the administration of the system, the possibility to adapt the code to the learning processes at the IUT-FV and the integration of the system with other infrastructure were the important criteria for the choice of the platform. Furthermore, the system is widely distributed particularly in French speaking countries, which makes the support easy.

2. Technical architecture of the system: The system is based on the LAMP (Linux, Apache, MySQL, and PHP) architecture. In comparison with other frameworks such as Java, or .NET, the skills and resources required to develop modules of the system fit the academic program at the IUT-FV. The technologies used for the platform are also part of the curriculum in the bachelor program of technical faculties at the IUT-FV. The technical and support team of the eLearning program consists of students or alumni of the university with a bachelor degree in computer science or telecommunication.

From the motivation and decision criteria for the choice of the platform, three requirements for the operation of an eLearning system in Bandjoun can be formulated:

I1 D. R. 8: The eLearning system and its components must be available under the open source licence model.
I1 D. R. 9: The community for the maintenance and development of the eLearning system must be large and stable.
I1 D. R. 10: Technologies used to develop the system must be simple. Students with a bachelor degree should be able to maintain and develop components of the system.

A major problem being faced by the university in a rural area is the lack of qualified personal. Qualified experts respectively instructors with good skills are rare and even do not want to live in this area. Most of them live in the urban area and compress their annual program to fit in a few weeks. The instructors available at campus are overloaded with the high number of students, administrative and organizational tasks.

The person in charge of the eLearning program at the IUT-FV needs concepts respectively models to deal with the problem of lacking human resources in Bandjoun.

I1 U. R. 11: Concepts to deal with the problem of lacking human resources in term of supervision are needed.

2.3.4. Process of virtual seminar from an instructor’s view

After the analysis of basic requirements for the realisation of an eLearning program in Bandjoun presented in the previous subsection, this subsection examines in detail the process of virtual seminar as a special form of eLearning in Bandjoun from an instructor’s perspective.

This analysis gives a deeper comprehension of the virtual seminar process in the different stages of its realisation. Various aspects of the process, e.g., the interaction with the platform and among stakeholders of the process, the communication, the organisation, and the teaching and learning approaches are in the focus of the analysis.

The analysis aims at identifying problems related to the realisation of virtual seminars in its various phases from an instructor’s view. Furthermore, requirements on solutions in order to improve the quality of the process will be formulated.

As in the analysis of basic requirement of eLearning in Bandjoun in subsection 2.3.3, the identification of problems is based on "open" and "semi-structured" interview with an instruc-
2. Problem and Requirements Analysis

tor respectively supervisor of virtual seminars in Bandjoun. The derivation of requirements is done by reformulating problems as needs to be satisfied by a solution.

The method of “open” and "semi-structured" interview for the analysis is described in the subsection [2.3.3]. The interviewer followed all steps of the preparation for the interview:

- Presentation of the context and goals of the interview
- Presentation of the seminar concept in Germany
- Presentation of the approach pursued within the scope of the thesis for the improvement of the virtual seminar process

The formulation of questions focused on processes for the realisation of virtual seminars and had a similar structure as the interview with the person in charge of the program on the basic requirements for eLearning in Bandjoun:

1. What is the status quo of a process?
2. Which problems are related to this process?
3. Which solution(s) is or are proposed?

This method aims to facilitate the interpretation of results by organising answers into the status quo of a process, identification of problems related to this process and formulation of requirements on a solution arranged in user requirements or deduced requirements. The interview was digitized into window media file movie and lasted two and half Hours.

The guideline of the interview followed the chronological evolution of the virtual seminar process. Measures of the analysis were organised as follows:

**Preparation of the seminar**

1. Which didactical approach underlies the conception of the current virtual seminar?
2. Could know-how from the Diaspora improve the process of virtual seminar and how?
3. Which measures have been taken to make students familiar with the didactical approach, goals and expectations of the seminar?
4. Are the several steps of the project seminar process clearly defined and standardized?

**Formation of groups and assignment of topics to groups**

1. How are the topics proposed?
2. How are topics assigned to students or groups of students?

**Development of the topic**

1. How is the monitoring and the control of participants’ development both at the individual as well as a group level organized?
2. How are several files related to a topic managed?
3. How is the interaction between the supervisor and the participants organized?
4. How can the supervisor’s participation in this phase be described?

5. How are the tasks and events during the seminar organized?

**Presentation and discussion**

1. How is the presentation process organised (virtually or presence) and structured?
2. How is the quality of presentations?
3. Are results of the work done by students during the seminar accessible for everyone?

**Evaluation of the work**

1. Which factors are taken into consideration for the evaluation of the participants’?

Because of the lack of human resources at the IUT-FV the roles of the person in charge of the program are not clearly defined and one person can assume several roles within the program. The interview took place with the person responsible of the technical support team of the platform. Furthermore, he is an instructor in charge of the eLearning program. He is 26 years old and has a bachelor degree in computer science from the IUT-FV. The technical staff consists of three persons, who are responsible for the adaptation of the platform to the local context and learning process, the further development of the platform and the assistance of students and instructors for technical problems during the teaching and learning processes. In addition to his responsibilities in the technical staff, he supervises some modules of the eLearning program, particularly the lab exercises and the project seminars.

The presentation of results of this analysis follows a similar approach as the analysis of basic requirements for eLearning in Bandjoun in the subsection 2.3.3. It is structured according to different stages of the process. First, the current process at the IUT-FV will be presented. The interaction in some phases of the process is illustrated by a graphic. After the status quo of the process, problems related to this process and requirements on a better solution are formulated. The formulation of requirements uses the same notation as in the subsection 2.3.3:

- Code or ID of the requirement (I2)
- Category of the requirement (User requirement / Derived requirement: U.R / D. R.)
- Textual description
- Example: I2 D. R. 1: The process must support asynchronous communication.

**Preparation of the seminar**

**Didactical approach of the seminar:** The project seminar at the IUT-FV takes place within the scope of a course and not as a separate didactical activity equivalent to a lecture or an exercise. In section 2.1.2 a detailed description of the process was presented. Two factors, namely the human resource and the access to actual content have been identified, which influence the didactical approach of the eSeminar. These factors limit the project seminar to a classical homework instead of using a didactical approach in which the supervisor attends to students in the analysis, comprehension, self-critique and presentation of a scientific work.
2. Problem and Requirements Analysis

Requirements related to the problem of human resource and access to actual literature were ready formulated by the person in charge of the program in the analysis of conditions for the realisation of eLearning in Bandjoun (see I1 U. R. 5 and I1 U. R. 11). Considering these problems, the virtual seminar receptively the project seminar should be seen as an independent didactical activity, which supports the student in the acquisition, the presentation and discussion of scientific insight.

I2 U. R. 12: Conception of the project seminar as an independent didactical activity is needed.

Integration of know-how from the Diaspora: The strategy of the eLearning program at the IUT-FV in Bandjoun includes the integration of know-how from the Diaspora in terms of supervision of students and access to know-how, technologies and content in order to complete and improve the eLearning program. This potential is not enough integrated in the practice respectively in the current process of virtual seminar because of many reasons, including a missing theoretical and structural concept, a lack of adapted infrastructure, etc.

Concepts, which help to integrate know-how from the Diaspora in the current process of virtual seminar respectively eLearning program at the IUT-FV in term of supervision of students, access to know-how, technologies and content, are needed.

I2 U. R. 13: Concepts to support the integration of know-how from the Diaspora in the current process of virtual seminar are needed

Introduction of the didactical approach of virtual seminar to students: the eLearning program at the IUT-FV starts each academic year with a workshop for new students. The workshop aims at presenting modules of the curricula, the organisation of courses and their didactical approaches, the platform and its uses within the scope of the eLearning program. The workshop lasts one week and it is not enough time to familiarise students with learning processes in a virtual context, their didactical approaches and expectations. Virtual seminars are not introduced in a special way. The workshop focuses on modules of the curriculum and the presentation of the platform.

I2 D. R. 14: The modified model of virtual seminar with its didactical approach, goals and expectations must be introduced to stakeholders involved in the process, especially to students.

Standardization of the process: the current process of virtual seminar at the IUT-FV is based on a predefined didactical approach and the different steps of the process are defined. This process is described in the subsection 2.1.2 and will be presented in detail in the following paragraphs.

Proposition of topic

On the basis of a framework defined by the person in charge of the faculty, instructors at the IUT-FV and experts from industry propose topics for seminars. A project seminar takes place within the scope of a course and can be organised in cooperation with an industry partner. A topic is subdivided into several subtopics referring to several parts of a course. The supervisor of the seminar established a list of criteria for the participation to the project seminar and the choice of a subtopic. Subtopics are completed with a reference of bibliography available on CD ROM, Flash Media, etc. In practice, a very small proportion of seminars take place in cooperation with the industry and the few of them are restricted to industries in Cameroon. Most of topics are proposed by teacher of the eLearning program within the scope of a course. Topics respectively themes proposed by the industry or by experts out of the campus are missing. A know-how respectively technology transfer between the institution of higher education and these actors (industry, remote experts) based on the didactical approach
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The integration of topics proposed by the industry and by experts out of the campus is needed.

Assignment of topics to students or group of students

The eLearning model of the IUT-FV is based on the distribution of students in different countries. Subtopics for a seminar are published on the Claroline platform by the administrator respectively the supervisor of the seminar. A forum is set on the platform in order to give students the opportunity to discuss on subtopics. The discussion is moderated by a supervisor, who has a deep comprehension of the subtopics. According to the "first come, first serve" principle, which means that the first to choose a topic gets it, topics are assigned to students. A topic can be developed in a group of two or three persons depending on the complexity of this topic. Students are free to choose partners to build a group. The list of topics with assigned students is published on the platform by the administrator or the supervisor of the seminar. Subtopics are organised into groups according to the abstract theme covered in the respective groups.

Although the distribution algorithm is easy to maintain and fits to the available resource on campus, it does not take into consideration the profile of a student to work on a specific subtopic. The priority of a student for the selection of a subtopic and conflicts among
2. Problem and Requirements Analysis

participants for the choice of a subtopic is not supported by the current approach for the assignment of subtopics. Group of students are building subject to the connection and the interdependency amongst subtopics. The following requirements can be formulated for the improvement of the process of assignment of subtopics to students:

- **R. 16**: The profile of a student to work on a subtopic must be taking into consideration.
- **R. 17**: The model for the assignment of subtopics must take into consideration the priority of students to choose a subtopic and deal with conflicts on a subtopic.
- **R. 18**: The model for the assignment of topics to students must be supported or automated by a computer system.

**Development of the topic**

After the phase of the assignment of subtopics to participants, required modules on the platform for the realisation of the project seminar are customised by the administrator of the platform or the supervisor of the seminar.

**Document Management**: Workspaces or folders are setting for group of students respectively categories of subtopics. Documents of students and feedbacks of the supervisor can be uploaded or downloaded on the workspace of the group. Another folder for common documents amongst participants (literature, calendar, etc.) is setting. Students become rights to handle (create, modify, etc.) on files and folders of their workspace.

**Collaboration and cooperation modules**: A common Wiki for participants is setting by the technical supervisor.

**Communication modules**: A common forum is setting for general questions related to the seminar. The right to initiate a thread on the forum and to configure a chat-room on the platform is delegate to all seminar participants.

**Tracing module**: The tracing tool of the platform is configured to keep the profile of participants during the virtual seminar.

**Notification module**: Deadlines of the seminar are set up by the supervisor in the distributed calendar of the platform. Another file with deadlines is uploaded on the common folder of the virtual seminar.

The first activity of the student in this phase of the process is to write an abstract of his subtopic with a plan for the execution of tasks. The abstract consists on following parts:

1. Summary of the theme
2. Presentation of the context and fields of application of the theme
3. Presentation of used methods
4. Presentation of used resources
5. Outcome of the work
6. Time schedule for the execution of task

The supervisor gives his feedback on the abstract and if necessary a discussion with the student takes place. The draft of the abstract is modified by the student to the supervisor’s satisfaction respectively approbation. After the approbation of the abstract, the students have to submit the table of content of his work. The process of 'supervisor control on the draft, supervisor feedback, discussion with the student on the draft and approbation of the draft'
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recurs for the table of content. After the approbation of the table of content, the student sends the first version of his paper. The same process of "control - feedback - discussion - approbation" runs for the first version of the paper. After the approbation of the first version of the paper, the student sends his slides for the presentation. Slides are controlled and approved by the supervisor through the process described above. The last document, which follows the recursion described above, is the revised version or the last version of the paper after the presentation of slides in the plenum. This phase of the process is described in a subsequent paragraph. Figure 2.3 illustrates the interaction in this phase.

The development of the topic represents the most important phase of the project seminar in terms of interaction between the participants and the supervisor. Most important processes in this phase are analysed in following paragraphs.

**Monitoring of participants:** the platform is setting to log activities of students also, the submitted and downloaded documents, contributions in forums and wikis, the time spent on the platform are logged. The interpretation of this data happens towards the end of the seminar. These data help to build a profile of the student’s participation during the seminar. The didactical approach conditioned by the lack of human resources does not allow a permanently monitoring of students during the seminar. Beside the control of the several drafts of students by the supervisor, a monitoring of students evolution during the seminar does not take place. This fact can cause the loss of motivation and eventually drop out by students.

**I 2 D. R. 19:** Concepts or methods to control the participant’s evolution during the virtual seminar and if necessary to take corrective action are needed.

**Document management:** Document are organised using the files and folders metaphor of Windows operating system. Operations on file are described in 2.3.2.2. Documents are organized in folders and build the workspace of a group. It is very difficult to manage the several versions of a document related to a subtopic because it is common to have many copies of the same document in the workspace of the group. The workspace becomes disorganized and unstructured with the time due to the amount of documents. Furthermore, it is difficult to match a document to the addressed person and the related subtopic in the workspace of the group.

**I2 D. R. 20:** The system used for the virtual seminar must manage efficiently the several versions of a document related to a subtopic and actions on its.

**Feedback on submitted draft:** The recursive process on a submitted draft "supervisor control, feedback to student, discussion with the student, supervisor approbation" described in figure 2.3 is not efficient in term of time and communication. The matching of a supervisor’s comments, changes and suggestions to a corresponding paragraph on the submitted draft is difficult for the student because these feedbacks occur on a separate document. This fact causes a misunderstanding by the stakeholders and a loss of time. Communication among the stakeholder in order to avoid misunderstanding takes basically place even if through mails. With the daily amount of mails, it is difficult for the stakeholder to manage the communication interaction during the recursive process described above as a conversation.

**I2 D. R. 21:** Concepts to improve the efficiency of the recursive process of "supervisor control, feedback to student, discussion with the student and supervisor approbation" and the communication during this process on a submitted draft by a student are needed.

**Communication:** The communication between the supervisor and students within the scope of the virtual seminar happens predominantly in asynchronous modus via e-mail. One chat session can take place during the seminar in order to clear general issue and some questions of students relating to their topics. With the amount of mails, the mailbox of
2. Problem and Requirements Analysis

Figure 2.3.: Development of topic
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the supervisor is generally full. It is difficult for him to follow the communication respectively
the interaction with a student on a subtopic as a conversation during the seminar process. This
fact causes a loss of time for the supervisor. Generally, the supervisor uses a mail-client, which
is not integrated in the learning platform. The POP3 protocol and web-client are common
for the communication via email. Depending on the computer used and its configuration to
check mails, not every mail in the mailbox is accessible. Furthermore, it is difficult for the
supervisor to manage several mail-clients on several computers.

I2 U. R. 22: Concepts to support the communication particularly in asynchronous modus
between the supervisor and the student in structured way during the seminar are needed.

Participation of the supervisor: Due to the lack of human resources and the didactical
approach of virtual seminar in Bandjoun, the participation of the supervisor in the current
process is minimal. This participation is resuming to moderate discussions on the common
forum of the seminar and to response student’s mails. In some project seminar, chat sessions
moderated by the supervisor take place. In practice, the recursive process of control of a
submitted draft, feedback to the student, discussion with the student and validation of the
draft is slacked off by the supervisor. The missing supervision during the project seminar is
visible in the unsatisfactory quality of the work done by students, who need an additional
support.

Concepts to overcome the problem of lacking human resources and to improve the didactical
approach of virtual seminar are ready formulated as requirement in the previous analysis
respectively interview with the person in charge of the eLearning program in Bandjoun. (see
I2 U. R. 13: Conception of the project seminar as an independent didactical activity is needed;
I2 U. R. 13: The integration of know-how from the Diaspora in the current process of virtual
seminar respectively in the eLearning program in Bandjoun must be supported).

Task and event coordination: The scheduling of tasks is managed by the calendar of
the platform. Deadlines of the virtual seminar are put in the calendar by the supervisor of
the seminar. Another file with deadlines is posted on the shared workspace of participants
of the seminar. Only the supervisor can edit the calendar. The platform does not support the
scheduling of tasks defined by students related to their abstracts.

The system provides a notification mechanism for new documents uploaded on the workspace
of the platform and for incoming event. New documents in the workspace are highlighted for
sessions after their upload. Incoming events appear in the personalised workspace of every
student. Mails are the common medium to synchronise appointment with the supervisor.

I2 U. R. 23: Concepts to manage both tasks and events posted by the supervisor and schedule
of students are needed.

I2 U. R. 24: Communications medium for the synchronisation of appointments must take
the infrastructure problems (computing and communication) in Bandjoun into consideration.

Presentation and discussion

Given the standard of infrastructure in Bandjoun (see \[2.3.3\]), it is difficult to perform virtual
presentation in synchronous modus on the platform. After the control and the approbation
of the slide of students by the supervisor, the schedule for all presentations is published on
the platform. Presentations take place in one of the four presence meetings of the eLearning
program. Successively, each student performs a fifteen minutes slides presentation followed by
a demonstration of the result of his work. The discussion in plenum closes the presentation.
Some metropolis in central Africa as Yaoundé hosts the 'Campus Numerique Francophone
(CNF)' of the AUF. The CNF offers modern infrastructures for eLearning particularly a
complete video-conference system for virtual presentation in synchronous modus. Students living in this metropolis use this infrastructure to perform their presentations.

The distribution of supervisor and students in different location must be taking into consideration by the model of virtual presentation. Furthermore, the lack of infrastructure in the urban area for the communication must be considered.

12 U. R. 25: Technologies respectively concepts to support the presentation, discussion and moderation taking into consideration the distribution of students and supervisors and the lack of infrastructure are needed.

Rhetorical skills and techniques to prepare and present results of a scientific work to a critical audience are not part of the eLearning program in Bandjoun. This is visible in the poor performance of some students by their presentations.

12 D. R. 26: Measures to improve the acquisition of key qualifications (techniques of presentation, rhetorical skills, teamwork, etc.) by students are needed.

Evaluation of the work

The evaluation of the current project seminar in Bandjoun by the supervisor is based on the followings aspects:

- Pedagogical progression: The evaluation of the progression is based on the achieved tasks defined by the student in his abstract at the beginning of the virtual seminar. Each task in the abstract represents a variable of a function with a coefficient.

- Participation profile: The data generated by the monitoring tool help the supervisor to appreciate the participation of a student during the seminar.

- Quality of the report: The evaluation of the final report of the seminar according to standards of the scientific community in terms of form and content plays an important role.

- Quality of the presentation and the demonstration: Beside the quality of the report, techniques of presentation and rhetoric skills play another role.

- Quality of the result: The result of a project seminar as a part of a practical course can be interpreted as a product (software, hardware, etc.) The quality of the result respectively of this product plays an important role in the final evaluation.

- Additional aspects such as the discipline during the seminar, initiative taken by the student for organizational tasks, etc. can play a subjective role in the evaluation.

2.3.5. Process of virtual seminar from student’s view

Issues covered in this subsection were partly examined in the previous analysis from the perspective of the person in charge of the eLearning program and instructors in Bandjoun. The analysis in this subsection examines problems respectively needs of students for the realization of virtual seminar in Bandjoun. First, basic requirements respectively learning and communication infrastructure, which have an influence on the realisation of virtual seminar are analysed. Afterwards, the process of virtual seminar in its different stages, which involved students at the preparation of the virtual seminar, the formation of group and the topic development will be analysed in detail. Various aspects of the process, e.g., the interaction
with the platform and amongst stakeholders, the communication, and learning processes are in the focus of the analysis.

The analysis aims at identifying problems related to the realisation of virtual seminars from students’ view. Furthermore, requirements on solutions supporting the improvement of the process will be formulated.

As in the previous analysis in subsection 2.3.3 and 2.3.4, the identification of problems is based on "open" and "semi-structured" interview with students of the eLearning program in Bandjoun. The derivation of requirements is done by reformulating problems as needs to be satisfied by a solution.

The method of "open" and "semi-structured" interview used for the analysis is ready described in the subsection 2.3.3. The following steps for the preparation of the interview were performed by the interviewer:

- Presentation of the context and goal of the interview
- Presentation of the virtual seminar concept in Germany
- Presentation of the approach of virtual seminar pursues within the scope of the thesis for the improvement of the virtual seminar process in Cameroon.

The formulation of questions used a similar approach as in the other analysis and was structured as follows:

1. What is the status quo of a condition or a process?
2. Which problems are related to it?
3. Which solution(s) is or are proposed?

This approach facilitates the interpretation of results by organising answers into status quo of a condition respectively process, identification of problems and formulation of requirements on a solution. The interview was recorded as window media file and lasted three hours.

The guideline of the interview consists of two parts. First, influences of infrastructures (learning and the communication infrastructure) on the virtual seminar process are analysed and lastly, stages of the process in which students are involved are examined in their chronological evolution. The measures of the analysis were partially considered in the previous interviews. Depending on the interests of the stakeholders involved in the process, different results to the same questions were expected. Questions of this interview are organised into the following structure:

**Communication and computing infrastructure**

1. Which influences have the communication and computing infrastructure on the work or achievement of tasks?

**Learning infrastructure**

1. Which influences have the learning infrastructure on the work or achievement of tasks?

**Preparation of the seminar**
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1. Which technical skills do the students have, in particular internet skills to perform task or activities during the virtual seminar?

2. Have the didactical approach and expectations of the virtual seminar been clearly formulated to the participants and have they been understanding by them?

*Proposition of topics*

1. Have the participants’ suggestion for the proposition of topics been taken into consideration?

2. Which expectations have the students on the proposition of topics?

*Development of the topic*

1. How does the platform support the interaction on the process of 'supervisor feedback on submitted draft’?

2. How is the access to learning material respectively literature organized?

3. Which form of communication takes place during the seminar and how?

4. How does the cooperation and collaboration process take place during the seminar?

5. How are events and tasks in this phase of the seminar organized?

The interview took place directly after a virtual seminar experience organised in the faculty of computer science at the IUT-FV in Bandjoun. Topics of the virtual seminar experience have been developed in the preparatory phase of the analysis in Germany and have been negotiated with the person in charge of the program in Bandjoun. The topics cover several aspects of eLearning and its potential for institutions of higher education in Cameroon. The interview was organised as a group interview with six people from the twelve participants of the virtual seminar experience. The interviewees were not selected on a controlled basis and consisted on two females respectively 22 and 21 years old and four males respectively 19, 21, 21 and 23 years old. The interviewees were all students of the 'CISCO Advanced Technology Networking Academy' certified program and had a bachelor degree either in computer science or in telecommunication.

The presentation of results of this analysis follows the sequence of questions described in the interview guideline. First, the influence of infrastructure for the realisation of the virtual seminar is described followed by the presentation of several stages of the virtual seminar process, in which students are involved. The approach for the presentation is similar to the previous analysis (see 2.3.3 and 2.3.4). After the presentation of the status quo of a condition respectively process, problems related to this and requirement on a better solution arranged in user requirements and deduced requirements are formulated. The formulation of requirements uses the same notation as in the previous subsection (see 2.3.3 and 2.3.4).

Example: I3 U. R. 17: Students need more interaction on the platform.

*Computing and communication infrastructure*

The availability of power supply and the access to computer and internet connection play a major role for the execution of tasks and activities within the scope of the virtual seminar.
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The status quo and the problems related to the internet access, the power supply and the technical equipment at the university are ready analysed and presented in the analysis of basic requirement of eLearning at the IUT-FV in Bandjoun. The influence of these factors affects negatively the students in the evolution of the seminar. Concerning the power supply, the frequent breakdowns in the computer pools stop activities of students (chat session, internet research, text editing, etc.) in these periods. The saturation of the computer pool in prime time and the performance of equipment do not allow an efficient online work. Online activities, which require a high rate of bandwidth for e.g., video streaming, upload and download of big document takes long time and are difficult to perform. For peoples, who are working outside of the campus (cyber café, office, etc.), the quality of internet is worse than the computer pool at the university. Most of students are equipped with a second hand desktop PC or have access to it. Performance of these computers is very low. They consist of a desktop PC with 300 to 450 MHz. processor, 32 to 64 Mbs. of ram, 20 to 40 Gbs. hard disk.

**Requirements related to computing and communication infrastructure in order to improve the work of students within the scope of the virtual seminar are similar to basic requirements formulated by the person in charge of the program.** (see I1 D. R. 1: eLearning system must deal with instability of power supply; I1 D. R. 3: All system components must be able to run on hardware with low performance; I1 U. R. 4: Work without need for continuous online connection to internet)

**Learning infrastructure**

The students' standard of living is relatively low in villages and most of them are supported financially by their parents. The accommodation on campus is less expensive and is one of the main issues. Many students prefer to live in cheaper accommodation around 20 to 30 km away from the campus. The fees of traffic from their accommodation to the campus respectively to the computer pool are quite high, even if a vehicle is available. Most of the students have to make long distances from their home to the university campus by foot. This fact causes a loss of time and energy by students. The 'internet café' as alternative to the computer pool to work online is very expensive. They are mostly used by students for short and urgent tasks (e-mail checking, literature search) because of high costs, the worse quality of the computer equipment and internet connection. Furthermore, the atmosphere in cyber café is not appropriate for learning.

Concepts, which allow students to work independently of the computer pool on campus, are needed. These concepts should increase the participation of the students in several activities and reduce considerably their costs and effort.

I3 U. R. 27: Students must be able to work on any computer independent of a location.

**Preparation of the seminar**

**Technical skills of the students:** The application for the eLearning program at The IUT-FV in Bandjoun requires a bachelor’s degree in computer science in advance. Students also have good skills in Hard- and software and are familiar with internet technologies. They do not take much of the advantage of new possibilities offer by internet (WEB 2.0) in order to enhance their creativity, the information sharing and collaboration within the context of eLearning. The current used internet services are limited to forum, mail, literature research and chat.

The integration of innovative web technologies and services into the teaching and learning
2. Problem and Requirements Analysis

process in order to improve the production of content, the creativity of students, the information sharing and collaboration are already formulated as needs in the interview with the person in charge of the program in Bandjoun. (II D. R. 6: Use of new and innovative internet technologies to enhance creativity, information sharing and collaboration.).

**Measure to familiarize students with the virtual seminar:** Most of students are familiar with lectures, tutorial, exercise, project and thesis as different didactical approaches. Students are not familiar with the didactical approach virtual seminar and they not understand expected requirements, the didactical goals and the evaluation criterion. This incomprehension results into a huge loss of time.

Therefore, the evaluation criterion, expectations to students related to didactic and tasks to achieve have to be clearly formulated at the beginning of the virtual seminar.

**I3 D. R. 28:** clear and explicit formulation of expectations of the virtual seminar and the evaluation criterion.

Measures to present and to familiarize students which the didactical approach of virtual seminar are ready formulated as requirement in the analysis of virtual seminar process from an instructor’s view (see I2 D. R. 14: The modified model of virtual seminar with its didactical approach, goals and expectations must be introduced to stakeholders involved in the process, especially to students.).

**Proposition of topic**

The current approach of virtual seminar does not take propositions of students for the formulation of topics into consideration. One reason amongst others is the lack of human resources in terms of supervision. Topics of the virtual seminar experience have been proposed on the basis of their actuality and their practical orientation. The actuality of topics and their practical orientation was formulated as a factor of motivation by interviewees and was enumerated as a problem of the topics proposed within the scope of the eLearning program in Bandjoun. They hope thereby to gain useful practical skills, which help them to do or find in a short time a job or to give them new perspectives.

From these arguments, the following requirements can be formulated:

**I3 U. R. 29:** The proposition of topics by students must be taking into consideration.

**I3 U. R. 30:** Topics for the virtual seminar must be selected on the basis of their actuality and practical orientation.

**Development of the topic**

Both, as well for the supervisor as for students, this phase represents the important phase of the seminar. Several aspects related to the development of the topic, e.g. the communication in the group and with the supervisor, the work on literature, the collaboration, the awareness on the virtual environment were analyzed.

**Management of documents and supervisor feedback on submitted draft:** The work on a topic in this phase is characterized by a high interaction between the supervisor and students. Problems related to the management of documents on the workspace of a group and the recursive process on a submitted draft by a student "Supervisor control, supervisor feedback, discussion with the student approbation of the supervisor" are described in the analysis of the virtual seminar process from an instructor’s view.

Therefore, requirements related to these problems are already formulated and are similar to requirements of this analysis(see: I2 D. R. 21: Concepts to improve the efficiency of the
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recursive process of 'supervisor control, feedback to student, discussion with the student and supervisor approbation' and the communication during this process on a submitted draft by a student are needed).

**Access to literature:** At the beginning of the virtual seminar, the supervisor distributes bibliography and literature to students. Supports of literature include flash media (CD-ROM, USB Memory, etc.), copy of books and reference of bibliography, and are managed on the common workspace of the seminar. Such initial literature helps to understand the topic and is not sufficient for the production of a good report. Problems related to the communication and learning infrastructure namely the worse quality of the connection to internet and the lack of libraries has a negative influence on the quality of the work during the seminar. Furthermore, it is more difficult to reference works of students in the same university or generally in universities in the same country as online bibliography respectively literature.

A model to improve the access to literature both outside as inside the country is already formulated as needs in the interview with the person in charge of the program in the analysis of basic requirements for an eLearning program in Bandjoun. (see I1 U. R. 5: The availability of literatures and the access to its must be supported by the eLearning system.)

**Communication:** The Communication amongst students’ takes place live on campus, through instant messaging services, e.g. yahoo messenger or Skype, e-mail and short text message service by means of a GSM phone. Synchronous audio-visual communication is very difficult with the bad quality of the infrastructures. The culture in Cameroon is characterized by a high emotional interaction between peoples. Students are missing awareness on the virtual environment particularly in the communication tools.

Concepts in order to improve the awareness on the virtual environment particularly communication tools are needed.

I3. U. R. 31: Awareness in the virtual environment particularly the communication tools is needed. Considering the accessibility of GSM network compared to internet, its integration in the teaching and learning process to overcome connectivity respectively communication problems is already formulated as needs in the analysis of basic requirements of eLearning in Bandjoun. (see I1 D. R. 2: Use of GSM Network for overcoming connectivity problems).

The possibility to work or to achieve tasks during the virtual seminar independent of the internet connection and of a special location was a main issue for students. These requirements have been already formulated in previous paragraphs. (see I3 U. R. 28: Flexibility to work anywhere; I1 U. R. 4: Work without need for continuous online connection to internet).

**Collaboration and cooperation:** The collaboration respectively cooperation during the seminar experiments takes place both virtually on the learning platform and physically on campus. The WIKI and forum are used as tools for collaborative and cooperative work. The wiki is used for collaborative work on a document. Didactical concepts based on the wiki as tools for collaborative work are missing. The forum is used for literature recommendation, general questions on topic and organisational issues during the seminar. Substantive issues related to a topic are discussed in face to face meetings on campus. Students feel shame about posting their problems on the forum or generally on common communication tools of the platform. They complain about the lack of private sphere on the platform. The convenience of the communication in a face to face (awareness, etc.) was another reason, which explains the use of forum only for general purposes.

Therefore, the followings requirements are formulated:

I3 U. R. 32: Concepts to support the private sphere of stakeholders on the learning environment are needed.

I3 D. R. 33: Concepts to support collaborative and cooperative activities amongst students
2. Problem and Requirements Analysis

are needed.

Task and event coordination: The communication among the participants in order to coordinate appointments, tasks and events mainly happens through short text message service (SMS) and mails.

Requirements related to tasks and events coordination are similar to requirements formulated in the analysis of the process of virtual seminar from an instructor view. (see I2 U. R. 23: Concepts to manage both tasks and events posted by the supervisor and schedule of students are needed; I2 U. R. 24: Communications medium for the synchronisation of appointments must take the infrastructure problems (computing and communication) in Bandjoun into consideration.

2.4. Summary of requirements

This section summarizes requirements formulated by stakeholders involved in the field study. These requirements are organized into functional and non functional requirements.

2.4.1. Functional requirements

Person in charge of the eLearning program

- I1 D. R. 1: eLearning system must deal with instability of power supply.
- I1 D. R. 2: Use of GSM Network for overcoming connectivity problems.
- I1 D. R. 3: All system components must be able to run on hardware with low performance.
- I1 U. R. 4: Work without need for continuous online connection to internet.
- I1 U. R. 5: The availability of literatures and the access to its must be supported by the eLearning system.
- I1 D. R. 6: Use of new and innovative internet technologies to enhance creativity, information sharing and collaboration.
- I1 D. R. 7: Concepts to improve the visibility of scientific work performed in institutions of higher education in Cameroon are needed.
- I1 D. R. 8: The eLearning system and its components must be available under the open source licence model.
- I1 D. R. 9: The community for the maintenance and development of the eLearning system must be large and stable.
- I1 D. R. 10: Technologies used to develop the system must be simple.

Instructor view

- I2 U. R. 13: Concepts to support the integration of know-how from the Diaspora in the current process of virtual seminar are needed.
2.4. Summary of requirements

- **I2 U. R. 18**: The model for the assignment of topics to students must be supported or automated by a computer system.

- **I2 D. R. 20**: The system used for the virtual seminar must manage efficiently the several versions of a document related to a subtopic and actions on its.

- **I2 D. R. 21**: Concepts to improve the efficiency of the recursive process of "supervisor control, feedback to student, discussion with the student and supervisor approbation" and the communication during this process on a submitted draft by a student are needed.

- **I2 U. R. 22**: Concepts to support the communication particularly in asynchronous modus between the supervisor and the student in structured way during the seminar are needed.

- **I2 U. R. 23**: Concepts to manage both tasks and events posted by the supervisor and schedule of students are needed.

- **I2 U. R. 24**: Communications medium for the synchronisation of appointments must take the infrastructure problems (computing and communication) in Bandjoun into consideration.

- **I2 U. R. 25**: Technologies respectively concepts to support the presentation, discussion and moderation taking into consideration the distribution of students and supervisors and the lack of infrastructure are needed.

**Students view**

- **I3 U. R. 27**: Students must be able to work on any computer independent of a location.

- **I3 U. R. 31**: Awareness on the virtual environment particularly the communication tools are needed.

- **I3 U. R. 32**: Concepts to support the private sphere of stakeholders on the learning environment are needed.

2.4.2. Non Functional requirements

**Person in charge of the eLearning program**

- **I1 U. R. 11**: Concepts to deal with the problem of lacking human resources in term of supervision are needed.

**Instructor view**

- **I2 D. R. 14**: The modified model of virtual seminar with its didactical approach, goals and expectations must be introduced to stakeholders involved in the process, especially to students.

- **I2 D. R. 15**: The integration of topics proposed by the industry and by experts out of the campus in the virtual seminar is needed.
2. Problem and Requirements Analysis

- I2 U. R. 16: The profile of a student to work on a special subtopic must be taking into consideration.
- I2 U.R.17: The model for the assignment of subtopics must take into consideration the priority of students to choose a subtopic and deal with conflicts on a subtopic.
- I2 D. R. 19: Concepts or methods to control the participant’s evolution during the virtual seminar and if necessary to take corrective action are needed.
- I2 D. R. 26: Measures to improve the acquisition of key qualifications (techniques of presentation, rhetorical skills, teamwork, etc.) by students are needed.

Student view

- I3 D. R. 28: Clear and explicit formulation of expectations of the virtual seminar and the evaluation criterion.
- I3 U. R. 29: The proposition of topics by students must be taking into consideration.
- I3 U. R. 30: Topics for the virtual seminar must be selected on the basis of their actuality and practical orientation.
- I3 D. R. 33: Concepts to support collaborative and cooperative activities amongst students are needed.
3. State of Art of Relevant Research

This chapter presents the state of the art of research relevant for the realization of virtual seminars in Cameroon. Subsection 2.1.3 presented the seminar concept proposed in this thesis. The proposed model of seminar is qualified as blended learning and addresses the lack of infrastructure and human resources in institutions of higher education in Cameroon (see 2.1.3). The conceptual solution is covered in detail in chapter 4 and consists of a social component, which encompasses a didactical model and a process model, and a technical component, which realizes the learning environment for implementation of the virtual seminar. The structure of this chapter is geared to components of this model. The first section of this chapter presents the state of the art related to the "social component" of the proposed model and the second section presents the state of the art related to system architectures, technologies, and tools for the implementation of the learning environment. The last section summarizes related work.

3.1. Social components for the realization of virtual seminars

Learning is a process which combines emotional, cognitive, and environmental factors and experiences in order to acquire, enhance, and make changes to an individual’s skills, knowledge, values, and views [AboutLearn, web2010]. While learning theory is an attempt to describe how people learn, instructional design creates detailed specifications for the development, implementation, evaluation, and maintenance of situations that facilitate the learning of both large and small units of subject matters at all levels of complexity [PenState, web2010]. The following subsections introduce first the learning theories underlying the realization of virtual seminars and the state of the art of didactical approaches and methods for their realization. Afterwards, several approaches for the specification of the instructional design of virtual seminars are presented. Finally, current standards used for the design and specification of the virtual seminar processes close this subsection.

3.1.1. Learning theories and didactical approaches for virtual seminars

Behaviourism, constructivism and cognitivism are three commonly used educational theories. Behaviourists view learning as a sequence of stimulus and response actions in the learner. They view the teachers or instructor’s role as one of modifying behaviour by setting up situations whereby learning is reinforced by the desired responses being exhibited [Taylor, 2004]. Behaviourism is applied in different educational areas including systems approach, computer-assisted learning, development of objectives, etc. In instructional design, the curriculum and behavioural objectives include learning tasks divided (chunked) into distinct quantifiable tasks through analysis. Pavlov, Watson, Thorndike, and Skinner are some key researcher in the development of the behaviourist theory (see Watson and Rayner, 1920). Behaviourism was the predominant learning theory for the first half of the twentieth century. The theory focussed only on observable behaviours. Thinking processes occurring in the mind or other unobservable phenomena were not considered.
3. State of Art of Relevant Research

Cognitivism extends behaviourism in that it deals with the internal mental processes of the mind and how these processes could be used to endorse effective learning. Behaviourism breaks tasks into small steps and/or chunks, which are then used to shape the learner’s behaviour. These chunks of information are then used to enlarge learning in an instructional design curriculum. Information is then organized and delivered or taught from the most simple to the most complex depending on the learner’s prior schema or knowledge. Cognitivism plays an important role in organizing information, using metaphors and arranging information from simple to complex in instructional design. Dewey, Piaget, Vygotsky, and Gagne are some researchers associated with the cognitivism theory.

The ability to solve practical problems of the everyday-life by learners is emphasized in the constructivist approach. According to the constructivists’ beliefs, learners construct their own reality or at least interpret it based upon their perceptions of experiences so an individual’s knowledge is a function of one’s prior experiences, mental structures, and beliefs that are used to interpret objects and events. "What someone knows is grounded in perception of the physical and social experiences which are comprehended by the mind" (see [Jonassen, 1991]). Constructivism principles in instructionally design curricula are applied in the use of hypertext and hypermedia where the learner can gain access to a wider area of learning by controlling what elements they access. Major players of the constructivist theory include Malcom Knowles, Carl Rogers and David Kolb (see [Wilson, 1997b]; [Wilson, 1997a]; [Jonassen, 1991] and [Merrill, 1992]).

The development of information and communication technologies in the last decade considerably changed the way we communicate, find, use, and share information. "Connectivism as a learning theory for the digital age" has been developed by George Siemens and Stephen Downes based on their analysis of the limitations of behaviourism, cognitivism and constructivism to explain the effect technology has had on how we live, how we communicate, and how we learn (see [Downes, 2010]). Donald G. Perrin executive Editor of the International Journal of Instructional Technology and Distance Learning says the theory says the theory "combines relevant elements of many learning theories, social structures, and technology to create a powerful theoretical construct for learning in the digital age" (see [Siemens, 2005]). This theory assumes that learners can exponentially improve their own learning by plugging into an existing network. "Knowing where to find information is more important than knowing information" [Siemens, web2010a]. The ability to find, collect, connect, and sort information among a multitude of humans and computer network is in centre of the theory.

While the first three theories presented above are dominant in classical institution of higher education in Cameroon, the new generation of students and some responsible involved in eLearning programs embrace the connectivism approach. Subsection 2.1 presented the general context of eLearning in Cameroon and subsection 2.1.2 presented current approaches for the realization of virtual seminars. The socio-technical context, which underlies the realization of the seminar, the didactical goals and expectations for its realization, its integration into curricula, its structure and the stakeholders involved in the process and their respective roles were covered in detail in that subsection. Subsection 2.1.1 presented the historical development of the seminar in Europe particularly in Germany, several metaphors or didactical approaches used to realize virtual seminars, and an approach for their classification.

The state of the art covered in this section focuses on results and experiences for the realization of virtual seminars in Germany. [Hornbostel, 2006] and [Schulmeister, 2002] present didactical concepts for the realization of virtual seminars derived from the classical seminar. [Mason, 1998] proposes a model for the classification of seminars according to tutorial support and transmission of content. Subsection 2.1.2 presented the current approach of seminars in
3.1. Social components for the realization of virtual seminars

Cameroon according to the classification of Manson and metaphors proposed by Schulmeister. [Meier, 2003] develops a didactical framework for the preparation of classical seminars, which can be adapted and used within the scope of virtual seminar. [Heino and Kraft, 2003a] analyses synchronous online seminars and proposes methods and didactical approaches for their realization. [Heino and Kraft, 2003b] analyses several aspects of online seminars including supervision, instruction design, success factors and proposed methods for the realization of virtual seminar. [Häfele and Maier-Häfele, 2004] presents practical methods and strategies for the realization of online seminars. [Salmon, 2002] developed methods qualified as e-activities to enhance active and participative online learning by individuals and groups. The different approaches proposed by researchers enumerated above provide a basis for the development of methods and strategies for the models proposed in this thesis. Firstly, these approaches must be adapted to specific requirements of the application context. Time defined to perform activities and processes, the formulation of tasks, the organisation of stakeholders, the technical support for the realization, and the intended goals are several aspects, which must be adapted to the specific requirements of the type of virtual seminar developed in this thesis. [Hesse, 1996a] and [Hesse, 1996b] analyse the structure and the development of the participation and interactions among stakeholders in virtual seminars. [Heino and Kraft, 2003a] analyses didactical requirements and organisational forms of the interaction in group. [Bett and Gaiser, 2006], [Mason, 1991] [Salmon, 2004] and [Schneider, 2003] focus on the moderation of online activities qualified as eModeration and propose several models and guidelines. The diverse interactions and participation models developed by these researchers assume that there is a geographic distribution of students involved in the learning process. Furthermore, the socio-technical aspects such as the learning culture of involved stakeholders and the technical infrastructure to support the methods are not considered. Requirements of the socio-technical context in Cameroon were covered in detail in the previous chapter. The interaction, participation, collaboration, communication and organisation models proposed by the researchers enumerated above must be adapted to requirements of the virtual seminar in Cameroon.

[Gerdes, 2003], [Apel and Kraft, 2003], [Caroli and Zandner, 2000] and [Boos and Jonas, 2002] present approaches for the preparation, conception and realization of online seminars. [Friedrich et al., 2001] propose a framework for the design and evaluation of virtual seminars which builds on the general process-product model of instructional research developed by [Brophy and Good, 1986] and [Dunkin and Biddle, 1982]. The extended framework retains three levels as relevant for net-based learning respectively virtual seminars: inputs, processes, and outcomes. Processes can be viewed as dependent on inputs, and outcomes as dependent on inputs and processes (see [McGrath and Hollingshead, 1994]). Inputs are the cognitive and motivational learning prerequisites brought to the learning situation by individuals, groups, and the learning environment. There are three types of processes: the interaction of the students with the technology, individual learning process, and the interaction with other persons. Outcomes are the individual and collective results of learning. [Bernath, 2000], [Heidbrink, 2004], [Mittrach, 1999], [Rogalla, 1998], [Caroli, 2000] and [Nistor and Mandl, 2002] present their experiences, problems and outlook regarding the realization of virtual seminars.

[Friedrich et al., 2001] develop a framework for the design and evaluation of virtual seminars. This framework defines a general level of important aspects for the design and evaluation of virtual seminars. Furthermore, it constitutes a basis for the development of specific seminars. It must be adapted to the didactical, social and technical requirements of the usage context. The virtual seminar developed in this thesis and covered in detail in section 4.1 is built on the experience from conducted virtual seminars enumerated above and the framework for the
3. State of Art of Relevant Research

design and evaluation of virtual seminar proposed by [Friedrich et al., 2001]. This framework will be adapted to requirements formulated by stakeholders involved in the virtual seminar process in Cameroon (cf. previous chapter). The distribution of stakeholders involved in the proposed seminar, the learning culture in Cameroon, and the problem of infrastructure were aspects of the learning/teaching context in Cameroon, which must be taken into account by the adaptation of the framework proposed by Hesse.

3.1.2. Instructional design for virtual seminars

Instructional design from a process perspective is defined by [Berger and Kam, 1996] as "the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction". Learning design as a method can be defined as a sequence of activities that stakeholders undertake within the scope of a didactical unit to attain predefined learning objectives including resources and support mechanism provided by a learning environments to perform these activities. This subsection presents the state of art related to approaches for the instructional design of virtual seminars. The presented approaches are based on scripts and belong to the field of CSCL.

According to [Kollar et al., 2006], a script provides individuals with information about appropriate actions within the particular situation and helps them to understand the everyday situations they are involved in a better way. [Dillenbourg et al., 2004] regards scripts as the convergence point between the instructional engineering approach, which dominated learning technologies for two decades, and the socio-constructivist stream. It is a compromise between the constraints usually induced by instructional design and the freedom of collaborative learning. [O’Donnell and Dansereau, 1992] define script as collaboration scenario and explicit didactic contract between the teacher and the students regarding to their mode of collaboration. Furthermore, a collaboration script describes the way students have to collaborate: task distribution or roles, turn taking rules, work phases, deliverables, etc. Concepts and methods to support collaborative interaction among stakeholder in distributed environment are widely discussed in the research community of Computer-Supported Collaborative Learning (see [Fischer et al., 2003]; [Doenmez et al., 2005]; [Weinberger et al., 2005]; [Kollar et al., 2005]; [Schellens et al., 2005]; [Weinberger et al., 2005] and [Haake and Pfister, 2007]).

[Dillenbourg et al., 2004] proposes a framework to conceptualize scripts by defining the script design space, which covers the following facets:

- Design dimension,
- Script schemata, and
- Level of abstraction.

The design dimension describes an abstract aspect of the scripts independent of the fact that these scripts are conducted with or without computer support. The design dimension can be structured around the following axes:

- Granularity: Granularity defines the variation of the script along the time scale (normally from 30 minute to a semester) and on the grain size of sub-task definition.
- Coercion degree: the degree of freedom that participants have in following a script represents the coercion degree. Several aspects of Script schemata are at the highest level of abstraction and describe the script structure. It expresses what is common to various scripts that belong to the same category or class.
3.1. Social components for the realization of virtual seminars

[Laru, 2004] list several script schemata illustrated by different families of scripts. The level of abstraction structures and presents scripts as variations of generic templates with a set of attributes. [Jermann and Dillenbourg, 2003] distinguishes between four levels of abstraction: Script schema, class, instance and session. The schema as the highest level of abstraction was presented in the paragraph above. Scripts classes are constructed from a script schema. A class covers a range of scripts that represent acceptable variations of a prototype. The core principles of the class have to fit to the schema and cannot be modified without affecting the efficiency of the script. A script instance is a prototype of a script initialized with a specific content. A script session is the most concrete form of a script instance and is defined within the scope of a didactical activity (seminar, lecture, exercise, etc.). Details like dates, name of participants and duration of tasks that are relevant for running the script in a specific session are defined in the script instance.

The modelling and standardization of scripts aims to improve re-usability and portability between different computer-supported learning platforms. [Dillenbourg et al., 2004] proposes a framework for the modelling. The framework considers scripts as a sequence of phases, each characterized by four attributes

- Type of tasks to be accomplished,
- Group formation and composition (number of participants, formation rules, etc.),
- Distribution of tasks within and among the group (subtasks, roles), and
- Type and mode of interaction (e.g. co-located vs. remote, synchronous vs. asynchronous, text-based vs. voice based, etc.).

In this approach, attributes can change from phase to phase. The tasks distribution consists of the allocation and re-allocation of roles and activities, the allocation of physical or virtual resource.

[Jermann and Dillenbourg, 2003] extended the scope of collaboration scripts from small group interaction to a whole class. Scripts in this approach encompass more than small group interaction. While collaborative activities constitute the core learning mechanism, "integrative scripts" also include individual and class-wide activities. The technical system supports the interaction within a script, which integrates physical with virtual activities and manages the data flow between them. [Kollar et al., 2006] analysed scripts from two research traditions: CSCL and instructional psychology. They identify five components, which characterize and differentiate a script:

- Objective of the script,
- Activities supported by the script,
- Sequencing of tasks,
- Roles within the script, and
- Type of representation of the script.

Scripts from both traditions did not differ much concerning the types of activities, which are supported (constructing argument, explaining, etc.). While scripts from instructional psychology have a focus on how to carry out these activities, CSCL scripts made use of computer mediated communication to support smooth and coherent communication and coordination.
3. State of Art of Relevant Research

during activities. The conceptual framework proposed in this thesis integrates the five components listed above. Objectives are reached by engaging groups in defined sets of activities. These activities are distributed among learners as distinct or a bundle of activities in the form of roles. Activities and roles are linked by specific sequences that follow a strategy and lead to the solution of certain tasks.

Kobbe, 2005 integrated several aspects concerning the specification presented above and refined his framework for structural compositions of scripts. He distinguishes between component and mechanism. Scripts in this approach can be described by the following components:

- Individuals that participate in a script,
- Organized group,
- Activities to be performed,
- Roles assumed within a script, and
- Required resources.

Script mechanisms help to describe the distributed nature of scripts. They describe how participants are distributed in groups (group formation), how components are distributed among participants (component distribution), and how both components and groups are distributed over time (sequencing). The framework for the specification of the learning design of the virtual seminar proposed in this thesis is based on models developed by researchers discussed above. These models are adapted to fit to the didactical model developed for the seminar and the process model discussed during the phases of empirical analysis. The resulting framework extends models discussed above with the consideration of requirements formulated by stakeholders of the empirical analysis and defines new abstraction levels for the modelling and design of virtual seminars. The framework is presented in subsection 4.2.2.2.

3.1.3. Approaches for the specification of instructional designs

The design and development of learning technology specifications is a global issue. Table 3.1 presents major organizations with their standards:

While the standards presented in table 3.1 focus on the design and specification of learning objects to improve the interoperability between different education systems or learning environments, the following standards focus on the design and specification of learning activities. They characterise and normalise how learning activities can be structured according to the needs, the specific actions and the performance of different users:

- Agostinho et al., 2002 developed a standard format for describing designs that have been extended and applied across education sectors. The standard learning design format provides textual information about how the design was derived from theory and/or practice, the research or evaluative evidence to support the approach, guidance about how it should be implemented, and suggestions for how the design might be adapted to other learning contexts. This description is accompanied by a graphical representation which illustrates the learning design as it is experienced by a learner. This learning design format makes it possible to represent any learning experience of any granularity in the form of a document (see Koper and Tattersal, 2008).
### 3.1. Social components for the realization of virtual seminars

**Table 3.1.: eLearning standardization organization and respective standards [Boher, 2005]**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Standard</th>
</tr>
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<tbody>
<tr>
<td>IEEE (see [IEEE, 2010]) – Institute of Electrical and Electronic Learning</td>
<td>LOM – Metadata standard for re-usability and interchangeability of LO’s</td>
</tr>
<tr>
<td>US Government (see [ADL, 2010] ) – Advanced Distributed Learning (ADL)</td>
<td>SCORM – Metadata specifications and content structure modelling</td>
</tr>
<tr>
<td>European Union (see [ARIADNE, 2010] ) – Alliance for remote Instructional Authoring and Distribution Network for Europe - EU</td>
<td>ADRIANE – Metadata Standard for Interoperability - now nearly integrated in LOM</td>
</tr>
<tr>
<td>European Union (see [ARIADNE, 2010]) – CORE Metadata Initiative</td>
<td>DC – Metadata specifications and content structure modelling - now integrated in LOM</td>
</tr>
<tr>
<td>International organisation – Aviation Industry CBT Committee (see [AICC, 2010])</td>
<td>AICC – Content structure modelling.</td>
</tr>
<tr>
<td>International organisation – Aviation Industry CBT Committee (see [AICC, 2010])</td>
<td>IMS – Metadata specifications Content Packaging Specification</td>
</tr>
<tr>
<td>US private company – Information Management Systems (see [IMS, 2010d])</td>
<td>Learning Design Information Model</td>
</tr>
<tr>
<td>IEEE (see [IEEE, web2010])</td>
<td></td>
</tr>
</tbody>
</table>

- **Simple Sequencing Information and Behavior Model:** The specification developed by the IMS (see [IMS, 2010c]) is based on the fact that sequence and choice of "Learning Objects" to be presented are determined by predefined parameters. These parameters can be the pre-test score marks, the predefined sequence of elements and child elements, the learner’s choice, the learner’s performance at a specific task or learning objective, and others.

- **Educational Modelling Language (EML):** It is a notational system developed by the Open University of the Netherlands (OUNL) in the late 1990s and intended to describe a wide variety of instructional models (for example, Competency Based Learning, Problem Based Learning). EML underlies many different behaviourists, cognitive and (social) constructivist approaches to learning and instruction. It describes not just the content of a unit of study (texts, tasks, tests, and assignments) but also the roles, relations, interactions and activities of students and teachers. The model revolves around describing ‘units of learning’ (e.g. courses, course components and study programmes), atomic or elemental units providing learning events for learners, satisfying one or more interrelated learning objectives (see [Hummel et al., 2004]).

- **IMS Learning design:** It is based on the work on EML. IMS Learning Design is a meta-language for describing learning designs that claims to be pedagogically neutral (according to their authors, it does not mandate a specific pedagogical approach). The specifications were developed around following principles (see [Koper and Tattersal, 2008]):

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3. State of Art of Relevant Research

- People act in different roles
- Roles work towards specific objectives by performing learning and/or support activities
- Activities are conducted within an environment consisting of learning objects and services

Element and structures of the IMS LD are not sufficient to model all structures, elements and processes of the framework for collaborative scripts developed in this thesis. However, IMS LD is flexible and can be extended to specific requirements. Several elements and structures are added to the IMS LD specification in subsection 4.2.2.2 in order to model the entire process of the proposed type of virtual seminar according to the proposed framework.

3.2. Implementation of learning environments for the realization of virtual seminars

Environments used for the realization of a virtual seminar depend on the didactical approach chosen for modelling the teaching/learning processes. Table 2.1 presented didactical methods based on classical seminars, which are used to process virtual seminar. This subsection presents the state of art of technical systems used for the realization of virtual seminars. First, architectures which underlie the implementation of learning environments are presented followed by technologies respectively tools for supporting teaching/learning processes of the virtual seminar.

3.2.1. System architecture

Architectures for the implementations of learning environments for the realization of virtual seminars can be classified into centralized and decentralized systems.

Centralized systems are web based platforms using the client server architecture. They are monolithic systems or integrated environments, which manage and render contents to students. They assume that eLearning is organized and managed within an integrated system. Different components or tools are integrated in a single or monolithic system which provides the necessary features to run and manage an eLearning course. All learning activities and materials in a course are organized and managed by and within the system. They are qualified as virtual learning environments or learning management systems and provide the following features:

- Management of stakeholders involved in the learning/teaching process;
- management of student rosters;
- controlling of access;
- support for the communication, cooperation and collaboration among stakeholders
- management, organization and delivery of contents;
- support for test and assignment;
- Monitoring of students learning experiences and tracking of students progress;
3.2. Implementation of learning environments for the realization of virtual seminars

- Scheduling and management of classes and classrooms related events.

Blackboard, Moodle, Ilia, Sakai, Claroline, and webCT are some popular LMS. Wikipedia, 2010 presents a selection of LMS. eLearning programs in Cameroon are mainly based on Moodle and Claroline (see Tonye, 2010). Chapter 2 presented the platform Claroline used at IUT FV to realize virtual seminars.

The evolution of the web from pure delivery to a communication, interaction and participation platform (WEB 2.0) promotes the emergence of a new generation of applications qualified as social software. Social software’s purpose is dealing with groups, or interactions between people. This evolution changes the way we communicate, find, and use information considerably. Connectivism as learning theory presented above is based on the evolution of information and communication technology (ICT) and the way we use it to learn. The new generation of applications based on the evolution of ICT provides a good solution for the integration of the expertise of the Diaspora in the teaching-learning process in institutions of higher education in Cameroon. These applications can be used to improve the teaching-learning process and to reduce the problem of lacking human resources in academic institutions. The potential of this software in the eLearning context in Cameroon questioned the use of integrated LMS and provoked more specifically the integration of social software in current LMS. Some LMS are built on modular architecture, which allows the integration of legacy system. This integration does not provide the optimal solution because further aspects such as pedagogy must be taken into consideration. Use and organization of tools within eLearning can be approached in different ways depending on the chosen pedagogy (see Dalsgaard, 2006). Levine, 2010, Blackall, 2010; Wilson, 2010; Siemens, 2008 and Anderson, 2006 discuss the problem of integration vs. separation depending on pedagogy. Koper, 2005 described the allure and promise of alternative learning models not based on management, but based on increased learner control: ‘Self-organised learning networks provide a base for the establishment of a form of education that goes beyond course and curriculum centric models, and envisions a learner-centred and learner controlled model of lifelong learning. In such learning contexts learners have the same possibilities to act that teachers and other staff members have in regular, less learner-centred educational approaches. In addition these networks are designed to operate without increasing the workload for learners or staff members. This model does not exclusively replace traditional learning approaches, but does provide greater alignment with the emerging work-life Learning triad. Instead of learning housed in content management systems, learning is embedded in rich networks and conversational spaces. The onus, again, falls on the university to define its views of learning’.

The model proposed by Koper fits to the approach of Personal Learning Environment already introduced before and is implemented in a decentralized system. A PLE can be defined as a system that helps learners take control of and manage their own learning. This includes providing support for learners to set their own learning goals, manage their learning, manage both content and process, and communicate with others in the process of learning (see Alan, 2010). Rather than integrating services into centralized system, PLE provides learners with several services and the flexibility to select, combined and use these services according to their convenience. Applications which implement services provided by PLE are commonly qualified as widgets. Without a pedagogy underlying the use of PLE, they can be considered as user friendly systems which allow users to communicate, interact and share data. Therefore, a didactical concept must be developed, specified and implemented on PLE in order to achieved instructional goals. The challenge of the use of PLE to model teaching/learning process of virtual seminars lies on the one hand in the definition and specification of didactical
accentuations of the seminar and on the other hand in the use of appropriate services of the PLE to perform such process. [Palmer et al., 2009] defines a framework of six dimensions for the design and implementation of PLEs. Table 3.2 presents these dimensions and the potential standard for their implementation.

Table 3.2: The dimensions for building web Personal Learning Environments [Palmer et al., 2009]

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Definition</th>
<th>Potential Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen</td>
<td>Organization of several widgets within a PLE in a spatial manner.</td>
<td>W3C Widgets 1.0 Google Gadget API Google Gadget-TabML, Netvibes UWA, OpenAjax Metadata 1.0</td>
</tr>
<tr>
<td>Data</td>
<td>Interoperability of data and metadata across widgets and underlying services Includes issues with cut &amp; paste, drag &amp; drop, data formats, protocols, semantics.</td>
<td>Various Data and metadata standards such as RSS, SCORM, Dublin Core RDF, HTML5 Dn’D OpenAjax Hub 2.0 Google gadget pubsub</td>
</tr>
<tr>
<td>Temporal</td>
<td>Updates to widget configuration, state or data is more or less synchronous with other active users who share the widget instance.</td>
<td>COMET/Reverse Ajax XMPP, XMPP over BOSH Google Wave Federation Protocol</td>
</tr>
<tr>
<td>Activity</td>
<td>The applications in use in the PLE can be controlled through scripts that engage the user into learning activities.</td>
<td>WS-BPEL (business oriented) IMS Learning Design Specification (targeted at VLE and design-time oriented, not runtime)</td>
</tr>
<tr>
<td>Runtime</td>
<td>Cross PLE interoperability allows to exchange one rendering and execution platform or its parts with another metadata specifications.</td>
<td>W3C Widgets 1.0: Packaging and Configuration OPML Open Ajax Mashup Reference Application</td>
</tr>
</tbody>
</table>

3.2.2. Technologies and tools

Technologies and tools supporting virtual seminars are covered in this subsection and are presented according to the didactical model used to perform the seminar and to the system architecture underlying the technical system.

Modules or components of LMS used to perform activities of virtual seminars can be classified according to the process underlying learning/teaching activities. Several categories can be distinguished:

- Communication tools: they are organized into two categories
3.2. Implementation of learning environments for the realization of virtual seminars

- Synchronous tools: Audio/Video conferencing system, share board, real time text system (chat, instant messenger), etc.
- Asynchronous tools: eMail, Forum, etc.

- Collaborative and cooperative tools: wiki, forum, blog, application sharing, shared editor, etc.
- Content Management: content management system
- Events and tasks management tools: calendar, etc.
- Monitoring tools: blog, logs file interpreter.

Generally, the tools presented above are integrated in a learning environment. They are combined to realize a virtual seminar. Claroline and Moodle are LMS used mostly in Cameroon. Subsection [2.3.2] presented the use of Claroline at the IUT-FV for the realization of virtual seminars. Seminars at the FernUniversität Hagen in Germany, which is a distance teaching university in German-speaking countries and regions, are mostly based on the blended learning approach. Face to face meetings are combined with stand alone tools or components of learning management system to facilitate remote phases. CURE (see [Haake et al., 2004]) is used by several faculties to perform blended virtual seminars. CURE is an open source tool that facilitates collaborative learning in distributed teams using standard browsers over the Internet. It is based on combining the room metaphor, WIKI ideas, and communication. Other combinations of tools such as adobe connect [Adobe, 2010b] combined with BSCW, forum, WIKI of learning management systems like Moodle are also used to perform virtual seminars.

[Hemsing, 2008] and [Häfele and Maier-Häfele, 2004] present several methods for the realization of virtual seminars and for each method the corresponding tools for its implementation is presented. [Häfele and Maier-Haefele, 2005] presents a set of open source tools used to perform activities of virtual seminars.

Tools or modules of LMS used to perform activities of virtual seminars can be implemented as autonomous applications or widgets. These widgets are organized or mashed up in a decentralized learning environment according to a specific learning/teaching process. This approach for the realization of seminars belongs to PLE approach. [Wilson, 2008] identifies 77 patterns for the integration of services in a PLE environment. These patterns are based on a wide range of tools:

- Chat and messaging tools: iChat, MSN Messenger, AOL Instant Messenger, etc.
- Groupware and community tools: Groove, ELGG, Colloquia, etc.
- Calendaring, scheduling and time management tools: iCal, Sunbird, TaDaList
- BaseCamp, Google cal, etc.
- News aggregation tools: NetNewsWire, Shrook, etc.
- Weblogging and personal publishing tools: Drupal, Wordpress, Blogger, XJournal, Flock, etc.
- Social software: 43Things, Flickr, LiveJournal, del.icio.us, Furl, Technorati, etc.
3. State of Art of Relevant Research

![Diagram](image)

Figure 3.1.: Functionality mash-ups in a learning context [Severancea et al., 2008].

- Authoring and collaboration tools: SubEthaEdit, Writely, WriteBoard, Synchro, Edit, OpenOffice, Office, zoho, Google docs, etc.
- Integration tools: NetVibes, EyeOS, SuprGlu, Pageflakes, igoogle, etc.
- File storage/distribution: Box.net, Google Docs, etc
- Quizzing/Polling: log Quizz, dakaBuzz, etc.

MacNeil, 2010 presents several approaches for the design of PLE. Godwin-Jones, 2003 presents emerging technologies for personal learning environments. In addition to categories of tools/services presented above, standards and technologies and design models used for the implementation of widgets are presented. The integration of services/tools/widgets in LMS is covered towards the end of the paper.

The problem related to the use of such decentralized application or tools/widgets lies in their integration in a learning context. This challenge is what makes this so much more complex than simple authentication/single sign-on integration. Each service/tool/widget cited this far implements its own interface specification, since few well-developed specifications exist in this area. Severancea et al., 2008 identified a number of important areas that need standardization to implement general purposes functionality mashed-up in learning contexts. Figure 3.1 illustrates these areas.

The needed standards break down into three basis areas:

1. Provisioning to initially establish the learning context and the agreement between the consumer and producer. This is often done by the instructor or owner of the learning context before the first learner can use the learning context;

2. Establishing a user session for an individual joining a particular learning context;

3. Run-time services needed by the producing application and provided by the consumer application.
3.2. Implementation of learning environments for the realization of virtual seminars

No specification has so far established standard in teaching/learning context for the mash-up widgets of personal learning environment. [Severancea et al., 2008] classified the existing standards into language independent standards, JAVA standards and emerging standards.

**Language independent standards**

- **IMS Tool Interoperability 1.0** (see [IMS, 2010a]). This standard is loosely based on a subset of WebCT’s PowerLinks.

- **SAML/ Shibboleth / GuanXi** - SAML are part of the provisioning process for many distributed systems (see [OASIS, 2010]).

- **Web Services for Remote Portals (WSRP) 1.0**. WSRP is a well-designed standard that provides a partial solution to discovery and provides a basic mechanism for mark-up exchange over web services (see [Thompson, 2010]).

- **WebCT PowerLinks** - PowerLinks is a proprietary tool interoperability mechanism developed by WebCT and now owned by BlackBoard (see [Blackboard, 2010]).

**Java Standards**

- **JSR-168: Portlet Specification** - JSR-168 addresses Preferences, Configuration, Identity, CSS conventions and limited AUTHZ (see [Scott, M., 2010]).

- **JSR-170: Java Content Repository** - This standard covers the storage of files, metadata, and properties (see [JSR170, 2010]).

**Emerging standards**

- **Web Services For Remote Portals (WSRP 2.0) and JSR-286 (Portlet API)** (see [Thompson, 2010]).

- **OKI: Open Service Interface Definitions (OSIDs)** (see [OKI, 2010]).

- **IMS Learning Design** - This standard allows the creation of dynamic learning sequences with automated control of the release and sequencing of learning activities (see [IMS, 2010d]).

- **Learning Activity Management (LAMS) Tool Contract** - The LAMS project has developed a REST-style interface that describes the contract between the LAMS learning activity engine and a tool that is to be controlled as part of LAMS (see [OKI, 2010]) LAMS.

- **IMS Learning Tool Interoperability (LTI 2.0)** - The effort to broaden and improve IMS Tool Interoperability 1.0 is just getting underway (see [IMS, 2010a]).

[Chatti et al., 2009] presents another approach based on semantic mash-up as a scalable approach to mash-up widgets on PLE. They present the conceptual and technical details of PLEF-Ext, a flexible framework for mash-up-driven end-user development of PLEs.
3. State of Art of Relevant Research

3.3. Summary

The analysis of the state of the art of didactical approaches for the realization of virtual seminars in Cameroon shows that these are generic virtual didactical units and do not take into account the didactical, the social and technical contexts present in Cameroon. The learning culture, the behaviour of stakeholders involved in the virtual seminar, and the lack of infrastructure for the realization of a virtual seminars are some parameters which must be considered for designing appropriate methods to be successfully employed in Cameroon. The distribution of stakeholders involved in the model of virtual seminar pursued in the thesis is another factor which plays an important role for the design of the didactical model of the seminar. In contrast to the majority of models analysed where stakeholders involved in the eLearning module are distributed, this thesis assumes that students are physically present at one place, i.e. at the university, while the expert or supervisor in charge of the know-how transfer is situated at a remote location. The approaches analysed can serve as basis and must be adapted to meet the requirements identified in chapter 2. The resulting didactical model must be used to design instructional sequences of the virtual seminar. Research performed in the field of collaborative scripts presented above can help to develop a framework for collaborative scripts fitting to the requirements of the didactical and socio-technical context in Cameroon. Standards for the specification of learning objects and learning processes such as those presented above must be adapted or extended in order to allow the specification of the learning design of the seminar on the basis of the developed framework for collaborative scripts. Among the system architectures analysed for the design of the learning environment of the virtual seminar, the personal learning environment represents the most obvious approach for the integration of remote experts in teaching/learning processes of institutions of higher education in Cameroon. The PLE approach may serve as a basis for the design of the learning environment of the virtual seminar. Components and modules of the designed PLE must then address functional requirements formulated in Chapter 2 to help improve virtual seminar teaching in Cameroon.
4. Conceptual Solution for the Realization of Virtual Seminars

This section presents a conceptual solution for the realization of a virtual seminar based on the results of the requirement analysis conducted in chapter 2. The solution consists of the design of a socio-technical system implementing a virtual seminar as proposed in this thesis. The solution defines the following two components:

- The human part respectively social component which consists of the following two models
  - The didactical model covered in detail in section 4.1 describes the didactical approach and method for the realization of the virtual seminar.
  - The process model covered in detail in section 4.2 describes the possible organizational forms of the virtual seminar and their specifications, the involved actors and their interactions during the seminar.

- The support environment respectively the technical component covered in detail in section 4.3 presents the conceptual architecture of the execution environment for the virtual seminar.

4.1. Didactical Model of the Virtual Seminar

The virtual seminar developed in this thesis is based on theoretical concepts for the realization of virtual seminars in Europe, particularly in Germany, and the experience of some universities in Cameroon in the field of eLearning (see subsection 2.1). The theoretical model is adapted from the framework for designing and evaluating virtual seminars developed by Friedrich et al., 2001. Further research on online respectively virtual seminars (Hemsing, 2008, Caroli, 2000, Caroli et al., 2002, Caroli and Zandner, 2000, Mittrach, 1999, and Becking and Bomsdorf, 2004) and experiences from conducted virtual seminars Nistor and Mandl, 2002 in Germany were additional sources for the development of the model proposed in this thesis. This model builds on the general process-product-model of instructional research developed by Brophy and Good, 1986, Dunkin and Biddle, 1982 and adapted to the context of virtual seminars by Friedrich et al., 2001. The extended framework retains three levels as relevant for net-based learning respectively virtual seminar: inputs, processes, and outcomes. Processes can be viewed as dependent on inputs, and outcomes as dependent on inputs and processes (see McGrath and Hollingshead, 1994).

- Inputs are the cognitive and motivational learning prerequisites brought to the learning situation by individuals and by groups and the learning environment.
- There are three types of processes: the interaction of the students with the technology, the individual learning process, and the interaction with other persons.
4. Conceptual Solution for the Realization of Virtual Seminars

Figure 4.1.: Didactical framework of the virtual seminar.

- Outcomes are the individual and collective results of learning.

Figure 4.1 presents the main elements of the framework developed by Friedrich et al., 2001 for the design and evaluation of virtual seminar.

The subjacent problems enumerated by Friedrich et al., 2001 provide the basis for the development of the didactical accentuations of the virtual seminar proposed in this thesis. The proposed didactical framework covers the following aspects to be described in subsections:

- General framework of the virtual seminar: The extent of virtualisation of processes (presence mode at the campus or virtual mode) during the seminar. Furthermore, standards and the context of the virtual seminar with parameters such as target audience, integration of the didactical approach in the curriculum, time required and the workload of the seminar etc are discussed.

- Aims and goals of the virtual seminar: The aims and the goals pursued within the scope of the seminar.

- Didactical accentuations of the virtual seminar: The aspects, which characterise the virtual seminar as an independent didactical unit, consist of:
  - Communication
  - Collaboration, interaction and participation
  - Supervision and monitoring
  - Motivation and learner support
  - Evaluation of the participation of learners
4.1. Didactical Model of the Virtual Seminar

4.1.1. General framework of the virtual seminar

The model assumes physical presence of students at one place, e.g., at the university, in contrast to most of the eLearning programs in Cameroon that are based on geographic distribution of students. The proposed model of the virtual seminar addresses the crucial lack of infrastructure and of human resources present in academic institutions in Cameroon. The integration of knowledge from the Diaspora and the adaptation of the concept of supervision with its distribution at different levels (technically and organizationally) and location addresses the lack of expertise respectively the problem of human resource. While the remote expert takes the pedagogical and intellectual role in the process and is in charge of the know-how transfer from his location to the participants, the local supervisor may help to manage organizational tasks on campus. Referring to the lack of infrastructure, the architecture of the intended technical system must match local realities. The proposed model of the virtual seminar uses a high level of asynchronous interaction between the remote expert and the local stakeholders on the campus. The whole approach can be qualified as a "Blended Learning Seminar" (see 2.1.3). The current approach of virtual seminars in technical faculties in Cameroon takes place within the scope of a course and aims to deepen the comprehension of some aspects of a lecture. The proposed model of the thesis extends and redesigns the current approach in Cameroon to a complete and independent didactical activity. The target audience of the seminar is extended to students of undergraduate and graduate study programs of any faculties. The number of participants in a seminar and the whole time allocated for this seminar depends on the availability of the remote expert. The higher the number of participants and the more time is needed for a seminar, the higher will be the cost for the remote expert in terms of supervision. A remote expert in the context of this work is a person living outside of the country with an expertise in a specific area. Generally, these experts are part-time or full-time employees in their residence country. For the efficiency in terms of supervision, participants vary from six to sixteen persons and the period allocated for the whole seminar from four or six to eight weeks according to the availability of the remote expert. Participants are distributed in small groups with the following partitioning schema:

- 6 participants are distributed into two groups of three persons
- 9 participants are distributed into three groups of three persons
- 12 participants are distributed into three groups of four persons or in four groups of three persons
- 16 participants are distributed into four group of four people

The subtopics of the global theme covered within the scope of the seminar correspond to the numbers of participants. The seminar can be considered as a compact and intensive didactical unit. Despite these facts, the proposed model of a virtual seminar is no longer a marginal or complementary form of learning alongside self study, lectures or other forms of learning; instead it is a complete and independent didactical activity, which is integrated as a module into the educational program (bachelor or master). In order to achieve the intended goals enumerated in the subsequent section, the virtual seminar must be integrated in the educational program and the active participation of the involved stakeholders must be obligatory, standardized and well defined.

Table 4.1 presents some aspects of the virtual seminar as independent didactical units in the context of a bachelor/ master program.
4. Conceptual Solution for the Realization of Virtual Seminars

<table>
<thead>
<tr>
<th>Module Information: virtual seminar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module Structure:</strong></td>
</tr>
<tr>
<td>1- Time: 4 - 6 weeks</td>
</tr>
<tr>
<td>2- Faculty: Open</td>
</tr>
<tr>
<td>3- Credit: 4</td>
</tr>
<tr>
<td>4- Workload: 120 Hours</td>
</tr>
</tbody>
</table>

Table 4.1.: information about the module virtual seminar

4.1.2. Aims and goals of the virtual seminar

Aims of the proposed concept are ranging from the acquisition of knowledge and key qualifications to change of attitudes, values and beliefs according to the effects of learning in a virtual seminar as identified by [Gagne, 1984].

Acquisition of knowledge: One of the main didactical objectives of the seminar is to support the learner in the acquisition of scientific insight, besides the presentation and the discussion of the results of scientific work, in other words to educate future scientists. The organisation of the learning materials and the instructional design supports students in the acquisition of knowledge in the topics covered within the scope of the seminar. The instructional goals are:

- Learning how to gain access to scientific work respectively literature;
- Improving the ability to read, understand and summarise content of scientific texts;
- Learning how to write a synopsis/ résumé/ abstract of a scientific text;
- Learning how to discuss the achieved results and outcomes;
- Introduction and comprehension of a complex theme divided and handled in sub topics

The achievement of these goals can be evaluated by looking at a scientific article produced by participants as result of the virtual seminar and their presentation and discussion behaviour. The book of articles which is a product of the seminar, does not cover original research, rather it accumulates and analyses literature, formulates, justifies and validates hypothesis, explains and presents the results of different sources on a particular topic in a coherent narrative way. References to the original research are provided. Ideally, the covered topic must introduce or deal with a practical problem in order to improve the application of the gained knowledge to concrete situation. The structure of the paper follows the AIMRaD acronym used by most scientific journals.

- **Abstract**: which summarizes the paper
- **Introduction**: why and where was the study undertaken? What was the purpose?
- **Materials & Methods**: how was the study done? What materials and methods were used?
- **Results**: what did the study find?
- **Discussion**: what is it about, why is this topic important? What are the follow-up measures?
  And, last but not least: how does it relate to other research?
4.1. Didactical Model of the Virtual Seminar

The review paper provides the basis for the evaluation of the acquisition of knowledge.

**Acquisition of key qualifications:** In addition to the acquisition of knowledge, the proposed model of the seminar intends to improve key qualifications of participants by jointly writing the book of publication. The following qualifications are concerned:

- Problem solving heuristics
- Strategies and techniques of self regulated learning
- Teamwork
- Rhetoric competences
- Communicative and cooperative competence.

The didactical accentuations of the proposed model put the learner in the core of the process and focus on his/her needs and responsibilities. The instructional method changes from teacher to student centred activities with the assignment of tasks to working-groups. Collaborative scripts support the participants in the acquisition of key qualifications in the phases of the seminar. The following sub-chapter gives more details about the didactical accentuations of the seminar in order to achieve the intended goals.

**Move from presence to virtual based learning and teaching:** The brain drain and its consequences in development countries particularly in the academic institutions (i.e., as a loss of important human resources) requires the development of new learning and teaching concepts in order to face this big challenge. Paradigms, such as the "African Diaspora Computer Supported Collaborative Working and Learning", offer new approaches for the reduction of the negative consequences of the brain drain syndrome. Net-based communication technologies are ascribed as a potential to enable the formation of virtual learning communities (see [Bielaczyc and Collins, 1999]). Innovative interaction possibilities between Africa and the Diaspora exist and knowledge or expertise can regardless of their location be transferred to remote, isolated and disadvantaged areas in Africa. If learners participate in such communities and can communicate with experts, it can lead to socialization effects in the respective community (see [Brown et al., 1989]). Group related learning effects, e. g., the transformation of individually distributed knowledge and skills into shared knowledge and skills among the members of the community may take place. The move from presence to virtual based learning with support of an expert from the Diaspora is mainly based on the integration of social media.

4.1.3. Didactical accentuations of the virtual seminar

The didactic model is grounded on constructivist and "connectivism" (see and [3.1.1]). The pedagogical methods for the transformation of instructional aims and contents into social interaction is based on principles developed by [Roblyer et al., 2003]. These methods are based on the following principles:

- A change from the teacher-centred to the student-centred activities, i.e. less lecturing and presentation and more assisting and coaching.

Social media describes a new set of internet tools that enable shared community experiences, both online and in person. These tools make it easier to create and distribute content, and discuss things the community cares about.
4. Conceptual Solution for the Realization of Virtual Seminars

- Fewer "whole-class" and more small-group activities.
- An appropriate combination of individualised competitive situation and cooperative activities.
- More activities which include real world problems - requiring interdisciplinary approaches and multiple resources in the group.
- Self regulated learning and self control.
- Standardization and formalisation of learning process in presence mode both at the individual and at the group level.
- Standardization and formalization of the interactions among the stakeholders of the seminar.
- Asynchronous interaction between the remote expert and the participants.

The model proposed in this thesis implies the participation of students both at the individual level and at the group level. Scripts for collaborative learning (see 4.2.2.2) are used to structure the net based group work. The implementation of principles enumerated before requires "learning tasks" that stimulate the students’ cognitive interaction with the topic and promote cooperation and communication among them. These tasks require the participation of students during the process from different perspectives respectively roles. The method of role-play is used to scaffold the interaction in several phases of the seminar. Role-plays are widely used and described in pedagogy as well as in psychotherapy as a method of social group-work where real life situations are simulated. The importance of roles on group efficiency in the context of eLearning is reported by [Strijbos et al., 2004]. The roles within the process respectively instructional tasks are organized according to the metaphor of writing a 'Book of publications'. In the 'Book of publication' metaphor, the participants of the seminar adopt roles related to a team of experts in charge of the publication of a scientific article, e.g., author, reviewer, manager of the team, etc. From the author’s point of view, these roles are connected to the task of formulating a hypothesis, validating it, justifying, explaining and presenting it to a small group or to a big audience. From the reviewer’s point of view, these roles are connected to the task of evaluating similar work, formulating critic, commenting and appreciation. From the manager of the team point of view, these roles are connected to the task of organisation and management of cooperative and collaborative activities, and representation of the team. The participants view the process in this approach from an insider’s point of view and place themselves consecutively in several roles and in the place of someone else. In this way, the acquisition of key knowledge and key qualifications can be achieved. Furthermore, the use of metaphor and roles ensures a great deal of communication and cooperation among the participants, and thus counter typical shortcomings of a seminar, e.g., lack of interest in work of other students.

The blended learning approach proposed for the seminar addresses the problem of infrastructures analysed in section 2.3.3. The model of the seminar is qualified as an "asynchronous off-line learner centric" approach of learning. It supports the learner in controlling the learning process, content and services in a technical environment independent of an internet connection. The person in charge of the program offers content, service and teaching but the control of the process is delegated to the learner within his personal learning environment. The application of this model implies a decomposition of learning activities in the virtual seminar.
4.1. Didactical Model of the Virtual Seminar

process into asynchronous sub-processes, which are supported by a technical system and performed in an environment independent of an internet connection. The model addresses the limited availability of remote experts by restricting their active participation in organizational and managerial tasks, which are delegated to participants. The expert is only involved in the supervision of the learning process and the effective transfer of know-how.

The didactical framework as part of the global solution presented in this thesis addresses many other aspects such as communication, collaboration, interaction and participation, supervision and monitoring, motivation and learner support, and evaluation of participation of learners. These aspects are presented in detail in the following.

4.1.3.1. Communication

On an abstract level the communication process during the seminar can be divided into synchronous and asynchronous forms according to the blended learning approach pursued within the scope of the seminar. Synchronous communication is characterised by the immediacy of mutual interaction while asynchronous communication has a greater temporal flexibility. The proposed solution is designed to combine the effectiveness and flexibility of virtual communication with the simplicity and effectiveness of face-to-face communication. The interaction among the stakeholders of the seminar present in the same geographical place (local responsible for the seminar, participants or among each other), e.g. university campus, takes place in a synchronous form. The interaction among distributed actors (remote expert responsible for the seminar and the participants) and in cooperative virtual work processes takes place in asynchronous form and are supported through various communication technologies. Further characteristics of the communication during the seminar can be organised according to the media attributes (see media theory in [Daft and Lengel, 1986], [Dennis and Valacich, 1999]):

Symbol variety: Symbol variety refers to the availability of different symbol systems to exchange messages. Symbol variety of video conferencing is high (compared to text based communication) because verbal and non verbal symbols are transmitted in video conferences. This is appropriate in social processes of negotiation and conflict resolution during the seminar. The interaction between distributed actors during the seminar has a low symbol variety and is predominantly textual. The technical system can provide tools to extend the symbol variety of textual communication between the distributed stakeholders. This will improve supervision and monitoring during the virtual seminar.

Direct Feedback: Direct Feedback refers to the communication situation in which rapid mutual correction is required, e.g. for delicate or easily misunderstood communication. This attribute is associated to collaborative and cooperative work of actors in the same geographical area in order to improve critical interaction between distributed stakeholders.

Parallelism: In context of this work, parallelism refers to the capability of the technology to support simultaneous interactions between group members, e.g. as in asynchronous forum. All participants may participate without production blocking; subtasks can be completed in parallel. This increases productivity within the groups.

Reprocessability: Reprocessability refers to the possibility to repeatedly process a message to ensure that the recipient has properly understood it. A particular form of reprocessability is rehearsability, which is associated with text based asynchronous communication. This is particularly important during remote supervision for subjects dealing with complex content.

Sequencing: Sequencing refers to the possibility to follow the persistent thread of a discussion. The interaction between distributed stakeholders can be seen as a conversation even...
4. Conceptual Solution for the Realization of Virtual Seminars

if it takes place in asynchronous form. This is particularly useful for remote supervision and the evaluation of the quality of the exchange during the seminar.

The technical system used to support the communication during the seminar should provide the following features:

- remote monitoring and coaching of individuals and groups,
- collaborative work in groups,
- interaction of the learner with the subject matter, and
- support for the achievement of learning objectives, the pedagogical method and the didactic concept.

4.1.3.2. Collaboration, interaction and participation

In Vygotsky’s view, development is conceptualized as the process by which people grow into intellectual life through interaction with those around them (see [Vygotsky, 1981]). The learner in the context of the seminar is no longer the individual but also part of the group with its cognitive and emotional learning prerequisites. Such collective learning prerequisites include the distribution of specific competence, prior knowledge and role, common goals, the prevailing emotional climate in the group or the relationship between one group and other groups (see [Dennis and Valacich, 1999]). Collaboration itself does not necessarily yield learning [Dillenbourg et al., 2004]. Collaboration indicates that effective collaborative learning requires that students engage in a well defined plan of how they should form groups, how they should interact and collaborate and how they should solve problems. Learning scripts provide the basis for standardization and structuring of the collaborative interactions among the stakeholders within the scope of the seminar (see 3.1.2).

Subsection 4.2.3 presents in detail the basics of collaborative learning scripts and appropriate scripts to be used in the phases of the proposed virtual seminar process.

The proposed interaction and participation model introduces a new paradigm of learning, which moves from presence to virtual based learning and extends teaching by the integration of know-how from the Diaspora. This approach addresses the consequences of the brain drain in terms of human resources for institutions of higher education in development countries. The model is based on the following principles:

- Decomposition of the learning respectively teaching process in appropriate small units.
- Delegation of the responsibility for learning, organizational, and managerial processes to the learner.
- Integration of the remote expert into the process as a guide, who supervises the learning process.
- Standardization and formalisation of the learning process among participants both on the individual and on the group level. This helps to benchmark the participation of the learner both on the individual as on the group level.
- Use of collaborative learning scripts to support the interaction among the stakeholders and to improve the learning process in groups.
4.1. Didactical Model of the Virtual Seminar

Figure 4.2.: Collaboration, interaction and participation model of the virtual seminar

- Use the potential of IT systems to support the interaction process between the remote expert and the students and to support the scaffolding by collaborative scripts.

The model is adapted from an approach developed by [Nussbaum et al., 2009] which introduces technology as a collaborative scaffold that guides and mediates the interactions between individuals of a class during a group work process. The individuals work through structured sequences of information, share information and construct knowledge. The sequence in the proposed model begins with individual participation, moves to group collaboration, and finishes with a teacher mediated whole class discussion. Figure 4.2 illustrates the interaction among the stakeholders in the phase of topic development for a formulated task or problem.

In Figure 4.2 the group consists of six participants according to the group partitioning schema presented in the subsection 4.1.1. The interaction among the stakeholders within the scope of an activity or problem statement consists of the following phases:

- **Phase 0 (Problem statement):** The supervisor assigns all groups an activity to carry out, for instance a problem to solve, a simulation to explore, a question to investigate, etc. The group activity consists of complementary tasks, which are distributed to members of a group.

- **Phase 1 (Individual response):** Each member is asked to work individually on the assigned tasks. In this phase, the participant’s work is solely based on his/her own
4. Conceptual Solution for the Realization of Virtual Seminars

understanding of the task and restricted to work with his/her own skills and previous knowledge.

- **Phase 2 (Collective decision):** The aim of the collective decision is to lead the group to construct a consensus, which is the key to social constructivism (see [Vygotsky, 1978](#)). Consensus here means the common understanding of a group, constructed through assimilation or accommodation of new knowledge into existing schemata gathered from experience (see [Brown et al., 1996](#)). This phase consist of two sub phases:
  - **2a (exchange and confrontation):** Solutions generated by the group members in phase 1 are now presented in the group panel for discussion. With regard to the global solution, every member of the group comments, criticizes and completes the presented solutions of other members. These appreciations are recorded in a journal.
  - **2b (group consensus):** The participants assemble parts of the solutions into a global solution that represents all the participants’ convergent solutions and opinions. The discussion process is repeated until a consensus is reached. One student assumes the role of a manager during the collective decision phases. She/he coordinates the work process in the group and represents the group outwards. Based on a rotation principle, every participant assumes at least once this role during the whole seminar process.

- **Phase 3 (review):** Each participant is asked to produce a review on the work dynamic in his/her group, on the individual solutions of participants in other groups and on the group solution of other groups. The report on the work dynamic in his/her group and the comment and criticism on his/her group mates are sent to the supervisor of the seminar. The reports on the individual and group solutions of participants in other groups are exchanged among the groups. Standards for elaboration of reviews are given by the responsible of the seminar depending on the group activity and problem statement.

- **Phase 4 (solutions revision):** The individual and group comments, critics and propositions formulated by members of other groups are revised in the group. The process of collective decision is repeated in order to improve the solutions.

- **Phase 5 (teacher guided classroom mediation):** Representatives of each group present their group solutions to the whole class while being facilitated by the supervisor, and thus close the cycle of the interaction.

The remote expert assumes the pedagogical and intellectual role in the process. She/he supervises the interaction among the participants, formulates the problem and designs the appropriate collaborative learning script. On the basis of the standards for reports developed within the scope of the eLearning program, he/she benchmarks the participation of attendees and monitors the learning processes. In the "learner centric" approach pursued in this model, learners are responsible for the organizational and managerial process of the seminar. Detailed roles and expectations of the stakeholders of the virtual seminar process are described in detail in subsection 4.2.1.

### 4.1.3.3. Supervision and monitoring

The supervision and monitoring approach is geared to the blended learning approach pursued within the scope of the thesis. Tasks, which are supposed to be performed locally in presence
mode, are supervised and monitored by the local supervisor. The location of the remote supervisor and the related time shift, his/her availability in terms of time to invest for the supervision, and the lack of infrastructure justified a supervision and monitoring approach based on asynchronous interaction. The supervision and monitoring approach proposed for the seminar is mainly based on self regulation and self control of participants both at the individual and at the group level. This approach fits to the didactical accentuation of the seminar, which places the learner into the center of the virtual seminar process. The proposed approach distinguishes the following two levels of supervision and monitoring:

**Individual level of supervision and monitoring:** The individual level of monitoring refers to the interaction between the remote expert and the participants. This interaction takes place mainly in an asynchronous form. This interaction can be regarded as a sequence of exchange of ideas and artefacts in a persistent channel. The protocol of the conversation is available any time and new ideas or artefacts can be added to the conversation until the end of the seminar. This protocol reflects the status of the interaction among involved stakeholders and their level of participation during the seminar. The potential of WEB 2.0 in context of eLearning and of related technologies such as web syndication, rich internet application\(^2\), etc, provide the technical basis for the implementation of the individual supervision and monitoring concept of the seminar.

**Group level of supervision and monitoring:** The blended learning approach of the seminar is based on the assumption that collaborative work processes take place in presence mode at the same place. Self-regulated learning and self control characterise the group’s learning process within the scope of the seminar. Self regulation refers to the application of a general model of regulation and self regulation of cognition, motivation, behaviour and context to issues of learning that take place in the group in order to achieve predefined goals. Self-regulated learner groups are cognizant of their academic strengths and weaknesses, and they have a repertoire of strategies, that they appropriately apply to face the day-to-day challenges of academic tasks. Collaborative learning scripts are used in several phases of the seminar process to standardize the learning process in the group. Depending on the stakeholders and the orientation of the evaluation process, the supervision and monitoring approach is organized at two abstraction levels: "intra-group regulation and control" and "inter-group regulation and control".

- **Intra-group regulation and control** refers to the mechanism developed in a group to monitor and evaluate the progress of the individuals in the group and the group as whole. At individual or micro level, each participant supervises and monitors the evolution of other members of his group. At group level, each participant supervises, monitors, and reports the work dynamic in his/her group in a distributed journal. Depending on the didactical approach pursued by a supervisor and the time schedule for a seminar several methods can be applied to standardize the processes.

- **Inter-group regulation and control** refers to the evaluation of contribution of participants in other group both on the individual and on the group level. The standard for the evaluation of contributions are defined by the supervisor responsible for the seminar. Subsection 4.2.2.2 presents different methods used to standardize the process. The distributed journal boosts the togetherness and the teamwork in the group and the review of individual and group participation of other participants boost competition

\(^2\)A type of Web application that can run independently of browsers, can run on any operating system and, in many ways, works like a traditional desktop application.
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among the groups.

The remote supervisor analyzes journals and reports elaborated by the participants both on
the micro level and on the group level in order to monitor the evolution of the seminar and
to evaluate participation of attendees.

The following equation presents the minimal amount of reports produced by participants
for a seminar: \( N = g \ast (x \ast [(x + (g-1) + c)) \)

- \( g \): represents the number of available groups with \( g \geq 2 \)
- \( x \): represents the number of persons in a group with \( x \geq 3 \)
- \( c \): is a constant \( \geq 1 \) representing the number of internal reports on the work dynamic
  within the group. According to the didactical accentuation pursued by a supervisor, the
  constant \( c \) can be modified to \( c = x' + c' \) with \( c' \) as the number of group report and \( x' \)
  the number of individual report on the participation of group mate. This modification
  improves more the competition than the teamwork among the members of a group.

The minimal amount of reports produced by a group of 6 participants distributed in 2 groups
of three persons is 30 \( (2 \ast 3 \ast [3 + (2-1) + 1]) \). The equation is linked to tasks, respectively
activities formulated by the supervisor during a seminar. According to the instructional design
of a seminar respectively the collaborative learning scripts used in this seminar, the cycle of
interaction among the stakeholders can be repeated. The higher the number of participants
or cycles of interactions and the more time is needed for a seminar, the higher will be the cost
for the stakeholders in terms of participation (supervision and monitoring). This equation is a
benchmark for the participation of stakeholders involved in the process of the virtual seminar.
It defines a part of the workload both for the supervisor and for the participants of a seminar.

Additional tests for individuals or groups depending on the phases of the seminar may
complete the supervision and monitoring of the participants. Technical systems provide in-
struments respectively tools to perform these tests.

4.1.3.4. Motivation and learner support

The move from presence to the virtual learning work puts additional efforts in terms of partic-
ipation on the learner. Unlike face to face based learning, it requires additional expenditure
with respect to operating one or more communication technologies, writing messages and for-
malising learning processes in presence mode, reconstructing the coherence of asynchronous
textual messages (see [Hesse, 1996a]). The virtual seminar as a didactical unit becomes central
and it is important to design a framework, which enhances the motivation and participation
of learners. The measures for enhancing motivation and participation can be classified into
intrinsic and extrinsic motivational factors.

In case of the virtual seminars, intrinsic motivational factors aim to enhance the attrac-
tiveness of the virtual seminar and the motivational value of the participants. The following
measures are recommended for the proposed model of virtual seminar:

- The virtual seminar must have a high degree of integration in the curriculum
- Topics respectively subject matters covered during the seminar must be interesting and
  meaningful for the participants (e. g. authentic problem, multiple perspectives, etc.).
- Actual and diverse content from the internet must be integrated into the process in a
  structured way
• The social arrangement, e.g. contact with remote experts, group work, etc, must be meaningful and may open new perspectives for the learner.

Extrinsic factors refer to measures taken by the person in charge of the program for supporting acceptance of the new learning approach. The virtual seminar should not be a marginal, optional form of learning alongside lecture, lab, internship or other forms of learning. It should become central and obligatory with a well defined amount of active participation. Expectations related to the virtual seminar must be clearly communicated to the learners (see Harasim, 1998, Mason, 1994 and Rohfeld and Hiemstra, 1995).

Considering the fact that the virtual based approach of learning places high demands on learners and requires special skills in terms of technology and didactics, several measures such as technical training, strategic training, template for general tasks, model of solution, proposal for group management and learning procedure must be developed in advance by the persons responsible for the program, and introduced to the learners.

4.1.3.5. Evaluation of the participation of learners

The model for the evaluation of participants is derived from goals and standards for virtual seminars described in subsection 4.1.2 and from the experience of the IUT-FV with the realisation of virtual seminars. The model is geared to the participation of learners during the seminar both on the individual level and on the group level.

Evaluation of the individual participation: The quality of the produced paper provides the basis for the evaluation of the acquisition of scientific insight. The reviewed paper as a product of the virtual seminar presents:

• How the work respectively the study was done.

• What materials and methods were used.

• What the result of the study is and how does it fit into other related research results

• What the conclusions and outcomes of the work are.

Furthermore, the capability to present and to discuss the result of the scientific work plays an important role for the evaluation of acquisition of scientific insight by the learner. Reports on the work dynamic in the group allow an insight into the acquisition of key qualifications by members of a group. In addition to these factors, several individual reports produced by other participants are other qualitative elements for the evaluation of the individual participation of the learner. The technical system and related modules respectively tools for the realisation of the virtual seminar deliver quantitative data for the evaluation of individual participation. Depending on the tools used to perform a task, statistic data for the evaluation of participation can be derived from logs and protocol files. The evaluation of individual participation represents a part of the final respectively global evaluation concept.

Evaluation of the participation in the group: The collaborative learning scripts support the participants in the acquisition of key qualifications in a group. These scripts provide the framework for the design of participation-reports developed by the responsible of the seminar within the scope of the eLearning program. The reports encompass the following aspects:

• Competence in communication and cooperation,
4. Conceptual Solution for the Realization of Virtual Seminars

- Fulfilment of role expectations within the scope of a collaborative learning script, and
- Contribution to the emotional and motivational cohesion within the group.

Reports produced by group mates and quantitative data derived from the technical system help to evaluate the acquisition of key qualifications and the participation of the learners in their respective group. The evaluation of the participation in a group builds another part of the final evaluation concept.

**Evaluation of the group participation:** Group participation is an abstract criterion, which evaluates the dynamics and production of a whole group. Measures on this level aim to analyse if the group developed specific collective qualifications such as:

- shared knowledge among the group,
- strategies for improvement of self-organisation,
- coordination of group work for solving a problem, and
- establishment of learning communities.

Members of a group record in a journal the work dynamic of their group and other participants must evaluate the group solution for a formulated task. Such data help to evaluate group participation in comparison to other groups. Quantitative data derived from the collaborative tools used during the seminar help to evaluate the group dynamics during the seminar. The evaluation of group participation complements the other parts (evaluation of the individual participation, evaluation of the participation in the group) of the final respectively global evaluation concept.

4.2. Process model of the virtual seminar

After the presentation of the didactical model of the virtual seminar in the previous subsection, the following subsections present the process model of the virtual seminar. First, the roles and expectations of the involved stakeholders are presented. Afterwards, the collaborative learning scripts used to support the interaction among the involved stakeholders in the phases of the seminar are presented in detail. The several phases of the virtual seminar covered in detail close this subsection.

4.2.1. Stakeholders of the process, their roles and expectations

The stakeholders in the virtual seminar proposed in this thesis and their roles are derived from the experiences of some universities in Cameroon in the field of eLearning, from the didactical model for the realization of virtual seminars in Germany, and from the lack of human resources in institutions of higher education in Cameroon. The realization of the virtual seminar is based on a blended learning approach (see 2.1.3). The approach assumes a physical presence of participants at one place, i.e. at the university, and acknowledges the lack of human resources in terms of supervision. For this purposes, the supervision is based on a partitioning of tasks at different levels (expertise, didactic, organization and techniques) and locations. The stakeholders involved in the proposed approach of a virtual seminar are classified into participants and staff or persons responsible for the seminar. The roles and expectations of these stakeholders within the process are presented in the following subsection.
4.2. Process model of the virtual seminar

4.2.1.1. Staff or responsible persons for the seminar

"Responsible persons" or staff of the seminar is a generic term to describe actors, which are involved in the organization of the seminar, the definition of instructions, the supervision of participants and the administration of the tools for the realization of the seminar. The roles, responsibilities and expectations of these actors are described in the following paragraphs.

The person in charge of the study program in the faculty: He/ She is responsible for the formal and administrative issues for the realization of the seminar. Furthermore, he/ she defines a framework for the realization of the seminar from the perspective of the institution of higher education, in particular the faculty. The integration of the virtual seminar into the whole concept of the learning program with related details such as workload for the involved actors, the period of the seminar, the target audience for the seminar, etc. belongs to his/ her competences. He/ she provides a set of collaborative learning scripts for the phases of the virtual seminar to the remote experts. Also he/ she provides templates for reports and journals, to be produced by the participants for the evaluation of their participation. He/ she is the contact person for the remote experts.

The remote expert: He/ she has the required know-how to deal with topics proposed within the scope of the seminar. He/ she is qualified as a remote expert and may not be present on campus. He/ she assumes the pedagogical and intellectual role in the process and is in charge of the know-how transfer. Besides, he/ she uses questions and probes for student responses that focus discussions on critical concepts, principles and skills (see [Berge, 2010]). This role may include a number of tasks such as providing general literature to introduce the topics, opening the discussions, focusing on relevant content and issues, intervening in order to promote interest and productive conversation, guiding and maintaining students’ involvement in the process of the virtual seminar, responding to the participants’ contributions, following the flow of the conversation and encouraging comments and summarizing debates. Additionally, these roles may encompass directing and focusing discussions on vital aspects of the seminar (see [Mason and Kaye, 1989]), analyzing and evaluating points made by the participants and controlling the quality of work done by participants so as to ensure that the results meet the required standards. Consequently, the expert must in addition to the subject expertise and traditional pedagogical training, be able to demonstrate additional skills, such as ability to:

- plan and organize delivery of course work by clearly specifying learning objectives and outcomes;
- set learning agendas and providing leadership and scaffolding in learning activities;
- welcome and embrace diversity of learning outcomes, attitudes and styles;
- adapt supporting styles to the needs of individual participants;
- provide advice on different levels of access to learning materials according to the needs of individual participants;
- create an atmosphere of collaborative learning of which the expert him/herself is often an integral part;
- be able to cope with and resolve on-line conferencing conflicts and difficult behaviours;
- adapt collaborative learning scripts to the phases of the seminar and to his/her content;
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- encourage active construction of knowledge by being actively involved in discussions, activities and debates;
- develop and implement methods for learners’ feedback and reinforcement;
- include advanced organizers into the content materials and advise on learning pace so as to avoid cognitive overload and information anxiety.
- place greater emphasis on written skills;
- does not confine teaching to specific times;
- place greater emphasis on student-student learning;

Coordinator, facilitator or local supervisor: He/she assists the remote experts during the seminar and supervises tasks, which are supposed to be performed on campus. Apart from that he/she is the contact person for the participants for administrative issues during the seminar. He/she assumes the social role in the campus, which involves the creation of friendly and comfortable social environments in which students feel that learning is possible. [McMann, 1994] considered the social role to be one of the key critical success factors in on-line learning. In this context, the local supervisor is responsible for guaranteeing opportunities for participants to introduce themselves; organization of groups of participants taking into consideration their backgrounds, identifying and dealing with lurkers who are reticent and sometimes reluctant to participate; ensuring that appropriate communication takes place; promoting interactivity between students; and finally, dealing with offensive and disruptive behaviour during the seminar. Furthermore, he/she delegates managerial and organizational tasks related to the seminar to participants, controls and coordinates their execution.

System administrator: He/she is responsible for the supervision of the technical aspects of the virtual seminar. Supervision in this context encompasses both the support of the stakeholders during the process and the support of the technical environment for the realization of the virtual seminar. Furthermore, he/she prepares the statistics about participation derived from the logs files and protocols of the technical system and its related modules used within the scope of the seminar. Depending on the resources available within the scope of the eLearning program, this role can be assumed by different persons or group of persons according to their competences. Regarding the supervision of the stakeholders, the role includes support and assistance for technical questions during the seminar, supporting the stakeholders in becoming competent and comfortable themselves by providing technical guidance such as offering study guides, directions and feedback on technical problems, ensuring that time to harness the ICT systems is made available (see [Creary, 1990]). Regarding the technical competences, the role is to configure, administrate and support the ICT system and software that composes the eLearning environment. The following technical competences are required to assume these roles:

- Skills on computer architecture and ability to install, configure, and fix hardware problems.
- Be able to configure, administrate and support tools for synchronous (e.g. instant messaging, Micro-blogging, web meeting and web conferencing, chat) and asynchronous (e.g., E-Mail, forum) communication during the seminar.
4.2. Process model of the virtual seminar

- Be able to configure, administrate and support the system for the management of content during the seminar and its related modules (Forum, Wiki, Blog, Calendar, statistic and report etc). Furthermore, skills on underlying technologies and protocols are needed.

- Be able to configure, administrate and support the runtime environment of the IT system. Skills on operating system, Middleware architecture, Computer network and distributed system, data backup and data security are suitable additional competences.

- Skills on publication of print (office suites, pdf, etc.) and audio-visual media (podcast, screencast, etc.).

4.2.1.2. The participants

Participants work on a topic either alone or in a group. This model of the virtual seminar places the participants in the center of the process. In addition to participant’s tasks taken from the didactical model, they are responsible for the organization and the management of many aspects of the virtual seminar. Managerial or organizational roles involve setting learning objectives, establishing agendas for the learning activities, scheduling learning activities and tasks, and clarifying procedural rules and decision-making norms ([Paulsen, 1995] and [Mason, 1991]). Expectations and competences of participants in online learning contexts have already been analyzed by several researchers ([Ladyshewsky, 2004]; [Heino and Kraft, 2003b]; [Reinmann-Rothmeier and Mandl, 2001]). These characteristics are extended and adapted to the model of virtual seminars proposed in this thesis and can be classified as follows:

- Communication and cooperative online competence
  - Accept critical thinking and decision making as part of the learning process.
  - Be open-minded towards sharing life, work, and educational experiences as part of the learning process.
  - Be able to work with others to complete projects.
  - Precise and explicit written formulation of opinions, so as to enjoy communication through writing.

- Technical competences
  - Computer hardware skills.
  - Have access to a computer and an internet connection.
  - Ability to use computer based communication tools particularly for synchronous communication (web meeting, web conference, shared editor, shared screen, etc.).
  - Be able to use computer based cooperative tools (Forum, Blog, Wiki).
  - Be able to search literature online.

- Self learning competence and personal attitude
  - Be willing and able to commit 4 to 15 hours per week for the seminar.
  - Ability to discern between important and not important stuff.
  - Disposition to seriously examine the proposed topic.
  - Be able to think ideas through before responding.
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- Be self-motivated and self-disciplined.
- Be able to meet the minimum requirements for the program.
- Be willing to 'speak up' if problems arise.
- Be able to deal with frustration.
- Be open towards trying-out new things.

- Organizational competences
  - Disposition to play several roles in the process of virtual seminar.
  - Be willing and able to commit the predetermined time for the virtual seminar.
  - Be able to take initiative and responsibilities in the learning process.
  - Time management: realistic appreciation of time and personal ability to perform a task on time.
  - Self definition of learning goals.

4.2.2. Design of the virtual seminar process

The didactical accentuation of the thesis is based on a constructivism and connectivism (see 3.1.1). The pedagogical methods for the transformation of instructional aims and contents into social interaction is based on principles developed by Roblyer et al., 2003 enumerated in the subsection 4.1.3.

The methods and sequences of activities that stakeholders undertake within the scope of the seminar to attain predefined learning objectives including resources and supports mechanism provided by a learning environment to perform these activities is called learning design of the virtual seminar. Designing consist of activities such as planning schedules, writing courses outlines, preparing materials, determining assessment tasks, and anticipating student’s need (see [Bennett and Lockyer, 2004]). Furthermore, designing may involve modifying and adapting a previous course, e.g. updating materials or trying new strategies. Learning design itself can be considered as a pedagogic meta-model because it does not offer a particular pedagogic model but rather allows to define a practically unlimited range of scenarios and pedagogic models. Important to the learning design concept is that the description communicates the general structure and logic of the learning sequence, but does not specify either the content or the particulars of the task or support. These decisions are left to the instructional agent (e.g. a teacher) acting on the guidance included in the learning design and on their understanding of their discipline and their knowledge of their students and institutional requirements (see [Koper and Tattersal, 2008]). The design of the virtual seminar process is based on the IMS learning design (IMS LD) specification (see [Koper and Tattersal, 2008]). This specification stems from the Educational Modelling (EML ) Language (see [OUN, 2010]) developed at the Open University of the Netherlands, which focussed on modelling lesson plans and courses and making them available as units of learning (UoL). EML proposes a well-structured terminology for designing instructional sequences. It describes not only the content of a unit of study (texts, tasks, tests, assignments, etc.) but also the roles, relations, interactions and activities of students and teachers. EML and IMS LD share the same philosophy and aims: In a unit of learning, people act in different roles in the teaching-learning process, working towards certain outcomes by learning and/or supporting activities within an environment, consisting of learning objects and services to be used during the performance of the activities.
4.2. Process model of the virtual seminar

The approach separates learning objects and services modelled outside the Learning Design from the educational method and learning activities used in the unit of learning modelled inside the learning design (see figure 4.3 and [Hummel et al., 2004]). The specification used to standardize the learning design of the seminar must be comprehensive and must fulfil certain requirements formulated by IMS LD (see [IMS, 2003c]):

- Completeness: The specification must describe how activities of both learners and the staff are integrated, how resources (objects and services) used during the learning are integrated, how blended learning and pure online learning is supported, how both single and group models of learning are supported. Pedagogical expressiveness: The specification must be able to express the pedagogical meaning and functionality of the different data elements within the context of a unit of learning. It must be flexible in the description of all different kinds of pedagogies and not prescribe any specific pedagogical approach.

- Personalization: The specification must be able to describe personalization aspects within a learning design, so that the content and activities within a unit of learning can be adapted based on the preferences, portfolio, pre-knowledge, educational needs, and situational circumstances of users. In addition, the control over the adaptation process must be given, as desired, to the student, a staff member, the computer, and/or the designer.

- Compatibility: The specification must be standardized and in line with other standard notations.

- Re-usability: The specification must make it possible to identify, isolate, de-contextualize and exchange useful parts of learning design (e.g. pattern) so as to stimulate their re-use in other contexts.

- Formalization: The specification must provide a formal language for learning design that can be processed automatically.

- Reproducibility: The specification must enable a learning design to be abstracted in such a way that repeated execution, in different settings and with different persons, is possible.

- Interoperability: The specification must support interoperability of learning design. Activities constitute the core of the modelling of interaction processes within the virtual seminar and are one of the main structural elements of the IMS LD specification. The learning process of the didactical model based on collaborative interaction and scripts are used to standardize and formalize these interactions. The notion of a "collaborative script" is used in this thesis. The subsequent sub sections cover the specification of the learning design of the virtual seminar and the collaborative scripts used to model the interactions process of the seminar in detail.

4.2.2.1. Specification of the learning design of the virtual seminar

The metaphor of the theatrical play used in IMS LD is adapted to model the virtual seminar process. The virtual seminar can be modelled with several plays, which in turn consist of several acts respectively sub-processes. Acts of the seminar are performed by a number of
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actors or stakeholders, who take up different roles at different times in a play. An act has one or more role-parts. The acts in a play follow each other in a sequence (although more complex sequencing behaviour can take place within an act). The role-parts within an act associate each role with an activity. The activity in turn describes what that role is supposed to do and which environment is available to support it within the act. The environment provides services (communication, collaboration, search, monitoring, etc.) and objects (webpages, articles, books, database, software, DVD, etc.) needed to perform an activity or set of activities. In the analogy, the assigned activity is the equivalent of the script for the part that the role plays in the act.

The core concept of the learning design of the virtual seminar is derived from the conceptual structure of the learning design developed in the IMS LD specification. This conceptual model of the seminar follows the philosophy of the EML and IMS LD already mentioned above: a supervisor and participants take over roles in the teaching-learning process. In their roles they strive towards certain outcomes by performing more or less structured learning and/or support activities within an environment. The environment consists of the appropriate learning objects and services to be used during the activities. Activities to be performed by each role at a specific moment in the process are determined by the method or by a notification. Figure 4.3 shows a UML diagram illustrating the conceptual model of a unit of learning developed in IMS LD with its several design specification expressed.

The method is designed to meet learning objectives (specification of the outcomes for learners), and presupposes certain prerequisites (specification of the entry level for learners). The method consists of one or more concurrent play(s); a play consists of one or more sequential act(s) and an act is related to one or more concurrent role-part(s), each role-part associates exactly one role with one activity or activity-structure. The teaching-learning process is modelled as the theatrical play described above. These elements represent level A of the implementation of the IMS LD specification (see [IMS, 2003c]).

A method may, at level B, contain conditions (i.e., If-Then-Else rules that further refine the visibility of activities and environment entities for persons and roles) by defining Boolean expressions on their properties. A property stores information about person (preferences, result, etc.), role, or learning design and can be grouped into property-groups. Global elements are used at this level in order to enable users to set and view properties (see [IMS, 2003c]).

Level C of the specification introduces a notification for "messaging" both between system components and between roles. Activities can then be defined as a consequence of dynamic changes to the learner’s profiles and/or of events generated in the course of the learning activities. Notification can also be used to trigger messages being dynamically sent to participants. More generally, it enables the automation of learning flow activities, which are triggered by the completion of tasks, rather than the learning flows being pre-planned (see [IMS, 2003c]).

Roles are separated into learner and staff. A finer specialisation into sub-role and their corresponding activities are left to the designer of the UoL. Activities can be assembled into activity-structures. An activity-structure aggregates a set of related activities into a single structure, which can be associated to a role in a role-part. An activity-structure can model a sequence or a selection of activities. In a sequence, a role has to complete the different activities in the structure in the order provided. In a selection, a role may select a given number of activities from the set provided in the activity structure. An activity uses an environment which provides learning objects and services. Learning objects are typically specified by a URL with optional metadata. A service relates to a concrete service facility available at runtime such as discussion forum, chat rooms, monitoring tools, search facilities, etc. (see [IMS, 2003c]). The information model of the learning design can be codified into
4.2. Process model of the virtual seminar

Figure 4.3.: Conceptual model of unit of learning (see Hummel et al., 2004)
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an XML file with references to the learning objects and services needed to perform activities. This file represents the IMS Learning design binding, which explains how the information are bound using the XML schema convention. Figure 4.4 presents a slice of the XML schema binding of the UoL information model as a tree.

![Figure 4.4.: LD schema](IMS, 2003d)

The XML schema binding should be interpreted by a runtime engine in order to generate appropriate sessions for the seminar according to the settings for the different stakeholders. In practice, this implementation is packaged as a ZIP file using IMS Content Package Specification (see IMS, 2001). The package can be shared, reused and interpreted by appropriate engines in diverse learning situations. Stakeholders of the seminar do not need to care about the management of activities and information flow within the seminar. The learning environment executes specifications defined in the learning design, automatically set up necessary content and services, and provides such contents and services to the appropriate stakeholders at the right time. A distinction is made between the package (representing the UoL at the class level) and the run of that package (an instance). The notion of an "abstract class" from which a specific instance can be created builds the core of the separation of concerns and provides a solution to the reproducibility of the UoL. Customization and initialization take place by the process of "instantiation" whereby the abstract UoL of the seminar modelled as class, is used as the basis from which specific instances of the seminar are created. This combination of concepts is illustrated by the UML class diagram shown in figure 4.5, which presents relationships between UoL runs and roles (see Tattersall et al., 2005).

The specific instances of the seminar as UoL are referred to as runs. They are defined as the combination of a particular UoL with an assigned community of users. Each run is assigned
4.2. Process model of the virtual seminar

Figure 4.5.: UML Class diagram of the design of a UoL

to exactly one UoL, but a particular UoL may have zero or more runs assigned to it. A run adds runtime information to a UoL by defining a start and end date of the instances, default parameters and identifiers for the instances. The unique identification of a UoL using a uniform resource identifier which is mandated by the IMS LD Specification is assigned to each run. The same UoL can have an unlimited numbers of runs. Attributes specify the minimum and maximum number of persons bound to the role before starting a run. Two principal roles inherent to the IMS LD Specifications are provided to distinguish learner and staff.

Further specifications of the IMS LD as Learner Information package (LIP) (see [IMS, 2001]) and content packaging (CP) are used within the scope of the thesis. The LIP is adapted to model records related to learners and their progress and CP is used to package or bundle all resources required in the learning process represented by the UoL including the learning design, physical files, and hyper-links to resource. Content Packaging supports an efficient aggregation, distribution, management and deployment of these UoL.

The learning design of the virtual seminar proposed in this thesis extends or adapts the IMS LD specification. The extended learning design is geared to the didactical model of the seminar presented in the section 4.1 which consists of the following aspects:

- Communication,
- Motivation and learner support,
- Collaboration, interaction and participation,
- Supervision and monitoring, and
- Evaluation of the participation of learners.

The IMS LD information model includes an extensive communication service model, in which communication properties and characteristics of the virtual seminar can be modelled.

Measures to motivate and support learners during the seminar can be modelled through elements of the "support activity" of the IMS LD design.

The collaboration, participation and interaction model of the thesis presented in subsection 4.1.3.2 is mainly based on collaborative interaction and is geared to the following pedagogical principles of the virtual seminar:
4. Conceptual Solution for the Realization of Virtual Seminars

- Fewer "whole-class" and more small-group activities.
- An appropriate combination of an individualised competitive situation and cooperative activities.
- Standardization and formalization of the interactions among the stakeholders of the seminar.
- Standardization and formalisation of the learning process in presence mode both on an individual and on a group level.

IMS LD provides no means to specify how members of a group interact within a learning activity. Each role-part associates exactly one role with one activity or activity-structure in the IMS LD model. The support of group and collaborative interaction is marginal and can be achieved through services of an assigned environment which provides collaborative capability. A collaborative learning experience can be described by associating multiple people and/or multiple roles to the same activity (see [Hernandez-Leo et al., 2005]). Activities are one of the core structural elements of the 'learning - teaching flow' model of the learning design. They form the link between the roles and the learning objects and services in the learning environment. In the metaphor of the play, the assigned activity is the equivalent of a script for the part that the role plays in the act. Collaborative scripts extend the IMS LD model of the virtual seminar to improve group and collaborative interaction. Furthermore, they formalise and standardize interactions among stakeholders of the seminar. Collaborative scripts and their representation using the IMS LD specification are covered in detail in the subsequent subsections.

The evaluation, supervision and monitoring of the virtual seminar is based on the following pedagogical principles:

- A change from teacher-centred to student-centred activities i.e. less lecturing and presentation and more assisting and coaching.
- Self-regulated learning and self control.

The proposed approach distinguishes between an individual and a group level of participation whereas at the group level of participation another classification is made between intra-group and inter-group participation. Subsection 4.1.3.2 presents their differences in detail. The two basic types of activities (i.e. learning activities and support activities) proposed by the IMS LD do not provide sufficient mechanisms to model the requirements of the evaluation, supervision and monitoring model proposed within this thesis. Thus, two new special types of activities ("monitoring" and "evaluation") with their related elements (references to resources to perform these activities) are proposed as extensions of the IMS LD model. The structure of these special types and their integration into the information model of the IMS LD are presented in subsection 4.2.2.2.

4.2.2.2. Collaborative scripts

Subsection 3.1.2 presents the state of art for the design and specification of instructional sequences of Unit of Learning using script. The framework for collaborative scripts proposed in this thesis is based on models developed by researchers discussed above. It based on the didactical accentuation presented in the subsection 4.1.3 and the initial model of virtual seminar developed and discussed during the empirical analysis phase (see 2.3). This framework
4.2. Process model of the virtual seminar

models and specifies on an abstract level the main components of the virtual seminar design as a unit of learning. On a highest abstraction level, the several phases of the seminar are identified as macro-script. A macro-script corresponds to a play in the IMS LD model and consists of acts respectively micro-scripts in the taxonomy used in the framework for the specification of phase or macro-script of the seminar. Micro-scripts in turn consist of activities organized in an activity structure. Activities are basic elements in the taxonomy. They are two kinds of activities according to the actor involved in the active role within the scope of the activity. Students perform learning activities and the responsible of the seminar performs support activities. Activities take place within an environment and can required resource(s) and create an outcome.

The framework specifies two aspects of collaborative scripts:

- Metadata about the collaborative script
- Processes of the collaborative script

A Metadata about the collaborative script:

Metadata describe the context or the frame of the collaborative script. General information about the script as the pedagogical attribute of the script (teaching or interaction style), the description and application field of the script, the involved actors, the intellectual property, etc. are described and specified at this level. The structure of the metadata about the script specified at this level is derived from the Learning Object Metadata (LOM) model standardized by the IEEE and the Alistair Cockburn’s use case template (see [Cockburn, 1997]).

Figure 4.6 illustrates metadata of a collaborative script specified in the XML language.

Metadata of script

A1 General Information: This information represents meta-information helping to understand and contextualize the application of a script. General informations are structured as follows:

A1.1 Description

- Name: The name of the script.
- Schema: The schema of the script, according to the schema enumerated in 4.2.2.2 (jigsaw, conflict, reciprocal or combined) is described in this element.
- Length: The whole length of the script is modelled in this element.
- Main Success scenario: role and activity specific demands for the learning experience to be successful.

A1.2 Context

- Didactical unit: The context of use of the script respectively the field of application of the script (e.g. seminar, lecture, exercise) is described in this element.
- Level: Description of the level of complexity of the script
- Scope: Runtime systems for the execution of the script
- Objectives: Goals or objectives of the script are described in this element.
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- Activities: General activities to be performed within the script are modelled in this field (asking thought-provoking questions, clarifying ideas and relations, comparing concepts, constructing arguments, critiquing proposals, elaborating content, evaluating the significance of findings, explaining idea and concepts, etc.).

- Precondition(s): Prerequisite for the successful achievement of the script is described in this element.

A1.3 Right

- Cost: This field present the cost for the use of the script
- Copyright-restriction: This field present the legal mentions, copyright and restriction for the use of the script
- Author: The author(s) of the script is (are) presented in this field
- Owner: The owner (s) of the script is(are) presented in this field

A1.4 Adaptation rule

- Exception: Various failures or exceptions, which can occur during the execution of the script and their handling are described in this element.
4.2. Process model of the virtual seminar

**A1-5 Related script**

- Similar: Scripts with similar goals or objectives are presented in this field.
- Complementary: Scripts which can be combined or orchestrated with this script in order to build a macro-structure are described in this field.

**A2- Stakeholders:** Actors and their respective roles, their organization, their mode and type of interaction are modelled in this component.

**A2.1 Actors and roles:**

- **Actor**
  - **Staff:** Person in charge of the didactical unit are modelled in this element. This element describes an abstract structure. A fine-grained modelling of the specific role (expert, facilitator, supervisor, system administrator, etc.) for the person in charge is left to the designer of the didactical unit.
  - **Participants:** Student or person, which performs tasks formulated by the person in charge of the didactical unit are described in this element.
  - **Group:** The mode of execution of the script which specify if the script is performed by one person, if tasks take place within a group or between two or more group is described in this element.

**A2.2 Group characteristics**

- **Number of groups:** The minimal and maximal number of groups required for the play of the script is described in this element.
- **Group size:** The minimal and maximal number of group members required for the script is specified in this element.
- **Group formation:** Policies of group formation are presented in this element. Groups can be organized by students themselves, randomly or by the supervisor referring to existing prerequisites (e.g. gender, age, etc). They can be homogeneous or heterogeneous.
- **Interaction of stakeholders**
  - **Type:** Synchronous vs. asynchronous: the nature of interaction among the actors involved in the script is described in this element.
  - **Mode:** Presence, virtual, blended: the environment for the execution of the script is described in this field.

**B- Processes of the collaborative script**

Processes describe and represent the dynamic part of the collaborative scripts. Several subprocesses of a collaborative script, their interactions and their runtime environment with the required resources to perform activities or tasks are specified. Processes and their outcomes are described in this part of the structure. The figure [4.7] presents the structure of information required to specify the dynamic behaviour of a collaborative script.

*Processes of the collaborative script*

**B(x) 0 Name of the micro-script**
4. Conceptual Solution for the Realization of Virtual Seminars

![Diagram of Script process structure]

**Figure 4.7.: Script process structure**

B(x) 1 *Narrative:* The general description of the micro script is modelled in this element.

B(x) 2 *Time:* The time required to perform activities of the micro-script is modelled in this element.

B(x) 3 *Grading-benchmark:* Benchmark for the evaluation of task performed in the micro-script is modelled in this element.

B(x) 4 *Activities and their sequencing:* Actors involved in the micro-script, activities of the micro script, the dynamic respectively the workflow within the micro script is modelled in this component.

- **a.** Actors and roles (floor control): Actions of stakeholders which are guided or constrained according to a floor control mechanism are described in this element.

- **b.** Activities-structure: This element groups activities of a micro-script according to their semantic.

- **c.** Activities-orchestration (Flow of activities): The flow or the synchronization of activities is modelled on this element.

B(x) 5 *Resources:* This component models resources required by actors to perform activities or task and their distribution.
4.2. Process model of the virtual seminar

The presentation of the macro-scripts respectively phases of the virtual seminar process correspond to the formalization of the learning design of the seminar. This formalization follows the recommendation of the IMS LD for the modelling of a learning activity as unit of learning although in the presentation of steps for the formalization. This formalization does not follow the order described in the IMS LD best practice and implementation guide (see [IMS, 2003b]). The formalization consists of the following steps:

1. Interaction diagram of the process: This step focuses on the visual formalization or representation of the processes using an interaction diagram. This diagram provides an overview and a shared visual insight into the complex flow of activities and formally models these flows. It is a kind of semi-formalization, an intermediary step between the textual specification of the script in the next phase and the XML instance of the script covered in detail in the section 5.2. The diagram presents in a simple form the important aspects of the process specified in the previous step. Stakeholders of the process and their interactions, activities of the process, resources and outcome of the processes are figured. The diagram format of the thesis can be viewed as an extension of an UML activity diagram. Swimlanes are used to illustrate which role is responsible for which activities. The following elements are added to the activity diagram:
   - Resource
   - Outcome
4. Conceptual Solution for the Realization of Virtual Seminars

Figure 4.8.: Framework for a collaborative script

- Environment
- Notification

2. Specification of the sub process using IMS LD: The second step moves from the visual formalization respectively specification of the processes to a detailed and textual formalization of the processes. This step focuses on the modelling of processes and activities of the virtual seminar according to the didactical model developed in section 4.1. The framework of the collaboration script developed in this thesis (see 4.2.2.2), which encompasses several levels (A, B and C) of the information model of the IMS LD specification, is used to specify the macro-script respectively phases of the seminar. The component of the information model of level A with their subcomponents such as roles, activities and environments are covered in subsection 4.2.2.2. Information about the process, stakeholders of the process, their roles and interactions, activities and their
4.2. Process model of the virtual seminar

Eight main phases respectively acts in the analogy of theatrical play presented in the subsection 4.2.2.1 constitute the model of the virtual seminar. These phases are structured according to the "teaching and learning" activities in a seminar. The following abstractions levels are distinguished:

- Pre-play: Encompassing stages of the seminar process which precede the effective "teaching and learning" processes. It consists of the following two phases:
  - Contact and Networking: The search, contact and networking processes among the remote expert and the organizer of seminar take place at this phase.
  - Preparation of the virtual seminar: Activities of the preparatory phase for a virtual seminar take place at this phase.

The technical environment for realization of the process of this level is not necessarily tied to the environment for the realization of the "teaching and learning" processes. Processes and the interaction diagram of this phase are covered in detail in subsections 4.2.3.1 and 4.2.3.2.

- Core-play: Encompasses stages of the seminar process, which represent the effective "teaching and learning" processes. The core-act consists of the following five phases:
  - Introduction to the virtual seminar: The introduction phase marks the formal begin of the seminar process. Participants, who applied for a seminar, are selected and the different stakeholders of the process come together and introduce themselves, explaining their motivations and expectations to the seminar. The concept of the seminar and the learning environment is presented to the participants. The specification of processes and the interaction diagram of this phase are covered in subsection 4.2.3.3.
  - Structuring of the work: The structuring of the work represents the most important phase of the seminar. The examination and comprehension of subtopics by the participants with the related learning activities (Individual and group subtopics analysis, elaboration of synopsis, feedback and comment of the responsible of the seminar, etc.) take place in this phase. A successful execution of activities and processes of this phase are important for a smooth development of the seminar. The specification of processes and the interaction diagram of this phase are covered in detail in subsection 4.2.3.4.
  - Writing the virtual seminar paper: On the basis of the structure of a paper developed in the phase of the structuring of work, participants write their respective paper under supervision of the responsible of the seminar in this phase. The specification of processes and the interaction diagram of this phase are covered in subsection 4.2.3.5.
  - Preparation of the presentation: The preparation of the presentation follows directly the phase of writing a virtual seminar paper. Activities of the participants for the presentation of their results and outcomes take place in this phase. The specification of processes and the interaction diagram of this phase are covered in subsection 4.2.3.6.
  - Presentation of the work: The presentation of the scientific article as result or product of the seminar takes place in this phase. The scientific article
4. Conceptual Solution for the Realization of Virtual Seminars

presents partially the effort of participants related to the acquisition of key qualifications. Several models of presentation are taken into consideration the distribution of stakeholder and their synchronization and the requirements in terms of infrastructure are presented. Specification of the processes and the interaction diagram of this phase are covered in subsection 4.2.3.7.

- Post-play: Post-play encompasses activities related to the evaluation of the seminar process. The post act consists of the phase of the evaluation of the participation and the fulfilment of expectations of stakeholders formulated in the beginning of the seminar. Processes and the interaction diagram of this phase are covered in subsection 4.2.3.8.

4.2.3.1. Contact and networking

The contact and networking phase represents the start of the whole seminar process proposed in this thesis. This phase precedes the effective "teaching and learning processes" of the seminar. The model of the seminar proposed in the thesis is based on the paradigm of the Diaspora computer supported collaborative learning and working. This paradigm implies a high level of networking, communication and interaction between experts living in the Diaspora, and actors of institutions of higher education in Cameroon. Figure 4.9 presents the activity diagram of this phase.

Networking represents the starting point of the virtual seminar process. A distributed computer system respectively an internet based platform can be used to support the networking process among the different stakeholders. This system is described as a "socio-professional networking platform" for the expertise available outside the country and demands of institutions of higher education for the supervision of virtual seminars. The responsible of the academic institution can search for specific competences and contact available experts. In the same way, experts can look for employment advertisements of academic institutions searching for the supervision of a virtual seminar. After the matching of required profiles, the corresponding stakeholders come together for the realisation of the virtual seminar. The connection and interactions among these stakeholders for the preparation of a virtual seminar must be supported by the networking platform. The preparation of the seminar with its steps and activities is covered in detail in the subsequent subsection.

Although the concept of a virtual seminar proposed in this thesis is mainly based on the integration and interaction of experts living in the Diaspora and actors of institutions of higher education in Cameroon, the design and implementation of such a platform is beyond the scope of the work. Instead, an open source social networking framework can be used to implement the networking platform. The platform must provide the following features:

- **ePortfolio or profile management**: ePortofolio system can be described as a personal electronic archive or database, from which the individual can build a range of portfolios for different purposes. When the ePortfolio belongs to individuals, it should be owned and managed by them and can be used to present their digital clone(e-self), to demonstrate, and receive recognition for different achievements, reflect on learning experiences, plan personal developments, find a job, link with peers, mentors, assessors, etc. If maintained, it can become a lifelong learning tool.
At the same time, a group or organization can use these systems to present themselves to develop collective competencies and interests, to build a community of practice or interest. In context of this work, the ePortfolio system host organizes and manages profiles and artifacts of stakeholders involved in the virtual seminar process. Information required to build the profile of stakeholders must meets the IMS Learner Information package specification (see [IMS, 2010b]) in order to improve the exchange and the interoperability with the seminar’s environment and legacy systems. In addition to the organization and management of profiles, the platform must support actions performed on these profiles. Moreover, the need for expertise respectively announcement of academic institution for the supervision of
4. Conceptual Solution for the Realization of Virtual Seminars

- **Communication:** The ePortofolio component models the static aspects of the processes of this phase of the virtual seminar. The “socio-professional networking” platform should provide communication services, i.e. tools, to support the interaction among of the seminar in the phase of the preparation of a seminar.

- **Search:** The platform should provide appropriate algorithms and filters to support the search on profiles and artifacts hosted and managed on it.

- **Open standard and interface to the learning environment:** The platform should support open standards and provide interfaces for the exchange of data and the interoperability with legacy system of the learning environment.

### 4.2.3.2. Preparation of the virtual seminar

The preparation of the virtual seminar follows the contact and networking phase and encompasses general tasks and activities performed in advance by the responsible of the seminar for its successful accomplishment. Like the contact and networking phase, this phase precedes the effective “teaching and learning” processes of the seminar and is qualified as pre-act of the seminar in the analogy of the theatrical play adopted to model the seminar process. The person in charge of the faculty develops on the basis of the didactical model proposed in subsection 4.1 a guideline for the realization of the virtual seminar. This guideline is adapted by the remote expert to fit with his/her methodical conception of the virtual seminar. The remote expert completes the guideline with subtopics of the session and their related learning materials and resources to build the concept of the virtual seminar.

The preparation and the configuration of the learning environment for a virtual seminar close this phase. Processes of this phase are covered in detail in the subsequent paragraphs. Figure 4.9 presents the activity diagram of this phase.

**A- Development of a guideline for the realization of the virtual seminar**

The requirements for the realization of the virtual seminar are derived from the didactical model developed in subsection 4.1. Persons in charge of faculty adapt this model to their specific context and write a document, which serves as a guideline for the realization of a virtual seminar in their faculty. This guideline addresses both the supervisor and the participants of the virtual seminar and supports a deeper comprehension of expectations of the faculty related to a virtual seminar. The remote expert uses the guideline of the virtual seminar as a template for the conception of his/her virtual seminar. His influence on the didactical model respectively didactical accentuations of the virtual is marginal but he can propose new ideas and approaches according to the guideline developed by the faculty. The participation of the involved stakeholders of the seminar can be evaluated on the basis of the guideline of the seminar.

Appendix A presents an example of such a guideline for the realization of a virtual seminar.

**B- Development of a concept for the virtual seminar**

On the basis of the guideline provided by the faculty for the realization and supervision of virtual seminars, the remote expert develops a concept for the realization of his/her virtual seminar. He/she adapts and completes the guideline provided by the faculty to
his/her conception of a virtual seminar and develops a theme with its related learning materials, which will be covered during the seminar. He/she organizes the proposed theme in subtopics depending on his/her availability and the complexity of the theme. The adapted guideline of the virtual seminar, the proposed theme, its sub topics and related learning materials builds the core of the concept for a virtual seminar. This concept is proposed to the person in charge of the faculty. A consultation among the staff of the faculty responsible for the virtual seminar takes place in order to analyze the concept of the remote expert. The proposition can be accepted, rejected or sent to revision. In case of a revision, the concept is modified and discussed until an agreement is found. The final concept of the seminar is introduced to the participants in a future phase of the seminar (see 4.2.3.3). The interaction (communication, exchange of data, etc.) among stakeholders of a seminar take place ideally on the "socio professional networking" platform presented in the previous subsection (see 4.2.3.1).

C- Preparation of the learning environment for the virtual seminar

The virtual seminar as a 'Blended Learning' seminar takes place within a learning environment. The learning environment in this context means the technical platform and its components respectively modules used to perform processes and tasks during the seminar. The IMS learning design used to model the teaching and learning process of the virtual seminar specifies for each process respectively activity the appropriate services, tools and resources required to perform it. Some processes or activities can be prepared in advance. The administrator or local supervisor pre-configures and initializes modules of the learning environment, prepares learning resources and allocates them to the respective stakeholders.
4.2.3.3. Introduction to the virtual seminar

This phase of the process corresponds to the formal begin of the virtual seminar. The staff of the seminar respectively the remote expert and the local supervisor introduce themselves to the participants. The didactical accentuations of the seminar (see 4.2.3.2), the benchmark for the evaluation of a performed task, requirements and expectations to participants, examples of solutions, micro-instructions and guidelines for the achievement, which were developed in the previous phase, are introduced to participants in a presence meeting. Subtopics and related materials proposed by the remote expert, and a guideline how to work with the technical environment prepared by the local supervisor or administrator of the environment are presented and distributed to participants in the same meeting.

In the process of the acquisition of key qualifications, which is one of the main goals of the seminar, participants slip consecutively into several roles related to a team of experts in charge of the publication of a book of articles. Qualifications and wishes of participants related to the work on a sub topic do not play a role and are not taken into consideration in the model of participation and interaction developed in this thesis. The model of the thesis assumes that participants are equal and everyone will perform the same tasks until the end of the seminar. These considerations justify the assignment of topics to participants based on a random algorithm. After the presentation of the general framework of the seminar and the assignment of participants to subtopics, each participant introduces him/herself to the staff and the students of the seminar. The macro-script respectively the phase "introduction to the virtual seminar" consists of the following micro-scripts respectively sub-processes:
4.2. Process model of the virtual seminar

1. Selection of participants and group formation;
2. Presentation of the responsible of the seminar;
3. Presentation of the framework and the learning environment of the seminar;
4. Presentation of subtopics and their related learning materials;
5. Assignment of participants to subtopics and presentation of the agenda of the seminar;
6. Presentation of the participants.

A. Metadata of the script

A1 General information

A1.1 Description
- **Name**: Introduction to a virtual seminar.
- **Schema**: reciprocal.
- **Length**: 2 days / 9 hours.
- **Main Success Scenario**: Presentation of the stakeholders, presentation of the framework of the seminar with the subtopics, distribution of the learning material, topic assignment and group formation.

A1.2 context
- **Didactical unit**: Seminar.
- **Level**: Bachelor.
- **Scope**: Online (Social networking platform, Learning Management System), off-line (campus).
- **Objectives**: Presentation of the stakeholders and defining the framework of the seminar in terms of topic and group formation.
- **Activities**: Selection of the participants, group formation, presentation of the framework of the seminar, presentation of the technical environment of the seminar, presentation of subtopics and related learning material, presentation of the stakeholders of the seminar, topic assignment and presentation of the agenda of the seminar.
- **Preconditions**: The framework of the seminar and participants are ready for the start of the seminar.

A1.3 Right
- **Cost**: Free.
- **Copyright-restriction**: Creative common (CC-by-sa).
- **Author**: Erick Tambo de Gankam.
- **Owner**: Erick Tambo de Gankam.

A1.4 Adaptation rules: None.
4. Conceptual Solution for the Realization of Virtual Seminars

<table>
<thead>
<tr>
<th>Participants</th>
<th>6</th>
<th>9</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote expert</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Group size</td>
<td>3 (2)</td>
<td>3 (3)</td>
<td>3 (4)</td>
</tr>
</tbody>
</table>

Table 4.2.: Group partition table

A1.5 Related scripts: None.

A2 Stakeholders (organization, expectations, interaction)

A2.1 Actors and Role
- Staff
  o Remote expert: Presentation and introduction to participants, presentation of the framework of the seminar, introduction and presentation of subtopics and related learning material to participants.
  o Local supervisor: Presentation and introduction to participants, selection of participants, group formation and assignment of subtopics to participants, presentation of the framework of the seminar, distribution of learning resources to participants, supervision of off-line event on campus, presentation of the learning environment to participants.
- Participants
  o Participants: Presentation and introduction to the staff and students of the seminar.
- Group: None.

A2.2 Group characteristics and group formation
- Amount of group, group size: See group repartition table 4.2.
- Group formation: Participants are distributed randomly according to the group partition table presented above.

A2.3 Interaction of stakeholders
- Type and mode
  o Participants - participants: Physical and synchronous at campus (off-line). In order to make the evaluation of participation possible through analysis of log files, participants need to perform certain activities on the virtual environment.
  o Remote expert - participants: Asynchronous on the virtual learning environment.
  o Remote expert - local responsible: Asynchronous on the virtual learning environment.
  o Local supervisor - participants: Physical at campus (off-line). In order to make the evaluation of participation possible through analysis of log files, local supervisor and the participants need to perform certain activities on the virtual environment.

B. Processes of the script
B.1 Selection of participants and group formation

B.1.1 Narrative Participants, which fulfil the requirements defined in the global concept of the seminar proposed by the remote experts and approved by the person in charge of the faculty, are selected. The organizer of the seminar is responsible for the selection of participants and their notification. Qualifications and wishes of participants related to work on a special sub topic do not play a role in the model proposed in this work and are not taken into consideration. The local supervisor selects participants according to criteria defined by the organizer of the seminar and requirements defined in the concept of the seminar. Groups in the seminar are formed according to the partition scheme defined in the concept of the seminar (see 4.1.1).

B.1.2 Time: 0 hour.

B.1.3 Grade benchmark: None.
- Appendix E presents the benchmark for the evaluation of task performed in this phase.

B.1.4 Activities and their sequencing
a. Actors and roles
   - staff
     o Local supervisor: Local supervisor selects participants from applicants, organizes group in the seminar.
   - Participants
     o Participants: Students applied to the seminar.

b. Activities-structure
   1. Selection of participants: Participants are selected according to criteria defined in the concept of the seminar.
   2. Group formation: Participants are assigned to groups according to table 4.2.

c. Activities-orchestration
   - Selection: 1 and 2.

B.1.5 Resources
a. Prepared resources
   - Templates / Guidelines
     o Group partition table (see 4.2);
     o Requirements for the participation defined in the concept of the seminar (see A)
   - Micro-instruction: None
   - Example of solution: None.

b. Distribution of resources and notifications
   - The list of selected participants is published on the workspace of the virtual seminar.
4. Conceptual Solution for the Realization of Virtual Seminars

B1.6 Services
- Form for the registration;
- File for the presentation of selected participants.

B1.7 Outcomes
- List of selected participants for the seminar organized into groups.

B2 Presentation of the responsible of the seminar

B2.1 Narrative The staff of the seminar introduces themselves to the participants of the seminar. Their presentation is based on profiles imported from the 'socio-professional networking' platform. Fields of the profile are standardized and proposed by the organizer of the seminar. In addition to the presentation of their profile, staff of the seminar formulates desires and expectations for the seminar. Ideally, the presentation of the local supervisor should take place in a presence meeting qualified as the introduction meeting of the seminar. By default the presentation of the remote expert takes place virtually using electronic support (multimedia, slide presentation or text format as odt, doc, pdf, etc.) and an asynchronous communication respectively presentation channel in the learning environment. Depending on the infrastructure available for the realization of the seminar, synchronous services respectively tools such as web conferencing or net meeting can be used. Information related to this phase are made available to the audience for the entire phase of the virtual seminar.

B2.2 Time: 2 hours.

B2.3 Grade benchmark: None.

B2.4 Stakeholders and activities

a. Actors and roles
   - staff
     - Remote expert (active): Presentation to participants and introduction to the seminar.
     - Local supervisor (active): Presentation to participants and introduction to the seminar.
   - Participants: None.
   - Group: None.

b. Activities-structure
   1. Presentation and introduction of the remote expert: The remote expert introduces him/herself to the participants, presents his/her motivations and expectations to the seminar.
   2. Presentation and introduction of the local supervisor: The local supervisor introduces him/herself to the participants, presents his/her motivations and expectations to the seminar.

c. Activities-orchestration
   - Selection: 1 or 2.
4.2. Process model of the virtual seminar

B2.5 Resources

a. Prepared resources
   - Templates / Guidelines
     o Profile of the: Profiles of the staff of the seminar are imported from the social networking.
   - Micro-instructions
     o Appendix B.1 presents micro-instruction for the introduction of the responsible.
   - Example of solution: None.

b. Distribution of resources and notifications
   - Profile of the staff is made available to participants;
   - Introduction information filled by the staff are made available to participants.

B2.6 Services

- Multimedia editor/reader: Depending on the format, an appropriate program to edit/read documents of this phase in a multi media form (audio, video, text, etc.);
- Text based document editor/reader: Depending on the format, an appropriate program to edit/read documents of this phase in a text based form (office formats, acrobat, etc.);
- Asynchronous communication: Mail for the communication and transmission of documents between the remote expert and the participants;
- Synchronous communication: Depending on the technical resources and infrastructures for the realization of the seminar, the presentation can take place virtually using synchronous conferencing service of the learning environment (web conference tools).

B2.7 Outcomes

- Profiles of the staff of the virtual seminar;
- Introduction data of the staff of the virtual seminar.

B3 Presentation of the framework and the learning environment of the virtual seminar

B3-1 Narrative The local supervisor presents the technical environment and the guideline for the seminar to the participants. The guideline for the seminar presents the didactical approach, evaluation criteria, learning resources, expectations and tasks for the seminar. Furthermore, the organizer of the seminar must provide a guideline for the use of the technical system and its related modules, a recommendation of software and hardware required to perform tasks and activities of the seminar for the stakeholders involved in the seminar process. Ideally, this presentation takes place in a presence meeting qualified as the introduction meeting of the seminar. Information enumerated above must be distributed to participants and made available in electronic form (multimedia, slide presentation or text format as odt, doc, pdf, etc.) to the audience for the entire virtual seminar.
B3.2 *Time:* 2 hours.

B3.3 *Grade benchmark:* None.

B3.4 *Activities and their sequencing*

a. *Actors and roles*
   - *staff*
     - *Remote expert or local supervisor:* The remote expert or local supervisor presents the general framework of the seminar.
     - *Local supervisor:* The local supervisor presents the learning environment of the seminar.

   - *Participants:* None.
   - *Group:* None.

b. *Activities-structure*
4.2. Process model of the virtual seminar

1. Presentation of the general framework of the seminar: The local supervisor or the expert presents the concept of the seminar (see appendix A).

2. Presentation of the learning environment of the seminar: The local supervisor presents the technical environment for the realization of the seminar.

c. Activities-orchestration
   - Sequence: 1 and 2.

B3.5 Resources

a. Prepared resource
   - Templates / Guidelines
     o Concept of the virtual seminar;
     o Chronogram of the seminar;
     o Guideline of the technical environment.
   - Micro-instructions: None.
   - Example of solution: None.

b. Distribution of resources and notifications
   - The concept of the seminar is distributed to participants in the introduction meeting of the seminar and published on the workspace of the seminar;
   - Guidelines of the technical environment are distributed to participants;
   - Prepared resources needed to perform tasks and activities of the seminar are distributed to participants in the introduction meeting of the seminar.

B3.6 Services

- Multimedia editor/reader: Depending on the format, an appropriate program to edit/read document of this phase in a multi media form (audio, video, text, etc.);
- Text based document editor/reader: Depending on the format, an appropriate program to edit/read document of this phase in a text or printed form (office formats, acrobat, etc.);
- Document management system: to manage the documents of this phase of the process.

B3.7 Outcomes:

- Documents which reviews and comments on the individual contributions (subtopics and learning materials analysis);
- Answers to questions related to subtopics;
- Document with review and comments on the group subject matter analysis.

Figure 4.12 presents the activity diagram for sub-processes related to the structuring of articles both on the individual and on the group level. Group reports which include synopsis of members of a group as well as activities related to its elaboration are evaluated. These sub-processes are specified in detail in the subsequent subsections.

B4 Presentation of the subtopics and related learning material
4. Conceptual Solution for the Realization of Virtual Seminars

B4.1 Narrative: The concept of the seminar consists of the guidelines proposed by the responsible and the sub-topics and related learning material proposed by the remote expert and added to the guideline. Sub topics and related learning material are prepared in electronic form (multimedia, slide presentation or text format as odt, doc, pdf, etc. in a preparatory phase of the seminar (see 4.2.3.2). The presentation of the sub topics is made by the remote expert and takes place virtually using asynchronous services of the learning environment. Depending on the infrastructure available for the realization of the seminar, synchronous services respectively tools of the learning environment (web conferencing or net meeting) can be used. Additionally or optionally, sub topics of the seminar can be presented in the introduction meeting of the seminar by the local supervisor. The protocol of the physical meeting must be included to the presentation. The local supervisor presents only the sub topics and is not supposed to deal with the questions related to these sub topics.

B4.2 Time: 2 hours

B4.3 Grade benchmark: None

B4.4 Activities and their sequencing

a. Actors and roles
   - staff
     - Remote expert (active): present the subtopic of the seminar and the related learning material.
     - Local supervisor (active): supervises the process of assignment of subtopics to participants.
   - Participants: None.
   - Group: None.

b. Activities-structure
   1. Presentation of subtopics and learning materials: Subtopics and related learning materials are presented to the participants.

c. Activities-orchestration:
   - Sequence: 1.

B4.5 Resources

a. Prepared resources
   - Templates / Guidelines
     - Subtopic list and related learning material;
     - Table of group membership.
   - Micro-instructions: None.
   - Example of solution: None.

b. Distribution of resources and notifications
   - Subtopics of the seminar and related learning material are distributed to the respective participants and published on the workspace of his/her group.
4.2. Process model of the virtual seminar

B4.6 Services

- Multimedia editor/reader: Depending on the format, an appropriate program to edit/read documents of this phase in a multimedia form (audio, video, text, etc.);
- Text based documents editor/reader: Depending on the format, an appropriate program to edit/read documents of this phase in a text or printed form (office formats, acrobat, etc.);
- Asynchronous communication: Mail for the communication and transmission of documents between the remote expert and the participants;
- Synchronous communication: Depending on the technical resources and infrastructure of the seminar organizer, the presentation can take place virtually using synchronous service of the learning environment (web conference tools).

B4.7 Outcomes: None.

B5 Assignment of subtopics to the participants and presentation of the agenda of the seminar

B5.1 Narrative: Participants are sorted alphabetically in accordance to the group partitioning scheme presented in table 4.2. Other random algorithms, which fit to the group partitioning scheme can be used. The local supervisor presents the deadlines for the important phases of the seminar. Ideally, this presentation takes place in a presence meeting qualified as the introduction meeting of the seminar. Informations related to this phase are distributed to the participants and made available in electronic form (multimedia, slide presentation or text format as odt, doc, pdf, etc.) to the audience for the entire virtual seminar.

B5.2 Time: 1 hour.

B5.3 Grade benchmark: None.

B5.4 Activities and their sequencing

a. Actors and roles
   - staff
     - Local supervisor (active): supervises the process of assignment of subtopics to participants.
     - Participants: None.
     - Group: None.

b. Activities-structure
   1. Assignments of subtopics to participants: Participants are assigned to subtopics according to the distribution algorithm defined in the concept of the seminar.
   2. Presentation of the agenda: Deadline and important events of the seminar are presented.

c. Activities-orchestration:
   - sequence: 1 and 2.

B5.5 Resources
4. Conceptual Solution for the Realization of Virtual Seminars

a. Prepared resources
   - Templates / Guidelines
     - Concept of the seminar.
   - Micro-instructions: None.
   - Example of solution: None.

b. Distribution of resources and notifications
   - Deadlines of the seminar are published on the shared calendar of the seminar;
   - Repartition list of subtopics is published on the workspace of the seminar.

B5.6 Services
   - Notification service: Shared calendar to manage events and deadlines of the seminar;
   - Document management system: Document management system to manage the documents of this phase of the process.

B5.7 Outcomes
   - Partition list of subtopic to participants;
   - The group elaborates a document, which consolidates all synopses.

B6 Presentation of participants

B6.1 Narrative The presentation of the participants is similar to the presentation of the staff of the seminar. Each participant introduces himself- or herself to the audience with a presentation of his/her profile, motivation, personal setting and expectations for the seminar. Fields of the profile of participants are standardized and proposed by the organizer of the seminar in order to harmonize the presentations. The presentation of participants takes place virtually on the learning environment because of the distributed location of stakeholders. By default, the electronic support and asynchronous communication service of the learning environment are used. Depending on the infrastructure available for the realization of the seminar, synchronous services respectively tools of the learning environment (web conferencing or net meeting) can be used. Information related to this phase are made available to the audience for the entire virtual seminar.

B6.2 Time: 2 hours.

B6.3 Grade benchmark
   - Appendix E presents the benchmark for the evaluation of task performed in this phase.

B6.4 Activities and their sequencing
   a. Actors and roles
      - Staff: None.
      - Participants (active or passive): Participants introduce themselves to the audience of the seminar.
      - Group: None.
b. Activities-structure

1. **Presentation of the profile of the participants:** Participants introduce themselves to the audience.

2. **Introduction to the seminar:** Participants present their motivation, personal setting and expectation for the seminar.

c. Activity-orchestration:

- sequence: 1 and 2.

**B6.5 Resources**

a. Prepare resources

- Templates /Guidelines
  
  - **Profile of the participants:** Profiles of the staff of the seminar are imported from the social networking.
  
- Micro-instructions
  
  - **Appendix B.1** presents microinstructions for the presentation of the participants.
  
- Example of solution: Sample of presentation of a participant.

b. Distribution of resources and notifications

- Profile of participants delivered to the staff of the seminar;

- Introduction information filled by participants are delivered to the responsible of the seminar.

**B6.6 Services**

- Form: The information required for the profile is filled into a form;

- Multimedia editor/reader: Depending on the format, an appropriate program to edit/read documents of this phase in a multi media form (Audio, video, text, etc.);

- Text based documents editor/reader: Depending on the format, an appropriate program to edit/read documents of this phase in a text or printed form (office formats, acrobat, etc.);

- Asynchronous communication: Mail for the communication and transmission of documents between the remote expert and the participants;

- Synchronous communication: Depending on the technical resources and infrastructure for the realization of the seminar, the presentation can take place virtually using synchronous conferencing service of the learning environment (web conference tools).

**B6.7 Outcomes**

- Profile of the participants;

- Introduction data of participants.
4. Conceptual Solution for the Realization of Virtual Seminars

4.2.3.4. Structuring of the work

This phase of the seminar follows the networking and the preparation phase described before and initializes the work on the several subtopics and learning material. It precedes the writing of seminar papers and is the most important phase of the seminar. It deals with the analysis of topics of the seminar and their related learning material. Participants examine their respective subtopics and learning material and from this analysis elaborate the structure of their further contributions respectively papers under the supervision of the staff of the seminar. This phase has a great influence on the development of the seminar and the quality of the participant’s contribution. The better activities and tasks of this phase are performed, the smoother the development of the seminar and the better the contributions of participants will be. The interaction and participation in this phase follows the model presented in 4.1.3.2. It begins with individual literature research and analysis, moves to group collaboration and peer review and finishes with a teacher mediated whole class discussion. The macro-script respectively the "structuring of the work" phase consists of the following micro-scripts respectively subprocesses:

1. Subtopic analysis;
2. Group subject matter analysis;
3. Feedback of the supervisor on the subtopics analysis;
4. Elaboration of the synopsis;
5. Group report;
6. Intra-group regulation and control;
7. Inter-group regulation and control;
8. Feedback of the staff on the individual and group contributions;
9. Revision of contributions.

The micro-scripts are covered in detail in the following paragraphs.

A. Metadata of the script

A1 General Information

A1.1 Description
- Name: Structuring of work.
- Schema: Jigsaw, conflict, reciprocal.
- Length: 13,5 days / 54 hours.
- Main Success Scenario: Subtopic analysis, elaboration of synopsis, elaboration of group report, inter and intra-group regulation and control, feedback of responsible, revision of contributions.

A1.2 Context
- Didactical unit: Seminar.
4.2. Process model of the virtual seminar

- Level: Bachelor.
- Scope: Online (Social networking platform, Learning Management System), offline (campus).
- Objectives: Analysis of subtopics and structuring of work.
- Activities: Analysis of subtopics, reading and understanding scientific content, analyzing and evaluating the significance of the findings of the literature, summarizing the findings of literature, formulation of a hypothesis, motivation and support of group mates, self and group regulated learning and control, self-evaluation (peer review), structuring of work, collaborative and cooperative writing of document, collaborative analysis of topic, sharing of information and knowledge among a group.
- Preconditions: Topics are assigned to participants.

A1.3 Right:
- Cost: Free.
- Copyright: Creative Common (CC-by-sa).
- Author: Erick Tambo de Gankam.
- Owner: Erick Tambo de Gankam.

A1.4 Adaptation rules: None.

A1.5 Related scripts: None.

A2 Stakeholders (organization, expectations, interaction)

A2.1 Actors and Role
- Staff
  - Remote expert: The remote expert evaluates individual and group contribution of participants, monitor groups dynamic and individual participation, answers open questions related to the subtopics and learning materials.
  - Local supervisor: The local supervisor supervises the work on the learning environment, distributes learning resources to the participants, supervises organizational aspects of the seminar.
- Participants
  - Participants: Analysis of subtopics and learning materials, review of contributions, report on the work in the group and the group dynamics, writing of synopsis.
  - Peer reviewer: Analysis of the contribution of the other participants both on the respective group and of other groups.
- Group: See group partition table 4.2

A2.2 Group characteristics and group formation
- Amount of group, group size: See group partition table 4.2
- Group formation: Intra-group formation.
4. Conceptual Solution for the Realization of Virtual Seminars

i. Group manager,
ii. Group participants

A2.3 Interaction of stakeholders

- Type and mode: See the subsection "introduction to seminar" (4.2.3.3/A2-3-a).

B Processes of the script

Figure 4.11 presents the activity diagram of sub-processes related to the analysis of subtopics and the feedback of the responsible or the staff. The sub-processes are covered in detail in the subsequent subsections.

B1 Individual subtopic analysis

B1.1 Narrative

Participants analyze their respective sub-topics and the literature related to it. He/she asks open questions to the supervisor and formulates questions to other members of his/her group so that they familiarize with the topics.

B1.2 Time: 3 days / 12 hours

B1.3 Grading benchmark

Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B1.4 Activities and their sequencing

- Actors and roles
  - Active
    - Participants: The Participants perform activities enumerated below.
  - Passive
    - Local supervisor: Organization and distribution of resources to the participants.

- Activities-structure

1. Analysis of the subtopics and related learning material: The participants analyze their respective subtopics and related materials according to micro-instructions, templates/guidelines and examples of solution of this phase (see appendix B.2 and C.1).

2. Formulation of questions: The participants formulate questions related to the comprehension of the subtopic to the remote expert according to micro-instructions of this (see appendix B.2).

3. Initialization of glossary: The participants initialize the glossary of the seminar. Relevant terms and definitions related to the subtopic are defined according to micro-instructions of this phase (see Appendix B.2).

4. Initialization of the forum: The participants publish questions related to the technical and organizational issue of the seminar on the common forum of the seminar according to micro-instructions of this phase (see appendix B.2).

- Activities-orchestration

- Sequence: 1 and 2 and 3 and 4.
4.2. Process model of the virtual seminar

**B1.5 Resources**

a. Prepared resources
   - Template / Guidelines
     - Prepared resources: Appendix C.1 presents the guideline, the structure for writing a synopsis.
     - Micro-instructions: Appendix B.2 presents micro-instructions for activities respectively tasks of this phase.
   - Example of solution: None.

b. Distribution of resources and notifications
   - The work space, the group-glossary and the common forum of each group is configured by the local supervisor;
   - Examples of outcomes related to this phase are distributed to the participants;
   - Templates and micro-instructions for the achievement of tasks are distributed to the participants;
   - The benchmark for grading of activities of this step is distributed to the participants;
   - Results of subtopic analysis and open questions related to this subtopic delivered to the remote expert and published on the workspace of the group;
   - Terms and definitions of subtopics of a group are published in a common glossary of the seminar;
   - Documents with complementary learning materials and open questions related to subtopics of group mates delivered to the respective person and published on the workspace of the group;
   - Open questions related to organizational and technical issues of the seminar are published on the common forum of the seminar. The technical responsible is notified about posts on this forum.

**B1.6 Services**

- Notification service: Mail for the transmission of documents to supervisors;
- Asynchronous communication: Forum for general questions related to the organizational and technical issues of the seminar;
- Document editor: The document editor is needed to edit documents related to the activities of this phase;
- Shared editor or WIKI: The shared editor edits the collaborative documents, i.e. the glossary of the seminar;
- Document management system: The document management system manages documents created in this phase of the process.

**B1.7 Outcomes**

- One document with the result of the subtopic analysis per member;
- Document with open questions related to subtopics and the organization of the seminar to the supervisor;
4. Conceptual Solution for the Realization of Virtual Seminars

- Definition of terms related to subtopics in a common glossary;
- Document with open questions related to the subtopic of a group mate;
- Document with complementary learning materials for the subtopics of a group-mate;
- Document with open questions related to organizational and technical issues of the seminar.

B2 Group topic analysis

B2.1 Narrative:
Each sub-topic of a group is related to a group problem. Members of a group analyze and reflect this theme in their group.

B2.2 Time: 1 day / 4 hours

B2.3 Grading benchmark:
Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B2.4 Activities and their sequencing

a. Actors and roles

- Staff
  - local supervisor: The local supervisor distributes resources needed to perform activities to participants.

- Participants
  - Participants: The participant performs tasks formulated in the activities above. Group responsible: The group responsible coordinates and organizes the work processes within the group in this step. He/she is the representative of the group.

b. Activities-structure

1. Choose a group responsible: Participants choose a group responsible in their respective group for the coordination of activities.

2. Questions to group mates: Participants formulate question to a group mate according to micro-instructions of this phase specified in the concept of the seminar (see appendix B.3).

3. Proposition of learning materials to group mates: Participants propose additional learning materials to group mates according to micro-instructions of this phase specified in the concept of the seminar (see appendix B.3).

4. Answering of questions of group mates: Participants answer questions of their group mates.

5. Analysis of subtopics in relation to the group theme: Each participants analyse his/her subtopic in relation to other subtopics of the group and to the group theme.

c. Activity-orchestration

- Sequence: 1 and 2 and 3 and 4 and 5.
4.2. Process model of the virtual seminar

B2.5 Resources

a. Prepared resources
   - Templates / Guidelines:
     - Appendix C.2 presents the guideline and the structure for the analysis of a subtopic in relation to the group theme.
   - Micro-instructions
     - Appendix C.2 presents micro-instructions for activities respectively tasks of this phase.
   - Example of solution
     - Example of documents which presents the analysis of a subtopic in a group in relation to other subtopics and to the subject matter of the group.

b. Distribution of resources and notifications
   - Questions and responses of the participants are delivered to the respective person and are published on the workspace of the group;
   - The presentations of a subtopic in relation to other subtopics of the group and to the group problem are delivered to the remote expert and are published on the workspace of the group.

B2.6 Service and tools

- Notification service: Mail for the transmission of documents to the remote expert;
- Shared editor or WIKI: The shared editor is used to collaborative documents in this phase;
- Document management system: The document management system manages and administrates documents of this phase of the seminar.

B2.7 Outcomes

- Each participant writes a document, which reflects his/her subtopic in relation to the subtopics of his/her group mates, which reflects his/her subtopic in relation to the whole group topic and to the subject matter covered in other group(s);
- Each participant answers questions formulated by other members of his/her group in a document.

B3 Feedback of the remote expert of the seminar on the analysis

B3.1 Narrative: The remote expert analyzes and comments documents submitted by the participants. The remote expert answers open questions related to subtopics. The local supervisor answers organizational and technical issues of the seminar.

B3.2 Time: 2 days / 8 hours.

B3.3 Grading benchmark

Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B3.4 Activities and their sequencing

a. Actors and roles
4. Conceptual Solution for the Realization of Virtual Seminars

- Staff
  - Remote expert or local supervisor: The remote expert analyzes and comments contributions of the participants.
  - Local supervisor: The local supervisor answers organizational questions related to the seminar.

- Participants: None

b. Activities-structure

1. Feedback on individual contribution: The remote expert analyzes and comments on the individual contributions of the participants.
2. Answer on open questions: The remote expert answers open questions related to the subtopics of the participants.
3. Feedback on group subtopic analysis: The remote expert analyzes and comments on the contributions of the participants on the analysis of the group topic.
4. Feedback on organizational questions: The local supervisor answers organizational questions of the participants. She/he supervises the learning environment of the seminar.

c. Activities-orchestration

- Sequence: 1 and 2 and 3 and 4.

B3.5 Resources

a. Prepared resources

- Templates / Guidelines
  - The remote expert uses guidelines for writing a group report (see appendix C.2). He/she gives his/her feedback on the contributions of the participants.

- Micro-instructions
  - The remote expert uses micro-instructions (see B.3) for the analysis of the group topic (see appendix C.2). He/she gives his/her feedback on the contributions of the participants.

- Example of solution: None.

b. Distribution of resources and notifications

- A document with comments on individual subtopics and learning materials analysis is delivered to each participant;
- Answers to questions related to subtopics are delivered to the respective participant;
- A document with comments on the group subject matter analysis is delivered to the participants and published on the group workspace

B3.6 Services

- Asynchronous communication: Mail for the transmission of documents to participants;
4.2. Process model of the virtual seminar

- Synchronous communication: Chat or video conference depending on the local infrastructure,
- Document editor: The document editor is needed to edit and comment on the contributions of the participants;
- Document management system: The document management system manages and administrates documents created in this phase of the seminar process.

B3.7 Outcomes

- Documents which reviews and comments on the individual contributions (subtopics and learning materials analysis);
- Answers to questions related to subtopics;
- Document with review and comments on the group subject matter analysis.

Figure 4.12 presents the activity diagram for sub-processes related to the structuring of articles both on the individual and on the group level. Group reports which includes synopsis of members of a group as well as activities related to its elaboration are evaluated. These sub-processes are specified in detail in the subsequent subsections.

B4 Elaboration of synopsis of works
4. Conceptual Solution for the Realization of Virtual Seminars

B4.1 Narrative: Participants and the supervisor agree on the structure of the final work respectively paper in accordance to the model defined in the concept of the seminar. Participants elaborate a synopsis of their respective work, which reflects their comprehension of subtopics and provide details of the evolution of the work.

B4.2 Time: 1 day / 4 hours

B4.3 Grading benchmark
- Appendix D.1 presents the reviewer evaluation form for synopsis.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B4.4 Activities and their sequencing
a. Actors and roles
   - staff
     o Remote expert or local supervisor: The staff presents the required elements of the synopsis.
     o Local supervisor: The local supervisor distributes resources needed to perform activities to the participants.
   - Participants elaborate synopsis
     o Participants: The participants elaborate a synopsis.

b. Activities
   1. Elaboration of synopsis: Each participant writes a synopsis to his/her respective subtopic.
   2. Publication of synopsis: The synopses of the participants are published on the group workspace and delivered to the remote expert and the members of the other group(s).

c. Activity orchestration
   - Sequence: 1 and 2.

B4.5 Resources
a. Prepared resources
   - Templates / Guidelines
     o Appendix C.1 presents the guideline for writing a synopsis.
   - Micro-instructions: None.
   - Example of solution: Example of synopsis.

b. Distribution of resources and notifications
   - Example of synopsis, guidelines for writing a synopsis, and evaluation model of synopsis are distributed to the participants by the local supervisor.

B4.6 Service and tools
- Asynchronous communication: E-Mail, in order to notify and communicate between the remote expert and participants.
4.2. Process model of the virtual seminar

- Document editor: The document editor is needed to write the synopsis.
- Document management: to manage and administrate documents created in this phase of the seminar process.

B4.7 Outcomes
- Synopses of participants.

B5 Group report

B5.1 Narrative: Each group produces reports, which summarizes the individual and group contribution of the respective group up to this phase of the process. The report consists of the presentation of the group subject matter, the presentation of borders and relationships between subtopics and the consolidation of synopses.

B5.2 Time: 1 day / 4 hours.

B5.3 Grading benchmark
- Appendix D.1 presents the reviewer evaluation form for synopsis.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B5.4 Activities and their sequencing

a. Actors and roles
- Staff
  - Local supervisor: The local supervisor distributes resources needed to perform activities to participants.
- Participants
  - Participants: The participants choose a group responsible for the coordination of the activities, elaborate a group report, which present the group theme, borders and relationship between subtopics of the group and summarize synopsis of the group.

b. Activities-structure
1. Choose group responsible: The group chooses a person responsible for the coordination of the activities.
2. Report on group topic analysis: The group writes a report, which presents the group theme, the borders and relationship between the subtopics of the group. The report is based on tasks performed in the previous phases.
3. Consolidation of synopses: The group report encompasses all synopses of the participants. The report is based on tasks performed in the previous phases.

c. Activity-orchestration
- Sequence: 1 and 2 and 3.

B5.5 Resources

a. Prepared resources
- Templates / Guidelines
4. Conceptual Solution for the Realization of Virtual Seminars

- Appendix C.2 presents the guideline for writing a group report.
- Microinstruction:
  - Appendix B.4 presents microinstruction for writing a group report.
- Example of solution: Document which presents, how to summarize subtopics of a group in a coherent form with an emphasis on the borders and relationship between these.

b. Distribution of resources and notifications
- Template/guidelines, microinstructions, example of group report and the evaluation model of activities performed on this phases are published on the workspace of the seminar and delivered to participants by the local supervisor;
- Outcomes of this step are published on the group workspace and delivered to the remote expert.

B5.6 Services
- Document editor with collaborative features or wiki to edit document of this phase;
- Document management: The document management manages the document created in this phase of the seminar;
- Asynchronous communication: E-Mail for the transmission of documents to the responsible.

B5.7 Outcomes
- The group elaborates a document (group report), which presents the group theme, which summarizes the individual subtopics and present borders and relationship between these, which presents the group subject matter in relation to subtopics of other groups;
- The group elaborates a document, which consolidates all synopses.

B6 Intra-group regulation and control

B6.1 Narrative: Intra group regulation and control refers to the monitoring of the work dynamics within a group. Each participant reflects his/her personal contribution to the group, analyzes and comments on the dynamic of work or the development of the group.

B6.2 Time: 1 day / 4 hours.

B6.3 Grading benchmark
- Appendix B.5 presents micro-instructions for the achievement of task in this phase.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B6.4 Activities and their sequencing
a. Actors and roles
  - staff
    - Local supervisor: The local supervisor distributes resources needed to perform activities to the participants.
4.2. Process model of the virtual seminar

- Participants
  - Group: participants logs activities of their respective group and formulate propositions for the amelioration of work within the group.
  - Group responsible: coordinate the work processes respectively the writing of reports in this phase. He/she is the representative of the group.

b. Activities-structure
  1. Choose group responsible: Each group chooses a group responsible for the coordination of activities.
  2. Protocol of activities: Each participant logs activities performed in his/her group according to micro-instructions specified in the concept of the seminar (see appendix B.5).

c. Activity-orchestration
  - Sequence: 1 and 2.

B6.5 Resources

a. Prepare resources
  - Templates /Guidelines: None.
  - Microinstructions
    - Appendix B.5 presents micro-instructions for activities and tasks of this phase.
  - Example of solution: Example of group journal.

b. Distribution of resources and notifications
  - Template/guidelines, microinstructions, example of group report and the evaluation model of activities performed on this phases are published on the workspace of the seminar and delivered to the participants by the local supervisor;
  - Outcomes of this phase created by the participants are published on the group workspace and delivered to the remote expert.

B6.6 Services

- Blog to edit and structure comments and appreciations of the group journal;
- Document editor with collaborative features or wiki to edit the group journal;
- Notification service: Mail for the transmission of documents to the supervisor of the seminar;
- Document management: The document management manages documents created in this phase of the seminar process.

B6.7 Outcomes

- Group journal, which illustrates the evolution and participation of members of a group and the work dynamic in this group;
- Concrete proposition of the group mates for the improvement of the next phases.
4. Conceptual Solution for the Realization of Virtual Seminars

B7 Inter-group regulation and control

B7.1 Narrative: Inter group regulation and control refers to the evaluation of the contributions of the participants of a group by the participants of other group(s). The evaluation is based on the group report, which contains relevant aspects to be evaluated.

B7.2 Time: 2 days / 8 hours

B7.3 Grading benchmark
- Appendix D.1 and D.2 present templates for the evaluation of synopsis and group report.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B7.4 Activities and their sequencing
a. Actors and roles
   - staff
     o Local supervisor: The local supervisor distributes resources needed to perform activities to participants.
   - Participants
     o Participants (Reviewer): Each participant reviews the contribution of the participants (peer review) of other group(s).
     o Group responsible: The group responsible coordinates the work processes respectively the writing of reports in this phase. He/she is the representative of the group for potential questions.

b. Activities-structure
   1. Choose group responsible: Each group chooses a group responsible for the coordination of activities.
   2. Evaluation of group report Each group evaluates the group report of another group according to the reviewer evaluation form presented in the concept of the seminar (see appendix D.2). The group responsibles coordinate the work in their respective group.
   3. Evaluation of synopsis Each participant evaluates the synopsis of the participants of other group according to the reviewer evaluation form presented in the concept of the seminar (see appendix D.1).

c. Activity-orchestration
   - Sequence: 1 and 2 and 3.

B7.5 Resources
a. Prepared resources
   - Templates / Guidelines
     o Appendix presents the template or guideline for the evaluation of activities respectively tasks of this phase.
4.2. Process model of the virtual seminar

- Micro-instructions: None.
- Example of solution
  o Example of evaluation of a group report.
  o Example of evaluation of a synopsis.

b. Distribution of resources and notifications
- Example of group reports is published on the workspace of the seminar and distributed to participants by the local responsible;
- Templates/guidelines for the evaluation of synopsis and group report are published on the workspace of the seminar and distributed to participants by the local responsible;
- Outcomes of this phase are published on the workspace of the seminar, delivered to the respective participants and to the remote expert.

B7.6 Service and tools
- Document editor: The document editor is needed to edit and comment on the contributions of the participants;
- Document management system (DMS): The DMS manages and organizes the documents of this phase. The DMS can provide a notification mechanism to inform interested stakeholders about changes in the common workspace of the learning environment;
- Asynchronous communication: Mail for the transmission of documents among stakeholders.

B7.7 Outcomes
- Each group writes a document, which evaluates the group reports of other groups (3* (3-1) = 6 documents);
- Each participant writes a document, which evaluates the synopsis of the participants in other groups(9 participants * 3 (3-1) = 54 documents).

B8 Supervisor feedback
B8.1 Narrative The supervisor analyzes the reports and documents produced by the participants. Two levels of evaluation can be organized depending on the availability of the remote supervisor and the aspects of the seminar to be supervised.

B8.2 Time: 2 days / 8 hours

B8.3 Grading benchmark
- Appendix D.1 and D.2 presents the reviewer evaluation for the synopsis and the group report.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B8.4 Activities and their sequencing
a. Actors and roles
4. Conceptual Solution for the Realization of Virtual Seminars

- staff
  - Remote expert or local supervisor (active): The staff analyzes and comments on the contributions of the participants.
- Participants: None.

b. Activities-structure

On a coarse evaluation level:

1. Analysis of the intra-group and regulation phase: The remote expert analyzes the outcomes of the intra group regulation and control phase;
2. Analysis of the inter-group and regulation phase: The remote expert analyzes the outcomes of the inter group regulation and control phase.

On a fine evaluation level

1. Analysis of the group report phase: The remote expert analyses the outcomes of the group report phase;
2. Analysis of synopses: The remote expert reviews the individual synopses.

c. Activity-orchestration

- Selection (coarse level): 1 or 2.
- Selection (fine level): 1 or 2.

B8.5 Resources

a. Prepared resources

- Templates / Guidelines
  - Reviewer evaluation form for synopsis;
  - Reviewer evaluation form for group report.
  - Template and guidelines used by the participants in the inter-group regulation and control phase.
- Micro-instructions
  - Micro-instructions followed by the participants in the phase of individual subtopics analysis;
  - Micro-instructions followed by the participants in the phase of individual subtopics analysis;
  - Micro-instructions followed by the participants in the phase of group report.
- Example of solution: None,

b. Distribution of resources and notifications

On a coarse evaluation level:

- Documents (comments on the group journal, comments on the presentation of the group subject matter and subtopics) created by the remote expert are delivered to the respective group manager and published on the workspace of the group.

On a fine evaluation level:
4.2. Process model of the virtual seminar

- A document with feedback and comments on the individual synopsis is delivered to the respective participant.

**B8.6 Services**

- Asynchronous communication: Mail for the communication between the remote expert and participants;
- Synchronous communication: Chat or video conference depending on the local infrastructure to clarify misunderstandings;
- Document editor: The document editor is needed to edit and comment on the contributions of a participant;
- Document management: The document management manages documents created in this step of the seminar.

**B8.7 Outcomes** On a coarse evaluation level:

- Document, which comments and appreciates the journal of the groups;
- Document, which gives a feedback and comments on the presentation of the group topic and group subtopics;
- Document, which comments on the propositions formulated by the participants for the improvement of the seminar.

On a fine evaluation level:

- Document, which gives feedback and comments on the synopses of the participants.

**A9 Revision of contribution**

Critics, propositions, comments formulated by participants of other group(s) and the remote supervisor both on an individual and on group level are analyzed and revised in the final version of individual and group contributions and reports. A protocol of accepted and rejected changes is written with reasons for the acceptance or the refusal. These protocols are published on the workspace of the virtual seminar and delivered to the responsible. Activities of this phase take 1 day or 4 hours.

**C Activity diagram**

Figure [4.13] presents the complete activity diagram of this phase.

**4.2.3.5. Writing of the seminar paper**

One of the main objectives of the concept proposed in this thesis is the acquisition of knowledge and key qualifications by participants presented in the subsection [4.1.2]. The scientific article produced by participants as a result of the seminar must reflect the achievement of the goals related to the acquisition of key qualification. The review paper, as a special case of a scientific article is geared to the synopsis proposed in the previous phase and follows the AIMRaD approach (see [4.1.2]) used by most scientific journals. The writing of the seminar paper assumes that participants are already familiar with their respective subtopics. Activities of this phase follow directly the elaboration of the synopsis and address the same requirements as enumerated in the previous phase (see [4.2.3.4]). The interaction and participation model applied in the previous phase and presented in the section [4.1.3.2] supports the participants.
4. Conceptual Solution for the Realization of Virtual Seminars

Figure 4.13.: Activity diagram: Structuring of the work
4.2. Process model of the virtual seminar

in the acquisition of these key qualifications. It begins with individual literature research and analysis, moves to group collaboration and peer review and finishes with a supervisor mediated whole class discussion. The macro-script respectively the phase "structuring of the work" consists of the following micro-scripts or sub-processes:

1. Individual contribution;
2. Intra-group regulation and control;
3. Elaboration of group-articles;
4. Inter-group regulation and control;
5. Feedback of the staff to individual and group contributions;
6. Revision of contributions;
7. Collection of articles for the book of articles of the seminar

These micro-scripts are covered in detail in the following paragraphs.

A. Metadata of the script

A1 General Information

A1.1 Description
- Name: Writing of the seminar paper.
- Schema: Jigsaw, conflict, reciprocal.
- Length: 10,5 days / 36 hours.
- Main Success Scenario: Writing of an article, inter and intra-group regulation and control, feedback of the staff, revision of contributions, elaboration of the book of articles.

A1.2 Context
- Didactical unit: Seminar.
- Level: Bachelor.
- Scope: Online (Social networking platform, Learning Management System), off-line(campus).
- objectives: Writing of the seminar paper.
- Activities: Formulation of hypothesis, summarize content of scientific text, application and presentation of scientific method for research, elaborating on content, presentation of results and outcomes of scientific research, protocol of group activities, motivation and support of group mates, self and group regulated learning and control, self evaluation (peer review), collaborative and cooperative writing of document, sharing of information and knowledge within a group.
- Preconditions: The participants are familiar with their respective subtopics and the seminar theme.

A1.3 Adaptation rules: None.
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A1.4 Related script: None.

A2 Stakeholders (organization, expectations, interaction)

A2.1 Actors and Role

a. Staff

   o Remote expert: The remote expert evaluates the individual and group contribution of the participants, monitors group dynamics and individual participation, answers open questions related to subtopics and learning materials.

   o Local supervisor: The local supervisor supervises the work on the learning environment, distributes learning resources to the participants, supervises organizational aspects of the seminar.

b. Participants

   o Evaluation of contributions, report the work in the group and the group dynamic, Write a synopsis, peer review.

   - Example of solution: None.

b. Distribution of resources and notifications

   On a coarse evaluation level:

   - Documents (comments on the group journal, comments on the presentation of the group subject matter and subtopics) created by the remote expert are delivered to the respective group manager and published on the workspace of the group.

   On a fine evaluation level:

   - A document with feedback and comments on the individual synopsis is delivered to the respective participant.

A2.2 Group characteristics and group formation

a. Amount of group, group size: See group repartition table 4.2.

b. Group formation: Intra-group formation.

A2.3 Interaction of stakeholders

a. Type: See Introduction to seminar 4.2.3.3 / A2-3-a).

b. Mode: See Introduction to seminar 4.2.3.3 / A2-3-b).

B Script sub-processes

Figure 4.13 presents the activity diagram of the sub-processes related to the structuring of an article both on the individual and on the group level. This figure can be used for the illustration of sub-processes related to the writing of an article because the interactions among the processes for the structuring of the work are similar to the interactions of the processes in this phase. The difference between the two cycles of processes lies in the product, which is in the focus of interactions. In the sub-process "structuring of the work" described before, the focus lies on the elaboration of a synopsis, and in processes of this phase, the focus lies on the writing of an article. Sub-processes of this phase are specified in detail in the subsequent subsections.
4.2. Process model of the virtual seminar

B1 Individual contribution

Each participant writes his/her paper based on the synopsis elaborated in the previous phase. The structure of the paper defined in the synopsis follows the AIMRaD approach. Processes of this phase are similar to the processes performed in the phase of "writing of synopsis" with following differences:

- Time: 3 days / 12 hours.
- Activities-structure: Writing, publishing and delivery of seminar article.
- Resources: Guideline for writing an article (see D.3).
- Outcome: Article of the seminar.

B2 Intra-group regulation and control

Processes of the intra-group regulation and control in this phase are similar to processes of the intra-group regulation in the phase "structuring of work" (see 4.2.3.4). Activities in this phase take 1 day or 4 hours.

B3 Elaboration of group-articles

B3.1 Narrative Participants summarize all papers produced in their respective group in a structured and coherent way. The summarized papers constitute a chapter of the book of articles.

B3.2 Time: 1 day / 4 hours.

B3.3 Grading benchmark

- Appendix D.4 presents the reviewer evaluation form for group articles.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

B3.4 Activities and their sequencing

a. Actors and roles

- staff
  - Local supervisor: The local supervisor distributes the resources needed to perform activities to participants.
  - Participants
    - Participants: The participants summarize the articles of the group and complete the glossary and lexicon of the group.
    - Group responsible: The group responsible coordinates the interaction and work processes of this phase. He/she is the representative of the group.

b. Activities-structure

1. Choose group responsible
2. Elaboration of the table of content: Participants elaborate the table of content of the respective group according to the guidelines specified in the concept of the seminar (see appendix C.4).
4. Conceptual Solution for the Realization of Virtual Seminars

3. Writing of group introduction: Participants of a group write a common introduction about the theme covered in their group (see appendix C.4).

4. Joining of articles: Participants consolidate all articles of their respective group (see appendix C.4).

5. Writing of group conclusion: Participants of a group write a common conclusion about their group theme (see appendix C.4).

6. Completion of group glossary and lexica: Participants complete the glossary and the lexicon of the seminar (see appendix C.4).

c. Activity orchestration
   - Sequence: 1 and 2 and 3 and 4 and 5 and 5 and 6.

B3.5 Resources

- Prepared resources
  - Templates / Guidelines
    - appendix C.4 presents the guideline for the writing of group articles.
  - Micro-instructions
    - Micro-instructions for activities: Complete the glossary and the lexicon of the group with five terms (describe three terms with own words and two by using technical literature).
    - Example of solution: Example of summary of group paper.

b. Distribution of resources and notifications
   - Prepared resources, micro-instructions and models of evaluation are published on the workspace of the group and delivered to the participants;
   - The summary of the group is published on the workspace of the group and delivered to the responsible of the seminar;
   - Participants edit terms of glossary and lexicon of the seminar.

B3.6 Service and tools see 4.2.3.4 / B4-4-c.

B3.7 Outcomes
   - Table of content of the chapter;
   - Conclusion of the chapter;
   - Summary of group articles respectively editing of a chapter of the book of article;
   - Extended group lexicon and glossary.

B4 Inter-group regulation and control

Each group reviews contributions of other group(s) both contributions of individual participants and group contributions. Processes of this phase are similar to processes performed in the phase "inter-group regulation and control" of the phase "structuring of work" with following differences:
   - Time: 2 days / 8 hours.
   - Activities-structure: Evaluation of individual and group articles.
4.2. Process model of the virtual seminar

- Resources: Guideline for writing of individual and group articles
- Outcome: Group report on the evaluation of other group(s) and on the evaluation of articles of participants in these group(s).

**B5 Feedback of the responsible**

Similar to the activities of the supervisor in the phase 'structuring of work', the supervisor analyzes reports and documents produced by the participants. Depending on the concept of the seminar and his availability, he/she can analyze reports of evaluation of participants from the phase of inter and intra-group regulation and control, or on a deeper level of individual contribution of participants and summary of group papers. The feedback of the staff takes 2 days or 8 hours.

**B6 Revision of contributions**

Critics, propositions and comments formulated by the participants of other group(s) and the remote supervisor both on an individual and on a group level are analyzed and revised in the final version of individual and group contributions. A protocol of accepted and rejected changes is written together with the reasons for the accepting or the rejecting. These protocols are published on the workspace of the virtual seminar and delivered to the responsible. The revision of the contributions takes 0.5 day or 2 hours.

**B7 Production of the book of articles**

**B7.1 Narrative**

At the end of the seminar, participants collect all contributions respectively papers in a book. Standards or specifications for the production of the book are defined in the concept of the seminar.

**B7.2 Time:** 1 day / 4 hours

**B7.3 Grading benchmark:** None

**B7.4 Activities and their sequencing**

a. Actors and roles
   - staff
     o Local supervisor: The local supervisor distributes resources needed to perform activities to participants.
     - Participants
       o Summarize article of the seminar in the book of article of the seminar.
       o Group responsible coordinates the interaction and work processes of this phase.

b. Activities-structure

1. Production of the book of articles: Participants collect all contribution of the seminar and produce a book of articles of the seminar according to the guideline presented in the concept of the seminar (see appendix C.5).


   - Sequence: 1 and 2.
4. Conceptual Solution for the Realization of Virtual Seminars

B7.5 Resources

a. Prepared resources
   - Templates / Guidelines
     - Appendix C.5 presents the guideline for writing of the book of articles of the seminar.
   - Micro-instructions: None.
   - Example of solution: Example of book of articles.

b. Distribution of resources and notifications
   - Prepared resources, sample of solutions and models of evaluation are published on the workspace of the group and delivered to the participants;
   - The book of articles is published on the shared workspace of the seminar and delivered to the responsible of the seminar.

B7.6 Services: see 4.2.3.4 / B4.7

B7.7 Outcomes

- Book of articles of the seminar.

In analogy to the argumentation in sub-section 4.2.3.5-B, the figure 4.13 can be used as an activity diagram to illustrate activities of the sub-processes of this phase. Processes for the production of the book of articles are similar to processes for the production of group-articles or chapters of the book of articles.

4.2.3.6. Preparation of presentation

The scientific article or seminar paper explains and presents results from the literature analysis on a particular topic in a detailed and coherent way. It formulates, justifies and validates hypothesis and presents outlook related to the respective topic. This result must be properly presented to the audience of the seminar for discussion. The presentation is based on the result of the scientific work and directly follows the phase of production of the book of the seminar. Activities performed by participants in order to prepare the presentation of results and outcomes of their respective work are modelled in this phase. The work processes or interaction and participation model of stakeholders in this phase consist of an individual contribution phase, moves to group collaboration and end with a participants peer review. Micro-scripts respectively sub-processes of this phase can be considered as extensions of processes of the previous phase. The paper of the seminar produced in the previous phase covers the subtopics and presents the work achieved in detail while the presentation in this phase summarizes important findings and presents them in a condensed form. Participants are responsible for their individual presentation. Members of a group elaborate a common document for presentation and perform the presentation as a group. This approach aims at supporting participants in the acquisition of key qualifications enumerated in the subsection 4.2.3.5. The presentation process is covered in detail in the next phase of the seminar. The macro-script "preparation of presentation" consists of the following micro-scripts or sub-processes, which are specified in detail in the subsequent paragraphs:

1. Preparation of individual presentation;
2. Preparation of group presentation.

A. Metadata of the script

Metadata of the macro-script "preparation of presentation" belongs to the previous phase "writing of the seminar paper". General information, stakeholders and their organization are similar to those of the previous phase (see 4.2.3.5).

B. Processes of the script

B1 Preparation of individual presentation

Each participant summarizes important findings of his/her work for the presentation to the audience of the seminar. Standards for the presentation are presented in appendix B. By default presentations are text based. The open document presentation Format (.odp) for office applications (OpenDocument) developed by the Advancing Open Standard for the global Information Society (OASIS) is favoured. Depending on the infrastructure available and the technical background of actors in campus (participants and local supervisor), presentations can be multimedia based with audio (podcast) and video (vodcast) support. Processes of this phase are similar to processes performed in the phase "inter-group regulation" of the phase "structuring of work" with following differences:

- Time: 1 day / 4 hours.
- Activities-structure: Each participant makes slides for the presentation of his/her subtopic.
- Resources: Guideline for writing slides for presentations (see appendix C.6.)
- Outcome: Individual presentations of participants.

B2 Intra-group regulation and control group for presentation

B2.1 Narrative Activities of the intra-group regulation and control in this phase are similar to those of the structuring of work phase (see 4.2.3.4). Participants reflect their personal contribution in the group, and analyze and comment on the dynamic of work in the group or the development of the group. Due to the fact that presentations take place as group presentation, members of a group elaborate a common document for their respective group presentation. Individual presentations in a group are combined to build the group presentation.

B2.2 Time: 0, 5 day / 2 hours

B2.3 Grading benchmark: None.

B2.4 Activities and their sequencing

a. Actors and roles

- staff
  - local supervisor (passive): The local supervisor distributes resources needed to perform activities to participants.

- Participants
4. **Conceptual Solution for the Realization of Virtual Seminars**

- **Participants:** The participants choose a group responsible, evaluate presentations of the group mates, prepare the group presentation and protocol activities of the group.

- **Group responsible:** The group responsible coordinates the interaction and work processes of this phase. He/she is the representative of the group.

### b. Activities-structure

1. Choose a group responsible.
2. Evaluation of the presentation of the group mates.
3. Preparation of the group slides.
4. Edit journal or protocol interaction and activities in the group.

### c. Activity orchestration

- Sequence: 1 and 2 and 3 and 4 and 5.

#### B2.5 Resources

##### a. Prepared resources

- **Templates / Guidelines**

  - Appendix [D.5](#) presents the reviewer evaluation form for presentations.

- Micro-instructions:

  - Appendix [B.5](#) presents micro-instructions for the intra-group regulation and control.

- Example of solution:

  - Example of group slide.

##### b. Distribution of resources and notifications:

- Prepared resources and benchmarks for the evaluation of activities of this phase are published on the workspace of the group and delivered to the participants by the local expert;

- Group presentations delivered to the responsible of the seminar by the group responsible.

#### B2.6 Services

- Shared presentation editor: The shared presentation editor is an appropriate program to edit/read slides in an open format specified in the concept of the seminar. (Open document format, Open template format, etc.);

- Notification service: Mail for the transmission of documents to supervisors;

- Blog: A blog to log the interaction within the group in a journal.

#### B2.7 Outcomes

- Document or protocol, which presents the development and participation of individuals in the group and the group dynamics;

- Document, which presents the evaluation of the slides of the group mates;

- Group slides.
4.2. Process model of the virtual seminar

<table>
<thead>
<tr>
<th></th>
<th>Asynchronous</th>
<th>virtual</th>
<th>Synchronous</th>
<th>physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Publication of slides for a text based, or vodcast / screencast for audio/video based, presentation</td>
<td>1- Group presentation using live conferencing services</td>
<td>1- Group presentation on campus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2a- Feedback and comments of the participants on the group presentation</td>
<td>2a- Feedback and comments of the participants directly after the presentation on the live conferencing environment</td>
<td></td>
<td>2- Feedback and comments of participants</td>
<td></td>
</tr>
<tr>
<td>2b- Feedback and comments of the remote expert on the group presentation</td>
<td>2b- Feedback and comments of the remote expert on the live conferencing environment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3- Log of the presentation session</td>
<td>3- Log of the presentation session</td>
<td></td>
<td>4- Feedback and comment of the remote expert on the published report of the presentation</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.3.: Models of presentation

4.2.3.7. Presentation of the work

The scientific article or paper of the seminar presents part of the effort of the participants related to the acquisition of key qualifications. The presentation of achieved results and outcomes is another important objective pursued by the concept of seminar proposed in this thesis.

Table 4.3 presents the different models of presentation according to the distribution of stakeholders within the scope of the thesis, the steps of the presentation process, the environment and medium used to support the presentation.

The virtual synchronous presentation presents the best model of presentation for distributed stakeholders if the time constraints for the synchronization of stakeholders are satisfied and the required infrastructures for the execution of the processes is available. This model is based on the use of virtual live conferencing services or tools, which provide functionalities such as moderated chat with audio and video channel, white board, desktop and files sharing, record of interactions. This model is not analyzed deeper in this thesis due to the fact that requirements in term of infrastructures are mostly not achieved in remote or rural area and in even some cities in African countries.

An alternative model of presentation is the organization of a physical presentation-meeting at the location of the participants. An important point for this model is the writing of the report of the meeting and its publication on the learning environment or its delivery to the remote expert in order to give him the possibility to give his/her feedback on the presentations respectively physical meeting.

The concept of the thesis is based on the virtual asynchronous model presented in table 4.3. This model belongs to the didactical accentuation of the seminar which is based on asynchronous interaction between the remote expert and the participants. According to the fact that the presentation process takes place mainly on the virtual environment, the platform for the execution of the presentation can deal with the problem of visibility of scientific work by providing interfaces so that content can be indexed by search engines.
4. Conceptual Solution for the Realization of Virtual Seminars

The macro-script respectively the phase ‘preparation of presentation’ consists of the following micro-scripts or sub-processes.

- Publication of the presentation;
- Feedback of the participants and discussion;
- Feedback of the remote expert and discussion;
- Protocol of the presentation session.

These micro-scripts are covered in detail in the following paragraphs.

A. Metadata of the script

A1 General Information

A1.1 Description

- Name: Presentation of work.
- Schema: Jigsaw, conflict, reciprocal.
- Length: 2 days / 8 hours.
- Main Success Scenario: Publication of presentations, discussion on presentations.

A1.2 Context

- Didactical unit: Seminar.
- Level: Bachelor.
- Scope: Online (Social networking platform, Learning Management System), off-line (campus).
- Objectives: Presentation of papers related to subtopics.
- Activities: Presentation of results and outcomes of scientific research, formulation of critic and appreciation.
- Preconditions: Framework (environment, content and stakeholders) for the presentation are ready prepared.

A1.3 Right: see 4.2.3.1

A1.4 Adaptation rules: None.

A1.5 Related script: None.

A2 Stakeholders (organization, expectations, interaction)

A2.1 Actors and Role

- Staff
  
  o Remote expert: The remote expert evaluates individual and group contribution of the participants, monitor groups dynamic and the individual participation, answer open questions related to subtopics and learning materials.
4.2. Process model of the virtual seminar

- Local supervisor: The local supervisor supervises the work on the learning environment, distribute learning resources to the participants, supervise organizational aspects of the seminar.

- Participants
  - Participants: The participants present and defend their respective presentation and harmonize the group presentation.

A2.2 Group characteristics and group formation: see group partition table (see table 4.3)

A2.3

Interaction of stakeholders

- Type and mode: see 4.2.3.2

B. Script sub-processes

B1 Publication or Presentation

The group presentations are published on a module of the learning environment dedicated to presentation. According to the asynchronous model of presentation pursued within the scope of the thesis, the module of the learning environment respectively the platform for the presentation must provide the following features.

- **Meta-information:** Meta information about the group and the authors of the presentation and meta-information about the context of the presentation are derived from the IMS LD information model and displayed on a view of the presentation platform.

- **Presentation area:** The presentation displays the presentation on another view of the presentation platform and provides functionalities to search and navigate within the presentation.

- **Group functionalities:** The presentation platform provides functionalities for moderated discussion in a structured way in a specified time frame.

- **Rating of presentation:** According to the didactical accentuation of the remote expert, the platform must provide functionalities to edit benchmarks for the evaluation of presentation, which will be rated by the participants. Furthermore, the platform must perform the evaluation of the ranking performed by the participants automatically according to a defined schema.

- **Support of open standard and integration interface:** The presentation platform should support open standards and provide interfaces for the exchange of data and interoperability with other modules of the learning environment and legacy system. Especially, the presentation platform must provide functionalities for the indexing of presentations by search engines.

- **Archival storage of the presentation session:** The presentation platform must provide functionalities to archive the whole session of a presentation. This archive reproduces the interactions among the stakeholders of the session in their chronological order. Furthermore, the archive must be exported in several learning environments.
4. Conceptual Solution for the Realization of Virtual Seminars

- **Miscellaneous:** Further functionalities, such as recommendation of the presentation session, download of presentations; etc should be provided by the presentation platform. An open source social publishing framework can be used to build the presentation platform of the learning environment. This platform can be used to publish the book of articles of the seminar. The design and implementation of such a platform is beyond the scope of the work. The responsible of each group publishes the presentation of his/her respective group on the presentation platform. The local supervisor configures the platform in order to allow an asynchronous discussion of the presentation in a specified time frame. Members of the group are available for questions related to the group presentation.

**B2 Feedback of participants and discussion**

**B2.1 Narrative:**
Participants of a group comment, appreciate and criticize the presentation of other group(s). They evaluate other presentations on the basis of benchmarks and standards for the evaluation of presentations defined in appendix D. In the same time frame each group defends its own presentation. The whole discussion is moderated by the remote expert.

**B2.2 Time:** 1 day / 4 hours.

**B2.3 Grading benchmark**
- Appendix D.5 presents the reviewer evaluation form presentation.
- Appendix E presents the benchmark for the evaluation of tasks performed in this phase.

**B2.4 Activities and their sequencing**

a. Actors and roles
   - staff
   o Remote expert: The remote expert moderates the discussion.
   - Participants (active): The participants discuss about the presentation.
   o Contributors: The contributor defends his/her respective presentation.
   o Audience: The audience appreciate, criticize and comment on the presentations.

b. Activities-structure
   1. Audience appreciate, criticize and comment the presentation.
   2. Contributors defend their presentation.

c. Activity orchestration
   - Sequence: 1 and 2

**B2.5 Resources**

a. Prepared resources
   - Templates / Guidelines: None.
4.2. Process model of the virtual seminar

- Microinstructions: None.
- Example of solution: Archive of presentations and discussions of old sessions.

b. Distribution of resources and notifications

- The prepared resources and the model of evaluation are part of the guideline of the seminar already delivered to participants in phase 4.2.3.2.
- Archive of a previous presentation and discussion session is made available to the participants.

**B2.6 Services**

- Presentation platform (see publication of presentation).

**B2.7 Outcomes**

- Discussion respectively appreciations, critics and comments about group presentations and arguments for the group presentation are exchanged.

**B3 Feedback of the remote expert and discussion**

The remote supervisor moderates the discussion and at the same time makes up his/her own opinion on the participants in consideration of the participation of the whole audience during the presentation session. Furthermore, the remote expert comments on, appreciates and criticizes the presentations after the feedback of the participants. Processes of this phase are similar to the previous phase with the remote expert in the role of the participant. As in the previous phase the evaluation of the presentations (critics, comment, appreciations, etc.) takes place on the same platform and is based on the benchmarks and standards defined in the concept of the seminar. The feedback of the remote expert takes 1 day or 4 hours.

**B4 Protocol of the presentation session**

The local supervisor archives the complete presentation session at the end of the presentation process (presentation and feedbacks). The archive of the session must reflect the interaction of the stakeholders in their chronological sequence. This archive serves as reference for stakeholders of the virtual seminar process of future seminars. The platform for the execution of the presentation must provide functionalities to archive and to replay the archive in several virtual environments (online and off-line).

**4.2.3.8. Evaluation of the work**

The model for the evaluation of the work is derived from the aims and goals of the seminar presented in the subsection 4.1.2. Particularly for participants in the phase of the empirical analysis, the clear formulation of expectations and evaluation criteria was an important factor for the success of the seminar. The lack of human resources in academical institutions in Cameroon justifies the development of an evaluation model, which is mainly based on the responsibilities of the participants of the seminar. The supervision and monitoring model is covered in detail in the subsection 4.1.3.3. The didactical principles presented in 4.1.3 provide the basis for the development of the evaluation of participants: The evaluation model distinguishes between two levels of abstraction:
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- Participant’s evaluation level: This level is the most important level and is assessed during the "inter and intra-group regulation and control" phase. The person in charge of the seminar provides micro-instructions, guidelines and templates to participants for the evaluation of individual and group contributions.

- Supervisor evaluation level: Depending on the availability of the remote expert and his/her didactical focus for the seminar, he/she can evaluate the work of participants on a coarse or fine level. On a coarse level, documents created by participants or outcomes of processes of inter and intra-group regulation and control are evaluated while on a fine level individual and group contributions of participants are evaluated. The acquisition of knowledge and key qualifications both on the individual and on the group level constitutes the principal variable for the evaluation of the work.

**Acquisition of knowledge:** The subsection 4.1.2 presents instructional goals defined by the guideline of the seminar for the acquisition of key qualifications. The achievement of these goals is evaluated by looking at the contributions of the participants both at the individual and the group level. At the individual level, the acquisition of knowledge can be evaluated according to the following variables:

- Comprehension of the individual subtopic and the group subtopic in the phase of the subtopic analysis;
- Quality of the synopsis in regard to form and content;
- Quality of the scientific articles in regard to form and content;
- Quality of the presentations in regard to form and content;
- Participation in the phase of the introduction to the seminar;
- Quality of the report elaborated for the evaluation of other participants;
- Consideration of critics, propositions and comments formulated by the group mates, the participants in other groups, and the remote supervisor.

At the group level, the acquisition of knowledge can be evaluated according to the following variables:

- Comprehension of the group subtopic;
- Quality of the group report;
- Contribution to the production of the book of articles;
- Contribution in the elaboration of the group slides;

Standards for the evaluation of the above variable as well as the repartition scheme respectively ratios of such variables in the global evaluation function are available in the appendix E.

**Acquisition of key qualification:** The subsection 4.1.2 presents instructional goals defined by the guideline of the seminar for the acquisition of key qualifications. The achievement of these goals is evaluated in a similar way as the acquisition of key qualifications by looking at the contributions of the participants both at the individual and the group level. At the individual level, the acquisition of key qualification can be evaluated accordingly to the following variables:
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- Team management;
- Quality of the diary on the personal development;
- Quality of the report on the group dynamics and development.

At the group level, the acquisition of knowledge can be evaluated according to the following variables:

- Shared lexicon and glossary;
- Sharing of knowledge (Proposition of learning resources);
- Group mate support and assistance;
- Rhetoric competence;
- Problem and conflict management;
- Motivation;
- Communication and cooperation.

Standards for the evaluation of the above variable as well as the repartition scheme respectively ratios of such variables in the global evaluation function are available in appendix E.

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A new trend in eLearning supported by the evolution of the web from a delivery platform to a participation platform is to build learning environments which can be organized or combined (mashup) at user convenience to create personalized environments. The current approach of virtual learning environments is focused on meeting the needs of learning institutions in providing basic, common platforms for teaching and learning processes. [Hawkins, 2010] considers supporters of the new trend as freedom fighters. They are liberating the learners from getting dominated, coerced, and damaged in the process of getting instructed. The approach is "user-centric" because the priority is the experience of the learners. The intended goal is to adapt the system to the user, not the user to the system. Then, the emerging concept of learning environment suggests instead of a monolithic learning management system, which integrates and runs a range of services, that teaching and learning activities can be performed using autonomous small applications (widgets), which can be mashed in a personal learning environment (PLE). The architecture of the execution environment for the virtual seminar proposed in this thesis belongs to both approaches and can be qualified as "user-process" oriented. The priority is the experience of users and their possibilities to build a learning environment organized and combined according to their convenience, whereas the specific teaching and learning processes in which they are involved are defined and specified in the framework of actions provided by the learning institution. Subsection 4.2.2.2 presented a framework of instructional sequences derived from the didactical requirements and the process model of a blended learning virtual seminar. [Palmer et al., 2009] defined a framework with a set of six dimensions and their corresponding features for the design and implementation of a web personal learning environment. Figure 4.14 illustrates the framework.
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The architecture of the execution environment of the seminar is geared to this framework. It belongs to the screen, temporal, data, social, activity and runtime dimensions of the framework. At a global level, the architecture of the execution environment of the virtual seminar is built around the following approaches:

- **Script based personal learning environment**: Without a pedagogical value, PLEs can be considered as user friendly systems, which allow users to interact and share data instead of educational tools. The didactical accentuations of the virtual seminar, which focus on the need and responsibilities of the learners, are designed into a framework based on collaborative scripts. [Dillenbourg et al., 2004] regards scripts as a convergence point between the instructional engineering design and the socio-constructivist stream. The framework for the design of scripts presented in [D.2.2.2] identifies several levels of abstraction (macro-script, micro-script, activities and micro-instructions) for the specification of collaboration, the interaction and participation of stakeholders involved in the process of a virtual seminar. It models and specifies the chronological evolution of the virtual seminar in its various phases according to the IMS LD specification.

All interactions of the teaching and learning flow respectively the instructional sequences of the seminar are modelled and codified into several files in the Extensible Markup Language (XML) and packages as ZIP archive, which can be deployed and interpreted by compliant platforms. Services respectively tools required to perform activities of the virtual seminar are implemented in autonomous small applications or widgets and integrated in the runtime environment of the virtual seminar. The tight integration of
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these autonomous and loosely coupled services into a learning environment according to specific instructional sequences characterizes the architecture of the execution environment of the seminar as "script based personal learning environment". The specifications and functionalities of a script based personal learning environment belong to the screen, data, temporal, and activity dimensions of the framework presented in figure 4.14.

• Rich mobile learning environment: The Rich mobile Learning environment refers to an approach which puts the control of the learning process, content and services by the learner in an environment independent of an internet connection. Although the institution continues to offer content, service and teaching, the control of the process is delegated to the learner on his personal learning environment. This approach fits to the didactical model of the virtual seminar presented in subsection 4.1. The application of this concept into the architecture of the execution environment for the virtual seminar implies a decomposition of learning and teaching activities in asynchronous sub-processes which can be performed on an environment without an internet connection (off-line). Activities performed off-line must be synchronised with the online environment as soon as an internet connection is available. So the widget of the online environment must provide a simple interface for the synchronisation of data with a remote application or client. The specifications and functionalities of a rich mobile learning environment belong to the screen, data and temporal dimensions of the framework presented in figure 4.14.

The architecture of the execution environment presented in figure 4.15 consists of the following components, which are covered in detail in subsequent subsections.

• Learning Design Authoring Environment
• Learning Design Runtime Environment
• Personal Learning Environment
• Rich Mobile Learning Client

4.3.1. Learning Design Authoring Environment

The learning design of a unit of learning (course, activity, subject, module, etc.) can be defined as a systematic specification of instructional sequences which involve stakeholders in a didactical scenario. A learning design language is a specification that describes and models learning design in a machine interpretable way (see 3.1.3). The purpose of using learning designs is to provide software tools that automatize the authoring, interpretation and publication process of units of learning (UoL). Figure 4.16 illustrates the computer supported authoring, interpretation and publication process of a learning design.

In this process the instructor or course designer interacts with software tools that allow him/her to model instructional sequences of an UoL according to his/her learning objectives. The UoL encapsulates all characteristics of the learning design (general information, actors and roles, resources, activities and their sequencing, etc.). The resulting UoL can be stored and published on a learning repository, shared in a community of practice, re-edited by other compliant authoring tools, interpreted by a learning design engine and executed by a learning management system.

The framework for the specification of collaborative scripts respectively learning design of the virtual seminar is based on the IMS LD specification and extends the specification
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Figure 4.15.: Architecture for the execution environment of the virtual seminar

with further structures and elements. Metadata for the description of scripts and additional information about the environment for the execution of activities are added to the IMS LD specification. Section 4.2.2.1 presents in detail the IMS-LD specification and section 4.2.2.2 presented the proposed framework respectively the added structures and elements. Due to the fact that the IMS LD specification is based on the XML language, any modern XML editor can be used to design UoL. Since 2001, several tools have been developed to support the design of UoL according to the IMS specification. These tools constitute the core of the Learning Design Authoring component of the architecture of the execution environment of the virtual seminar. The tools can be extended to support the editing of structures and elements added to the IMS LD specification according to the framework of collaborative scripts developed in this thesis.

An alternative to an extended IMS LD authoring tool is the combination of XML based tools. A Learning Object Metadata (LOM) editor can be used to edit metadata for the description of the learning design of the virtual seminar. This editor can be combined with an IMS LD authoring tools and other XML based editors to design the instructional sequences of the virtual seminar. Figure 4.16 illustrates the learning design process already described above with the corresponding tools.
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4.3.2. Learning Design Runtime Environment

The Learning Design Runtime Environment consists of the following parts covered in detail in the subsequent subsections:

- Learning design Runtime Engine
- Learning design deployment environment

4.3.2.1. Learning Design Runtime Engine

Subsection 4.2.2.1 presented the implementation levels of the IMS LD specification.

The framework for the design of a virtual seminar proposed in this thesis models all levels of the IMS LD specification. The Learning Design Runtime Engine executes the specification defined in the learning design of the virtual seminar, automatically sets up the necessary content and services and provides the appropriate stakeholders with this content and service at the right time. This process called "instantiation" is presented in detail in subsection 4.2.2.1. By instantiation, a specific instance or "run" of the seminar from the learning design specification is created by a runtime engine. The best practices and implementation guide [IMS, 2003a] provides some insights into the main requirements for the implementation of a Learning Design Runtime Engine. The following two characteristics are essentials for the implementation of a LD runtime engine, which can execute the specification of the learning design of the virtual seminar consistent with the framework proposed in this thesis:

- **Validation:** The re-usability and sharing of UoL and the possibility to use different authoring tools require the validation of the manifest or the code of the learning design of the virtual seminar according to the proposed specification. The validation process can provide the author of the UoL with useful feedback about the correctness of the syntax and the semantic of instructions defined in the learning design. The syntax validation checks the correctness of the content package or ZIP archive and the lexically validity of therein contained XML files. Furthermore, the referential integrity within the elements of the specification: role, activities, resources and environment must be checked.

Figure 4.16.: Process of learning design supported by authoring tools
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- **Parsing**: The instructional sequences defined in the learning and teaching flow must be extracted, interpreted and executed by a runtime engine. This process can be handled in different ways: It could be done during the runtime of the learning design by taking the complete UoL, unpacking it and interpreting it for each request to the engine, or some steps of the teaching/learning flow can be processed in advance. The next subsection covers the processing of teaching and learning instructions in advance.

The Educational Technology Expertise Centre of the Open University of the Netherland developed a kernel capable of processing IMS LD-compliant contents. The kernel known as CopperCore, has been developed under GNU GPL licences. The runtime engine of the learning design specification respectively the framework for collaborative scripts proposed in this thesis is based on CopperCore. It can be used for several settings, among others the validation and interpretation of the learning design of the virtual seminar, and can be integrated in a learning management system.

CopperCore has the following features:

- A validation routine for the validation of the manifest of an UoL.
- An administrative backend for the management of the roles involved in a learning design.
- Interpretation and delivery routine for the parsing and delivery of personalized content according to the rules specified in the learning design specification of the UoL.

CopperCore relies on a client server architecture and is implemented using Sun’s Java 2 platform Enterprise edition. Figure 4.17 presents the technical architecture of CopperCore.

The "JDBC Data Base Connectivity Layer" is responsible for all interactions with the database. The "Database Access Layer" deals with the administration of the learning design, which involves concepts such as user management, management of instantiation or run of Unit of Learning. The "Business Logic Layer" is in charge of the business logic or the teaching respectively learning flow of the learning design. It consists of containers for the respective IMS LD elements accessible through APIs and further components such as an 'EventDispatcher' and an 'EventHandler' which deal with events of the learning design. The 'parser' component is responsible for the processing of the LD manifest. The "Application programming interfaces" layer consists of three session beans. The 'LDCoursemanager' deals with administrative calls for the delivery of an LD instance. The 'LD Engine', which constitutes the core of the delivery mechanisms, is in charge of the personalization of the LD instance for a specific user at a specific time. The 'timer' deals with time related events specified in the learning design. The 'CopperCore client Libraries' layer is a collection of libraries that should be used for the integration of CopperCore in legacy systems as learning management systems. [Vogten, 2008] describes in detail the reference implementation of the CopperCore engine.

The validation, parsing and interpretation of structures and elements added to the IMS LD specification is based on XML parsers/transformers and predefined XML schemata. This process qualified as deployment is covered in detail in the next subsection.

[Zualkernan et al., 2009] developed a distributed architecture for the implementation of an LD engine. The designed architecture is based on the assumption that mobile devices which incorporate the environmental context of learners do not require a centralized server. An advantage of this approach is the deployment of the distributed architecture of the learning design in areas where the internet coverage is not available or unreliable. In the proposed architecture, the learning design is processed once to generate a native code for various learning environments using different mobile devices (see [Zualkernan et al., 2009]). An application
programming interface (API) of the Google Android emulator (JAXB) is used to parse and transform the learning design of the UoL. The result of this process is the creation of an Abstract syntax three (AST). The AST is based on an abstract grammar defined for learning design purposes consistent with the IMS LD specification. The native code is downloaded on the mobile device and the teaching and learning activities are executed in peer to peer mode. The current implementation of the architecture is described in [Zualkernan et al., 2009]. This implementation generates codes for Google android mobile platforms. This architecture represents another good alternative for the implementation of a learning design engine fit to the requirements of the virtual seminar developed in this thesis.

4.3.2.2. Learning Design Deployment Environment

The framework for collaborative scripts proposed in this thesis extends the data model of the IMS LD specification with meta-information about the scripts. Furthermore, the concept of environment for the achievement of activities of the learning design is redefined according to
the requirements of the virtual seminar process.

Structures and elements of the framework for collaborative scripts presented are modelled according to the IMS LD specification. The deployment environment is in charge of validating, parsing and transforming structures and elements added to the IMS specification. The learning design deployment environment can be considered an extension of the runtime engine for the execution of the learning design of the virtual seminar. Structure and elements of the framework, which can be mapped to the IMS LD specification are parsed, and transformed by the runtime engines. The additional parsers/transformer deals with the structures and elements of the framework, which cannot be interpreted by the LD engine.

Figure 4.18 presents the architecture of the learning design deployment environment:

![Figure 4.18.: Learning Design Deployment Environment](image)

Structures and elements of the learning design, which are validated, parsed and transformed within the deployment environment, are presented in the subsequent subsections:

- **Metadata of Macro-script**: Depending on the framework used to model a UoL, instructional sequences of a UoL can be designed in a single play with several acts or multiple plays according to the metaphor of the theatrical play presented in subsection 4.2.2.1. A Macro-script in the framework for collaborative scripts developed in this thesis corresponds to a play in the IMS LD model. The learning design of the virtual seminar is modelled with several plays also called macro-scripts. Figure 4.17 presents the composition of a macro-script. The IMS LD specification does not model explicit meta-information about a play. They can be modelled implicitly using acts and further
structures of the IMS LD specification. The framework for collaborative scripts identifies several elements for the description of a script; its contextualisation; information related to the copyright as well as the stakeholders involved in the script. These elements are codified in a XML file and added to the IMS LD specification through the element 'metadata' of a play. Appendix F presents the XML schema for the validation of the added elements or metadata of a play. An XML parser/transformer is used to validate, parse and transform data codified in the 'metadata' structure. The XML parser/transformer consists of an XSLT processor, which needs as input the metadata of a macro-script and an XSL file with instructions for the transformation. It creates an output or data for the view of the personal learning environment. The uninterrupted hyphen elements of figure 4.18 illustrate the process.

• **Metadata of Micro-script:** Micro-scripts constitute the phases of a macro-script or play. A micro-script corresponds to an act in the IMS LD model and consists of several activities. Metadata of a micro-script respectively act are modelled and mapped into semantically similar elements of the IMS LD specification. These elements are parsed, interpreted and executed in an IMS LD conform environment. Metadata of a micro-script are modelled in several files according to their semantic. The description of a micro-script or phase of a UoL and its activities, the benchmarks for the evaluation of tasks perform within the scope of a micro-script, objectives and outcomes of the micro-script are modelled in several XHTML files. These information are mapped into sub-elements of the element 'learning' or 'support activity' of a micro-script. The XHTML format allows the modeling of metadata of a micro-script according to a defined schema and the XHTML file can be interpreted by an XML compliant browser. This particularity of the XHTML format is called "hybrid modelling" within the scope of the thesis. Hybrid modeling allows the parsing/transformation (Re-editing, parsing, interpretation and execution) of data both by a simple parser as by IMS LD compliant runtime engine. The simple parser/transformer used to validate, parse and transform data codified in the data-structure of micro-script is similar to the parser of metadata of macro-script described above. Uninterrupted bullets elements of figure 4.18 illustrates the hybrid modeling process and appendix F presents the XML schemata of the XHTML files or data structures used to define metadata of a micro-script.

• **Resources for Activities:** The framework for collaborative scripts proposed in this thesis defines three kinds of elements as resources, which are related to a micro-script and are required to perform activities within the scope of the micro-script. Templates or guidelines, micro-instructions and examples of solution are resource types of the framework used to support stakeholders in the achievement of learning and teaching activities. These elements of the framework are modelled as 'learning objects' of the element 'environment' in the IMS LD specification. Most activities of a micro-script require resources. These resources can be delivered just in time by the runtime environment of the learning design or preconfigured and published in advance on the runtime environment. The IMS LD specification supports only the just in time deployment of resources. The pre-configuration of a resource requires semantical references between the resource and its corresponding activity. Due to the fact that each activity takes place within the scope of an environment, the semantical reference is modelled into the XHTML data structure of an environment according to the hybrid modeling approach described above. The hybrid modeling allows the extension of the default environ-
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The realization of virtual seminars requires the adaptation of the IMS LD specification with further elements. A parser/transformer is used to extract and prepare the data from the XHTML structure for the pre-configuration process. This parser/transformer is similar to the parser/transformer of metadata of micro/macro-script described above. The type (media, text, etc.) of the resources, its location and its destination are required for the pre-configuration process. Figure 4.18 illustrates the hybrid modeling process of resources and the uninterrupted hyphen and bullets elements of the figure the pre-configuration process. The following subsection cover in detail the data structure for the modeling of an environment and appendix F presents in detail the structure.

- **Environment of Activities**: Activities are performed in the IMS LD specification in an environment, which provides appropriate learning objects or services. Although the technical implementation of a service could be achieved by a web service, the LD term service does not refer to the technical notion of a service as in the term web service but to the functional concept of a learning service supporting a user in the learning or teaching process (see [Vogten, 2008]). The LD specification models explicitly a number of services such as mail service, communication service, conferencing service and search service. The process model of the virtual seminar presented in the section 4.2 requires a set of services, which are not covered explicitly by the LD specification. The framework for collaborative script proposed in this thesis redefines respectively extends the notion of an environment by overwriting the element 'services' of the IMS LD specification. As in the IMS LD model, activities are performed in the proposed framework in an environment which consists of knowledge objects and tools objects. The element "service" of the IMS LD specification corresponds to the element 'Tools object' in the framework and the element "learning object" corresponds to a 'Knowledge object'. A "Tools Object" in the framework represents an interface of a service required to perform an activity and a "Knowledge Object" represents a resource required to perform an activity. The elements "Environment" and "Tools Object" of the framework have an attribute which provides a reference to the elements "Environment" and "learning object" of the IMS LD specification. Figure 4.19 presents the structure of a "Tool Object" and appendix F gives more details on this structure.

The "Tool Object" or interface of a service consists of the following elements:

- **Identifier**: The attribute 'Identifier' represents the ID of the interface

- **interfaceType**: The attribute 'interfaceType' specifies if the interface is a simple service, or defines a complex binding. A simple service does not require an input and does not create an output whereas a complex service can have operations, which require an input and create an output. An input can be a simple parameter or a reference to a resource of the learning design.

- **imsldItemObjectEnvironmentRef**: The attribute "imsldItemObjectEnvironmentRef" represents a reference to an object-item of an element "environment" of the IMS LD specification.

- **Title**: The element 'title' models the name of the interface

- **Description**: The element 'description' gives more details on the interface
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Figure 4.19.: Structure of a 'tool object' or interface of a service
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- **Operation:** The element "operation" models the action performed by the service and can require an "input" and create an "output". "Inputs" are already presented above and an "output" is the outcome of the activity.

- **Binding or void:** The element "binding" defines the environment for the execution of a service. Its attribute "OperationRef" models the reference to the operation performed by the service. Additional information such as the location of the service, the protocol for the data transfer, the procedure for the achievement of an activity etc. are modelled in its sub-element "onlineBinding" and "off-lineBinding". The element "void" emphasises that the respective service does not perform an operation. This element is used to reference a legacy system.

The redefined notion of an environment proposed in the framework allows an easy binding of any kind of services for the achievement of activities in the runtime environment for the execution of the learning design. Specific services of a UoL, which are not explicitly defined by the IMS LD specification, can be integrated as autonomous and loosely coupled application in the runtime environment of the learning design. This tight integration of service characterizes the architecture of the execution environment as Personal Learning Environment. The data structure used to model the environment of an activity is qualified as hybrid because it allows a "static binding" and a "dynamic binding" of service. Figure 4.20 illustrates this process. The process consists of the following steps:

1. **Modeling:** Metadata of the environments or services required to perform activities of a micro-script are codified into a XML data structure.

2. 2a-Transformation: The XML data structure is parsed/transformed by a processor which requires a XSL file with the instruction for the transformation process. 2b-The processor creates for each environment defined in the XML data a structure hybrid file. This file identifies a "ServiceQueryObject" in the XHTML format. The file is qualified as hybrid because it allows the definition both of the "static binding" and the "dynamic binding" of services in the same file.

![Figure 4.20.: Binding of services on the execution environment of the virtual seminar](image-url)
3. **Static binding:** The "static binding" of service is realised through a reference to a legacy system specified in the XHTML code of the 'ServiceQueryObject'. In case of a static binding of services, the process continues to step 6.

4. **Service design:** During the "second design level" which is described in detail in the subsection 4.3.4, an instructor or supervisor specifies through the "Service Manager" of the PLE a set of services or interfaces required to perform activities of the learning design of an UoL.

5. **Dynamic Binding:** On the basis of the services specified by the 'service manager' the 'QueryWidgetsProcessor' loads the corresponding 'ServiceQueryObject' created in the step 2b and makes a request to the 'service registry' of a 'widget server'. The 'QueryWidgetsProcessor' represents an extension of the runtime environment. The widgets server identifies instantiates and return through its 'service registry' references of widgets corresponding to the specification defined in the 'ServiceQueryObject'. The W3C define a specification for the standardization of widgets and their interfaces. The design of widgets and the implementation of a widgets server is out of the scope of the thesis. Wookie (see [Tencompetence, 2010]) and Palette (see [Bogaerts et al., 2009]) are two reference implementations of such a server according to the W3C widget specification.

6. **Service deployment:** According to the binding model (static or dynamic) defined in the 'serviceQueryObject', the service manager deploys widgets on the PLE.

7. **Service Use:** Students interact with widgets of the PLE through a Rich Mobile Learning Client presented in detail in subsection 4.3.4. The instructor uses the same widgets to supervise students during the 'run' of the learning design.

All environments used to perform activities of a macro-script are described in a single XML data structure. The structure can be used to model further characteristics of an activity such as the benchmark for grading of activities of a micro-script, the distribution of resources required to perform an activity, etc. In the data structure, each activity is defined with an environment, an activity refers to a micro-script which belongs to a macro-script. These relationships are modelled through references. The element "activity" of an environment defines a sub-element of the type "prerequisite", which represents a container of "learning objects" or resources required to perform activities of a micro-script. This element has the boolean attribute 'mustBePreconfigured' which specifies if the "learning object" or resource must be preconfigured in the runtime environment before the learning and teaching instructions of the learning design are executed. The data structure which describes environments of a macro-script and further information about activities is presented in detail in appendix F.

### 4.3.3. Personal Learning Environment

The Personal Learning Environment (PLE) represents the user interface of the runtime environment of a learning design. The teaching and learning activities of the learning design are performed by the respective stakeholders in the PLE. The different stakeholders involved in the virtual seminar process or users of the PLE have been presented in section 4.2.1. The PLE can be viewed from two perspectives.

- **Designer perspective:** The designer perspective is used by instructors. This actor assumes the pedagogical and intellectual role in the learning process of the UoL. This...
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The perspective of the PLE allows him/her to customize the learning environment according to his/her convenience. This process can be qualified as "second design level" of the UoL. It is an intermediary level between the design of the UoL performed by a course designer who is familiar with the IMS LD specification and the design of instructional sequences performed by an instructor without background on the IMS LD specification. This perspective of the PLE supports the instructor in the preparation of the UoL because instructional sequences and pedagogical approaches of the UoL have already been codified on an abstract level in the learning design of the UoL. The perspective can be qualified as authoring environment, where metadata of the learning design of a UoL can be modified. Furthermore, environments of activities can be added and personalized with the appropriate services or widgets. Transformers of the deployment environment provide the views of the PLE with the data required for the re-editing or modification of metadata of micro/macro-script. They deal with the transformation of the initial XHTML structure of the learning design. Figure 4.18 illustrates this process. In case of a dynamical binding of services, the 'service manage' and the 'ServiceQueryProcessor' of the PLE support the instructor in the management and the composition of widgets provided by a widget server.

- **Player perspective**: Activities of the UoL are performed in this perspective of the PLE. Stakeholders involved in the learning design can view and interact with the UoL. The player perspective manages users involved in the UoL, services and resources defined in the learning design of a UoL. A service can be a complex component with its own application logic and resources, a reference to a legacy system or an eLearning widget. A widget in this thesis is defined as a light application design for a particular purpose or service, which is deployed within a server that makes it available through API. The design of such a server is out of the scope of the thesis. Wookie (see [Tencompetence, 2010]) and Palette (see [Bogaerts et al., 2009]) are two reference implementations of such a server according to the W3C widget specification. Widgets used to perform activities within the scope of an eLearning scenario are qualified in this thesis as eLearning Widgets. The execution environment of the learning design of the virtual seminar classifies widgets into desktop and web widgets. Desktop widgets run on the Rich Mobile Learning Client and web widgets on the player perspective of the PLE. Both have the same basic components and are built using web compatible formats. All widgets of the PLE implement an interface for the synchronisation with their corresponding desktop widgets. The design and implementation of widgets is out of the scope of this thesis. The subsequent subsections present services and widgets of the PLE derived from the process model of the virtual seminar.

**Authentication component**: This component encompasses services required for the authentication of stakeholders involved in the learning design of the virtual seminar. It must implement a uniform concept for the authentication of these stakeholders on services of the PLE. In addition to the stakeholders involved in the virtual seminar process, this component is responsible for the authentication of remote applications, which must be synchronized with the services of the PLE.

**Networking component**: This component is used to support interaction among stakeholders in the contact and networking phase as well as in the preparation and introduction phase of the virtual seminar. It provides features like the management of profiles of stakeholders involved in the virtual seminar, the networking, search and communication among
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the staff of the seminar. It should implement an interface for the exchange of data and enable the interoperability with other services of the PLE and legacy systems. The networking component has been covered in detail in the subsection 4.2.3.1.

Learning Content Management Server: The work on electronic documents is a recurrent activity of the virtual seminar. The management of several versions of documents of the virtual seminar and actions performed by the stakeholders on these documents are implemented in a specific component appropriated for this purpose. This component should provide features such as the storage and versioning, search and indexing of documents, user management and access control on documents. Furthermore, this component should implement a workflow mechanism for the synchronisation of stakeholders working on resources of the PLE. It must provide an API for the interoperability with other services of the PLE and legacy systems.

Communication component: The communication among distributed stakeholders of the virtual seminar takes places predominantly through e-mails. Although the model of the virtual seminar proposed in this thesis is based on a blended learning approach with face to face interactions for stakeholders present in the same geographical area, a component which supports and structures the synchronous virtual communication among distributed stakeholders can be integrated to the PLE. Micro-blogging service represents an efficient way for the virtual communication among distributed stakeholders of the seminar. It can implement sequencing as characteristic of the communication within the scope of the seminar presented in the subsection 4.1.3.1. Sequencing refers to the possibility to follow the persistent thread of a discussion. The interaction between distributed stakeholders can be seen as a conversation even if it takes place in asynchronous form. This service supports various communication infrastructures such as GSM and internet and does not require a complex infrastructure for its implementation. It can be used to organise and schedule different tasks during the virtual seminar. Depending on communication and computing infrastructures available web conferencing tools can be used to perform presentations in a synchronous mode. Web-conferencing tools provide features such as a slide show presentation, chat and voice over IP, whiteboard, and screen sharing and recording of the conference session. Communication services can be integrated to the PLE through references to an existing system or widget.

Monitoring and reporting component: The distributed nature of the architecture of the PLE implies an appropriate concept for the tracing and monitoring of activities performed in its components. The monitoring and reporting component encompasses services required to trace and log activities of stakeholders involved in the teaching and learning processes. The resulting data help to build a participation profile of the stakeholders and to evaluate their participation. These data play an important role in the evaluation phases of the virtual seminar.

Presentation and Publication component: This component encompasses services required for the presentation and the publication of results or documents created during the virtual seminar (book of articles, slides, etc.). It provides features such as the indexing of documents by web search engines, presentation of documents and discussions related to these documents. Features of this component have been presented in detail in subsection 4.2.3.7.

eLearning Widgets: The process model of the virtual seminar identifies the following categories of widgets:

- **Widgets for collaborative and cooperative activities**: Forums, blogs and wikis are effective widgets to support collaborative and cooperative activities in the phase of topic development. A forum widget with its features is a central service for the support
4. Conceptual Solution for the Realization of Virtual Seminars

of collaborative and cooperative activities in an asynchronous modus. A blog widget can be used to perform tasks of the intra-group regulation such as the editing of the group journal and the wiki widget can be used to edit the common glossary and support cooperative and collaborative tasks among participants.

- **Widgets for tasks and event management**: A distributed calendar widget can be used to manage tasks and events of the seminar. The calendar widget is used to synchronise appointments and to schedule general deadlines during the seminar. Due to the fact that the GSM network is quite diffused and more frequently used than the internet in Africa, an interface for the notification of events on a GSM network through short message services (SMS) can improve and simplify the communication process among stakeholders of the seminar.

4.3.4. Rich Mobile Learning Client

The Rich Mobile Learning Client (RiMoLeC) constitutes the core of the "off-line learner centric" model of the virtual seminar. The off-line learner centric model in this thesis is characterized through the possibility to perform learning activities of the virtual seminar without a continuous internet connection. Another characteristic of the model is the flexibility, which allows learners to move with their learning environment from one location to another and perform activities on different computers. As the PLE, The RiMoLeC distinguishes between components and widgets depending on the complexity and granularity of the service implemented by the application. Components and widgets are integrated into a common environment and run on this environment. Components of the RiMoLeC are stand alone applications, which implement their own logic and can have their own user interfaces. They provide interfaces for the interoperability with components or widgets of the PLE. Widgets of the RiMoLeC are desktop widgets and interact with their corresponding web widget on the PLE. All widgets are modelled in a framework. The framework should be able to pull information from the server to the desktop widget. Furthermore, it should implement a mechanism to push data changed off-line to its respective interface on the server or to legacy systems.

The RiMoLeC consists of a framework of widgets and components derived from the process model of the virtual seminar.

- **Authoring component**: The work on documents (creating, editing, viewing, etc.) is one of the most important processes of the virtual seminar. According to the format of documents specified in the concept of the virtual seminar, an open source office application can be integrated into the RiMoLeC in order to edit and view text based documents of the seminar. Depending on the infrastructure a multimedia editor can be integrated into the RiMoLeC in order to edit and view audio, video, or multimedia based documents of the seminar. The authoring component should implement an interface for the synchronisation of the created documents with services of the PLE or legacy systems. The text based authoring application of the RiMoLeC should provide features such as comments and revisions marks on a document. This characteristic of the authoring component combined with the asynchronous synchronisation of documents on the PLE support collaborative and cooperative work on documents among several stakeholders involved in the virtual seminar.

- **Mail client or personal information manager component**: E-Mail represents the main service for the asynchronous communication among distributed stakeholders of the virtual seminar. The access, the management and organisation of e-mails without continuous
internet connection are important features, which must be implemented by the RiMoLeC. These functionalities can be performed by an open source e-mail application or a personal information manager (PIM) integrated into the RiMoLeC. In addition to the management of e-mail, the PIM can manage and organize events and deadlines of the seminar. Functionalities of a PIM can be implemented as Widgets.

**Widgets dashboard:** The PLE identifies a forum, a blog and wiki widget to support collaborative and cooperative activities during the seminar. Furthermore, the widgets dashboard contains a distributed calendar widget for the management of tasks and events. These web widgets of the PLE have their corresponding counterpart on the RiMoLeC qualified as desktop widgets. The widgets dashboard of the RiMoLeC is an environment for the use and management of desktop widgets. The desktops widgets should be organized, managed and implemented on the dashboard according to the screen, data and temporal dimension of the framework for the development of PLE proposed by [Palmer et al., 2009]. The HTML5 specification (see [W3C, 2010]) and framework such as Google gears (see [Google, 2010]) and adobe Air (see [Adobe, 2010a]) define several API for the implementation of widgets. Although the design and implementation of eLearning widgets is out of the scope of this thesis, the framework used to implements widgets must fulfil the following requirements enumerated in the empirical analysis (see chapter 2):

- The framework must support the implementation of widgets, which follows the 'off-line learner centric' model described above.
- The framework must be available under an open source licence model.
- The framework must be easy to maintain and supported by a broad developer community.
- The framework must support the implementation of widgets based on open protocols.
4. Conceptual Solution for the Realization of Virtual Seminars
5. Prototype Implementation

This chapter presents a prototypic implementation of the conceptual solution for the realisation of virtual seminars presented in the last chapter. The conceptual solution covered in the previous chapter is based on requirements formulated by stakeholders involved in virtual seminars in Cameroon. The prototypic implementation of the conceptual solution consists of the following parts presented in subsequent subsections:

- **Pedagogical concept of the prototypic seminar**: The pedagogical concept of the virtual seminar developed for the prototype presents the guideline for the realization of the prototypic seminar and prepared resources for the achievement of tasks.

- **Learning design of the prototypic seminar**: The different phases of the prototypic seminar are specified on the basis of the framework presented in subsection 4.2.2.2. This teaching/learning process is codified into several files and packaged in a zip-archive according to the IMS LD specification. The archive contains a manifest, which represents the learning design of the prototypic seminar. Appendix I presents the learning design of the prototypic seminar.

- **Execution environment for the realization of the prototypic seminar**: The manifest is interpreted by a runtime environment in order to create an instance or run of the prototypic seminar. Here, an example of an environment based on the system architecture for the execution of the learning design of a virtual seminar developed in the subsection 4.3 will be presented.

5.1. Pedagogical concept of the virtual seminar

The guideline for the realization of virtual seminars developed in this thesis is based on the didactical model presented in subsection 4.1. Appendix B, C and D present resources (guidelines/templates, micro-instructions and example of solution) used for the prototypic implementation of the conceptual solution. The guideline of the seminar, the proposed topics, and related materials and the prepared resources constitute the main elements of the pedagogical concept of the prototypic virtual seminar.

5.2. Learning design of the virtual seminar

The specification of the process model of the seminar is based on the framework for collaborative scripts presented in subsection 4.2.2.2. This framework was developed according to the didactical accentuations of the seminar presented in subsection 4.1 and the initial model of virtual seminar developed and discussed during the empirical analysis phase (see 2.3) in Cameroon. This subsection presents the implementation of the process model specified in the last chapter in order to create the learning design of the prototypic seminar. The phases of a seminar are represented as macro-scripts in the framework for collaborative scripts. The
5. Prototype Implementation

learning design of the prototype is based on this framework, which specifies the following aspects of macro-scripts or plays of the prototypic seminar:

- Metadata of a macro-script of the prototypic seminar: Metadata describe general information about a macro-script. Figure 4.6 presents the structure of metadata of a macro-script. Appendix F presents the XML schema or data structure used to specify such metadata. The data structure containing metadata of the macro-script is added as an extension to the IMS LD specification through the sub element "metadata" of the element "play". The following plays respectively macro-scripts are implemented for the prototypic seminar:
  1. Contact and networking
  2. Presentation and introduction of stakeholders
  3. Structuring of work
  4. Writing of papers
  5. Preparation of presentations
  6. Presentation of work
  7. Grading - End of the seminar

Only metadata of "core-plays" of the prototypic seminar, are specified (play 2-6). "Core plays" are represented as macro-scripts or phases of a virtual seminar, which represent the effective "teaching and learning" process (see 4.2.3).

- Processes of a macro-script of the prototypic seminar: Dynamic parts or processes of a macro-script of the prototypic seminar are specified in this view of the framework. The prototypic seminar specifies 31 micro-scripts respectively acts, 41 learning activities, and 34 support activities organised into 33 activity-structures.

The remainder presents elements and structures used to specify and implement processes of macro-scripts respectively phases of the prototypic seminar. These elements are derived from the process model developed in the last chapter.

1. B(x) Name of a micro-script: The prototype of the conceptual solution specifies 31 micro-scripts respectively acts of the seminar.

2. B(x) Narrative: The narrative is used for the general description of a micro-script and its activities according to the "hybrid modeling" approach presented in subsection 4.3.3. This information belongs to the metadata of a micro-script Narrative → "Activity → learning/support-activity → activity-description"

3. B(x) Time: The time required to perform activities of a micro-script. This information belongs to the metadata of a micro-script.

   Time → "Activity → learning-activity → complete-activity → time-limit".

   Appendix 1 presents the timetable used for the implementation of the prototype.

4. B(x) Grading-benchmark: models the benchmark for the evaluation of activities and tasks of a micro-script. This information belongs to the metadata of a micro-script.

   Grading-benchmark → "Activity → learning-activity → prerequisite"

   Appendix E presents the grading-benchmark used for the prototypic seminar.
5.2. Learning design of the virtual seminar

5. B(x) Activities and their sequencing: Actors involved in the micro-script, activities of the micro script, and the dynamics or the workflow within the micro script are modelled in this component:

a) Actors and Roles → "Role → learner/staff".

The following roles are defined for the implementation of the prototypic seminar:

- **Learner**: 'Participant X' belongs to the type 'Participants'. He/She performs learning activities of the prototypic seminar.
- **Learner**: 'Group' belongs to the type 'Participants'. A group performs learning activities of the prototypic seminar.
- **Learner**: 'Group responsible' belongs to the type 'Group'. He/She performs learning activities of the prototypic seminar.
- **Learner**: 'Participants' is a generic role to describe participants of the prototypic seminar.
- **Staff**: 'Admin-learning Designer' belongs to the type 'Responsible of the seminar' and specifies the instructional sequence of the prototypic seminar according to the IMS LD standard. He/She administrates the learning environment of the prototypic seminar.
- **Staff**: 'Contact Person Institution' belongs to the type 'Educational Institution'. He/She is the representative of the institution, which hosts and organizes the seminar.
- **Staff**: 'Educational Institution' organizes and hosts the prototypic seminar.
- **Staff**: 'Expert' belongs to the type 'Responsible of the seminar'. He/She is in charge of the know-how transfer, performs teaching activities and monitors participants of the prototypic seminar.
- **Staff**: 'Local Supervisor' belongs to the type 'Responsible of the seminar'. He/She supervises participants and performs teaching activities of the prototypic seminar on campus.
- **Staff**: 'Responsible of the seminar' is a generic role to describe a person in charge of the teaching process.

Subsection 4.2.1 presented the stakeholders involved in a virtual seminar process and their respective roles and expectations.

b) Activities-structure → "activities → activity-structure" Activities of a micro-script are organized into an activities structure according to their semantics. 'Learning activities' are performed by participants while 'Support activities' are performed by the responsible of the prototypic seminar. The prototype of the conceptual solution identifies 41 'Learning activities' and 34 'Support activities' organised into 33 activity-structures.

c) Activities-orchestration → "activity-structure → sequence/selection" Activities of the prototypic seminar follow the process model of the seminar presented in subsection 4.2.3.

6. B(x) Resources: This component models resources required by actors to perform activities or tasks of the prototypic seminar. Furthermore, this component models the distribution of these resources.

a) Prepared resources: Predefined artefacts, micro-instructions and example of solution required by the stakeholders to perform tasks within an activity are modelled in this element. Three kinds of resources are modelled for the prototype:
5. Prototype Implementation

- Templates / Guidelines → Environment → learning-object → Templates*. Appendix C presents guidelines to support participants in the phases of the prototypic seminar and appendix D provides templates for the evaluation of activities of participants.


- Example of solution → Environment → learning-object → Example*. b) Distribution of resources and notification: The prototype of the conceptual solution supports only the "just in time deployment" of resources (see subsection 4.3.2). The e-mail service is used for the communication respectively notification among distributed stakeholders.

- Notification → 'Notification → E-Mail-data'

7. B(x) Services: The prototype for the implementation of the solution supports only the static binding of services (see subsection 4.3.2).

- Service → 'serviceQueryObject' The prototypic seminar specifies the following "serviceQueryObjects":
  - SoPraNeP: The SoPraNep is used for the networking among stakeholders of the seminar.
  - Wiki: The Wiki is used for the collaborative editing of documents.
  - Blog: The blog is to protocol the development of the seminar.
  - Document management system: The document management system manages the documents created during the seminar.
  - Calendar: The calendar manages the events and deadlines of the seminar.
  - E-Mail: E-Mail is used for asynchronous communication among distributed stakeholders.
  - Text editor: The text editor is used to edit and read text based documents of the seminar.

8. B(x) Outcome: Models objects or artefacts created by an activity.

- Outcome → Learning/support-activity → on-completion → feedback-description → item* Outcomes of the prototypic seminar are presented in the process model (see subsection 4.2.3).

5.3. Execution environment for the realization of the prototypic seminar

Figure 4.15 presents the architecture of the execution environment of a virtual seminar as it is developed in this thesis. The execution environment of the prototypic seminar is geared to this architecture. Subsequent subsections present components of the architecture of the prototypic seminar:

- Learning Design Authoring Environment: Tools used to design instructions of the prototypic seminar are presented in this subsection.
5.3. Execution environment for the realization of the prototypic seminar

- **Learning Design Runtime Engine:** The CopperCore kernel, which implements all levels of the IMS LD specification, is used as run-time engine for the execution of the learning design specification of the prototypic seminar. Here, the validation and parsing tools of the learning design of the prototypic seminar will be presented.

- **Learning Design Deployment Environment:** The environment used for the deployment of metadata of the learning design of the prototypic seminar is presented in this subsection.

- **Personal Learning Environment:** The player of the learning design or the personal learning environment of the execution environment of the prototypic seminar is presented in this subsection.

- **Rich Mobile Learning Client:** The learning environment of the participants of the prototypic seminar is presented in this subsection.

5.3.1. Learning Design Authoring Environment

Figure 4.16 presents the authoring process of the learning design of a UoL supported by software tools according to the framework for collaborative scripts developed in subsection 4.2.2.2. The framework is geared to the IMS LD specification. It identifies elements and structures which are mapped to elements and structure of the IMS LD specification and new elements used to model specific process of the seminar which are not covered by the IMS LD specification. The specification of instructional sequences of the prototypic seminar was covered in detail in the previous subsection. The Learning design authoring process of the prototype is supported by the following tools:

- **ReCourse:** ReCourse is used to edit elements and structures of the framework which can be mapped to elements of the IMS LD specification.

- **XML Spy:** XML Spy is used to edit elements and structures of the framework added to the IMS LD specification

**ReCourse** "ReCourse" (see [ReCourse, 2010]) is an IMS LD offline desktop editor developed within the scope of the TenCompetence project. It addresses educational practitioners and instructional designers with little experience about the technical specification of the IMS Learning Design specification. The editor is based on eclipse (see [Eclipse, 2010]) and supports modeling and implementation of the learning design of a UoL. ReCourse is used to model and implement structures and elements of the framework for collaborative script developed in this thesis, which can be mapped to structures and element of the IMS LD specification.

Figure 5.1 illustrates the use of ReCourse for modeling stakeholders involved in the prototypic seminar and their corresponding activities, macro and micro-scripts of the prototypic seminar, activities and their sequencing.

- **View A:** View A presents the perspective used to specify the general structure of the learning design of the prototype. Macro-scripts and micros-scripts respectively plays and acts of the learning design of the prototypic seminar are specified in this view.

- **View B:** View B: presents the perspective for the specification of activities and their corresponding actors. Furthermore, the organization of activities according to their semantic is performed in this view.
5. Prototype Implementation

- View C: View C presents the perspective for the modeling of stakeholders involved in the learning design of the prototypic seminar.

- View D: View D presents the perspective for the specification of resources linked to an activity.

- View E: View E presents the perspective for the specification of metadata of a micro-script or phase of the prototypic seminar. The following metadata are specified:
  - Narrative of the micro-script;
  - Activity description, Time, Grading-benchmark;
  - Outcomes.

Figure 5.1.: Modeling view of ReCourse

Figure 5.2 presents the perspectives for the specification of ’environment’ respectively ’services’ and resources of the learning design of the prototypic seminar.

- View A: View A presents the perspective used to specify ’environments’.

- View B: View B presents the perspective used to specified ’resources” and ’services’ of an environment.
5.3. Execution environment for the realization of the prototypic seminar

Figure 5.2.: Modeling of "environments" and "resources" on ReCourse

- View C and E: View C and View E present perspectives used to model "resources" and "services" of the learning design of the prototypic seminar. Resources and services of the learning design are assigned to their respective environment in this perspective. Further details of the respective service or resource of an environment are specified in view E.

- View D: View D presents the environment or container used to model "Prepared Resources" of the prototypic seminar.

5.3.2. Learning Design Runtime Engine

"CopperCore" was used as Learning Design Runtime Engine for the validation and parsing of the manifest of the prototypic seminar (see [Nederland., 2010]). Subsection 4.3.2 covered in detail the architecture of CopperCore. CopperCore provides APIs for the publication, administration and delivery of the learning design of a UoL. It supports all level of the IMS LD specification. The ReCourse editor integrates the CopperCore engine for the parsing and validation of files created during the design process of a UoL. Figure 5.3 presents the user interface of ReCourse used for the parsing and validation of the learning design of the prototypic seminar. This UI provides several levels of debugging of the learning design of the
5. Prototype Implementation

Figure 5.3.: Validation the learning design of the prototype

prototypic seminar. The correctness of the ZIP archive and the validity of therein contained files are checked. Furthermore, the referential integrity within the elements of the learning design of the prototypic seminar is checked.

5.3.3. Learning Design Deployment Environment

Figure 4.18 illustrates the architecture of the "Learning Design Deployment Environment". This architecture is presented in detail in subsection 4.3.2.2. Structures and elements of the framework such as metadata of micro-scripts, which can be mapped to the IMS LD specification, are validated, parsed and transformed by the CopperCore engine. Appendix F present XSL Schemata used for the validation, parsing and transformation of structures and elements added to the IMS LD specification. The element "environment" of the framework is used to model 'resources' and 'services' of the learning design and overwrites the original element "environment" of the IMS LD specification. Modifications performed on this element were covered in detail in subsection 4.3.2.2. Appendix F presents also the XSL schema used for
5.3. Execution environment for the realization of the prototypic seminar

the deployment of the structure "Environment" as it is defined in this thesis. XML schemata
were edited with XML Spy [Altova, 2010c] and transformers were implemented and tested
with the AltovaXML parser [Altova, 2010b]. All these tools are part of the altova mission kits
for software architects [Altova, 2010a].

5.3.4. Personal Learning Environment

Subsection 4.3.4 presented the perspectives of a Personal Learning Environment (PLE) for the
execution of the learning design of a UoL. The prototypical implementation of the conceptual
solution supports only the "static binding" of services during the design time of the UoL. The
"second design level" with the dynamic mash-up of services on the designer perspective of the
PLE is not supported by the prototypical implementation of the conceptual solution. The re-
editing of structures and elements of metadata of the prototypic seminar, which are mapped
to the IMS LD specification, take place in the ReCourse editor. The customization of the
PLE by the supervisor is not supported by the prototypical implementation of the conceptual
solution.

Figure 5.4 presents the perspective of ReCourse, which deals with the re-editing and modi-
fication of metadata of the learning design of the prototypic seminar.

- View A: View A presents the perspective for the specification of metadata (Description,
  Prerequisite, Objective, Outcome, etc.) to be edited.
- View B: View B presents the perspective for the configuration of the specific metadata.
  The name, the related resource(s) and parameters of the metadata are specified in this
  perspective.
- View C and D: View C and View D present perspectives for the re-editing of meta-
data. Depending on the selected tab, the content of the metadata can be re-edited in
  WYSIWYG or in plain text mode.

CopperCore and the Reload (Reusable eLearning Object Authoring and Delivery) player con-
stitute the delivery and player component of the PLE for the prototypic seminar. In addition
to the validation and parsing of the learning design of the prototypic seminar, CopperCore is
used as a backend for the interpretation and delivery of instructional sequences defined in the
manifest of the prototypic seminar. The ReLoad player was developed at the University of
Boston and is available as free Open Source [Reload, 2010]. It extends the CopperCore engine
with a user interface for the delivery, viewing and interaction with the learning design of a
UoL. Furthermore, it manages users, services and resources defined in the learning design.
Figure 5.5, 5.6 and 5.7 present several perspectives of the ReLoad player. The prototypical
implementation of the execution environment implements only the "static binding" of services
through references to legacy systems. This process was covered in detail in subsection 4.3.2.2.
The following services respectively components and widgets are integrated to the PLE of the
prototypic seminar:

- **Networking component**: A reference to the social networking platform "LinkedIn" [LinkedIn,
  2010] is specified to support the contact and networking processes among stakeholders
  involved in the learning design of the prototypic seminar.
- **DMS component**: Resources required to perform activities are managed by the Reload
  player. Artefacts created during the prototypic seminar are managed on the virtual stor-
5. Prototype Implementation

Figure 5.4.: Designer perspective of the PLE
5.3. Execution environment for the realization of the prototypic seminar

age and document management system provided by Google. The Google Docs storage system is referenced for activities which create documents.

- **Synchronous communication component:** The communication among distributed stakeholders in the prototypical implementation of the conceptual solution takes place through e-mails.

- **Document editor component:** "Google Docs" is used to edit and manage documents of the prototypic seminar.

- **Publication components:** The publication platform "scribd" is referenced for the publication and discussion of results of the prototypic seminar.

- **Calendar widgets:** The "Google calendar widgets" are used to manage event of the prototypic seminar.

- **Blog widgets:** The blog publishing tools "blogger" of Google is referenced to log both the personal and the group development during the prototypic seminar.

- **WIKI widgets:** Wiki functionalities are builds around the virtual storage system of Google and the collaborative editing functionalities of Google Docs (annotation, comment, etc.).

Figure 5.5 presents the ReLoad player or the player perspective of the PLE of the prototypic seminar.

- **View A:** View A presents the UI of the player for the management of users involved in the learning design of the prototypic seminar.

- **View B:** View B presents the UI for the management, control and delivery of instructional sequence of the learning design of the prototypic seminar.

- **View C and D:** View C and View D present the UI for the delivery of resources and services specified in the learning design of the prototypic seminar.

- **View E:** View E presents the UI for viewing artefacts specified in the learning design of the prototype. Figure 5.6 shows how to present resources of the learning design and Figure 5.7 presents the user interface of a service specified in the learning design, i.e. the view E presents the user interface of the networking platform "LinkedIn" specified for the contact and networking among stakeholders of the prototypic seminar.
5. Prototype Implementation

Figure 5.5.: Player perspective of the PLE
5.3. Execution environment for the realization of the prototypic seminar

Figure 5.6.: Player perspective of the PLE (resource view)
5. Prototype Implementation

Figure 5.7.: Player perspective of the PLE (service view)
5.3. Execution environment for the realization of the prototypic seminar

5.3.5. Rich Mobile Learning Client

The Rich Mobile Learning Client (RiMoLeC) of the prototype constitutes the core of the off-line centric model. It consists of standalone applications and widgets derived from services defined in the learning design of the prototypic seminar. These applications run on a 2 GB USB stick in order to allow participants to move with their learning environment from one location to another and perform learning activities on different devices. The widgets of the prototype are built using the Gears framework (see [Google, 2010]). This framework fulfills the requirements for the implementation of widgets for virtual seminars. It implements the "off-line centric model" pursued in this thesis through its API and supports many open protocols. It is available under the open source Berkeley Software Distribution (BSD) license and is supported by a broad developer community. The following components are running on the RiMoLeC of the prototypic seminar:

- **Personal information manager:** The portable Open Source application "Thunderbird" is used to manage and deal with mails exchanged by stakeholders of the prototypic seminar (see [portableApps, 2010]). Its calendar extension lighting, which can deal with distributed calendars, is synchronized with the remote calendar of the PLE.

- **Authoring components:** Google Docs is used to edit text based documents created by the stakeholders of the prototypic seminar. Google Docs implements a mechanism for the synchronization of documents available online and on the RiMoLeC. This mechanism is based on the "Gears" framework, which is installed in the portable version of the Firefox browser used on the RiMoLeC of the prototypic seminar.

- **Blog widgets:** "blogger.gears" (see [Blogger, 2010]) is a widget running on the RiMoLeC, which allows a participant to edit blogs off-line and synchronize it with the online blog of the PLE.

- **Wiki Widgets:** Collaborative functionalities of Google Docs (support of annotation, commenting and versioning of a document, etc.) and the synchronization functionalities provided by the Gears framework constitute the basis of the modeling of a wiki defined as services of the learning design of the prototypic seminar. The work on collaborative documents using Google Docs among distributed stakeholders of the prototypic seminar occurs in asynchronous modus.
5. Prototype Implementation
6. Evaluation

In this chapter, components of the conceptual solution presented in chapter 4 are analysed in order to validate the fulfilment of the requirements formulated in chapter 2. Subsection 2.4 presents the summary of requirements organized into functional and non-functional requirements. Several methods are used to validate these requirements. Functional requirements are validated in the first subsection. The validation of these requirements is based on the analysis of components or applications (widgets) of the learning environment and didactical and organizational arrangements developed in the thesis. Non-functional requirements are covered in the second subsection. The validation of these requirements is based on walkthroughs with remote supervisor and didactical experts. The goals, the setting, the methods, the subjects and the procedures applied for the validation are presented. Afterwards, results of the evaluation are discussed. The last subsection summarizes fulfilled requirements in table form. Requirements that were not addressed, deficits of the proposed solutions, and propositions for their improvement are presented in this subsection.

6.1. Validation of the functional requirements

The validation of functional requirements is mainly based on the analysis of components or applications (widgets) of the learning environment, which provides services or implements features to solve the problems addressed by specific requirements. Didactical methods and organizational arrangements modelled in the thesis constitute the other part of the argumentation for the validation of functional requirements. The feasibility of the learning environment is already verified through the prototype implemented and presented in chapter 5. Functional requirements to be validated are presented in the subsequent paragraphs. They can be grouped for the validation according to a common problem addressed.

Requirement(s):
- I1 D. R. 1: eLearning system must deal with instability of power supply
- I1 U. R. 4: work without need for continuous online connection to internet

This group of requirements addresses the problem of the lack of infrastructure in Cameroon. Solutions propose to solve the problem consist of didactical and organizational arrangements supported by technical tools. In order to solve the problem presented above instructional sequences of the seminar particularly learning activities were decomposed in asynchronous sub-process which must be performed in face to face situation. In case of the instability of power supply, participants can perform tasks of the seminar on classical support as papers and blackboard. Electronic devices are used to digitalize and store data or processes perform on classical support. Computer networks are used to interact with the remote supervisor. In addition to this arrangement which minimizes the use of technical systems, applications of the learning environment of participants (Rich Mobile Learning Client) are build on a framework, which allows them to perform activities of the seminar offline and to synchronize processes and data with an online environment as soon as an internet connection is available.

Requirement(s):  I3 U. R. 27: Students must be able to work on any computer independent of a location.
6. Evaluation

Applications or widgets of the learning environment of participants are running on a portable device (Memory Stick). These applications are built on web based technologies and require only a web browser which is available in any computer as runtime environment.

**Requirement(s):** I3 U. R. 32: Concepts to support the private sphere of stakeholders on the learning environment are needed.

The execution environment of the virtual seminar encompasses a component which provides basic features as the login and authentication of stakeholders and applications on the PLE. The security and privacy of data and users in decentralized learning environment according to the PLE approach is still an open issue in the scientific community.

**Requirement(s):**
- I2 U. R. 13: Concepts to support the integration of know-how from the Diaspora in the current process of virtual seminar are needed.
- I2 D. R. 15: The integration of topics proposed by the industry and by external experts in the virtual seminar is needed.
- II D. R. 6: Use of new and innovative internet technologies to enhance creativity, information sharing and collaboration.

This group of requirements addresses the lack of human resources in institutions of higher education in Cameroon and the actuality of content used in these institutions. Solutions proposed to solve the problem consist of didactical and organizational arrangements supported by technical tools. Support structures (e. g. supervision, coaching, monitoring, etc.) of the proposed seminar are distributed at different levels (technically and organizationally) and locations in order to support the integration of remote experts into the virtual seminar process. Didactical accentuations of the seminar are designed bearing in mind the location of the remote experts. They focus on the needs and responsibilities of participants. In addition to these arrangements, the 'Social Professional Networking Platform' designed in the thesis is an efficient instrument to support the integration of remote experts in the virtual seminar process. Academic institutions can search for specific competences and profiles and experts can look for demand of institutions for the supervision of seminars. The matching of these stakeholders is supported by the platform. Furthermore, the platform characterized as social software supports the information sharing, the collaboration and the networking among the remote expert and campus based students.

**Requirement(s):**
- I2 U. R. 20: The system used for the virtual seminar must manage several versions of a document related to a subtopic and actions on it efficiently.
- II U. R. 5: The availability of literature and access to it must be supported by the eLearning system

The document management system integrated into the learning environment of the virtual seminar provides functionalities such as indexing, search, storing, management of artefacts and management of users. This system is used to manage efficiently all contents related to the virtual seminar (literature and learning materials, contributions of participants, prepared resources, etc.).

**Requirement(s):**
- I2 U. R. 22 Concepts to support the communication particularly in asynchronous mode between the supervisor and the student in a structured way during the seminar are needed.
- II. D. R. 2: Use of GSM Network for overcoming connectivity problems.

Micro-blogging tools, which support several communication technologies, such as GSM and internet, are integrated into the learning environment of the virtual seminar. These tools implements the symbol variety, the direct feedback and the sequencing of communication
6.1. Validation of the functional requirements

described in [1.1.3.1] in order to support the asynchronous communication between the remote experts and campus based students in a structured way.

**Requirement(s):** I2 D. R. 19: Concepts or methods to control the participant’s evolution during the virtual seminar and if necessary to take corrective actions are needed.

The process proposed in subsection [4.1.3.3] is designed to monitor and control participant’s evolution. This process is supported by the monitoring component of the learning environment. It traces and logs activity performed on the learning environment of the virtual seminar. Data provided by this component can be interpreted in order to give an overview on the development of participants. Also, corrective action can be taken if necessary.

**Requirement(s):**

- I2 U. R. 25: Technologies respectively concepts to support the presentation, discussion and moderation taking into consideration the distribution of students and supervisors and the lack of infrastructure.

- I1 D. R. 7: Concepts to improve the visibility of scientific work performed in institutions of higher education in Cameroon are needed.

- I1 D. R. 6: Use of new and innovative internet technologies to enhance creativity, information sharing and collaboration.

The presentation and discussion of results of the virtual seminar is performed virtually in asynchronous modus. First, participants publish their presentations on a platform qualified as social publishing platform. After a delayed period they receive feedback and comments chronologically from other participants and from the remote supervisor. The presentation and discussion process in this way takes into account the distribution of stakeholders and the lack of infrastructure. Interactions among stakeholders and artifacts used for the presentations are stored on the publishing platform. Theses artifacts are indexed and can be referenced by online search engines. These features of the publishing platform increase the visibility of results achieved within the scope of the seminar. Furthermore, the publishing platform qualified as social software implements features to support discussions, collaboration and information sharing among stakeholders.

**Requirement(s):**

- I3 D. R. 33: Concepts to support collaborative and cooperative activities amongst students are needed.

- I2 D. R. 21: Concepts to improve the efficiency of the recursive process of "supervisor control, feedback to student, discussion with the student and supervisor approbation" and the communication during this process on a submitted draft by a student are needed.

The process proposed in subsection 4.1.3.3 is designed to support collaborative and cooperative processes among students. This process is supported by widgets like wiki and blogs which implements features to support collaborative and cooperative processes.

**Requirement(s):** I2 U. R. 23 Concepts to manage both tasks and events posted by the supervisor and students are needed.

The calendar widgets integrated in the execution environment used to manage the tasks and events of the virtual seminar implement server push or push technologies that help to synchronizes events and tasks edited on a calendar between different clients such as Personal Information manager (Outlook, Thunderbird, etc), mobile devices, etc.

**Requirement(s):**

- I1 D. R. 3 All system components must be able to run on hardware with low performance.

- I1 D. R. 8: The eLearning system and its components must be available under the open source licence model.

- I1 D. R. 9: The community for the maintenance and development of the eLearning system
must be large and stable.

- I1 D. R. 10: Technologies used to develop the system must be simple.

This group of requirements addresses the lack of infrastructure (human and technical) in academic institutions running eLearning programs. All system components of the execution environment of the seminar are built on open source technologies. The runtime engine used to processes the learning design of the virtual seminar is based on Java Enterprise technologies which is as complex qualified in terms of required resources to run and to maintain the systems by responsible of eLearning programs in Cameroon. The community support for the development of the runtime engine is proportional to the acceptance of the IMS LD specification. Statistics on the acceptance and the growth of this community are not available. Except the runtime engine used to process the learning design of the virtual seminar, all components of the system architectures are built on web based technologies such as Linux, Apache, MySQL, PHP, XML, Javascript, Ajax, etc. qualified as simple and able to run devices with low performance. Community support for these technologies can be evaluated as large and grow with the evolution of the internet from a delivery platform to an interactive, participative platform (WEB 2.0).

6.2. Validation of the non functional requirements

Non functional requirements are partitioned into subsets according to the methods used for their validation and subjects involved in the evaluation. The validation aims to evaluate the solution developed in the thesis from the perspective of the staff of the seminar and didactical experts. Quantitative methods were not used for the validation due to the limited resources available for the thesis and time required to perform the process. Summative evaluation based on interviews with responsible of the seminar in Cameroon was used as method for the evaluation. The usability of the proposed solution was evaluated through walkthrough with remote experts/supervisors from the Diaspora and didactical experts in Germany. Participants of the virtual seminar were not addressed as a target group, because the focus of the proposed solution lies on requirements formulated by persons being in charge of eLearning programs in Cameroon (responsible in the faculty, instructor and administrator of the learning environment). The subsequent paragraphs present subjects or target groups of the evaluation, methods used by the evaluation, settings and measures used in the evaluation. The results are presented and discussed at the end of each section.

6.2.1. Interview with responsible of eLearning programs in Cameroon

The evaluation presented in this paragraph aims to validate the fulfilment of non functional requirements formulated by responsible of eLearning programs in Cameroon involved in the empirical study (see 2.3.3). Components of the conceptual solution which represent a solution to problems addressed by requirements formulated by this target group are analysed and evaluated. Furthermore, several aspects of the conceptual solution developed in this thesis are evaluated. The validation of these requirements is based on questionnaires addressed to the following four persons:

- An instructor and coordinator of eLearning activities at the IUT-FV. He supervises students and assists the head of the department in organizational tasks within the scope of the Cisco eLearning program. He was already the contact person and the main
6.2. Validation of the non functional requirements

responsible of activities performed at IUT-FV during the empirical analysis. He was interviewed as a member of the staff of the eLearning program in this phase.

- The coordinator of the eLearning Program "MASTEL" of the "Ecole normal superieur polytechnique (ENSP)". He assists the head of the department in his daily tasks, organizes the curricula of the MASTEL and coordinates teaching activities. The MASTEL program is an eLearning Master degree program in telecommunication. In addition to the responsibilities enumerated above, he supervises some modules or courses of the program.

- The head of the faculty of computer science at the "Université des montagnes (UDM)" in Cameroon. The UDM is a presence university which offers some courses in blended learning modus. He is the head of the department and coordinates the strategic orientation and the human resources of the faculty.

- An instructor or supervisor of eLearning courses at the ENSP and UDM. He supervises students within the scope of the MASTEL and is an external lecturer in the computer science faculty at the UDM.

Requirements to be validated are organized according to the components of the conceptual solution. First, the didactical and organizational arrangements are analysed and evaluated, followed by the process model and lastly components of the execution environments. Appendix H presents the structure and item of the questionnaire. Each item of the questionnaire addresses a requirement of the empirical analysis. Responsible actors in Cameroon evaluated the solution using a range from 1 to 5 with 5 representing the high score given for the fulfilment of a requirement and 1 the lowest score.

The questionnaire and information required to fill the questionnaire (micro-instructions, templates and guidelines, chapter which describes the solution, etc.) were sent per mail to subjects of the analysis. Afterwards a telephone call on Skype was conducted with each subject in order to presents the context of the interview and to answer open question related to the items of the questionnaire. The following steps are performed during the conference:

1. Presentation of the context of the thesis

2. Brief presentation of problems addressed by the requirements and the solutions to be evaluated.

3. Presentation of the design and items of the questionnaire.

4. Answering of open questions from the interviewed related to items of the questionnaire.

The telephone call lasted 30 Minutes and after this, subjects filled the completed questionnaire and sent it back for the interpretation of answers. Appendix H presents the average answers of all subjects.

Answers given by responsibles in Cameroon or results of the evaluation are presented and discussed in subsequent paragraphs. The presentation of results is structured as follows:

1. Requirement to be validated

2. Proposed solution

3. Item of the questionnaire addressing the requirements
6. Evaluation

4. Answers of the interviewed and discussion

**Requirement(s):** I1 U. R. 11: Concepts to deal with the problem of lacking human resources in term of supervision are needed.

**Solution(s):** supervision and monitoring model developed in the thesis

**Questionnaire Item(s):** Does the approach of collaboration, interaction and participation based on self regulation and self control helps to solve the problem of lacking human resources in terms of supervision?

**Answers and discussion:** Three participants considered the proposed solution as very good and one as good. One participant remarked that it was time consuming and an additional effort for students. In general, all participants regarded the proposed solution as good.

**Requirement(s):** I2 D. R. 19: Concepts or methods to control the participant’s evolution during the virtual seminar and if necessary to take corrective action are needed

**Solution(s):** peer review, group report and participant journal

**Questionnaire Item(s):** Are the peer review process, the group report and journals of participant’s appropriate measure to control and monitor the development of participants?

**Answers and discussion:** All subjects considered the measures as very good and appropriate particularly because participants receive guidelines or instructions in advance on how the process must be performed.

**Requirement(s):** I2 D. R. 26: Measures to improve the acquisition of key qualification (techniques of presentation, rhetorical skills, teamwork, etc) by students are needed.

**Solution(s):** Participation, collaboration and interaction model; Micro-instructions of the intra-group regulation and control process

**Questionnaire Item(s):** Do the participation, collaboration and interaction models and micro-instructions of the process of intra-group regulation and control help to improve the acquisition of key qualifications?

**Answers and discussion:** All subjects rated the proposed solutions as very good to help student in the acquisition of key qualifications.

**Requirement(s):** I3 D. R. 33: Concepts to support collaborative and cooperative activities amongst students are needed.

**Solution(s):** Micro-instructions of processes of the group subject matter analysis and the intra-group regulation and control

**Questionnaire Item(s):**
- Do micro-instructions of the group subject matter analysis and the intra-group regulation and control support students to perform cooperative and collaborative activities?
- Does the proposed approach of collaboration, interaction and participation help participants to perform cooperative and collaborative activities?

**Answers and discussion:** All participants evaluated the design of micro-instructions as very helpful to support cooperative and collaborative activities among students. One subject considered the collaborative, participative and interactive model as very good; another rated the model as good and two considered the model as inappropriate: the model is complex with too many steps. As general conclusion, all subjects rated the micro-instructions as a very good solution. Some steps of the participation, interaction, and collaboration model should be revised and simplified.
6.2. Validation of the non functional requirements

**Requirement(s):**
- I2 D. R. 14: The modified model of virtual seminar with its didactical approach, goals and expectations must be introduced to stakeholders involved in the process, especially to students.
- I3 D. R. 28 Clear and explicit formulations of expectations of the virtual seminar and the evaluation criterion.

**Solution(s):** Organisation of a meeting at the beginning of the seminar to introduce the seminar to participants.

**Questionnaire Item(s):**
- Is a presence meeting necessary to help participants to become familiar with the seminar with its approaches, goals and expectations?
- Does the presentation of the aims and goals of the seminar particularly the evaluation model helps participants to understand expectation and evaluation criterion of the seminar?

**Answers and discussion:** All subjects considered the organization of a presence meeting as indispensable to present the seminar with its goals and expectations. Two subjects evaluated the presentation of evaluation criterion as very inappropriate. They argued that participants will perform only necessary tasks to pass the course if they know the evaluation criterion in advance. The other two participants account the presentation of goals, expectation and evaluation criterion in advance as good, but they mentioned that the assignments must be well designed and constraint students to achieve a minimum of tasks in order to pass the seminar.

**Requirement(s):**
- I1 U. R. 11: Concepts to deal with the problem of lacking human resources are needed.
- I2 D. R. 15: The integration of topics proposed by the industry and by experts out of the campus in the virtual seminar is needed.

**Solution(s):** Blended learning virtual seminar with remote experts from the Diaspora

**Questionnaire Item(s):**
- Does the integration of experts helps to deal with the problem of human resources in your institution?
- Is the nature of the subject matter (e.g. authentic problems, multiple perspectives, etc.) proposed by the remote experts and the social learning arrangement (e.g. contact with experts, group work, etc.) appropriate for the eLearning context in your institution?
- Is the integration of the seminar in the curriculum as a complete and independent didactical unit possible in your institution?

**Answers and discussion:** All subjects evaluated the integration of remote experts as a very good solution to deal with the problem of human resources in their respective academic institution. They evaluated the proposed model of a seminar with a remote supervisor as innovative and a good extension to the current didactical units.

**Validation of the functional requirement of the learning environment**

In addition to questions related to the validation of non functional requirements of the empirical analysis, several questions related to the evaluation components of the learning environment were designed. The subsequent paragraphs present the questions and summarize answers.

**Question(s):** Does the design of the technical system based on a "Personal Learning Environment" (use of widgets to perform activities, system based on decentralized in opposition to LMS) fit to the eLearning context in your institution?
6. Evaluation

All responsible evaluated the design of the learning environment of the seminar based on PLE as appropriate for the underlying processes.

**Question(s):**
- Does a social networking platform like ‘linkedIn’ help to improve the contact and networking among stakeholders of the seminar?
- Does the social networking platform help to improve the building of a community of practice and interest?
- Does the social publishing platform help to improve the networking among stakeholders of the seminar?
- Does the social publishing platform help to improve the building of a community of practice and interest?

The regarded the integration of social software into the teaching/learning process in their respective institutions as innovative and very good. They rated this approach as very efficient for the integration of the know-how from the Diaspora in the current teaching/learning processes in their respective institution. All responsible evaluated this approach as helpful to improve interactions (contact, networking, collaborative work, etc) between the remote experts and their institutions.

**Question(s):**
- Does the face to face communication approach among participants on campus fit to the need of communication in virtual seminar realized in your institution?
- Does the integration of micro-blogging tools (twitter, Google buzz, etc.) supporting GSM standard helps to improve the communication among stakeholders of the seminar?
- Are additional tools for the communication such as web conferencing, shared white board cooperative editing tools, student homepages, etc required for the virtual seminar?

They rated as very positive the face to face communication among participants on campus and the integration of communication technologies based on GSM standard.

Two responsible of eLearning program running in the city with passable infrastructure required the integration of synchronous communication services on the learning environment. The others considered the asynchronous communication model among distributed stakeholders as appropriate for their institutions.

**Question(s):** Is the use of a wiki appropriate to support collaborative and cooperative activities among participants of the virtual seminar?

Three responsible considered the use of a wiki for collaborative activities among students as appropriate and one as passable.

**Question(s):** Is the use of blogs appropriate to log the personal development of participants and the development of groups in the virtual seminar?

The use of Blogs to log the personal development of participants and the development of the group was approved and rated as very adequate by three responsible while one rated it as satisfactory.

**Question(s):** Does the distributed calendar help to facilitate the management of tasks and events of the virtual seminar?

The integration of a distributed calendar for the management of tasks and events of the seminar was rated as very good by all responsible.

**Question(s):**
- Does a portable environment (Memory stick) to perform activities of the virtual seminar improve the flexibility of participants to work anywhere at any time?
- Does the performing of off-line activities on a local environment improve the participation of student and the quality of their contributions in the virtual seminar?
6.2. Validation of the non functional requirements

- Does the off-line environment reduce costs related to the access to the Net?
- Does the off-line environment represent a solution for the problem of the instability of power supply?
- Does an off-line environment represent a solution for the problem of the instability of internet connection?

The learning environment of participants implemented on portable devices and its capability to support participants in the achievement of tasks and activities of the seminar off-line were rated as very good in terms of cost reduction, improvement of the participation of students, quality of their contribution, and flexibility to work anywhere at any time. Furthermore, all responsibles considered the Rich Mobile Client as an efficient solution to deal with the problem of instability of power supply and internet connection.

Question(s):
Evaluate the use of web based technologies (Open source) for the development of the learning environment according to the following aspects:
- Facilitate the development of further components of the learning environment by developers in your institution
- Facilitate the maintenance of the learning environment by technical responsible/administrator in your institution
- Fits to hardwares used by stakeholders involved in eLearning in your institution

All responsibles recommend using open source web based technologies for the implementation of the learning environment. They evaluated the maintenance of such systems as easy and regarded the development of specific modules under such technologies as simple. Another argument for the use of these technologies was the capacity of hardware devices used within the scope of the eLearning program in their respective institutions.

6.2.2. Walkthrough with remote supervisors or experts from the Diaspora

This subsection presents the validation of non functional requirements by remote experts involved in the seminar process. The evaluation is based on cognitive walkthrough with subjects playing the role of remote experts in order to test the usability of the developed solution (see [Rieman et al., 1995]). The evaluation was performed with the following subjects:

- Two master graduates from the faculty of computer science of the technical university in Dortmund. One graduate is 31 years old and works as a software developer in a company in Germany, and the other is 33 years old and works as a consultant in a software consulting company.

- A Ph D. graduate of the faculty of statistic at the technical university in Dortmund. This subject has a five years experience as research assistant in his former university. He currently leads the statistic division of a bank company in Germany and is 36 years old.

- A research assistant from the faculty of statistics at the technical university in Dortmund. This subject is 28 years old and has an experience of two years as assistant in this faculty.

- A Ph. D. student in the faculty of electronic of the technical university of Braunschweig.
6. Evaluation

These subjects are Cameroonian graduates in institutions of higher education in Germany. At the beginning of the walkthrough, the context of the thesis particularly requirements of the empirical analysis was presented to the subjects. Afterwards, components of the conceptual solution were presented briefly and the scenario of the seminar was played on the prototype. Before the walkthrough starts, interaction diagrams of sub-processes/phases or micro-scripts of the seminar were presented. After this presentation, subjects "walked" in the role of remote experts through several phases of the seminar using the prototype system and stated their impressions about processes and whether they are supported by the learning environment during the performing of activities. The following questions related to the sub-process were asked during the walkthrough:

- Do you consider this phase as relevant for the complete process?
- Do you regard the time allocated to this process as sufficient?
- Do you consider the activity sequencing as appropriate?
- Do you regard the environment to perform the process as appropriate (resource and tools)?

All subjects considered the "contact and networking" phase as important. No time was pre-defined for the activities of this phase. They regarded the modelling and sequencing of activities as appropriate for the sub-processes. Features of the learning environment to support the sub-processes were presented and all subjects considered them useful and appropriate for the process. Due to the fact that experts were already registered in other social networks, two subjects proposed to import some basic data from such platforms, which can be complemented on the platform of the virtual seminar. Subjects only evaluated features of the social networking platform because its implementation was out of scope of the thesis.

All subjects regarded the phase of the "preparation of the virtual seminar" as important. The proposed model does not define a time for activities and processes of this phase. Subjects were of the opinion that the social networking platform is not absolutely indispensable to perform activities of this phase. They proposed the direct and synchronous communication with the academic institution, which hosts the seminar to avoid misunderstanding during the development of the concept of the virtual seminar.

All subjects evaluated the phase "introduction to the seminar" as important. They regarded the time allocated to this phase as adequate. They evaluated the modelling and sequencing of activities (presence meeting for stakeholders on campus and asynchronous presentation of distributed stakeholders) of this phase as appropriate due to the distribution of stakeholders involved in the process. They proposed to videotape the presence meeting and provide remote experts with access to the recording in order to have a live impression of the meeting and other stakeholders involved in the process. They approved the use of social networking platforms to manage the profiles of stakeholders involved in the seminar.

All subjects rated the phase of "structuring of work" as important but too complex. They estimated the time allocated to processes of this phase as sufficient. Two subjects proposed to simplify the process by removing the group based activities (group subject matter analysis and group report). They held the opinion that the peer review process and the monitoring approach based on the control of report and journal was adequate. Communication, collaboration and cooperation tools of the learning environment were positively evaluated by all subjects. Subjects with a didactical background proposed to organise a chat session after the process of the topics analysis and after the process of elaboration of synopsis in opposition
6.2. Validation of the non functional requirements

to subjects from industry. The latter proposed to minimise their participation as much as possible in the supervision process. All evaluated the use of an off-line office program to edit documents of this phase as appropriate.

The phase of "writing of the seminar paper" was evaluated as important by subjects with a didactical background. Subjects active in industry proposed to combine the process of this phase with the process of elaborating the synopsis, in other words, participants should write their paper directly after the subtopic analysis. Time constraint and simplification of the model were the arguments enumerated by those subjects. Subjects with a didactical background regarded this phase important and the time allowed for activities as sufficient. They evaluated the tools of the learning environment that were already used in the previous phases as appropriate to support processes of this phase.

All subjects proposed to integrate processes of the phase "preparation of the presentation" into the phase of "writing of the seminar paper". They recommended that processes of this phase should not be modelled explicitly.

The phase of the 'presentation of the work' was evaluated as important by all subjects. All subjects rated the virtual asynchronous model and expressed that it was not ideal but did fit their time requirements. The platform used to perform the process was evaluated as good; but subjects proposed to extend the platform with synchronous communication features in order to perform the discussion process.

In summary, all subjects evaluated the entire process as very good and deemed the tools proposed to support the process as appropriate. Depending on the background of the subjects (i.e. if they have a didactical background or work in industry) the participants considered the process complex and time intensive and proposed to eliminate some steps and simplify some processes. All subjects proposed to extend the eLearning environment with synchronous communication capabilities so as to complement the current approach of communication with chat or conferencing.

6.2.3. Walkthrough with didactical experts

The evaluation of the didactical model by didactical experts is presented in this section. The evaluation is based on cognitive walkthrough. The design, the measures and the procedure of the walkthrough with didactical experts were similar to the walkthrough with remote experts (see previous section). The following didactical experts were involved in the evaluation:

- A senior lecturer from the faculty of computer science and mathematics at the FernUniversität in Hagen. This subject has more than ten years of experience as a lecturer at the FernUniversität in Hagen. He organizes and supervises several courses in the department of Mathematics and Computer Science. The FernUniversität is the only state-maintained distance teaching university in the German-speaking countries and regions. It provides high-quality final degrees (Bachelor, Master and Doctorate) to over 62 000 Students.

- A post graduate lecturer from the faculty of Mathematics and Computer Science at the FernUniversität in Hagen. This subject is responsible for the tutoring of students. She had more than ten years experience as assistant lecturer and had supervised several courses.

The involved experts evaluated the proposed model as adequate and appropriate for the given distribution of stakeholders. Particularly the modular design of the processes and subprocesses of the seminar and the use of prepared templates, micro-instructions and guidelines
were appreciated. They shared the view that this approach enables the re-usability and reproducibility of artefacts and processes of the seminar, and allows for pedagogical expressiveness and personalization of the learning design of the seminar. In other words, prepared resource or processes of a seminar can be reused, personalized and adapted to specific didactical requirements and applied in several contexts. The codification of the learning design of the proposed seminar using IMS LD was appreciated because of the compatibility and the interoperability of the underlying technologies (XML) with common eLearning standards. Both subjects estimated the efforts required by an expert to conduct the first seminar as high but this effort should decrease considerably for further sessions of the seminar building on the first seminar due to the reproducibility of processes and the re-usability of resources supported by the execution environment. They evaluated the user’s interface of the prototype as not user friendly. They questioned in general the usability of structures and components of the conceptual solution. They proposed that the interfaces of the learning environment for performing activities and tasks of the virtual seminar must be simple and intuitive. Information, which is not required for a specific process, must be faded out. They approved the approach of dynamic binding of services even if this approach was not implemented on the prototype. The experts evaluated the design of the execution environment based on the personal learning environment as appropriate for the underlying process and the distribution of stakeholders. Especially the use of the Rich Mobile Learning client to overcome the infrastructure problem in Cameroon and the use of social software were appreciated.

6.3. Summary

The proposed model assumes that participants do not require special competences or prerequisites to work on a topic. They are all supposed to perform the same tasks during the seminar process. Therefore, the assignment of subtopics to participants is based on a random algorithm and their wishes and profiles to work on a special issue are not taken into consideration. Thus, the following requirements were not addressed by the conceptual solution:

- I3 U. R. 29: The proposition of topics by students must be taking into consideration.
- I2 U. R. 16: The profile of a student to work on a special issue must be taking into account.
- I2 U. R. 17: The model for the assignment of subtopics must take into consideration the priority of students to choose a subtopic and deal with conflicts on a subtopic.

The assignment of topic to participants takes place during the introduction meeting on campus. Topics are assigned randomly to participants and do not require a computer system to automate the process. Therefore, the following requirements of the empirical analysis can be regarded as fulfilled:

- I2 U. R. 18: The model for the assignment of topics to students must be supported or automated by a computer system.

The runtime engine used for the prototypic implementation of the seminar is built on CopperCore, which is developed using Java enterprise technologies. The use of these technologies is in contradiction to a requirement formulated by the person in charge of the eLearning program in Cameroon during the empirical analysis:

- I1 D. R. 10: Technologies used to develop the system must be simple.

However, the learning design of the developed seminar is codified using XML language, other engines based on light technologies as PHP can be implemented to interpret and run the learning design of the developed seminar.

Table 6.1 presents the summary of fulfilled and not addressed requirements (non functional)
### 6.3. Summary

Table 6.1.: validated Non functional requirement

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1 U. R. 11: Concepts to deal with the problem of lacking human resources in term of supervision are needed</td>
<td></td>
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</tr>
<tr>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>I2 D. R. 15: The integration of topics proposed by the industry and by experts out of the campus in the virtual seminar is needed.</td>
<td></td>
<td>X</td>
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<tr>
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<td></td>
<td>X</td>
</tr>
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<td>I2 D. R. 26: Measures to improve the acquisition of key qualifications (techniques of presentation, rhetorical skills, teamwork, etc.) by students are needed.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I3 D. R. 28: clear and explicit formulation of expectations of the communication tools are needed.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I3 U. R. 29: The proposition of topics by students must be taking into consideration.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I3 U. R. 30: Topics for the virtual seminar must be selected on the basis of their actuality and practical orientation.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I3 D. R. 33: Concepts to support collaborative and cooperative activities amongst students are needed.</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

...of the empirical analysis.

Table 6.2 summarized functional requirements of the empirical analysis organized into fulfilled and not fulfilled. The last row marked requirements, which are partially fulfilled.

Table 6.2.: validated functional requirement

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Yes</th>
<th>No</th>
<th>Partially</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1 D. R. 1: eLearning system must deal with instability of power supply</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I1 D. R. 2: Use of GSM Network for overcoming connectivity problems</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>I1 D. R. 3: all system components must be able to run on hardware with low performance.</td>
<td></td>
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<tr>
<td>I1 U. R. 4: work without need for continuous online connection to internet</td>
<td>X</td>
<td></td>
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<tr>
<td>I1 U. R. 5: The availability of literatures and the access to its must be by the eLearning system.</td>
<td>X</td>
<td></td>
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<tr>
<td>I1 D. R. 6: Use of new and innovative internet technologies to enhance by the eLearning system.</td>
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### 6. Evaluation

<table>
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<tr>
<td>I1 D. R. 8: The eLearning system and its components must be available under the open source licence model.</td>
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<td>I2 U. R. 13: Concepts to support the integration of know-how from the Diaspora in the current process of virtual seminar are needed</td>
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<td>I2 D. R. 15: The integration of topics proposed by the industry and by external experts in the virtual seminar is needed.</td>
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<td>I2 U. R. 18: The model for the assignment of topics to students must be supported or automated by a computer system.</td>
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<td>I2 D. R. 19: Concepts or methods to control the participant’s evolution during the virtual seminar and if necessary to take corrective actions are needed.</td>
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<td>I2 D. R. 20: The system used for the virtual seminar must manage efficiently the several versions of a document related to a subtopic and actions on its.</td>
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<td>I2 D. R. 21: Concepts to improve the efficiency of the recursive process of supervisor control, feedback to student, discussion with the student and supervisor approbation and the communication during this process on a submitted draft by a student are needed.</td>
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<td>I2 U. R. 22: Concepts to support the communication particularly in asynchronous modus between the supervisor and the student in structured way during the seminar are needed</td>
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<td>I2 U. R. 23: Concepts to manage both tasks and events posted by the supervisor and schedule of students are needed.</td>
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<td>I2 U. R. 24: Communications medium for the synchronisation of appointments must take the infrastructure problems (computing and communication) into consideration.</td>
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<td>I2 U. R. 25: Technologies respectively concepts to support the discussion and moderation taking into consideration the distribution of students and supervisors and the lack of infrastructure are needed.</td>
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<td>I3 U. R. 27: Students must be able to work on any computer independent of a location.</td>
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<td>I3 U. R. 32: Concepts to support the private sphere of stakeholders on the learning environment are needed.</td>
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<tr>
<td>I3 D. R. 33: Concepts to support collaborative and cooperative activities amongst students are needed</td>
<td>X</td>
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**Deficits of the proposed solutions identified or formulated by subjects during the evaluation can be summarized as follows:**

- **Simplification of the process model:** A remote supervisor or expert of the industrial field evaluated the entire seminar process as complex and proposed to join some phases (Writing of paper and preparation of presentation) of the process and to remove some sub-processes such as the group report.
6.3. Summary

- **Simplification of the collaboration interaction and participation model:** One responsible interviewed considers that the model requires a lot of time and effort from participants. He proposes to simplify the proposed micro-instructions. Didactical experts estimated that the strict specification of activities to be performed by participants can have the negative effect that they only perform tasks in order to receive a certificate of performance.

- **Technical support of remote experts in the phases of topic formulation:** The execution environment of the virtual seminar does not provide enough support to remote experts during the formulation of topics.

- **Technical support for the archiving, storage and instantiation of seminar on the basis of performed seminar:** The execution environment of the virtual seminar must implement services to automatically store, archive and clone performed seminar. Furthermore the environment must support instantiation of new session on the basis of archived respectively cloned seminars.

- **Integration of synchronous communication services:** Remote experts proposed to integrate synchronous communication services into the technical system in environments where the needed infrastructure is available. This would save time, help to simplify the communication among distributed stakeholders in order to avoid misunderstandings which could be caused by asynchronous communication.

- **Dynamic binding of services and interoperability of data between widgets of the execution environment:** Remote experts and didactical experts appreciated the architecture of the learning environment based on PLE. The dynamic binding of services into the learning environment was missed and the problem of interoperability of data between widgets was mentioned.

- **Use of simple technologies (XAMP, AJAX):** Responsibilities of the eLearning program evaluated the use of JAVA based technologies for the implementation of the runtime engine (CopperCore) of the learning design of the seminar as inappropriate for their institution. Resource to develop modules in order to extend and adapt the system to specific requirements are missing and hardware devices used by stakeholders are very poor in terms of resources and capacity. Technologies used for the entire system must be similar to technologies used for the implementation of the learning environment of participants.

- **Intuitive user interface for the execution of teaching/learning processes:** Remote experts and didactical experts considered that the execution environment is not user friendly and intuitive enough. They propose to ameliorate interfaces of the execution environment and to hide information of the learning design, which are not relevant to perform activities.
6. Evaluation
7. Summary and Outlook

This chapter summarizes the results of this thesis, explains the contributions of this thesis by comparing the results with the state of the art, and outlines future work.

7.1. Results

As many African countries, Cameroon, loses year by year important human resources as a consequence of the migration. According to the International Organisation for Migration (IOM), over 300,000 African professionals reside outside Africa, while the continent has been losing over 20,000 professionals each year since 1990. This problem is particularly observable in academic institutions, where human resources for the supervision of students are lacking. The constant growth of students is disproportional to human resources available for their supervision. Didactical units or courses provided by these institutions must be designed to face this reality.

The hypothesis of the work is that through an optimized integration of technology, didactics and expertise gained from the African Diaspora, a flexible and cheaper solution can be developed to support the transfer of know-how from expertise of people living in the Diaspora to the teaching/learning process in institution of higher education in Cameroon. This solution would help to alleviate the lack of human resources faced by these institutions. From all didactic approaches (lecture, labs exercise, etc.) used in academic institutions in Cameroon, the virtual seminar with its different phases (announcement of a topic, search and use of literature, topic preparation, presentation and discussion, evaluation), expectations, and processes was identified as an appropriate model for such integration. The challenge was the design and implementation of a socio-technical system which considers the characteristics and problems of the Cameroonian context. These characteristics and problems were identified during a field study conducted in institutions of higher education in Cameroon (see chapter 2).

The analysis showed that, due to the lack of human resources in terms of supervision, virtual seminars are confined to a classical homework instead of being a didactical unit in which the supervisor attends to students in the analysis, comprehension, self criticism and presentation of scientific work. In addition to the problem of human resources, academic institutions running eLearning programs are faced with infrastructural and social problems related to the socio-technical context in Cameroon. Most important are the instability of the power supply and internet connection, and the cost associated with running an eLearning program both at the level of the academic institution and at the level of stakeholders involved in the program. Chapter 2 presented in detail results of the field study.

On the basis of requirements formulated by stakeholders involved in the empirical analysis, several approaches for the improvement of the current process were examined. Chapter 3 presented the state of the art of relevant research for the realization of virtual seminar in Cameroon. Before analyzing didactical approaches and methods for the realization of virtual seminars, learning theories underlying these methods were introduced. The analysed models and methods were either too generic or were developed according to the didactical and
technical requirements of western societies. These models assume that the minimal infrastructures (internet connection and bandwidth, power supply, etc.) required to support the didactical models are available and suppose that all stakeholders of the virtual seminar are geographically distributed. These assumptions do not match the requirements formulated by stakeholders in the empirical analysis. The lack of infrastructure was identified as a challenge to run eLearning programs. Therefore, the approach of this thesis assumes that students are physically present at one place, e.g., at the university, while the expert or supervisor in charge of the know-how transfer is situated at a remote location. The analysed models were then adapted to the requirements of the didactical and socio-technical context in Cameroon. The result was the development of didactical methods for the realization of blended learning virtual seminars involving remote experts and campus based students in Cameroon presented in section 4.1. After the development of these methods, approaches to design and specify instructions and processes of virtual seminars were examined. Specific collaborative scripts were analysed and presented. These collaborative scripts must organise stakeholders involved in a virtual seminar, model their interactions, distribute tasks and organize the phases of the seminar. The explored models contributed to the development of the framework for collaborative scripts proposed in 4.2.2.2. Current standards for the specification of instructional sequences of the seminar were examined and the IMS LD model was chosen and extended with several structures to fit the requirements of the framework developed before. The process model respectively the learning design of the virtual seminar presented in 4.2.3 is based on the developed framework and instructional sequences were codified according to the IMS LD specification. For the processing of the learning design developed before, several system architectures for the realization of the execution environment of the virtual seminar and current trends were discussed and presented. The resulting system architecture presented in 4.3 takes into consideration the distribution of stakeholders involved in the virtual seminar and acknowledges the lack of infrastructures in Cameroon. Technologies, tools and protocols used to implement these architectures and to support the teaching/learning processes were evaluated. The execution environment of the virtual seminar developed in this thesis and presented in chapter 4 is based on the deficits of existing approaches and addresses the requirements of stakeholders formulated in the empirical analysis. The learning design and the execution environment developed before provided the basis for the implementation of a prototypic seminar presented in chapter 5. Components of the conceptual solution developed in the thesis were evaluated by didactic experts in Germany, responsible of eLearning program in Cameroon and Cameroonian graduates in the role of remote experts. Chapter 6 presents the results of the evaluation, methods and procedures used to validate the fulfilment of requirements enumerated in the empirical analysis.

7.2. Contributions

The solution presented in this thesis consists of the design of a socio-technical system facilitating implementation of virtual seminars matching the needs of Cameroon. The main contributions of this thesis compared to the state of the art include:

1. **New didactical concepts:** Didactical methods applied within the scope of eLearning programs in Cameroon are mostly constrained by features of the LMS used. Modules or plug-ins developed to support specific didactical accentuations defined from academic institutions in Cameroon are missing although the LMS used are often based on open source technologies and can be extended with further components or modules. In case
7.2. Contributions

of Cameroon, the lack of experts in the area of eDidactic and the missing know-how of LMS developers in this area can explain the lack of technological support for specific didactical approaches. Didactical concepts as part of the social component of the solution developed in this thesis aim at providing a basis for the design of eLearning modules involving remote experts and campus based students in Cameroon. A virtual seminar as didactical unit was used as a reference to implement these concepts. Further didactical units with processes similar to a virtual seminar can be modelled using the concepts developed in the thesis. Modules or components of LMS implemented according to the proposed concepts can help to improve the transfer of know-how to students. Components or characteristics of the didactical concepts are outlined in the following paragraphs:

a) **Blended learning virtual seminar**: In contrast to common eLearning models which assume that there is a geographic distribution of participants and instructors, the model developed in this thesis starts from the assumption that participants are physically present at one place and the supervisors are distributed depending on their role in the virtual seminar process. The proposed model integrates experts from the Diaspora in the teaching/learning processes of the seminar by adapting the concept of supervision. Support structures are extended (e.g., supervision, coaching, etc) and distributed at different levels (organizationally and technically) and locations. A local supervisor or facilitator supervises organizational tasks of the seminar, which are supposed to be performed by students locally. The remote supervisor assumes the pedagogical and intellectual role in the learning process. This approach addresses the lack of local expertise respectively the lack of human resources in academic institutions in Cameroon and is qualified as "blended learning virtual seminar". It combines the effectiveness of virtual learning processes with the advantage of face to face interactions.

b) **Extending aims and goals of virtual seminars in Cameroon**: The extension of support structures allows the design and modelling of the virtual seminar as an independent and complete didactical units with its goals and expectations in comparison to the current approach of virtual seminars in Cameroon. The proposed model aims at supporting the learner in the acquisition of scientific insights besides the presentation and discussion of the results of scientific work. Participants in the proposed model learn how to gain access to scientific work respectively literature, they improve their ability to read, understand and summarise content of scientific texts, they learn how to write a synopsis and scientific article, and they learn how to present and discuss achieved results and outcomes. In addition to the acquisition of knowledge enumerated above, the proposed model aspires to improve key qualifications of participants. Key skills like problem solving heuristics, strategies and techniques of self regulated learning, teamwork, rhetoric, communication and cooperation competence are particularly emphasized.

c) **Didactical accentuations**: Didactical models developed in this thesis are grounded on constructivism and "connectivism" learning theories (see 3.1.1). They focus on the needs and responsibilities of learners and interactions among stakeholders supported by computer networks (see 4.1.3). The didactical accentuations are implemented through an improved learning process integrating several components such as the communication, the collaboration, interaction and participation, the supervision and monitoring, the motivation and learner support and the evaluation
7. Summary and Outlook

of participation. Results of relevant research and experiences for the realization of virtual seminars in Germany were taken into account for the design of these components.

2. New process model for blended learning virtual seminars: The process model proposed in this thesis specifies and codifies the didactical concepts developed before using the following two instruments:

a) **Extended IMS Learning Design:** The sequences of activities undertaken by stakeholders within the scope of the virtual seminar to attain aims and goals enumerated above including resources and support mechanisms provided by a learning environment to support the process are specified using this instrument. Among many standards analysed, IMS LD was used to specify the learning design of the virtual seminar because of the diffusion of the underlying technologies (XML). The IMS LD meta-language provides several structures and components at different levels for the implementation of the learning design for the Unit of Learning (UoL). The IMS specification was extended with portable and personalized services in order to fit to the architecture model developed within the scope of the thesis. Portability refers to the integration of a wide range of services across different LD compliant platforms. Personalization refers to instantiation of services according to parameters defined in the learning design of a UoL, to the technical requirements of the instantiated services and to the preferences of stakeholders involved in the teaching/learning processes of the UoL.

b) **New framework for collaborative scripts:** Scripts are used to describe and structure processes of the virtual seminar. The framework for collaborative scripts proposed in this thesis is based on the state of the art of relevant research in the field computer supported collaborative scripting. It specifies on an abstract level the main components of the virtual seminar design as a unit of learning. On the highest abstraction level, the phases of the seminar are identified as macro-scripts. A macro-script corresponds to a play in the theatrical metaphor used in the IMS LD model and consists of acts respectively micro-scripts. Micro-scripts in turn consist of activities organized in an activity structure. Activities are basic elements in the taxonomy and implement a teaching/learning flow. Two kinds of activities are defined according to the actor playing the active role within the scope of the activity. Participants perform "learning activities" and supervisors or responsible perform "support activities". Prepared resources such as templates/guidelines, instructions or examples of solution can be used to perform specific processes. Activities take place in an environment and create an outcome. The environment manages and provides the resources and services. In addition to the dynamic behaviours of scripts described above, the framework specifies general information or metadata about scripts such as its pedagogical attributes, its description and application field, its intellectual property, etc. The complete process model of the seminar is codified into several XML structures according to the IMS LD specification and packaged in a ZIP archive. This archive can be shared, reused and deployed in several learning environments implementing the IMS LD specification. The process model of the virtual seminar developed in this thesis is based on the extended IMS LD model and has following characteristics:

- **Pedagogical expressiveness:** The processes model expresses specific didactical
7.2. Contributions

accentuations developed for the virtual seminar purpose.

• **Completeness:** The process model describes how activities of both learners and the responsible of the seminar are integrated, how resources (objects and services) used during the learning/teaching process are integrated, how both single and group models of learning are supported.

• **Personalization:** Content and activities of the virtual seminar can be adapted to preferences, portfolios, pre-knowledge, educational needs, and situational circumstances of stakeholders.

• **Compatibility and interoperability:** The underlying language for the codification of the process model is standardized, in line with other notations and interoperable with other specifications.

• **Re-usability:** Useful parts (instruction, template/guideline, micro-script, macro-script) of the learning design can be identified, isolated, de-contextualized and exchanged in order to stimulate their reuse in another context.

• **Formalization:** The process model of the virtual seminar can be processed automatically by different learning environments implementing the IMS LD specification.

• **Reproducibility:** The process model allows an abstraction of specific processes, which can be repeated in different settings with different stakeholders.

3. **Offline Script-based Personal Learning environment:** The learning environment represents the technical component of the conceptual solution. It executes the specification defined in the learning design of the virtual seminar. It automatically sets up necessary content and services, and provides such content and services to the appropriate stakeholders at the right time. The learning environment developed in this thesis can be qualified as 'user-process’ oriented. In addition to the execution of the specification defined in the learning design of the seminar, users of the system or stakeholders involved in the seminar process are in the focus of the design of the learning environment. The system is designed to be adapted to their experiences and behaviours during the seminar process. The resulting learning environment addresses functional requirements identified in the empirical analysis, particularly requirements related to the lack of infrastructure. The following approaches characterize the learning environment:

a) **Script based personal learning environment:** The developed learning environment is built around the approach of personal learning environment (PLE). The following factors motivated the design:

• The evolution of the web from a delivery to a communicative, interactive and participative platform,

• The distribution of stakeholders involved in the seminar process,

• The use of computer network by students in Cameroon to interact with others, to find and use relevant contents to improve their knowledge

• The deficits of current learning environments used within the scope of eLearning programs.

A PLE in comparison to LMS used within the scope of eLearning program in Cameroon allows the flexible integration of several kinds of resources, content and
services in the learning environment of the virtual seminar, according to specific instructional sequences and user preferences. Services are provided by autonomous small applications qualified as widgets. The tight integration of these autonomous and loosely coupled applications characterizes the architecture of the learning environment as "script based personal learning environment". Current approaches analyzed for the integration of services on a PLE were either complex (based on adapters design pattern), restricted to specific services of a particular environment, or do not support personalization in terms of using information from the UoL to instantiate services. The approach developed in this thesis is based on the extension of the "service environment" defined in the IMS LD model in order to support the integration of portable and personalized services (see 4.3.2).

b) Rich mobile learning client: The RiMoLeC constitutes the learning environment of participants. It implements the "offline learner centric" model pursued within the scope of the thesis. This model refers to the possibility to perform learning activities of an UoL without a continuous internet connection. Another characteristic of the model is the flexibility to allow learners to move with their learning environment from one location to another and perform activities on different computer devices. The RiMoLeC addresses problems related to the lack of infrastructure identified in the empirical analysis. Participants can perform activities of the virtual seminar despite the instability of power supply and internet connection on different computer devices independent of their locations. The RiMoLeC consists of components and widgets derived from the process model or the learning design of the virtual seminar. These components or widgets implement interfaces for the synchronization of their data with services of the PLE. The RiMoLeC represents an innovative mobile learning solution design according to the teaching/learning process and fits to the requirements of the socio-technical context in less developed countries.

The control and delivery of instructional sequences of the virtual seminar on a decentralized learning environment integrate several kinds of services which can be run independent of an internet connection. This characterizes the system architecture as an "offline script based PLE environment". This system architecture fits to the eLearning context of less developed countries characterized through a lack of infrastructures.

7.3. Open issues and further research perspectives

The conceptual solution developed in this thesis can be extended to various directions according to the interests of stakeholders of the virtual seminar. The evaluation of the conceptual solution in chapter 6 identified some deficits of the proposed solution, which can be considered as open issues and opening further research perspectives. The following paragraphs summarize first the open issues and then present further research perspectives.

Open Issues

• Design of "eLearning" widgets: Widgets are defined within the scope of the thesis as autonomous and loosely coupled applications implementing a service. Their use within the scope of eLearning demands a specific design to fit the requirements of a didactical context. In the design of eLearning widgets the following aspects must be
7.3. Open issues and further research perspectives

taken into consideration: the security and privacy of data, the security and privacy of users using the widgets, the logs of activities performed on widgets in order to monitor and interpret the data recorded and the interoperability with other components of a learning environment. The current widget specifications are too generic and do not fit the requirements of the eLearning context.

- **Dynamic binding of services**: The dynamic binding of services in the player of the PLE is indeed modelled within the architecture of the learning environment, but its implementation is still an open issue. Furthermore, the specification of the layout of the user interface of the PLE using widgets was not covered within the scope of the thesis.

- **Usability of the system**: Usability of the proposed UI was not tested in this thesis. Results achieved by [Klebl, 2004] in the area of the usability of and design of a learning environment based on IMS-LD can be used to test and improve the solution developed in this thesis.

- **Technical support** for the storage, archiving, cloning of seminar session. Furthermore, the instantiation of new seminar session on the basis of the cloned seminar must be supported.

- **Technical support for remote experts** during the formulation of topics of the seminar.

- **Implementation of the social platforms** specified in the learning design of the virtual seminar. The social professional networking platform and the social publishing platform specified in the learning design of the seminar were not implemented and integrated into the PLE developed in this thesis. The Learner Information Package specification provided by IMS can provide the basis for the implementation of such platforms because it defines structures for managing information about learners (individual or group) and producers of eLearning contents (creator, provider or vendor). Furthermore, it will enhance the interoperability of the social platform with the PLE.

- **Simple Technologies**: Learning environments used within the scope of eLearning programs in Cameroon are usually built on Linux, Apache, MySQL, PHP (LAMP) architecture and web based technologies (AJAX). These technologies are qualified as 'simple' by persons in charge of such programs in terms of development and maintenance, and of required resources. The runtime engine used in this thesis for processing the learning design of the virtual seminar is based on Java technologies which were qualified as 'inappropriate' to the eLearning context in Cameroon. The implementation of an IMS LD runtime engine based on the LAMP stack would help facilitate the integration of the proposed solution into the eLearning landscape in Cameroon and in many other countries in Africa with similar infrastructures.

**Further research perspectives**

- **Extension of the proposed model with other didactical units and for other faculties**: Concepts developed within the scope of this thesis can be extended and used in other didactical units involving remote experts and campus based students. Particularly in the area of human sciences the developed concepts can be adapted to realize several approaches of a seminar (see table 2.1) or didactical units similar to seminars. In a broader sense, the possibility to organise curriculum around the proposed model can be analysed.
7. Summary and Outlook

- **Transfer or adaptation of the model to other countries in Africa:** The adaptation or transfer of the model developed in this thesis to other countries in Africa with similar characteristics like Cameroon represents an interesting challenge. Although the conceptual solution has a modular design and is based on open source technologies, the transfer of technological developments to different societal contexts is generally an open issue.

- **Community of practice and interest** may be built around the framework developed within the scope of the thesis:
  - A portal can be developed to support didactic experts in Africa in the design, development and sharing of eLearning templates such as prepared resources (micro-instructions, templates, guidelines, etc.), didactical scenario, best practices, etc.
  - Widgets: eLearning system developers may implement and share eLearning widgets to extend services provided by the PLE.

- **Support of lifelong learning:** The learning environment developed in this thesis fits to the requirements of a knowledge society. Academics institutions, schools, teams or organisations can integrate modules or services on the learning environment to support further development of competences in a formal or informal manner.

7.4. Conclusions

The historical development of countries like Israel and India shows that the Diaspora represents important resources for the development. In the case of African countries, not only remittances but the know-how of remote experts constitute an important capital for the development of their respective home country and in a broader sense for the whole continent, under the condition that a framework exists that helps to detect, collect, manage and canalize this know-how for specific purposes. Although many countries already recognized this potential and the wish by the remote experts to contribute to the development of the continent is still present, effective solutions to use this know-how are still lacking. The conceptual solution developed in this thesis represents a solution to use the know-how of remote experts in teaching/learning processes in institution of higher education in Africa. If we act on the assumption that education provides the basis for the development of any society, we can argue that the solution developed in this thesis can contribute to foster the growth of Cameroon. For experts living in the Diaspora, the proposed solution represents an instrument which allows them to interact with their respective country or with other countries independent of their location and to contribute to its development.
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List of Tables
A. Guideline for the virtual seminar

A.1. Cover for the concept of the seminar

- Name and logo of the institution in charge of the seminar
- Name, affiliation and contact data of the responsible of the seminar
- Period of the seminar

A.2. Framework of the seminar

<table>
<thead>
<tr>
<th>Module Information: virtual seminar</th>
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<tr>
<td><strong>Module Structure:</strong></td>
</tr>
<tr>
<td>1- Time: 4 - 6 weeks</td>
</tr>
<tr>
<td>2- Faculty: Open</td>
</tr>
<tr>
<td>3- Credit: 4</td>
</tr>
<tr>
<td>4- Workload: 120 Hours</td>
</tr>
</tbody>
</table>

Table A.1.: Information about the module virtual seminar

A.3. Requirements to participants

Following competences are required for the participation to the seminar:

- Communication and cooperative online competence
  - Accept critical thinking and decision making as part of the learning process.
  - Be open minded towards sharing life, work, and educational experiences as part of the learning process.
  - Be able to work with others to complete projects.
  - Precise and explicit written formulation of opinions, so as to enjoy communication through writing.

- Technical competences
  - Computer hardware skills.
  - Have access to a computer and an internet connection.
  - Ability to use computer based communication tools particularly for synchronous communication (web meeting, web conference, shared editor, shared screen, etc.).
  - Be able to use computer based cooperative tools (Forum, Blog, Wiki).
A. Guideline for the virtual seminar

- Be able to search literature online.

- Self learning competence and personal attitude
  - Be willing and able to commit 4 to 15 hours per week for the seminar.
  - Ability to discern between important and not important stuff.
  - Disposition to seriously examine the proposed topic.
  - Be able to think ideas through before responding.
  - Be self-motivated and self-disciplined.
  - Be able to meet the minimum requirements for the program.
  - Be willing to 'speak up' if problems arise.
  - Be able to deal with frustration.
  - Be open towards trying-out new things.

- Organizational competences
  - Disposition to play several roles in the process of virtual seminar.
  - Be willing and able to commit the predetermined time for the virtual seminar.
  - Be able to take initiative and responsibilities in the learning process.
  - Time management: realistic appreciation of time and personal ability to perform a task on time.
  - Self definition of learning goals.

A.4. Didactical approach of the seminar

The didactic model is grounded on a constructivist approach, which focuses on the needs and the responsibilities of the learner. These methods are based on the following principles:

- A change from the teacher-centred to student-centred activities i.e., less lecturing and presentation and more assisting and coaching.

- Fewer 'whole-class' and more small-group activities.

- An appropriate combination of individualised competitive situation and cooperative activities.

- More activities which includes real world problems - requiring interdisciplinary approaches and multiple resources in the group.

- Self regulated learning and self control.

- Standardization and formalisation of learning process in presence mode both at the individual as at the group level.

- Standardization and formalization of the interactions among the stakeholders of the seminar.

- Asynchronous interaction between the remote expert and participants.
A.4. Didactical approach of the seminar

A.4.1. Goals and objectives of the seminar

Aims and goals of the seminar ranging from the acquisition of knowledge to the acquisition of key qualifications

**Acquisition of knowledge:** The organisation of the learning materials and the instructional design supports participants of the seminar in the acquisition of knowledge in the topics covered within the scope of the seminar. The instructional goals of the seminar are:

- Learning how to gain access to scientific work respectively literature;
- Improving the ability to read, understand and summarise content of scientific texts;
- Learning how to write a synopsis/ résumé/ abstract of a scientific text;
- Learning how to discuss the achieved results and outcomes;
- Introduction and comprehension of a complex theme divided and handled in sub topics

**Acquisition of key qualifications:** The seminar intends improve the following key qualifications of participants by jointly writing the book of publication

- Problem solving heuristics
- Strategies and techniques of self regulated learning
- Teamwork
- Rhetoric competences
- Communicative and cooperative competence.

A.4.2. Collaboration, Interaction and participation

The collaboration, interaction and participation model of the seminar based on the following principles:

- Decomposition of the learning respectively teaching process in appropriated small units.
- Delegation of the responsibility for learning, organizational, and managerial processes to the learner.
- Standardization and formalisation of the learning process among participants both on the individual and on the group level. This helps to benchmark the participation of learner both on an individual as on the group level.
- Use of collaborative learning scripts to support the interaction among the stakeholders and to improve the learning process in groups.

The interaction among the stakeholders during the several steps of the seminar consists of the following phases:

- Phase 0 (Problem statement): the supervisor assigns all groups an activity to carry out, for instance a problem to solve, a simulation to explore, a question to investigate, etc. The group activity consists of complementary tasks, which are distributed to members of a group.
A. Guideline for the virtual seminar

- Phase 1 (Individual response): each member is asked to work individually on the assigned tasks. In this phase, the participant’s work is solely based on his/her own understanding of the task and restricted to work with his/her own skills and previous knowledge.

- Phase 2 (Collective Decision): The aim of the collective decision is to lead the group to construct a consensus. Consensus here means the common understanding of a group, constructed through assimilation or accommodation of new knowledge into existing schemata gathered from experience [citeBrown1996]. This phase consists of two sub-phases:
  - 2a (exchange and confrontation): Solutions generated by the group members in phase 1 are now presented in the group panel for discussion. With regard to the global solution, every member of the group comments, criticizes and completes the presented solutions of other members. These appreciations are recorded in a journal.
  - 2b (group consensus): The participants assemble parts of the solutions into a global solution that represents all the participants’ convergent solutions and opinions. The discussion process is repeated until a consensus is reached. One student assumes the role of a manager during the collective decision phases. She/he coordinates the work process in the group and represents the group outward. Based on a rotation principle, every participant assumes at least once this role during the whole seminar process.

- Phase 3 (review): Each participant is asked to produce a review on the work dynamic in his/her group, on the individual solutions of participants in other groups and on the group solution of other groups. The report on the work dynamic in his/her group and the comment and criticism on his/her group mates are sent to the supervisor of the seminar. The reports on the individual and group solutions of participants in other groups are exchanged among the groups. Standards for elaboration of reviews are given by the responsible of the seminar depending on the group activity and problem statement.

- Phase 4 (solutions revision): The individual and group comments, critics and propositions formulated by members of other groups are revised in the group. The process of collective decision is repeated in order to improve the solutions.

- Phase 5 (teacher guided classroom mediation): representatives of each group present their group solutions to the whole class while being facilitated by the supervisor, and thus close the cycle of the interaction.

A.4.3. Supervision and monitoring

The didactical approach distinguishes the following levels of supervision and monitoring:

- Individual level of supervision and monitoring
  Individual level of monitoring refers to the interaction between the remote expert and participants. This interaction takes place mainly in asynchronous form.

- Group level of supervision and monitoring
  Self regulated learning and self control characterise the group’s learning process within
the scope of the seminar. The supervision and monitoring approach is organized according to the abstraction levels:

- Intra group regulation and control refers to the mechanism developed in a group to monitor and evaluate the progress of the individuals in the group and the group as whole. At individual or micro level, each participant supervises and monitors the evolution of other members of his group. At group level, each participant supervises, monitors, and reports the work dynamic in his/her group in a distributed journal.

- Inter group regulation and control refers to the evaluation of contribution of participants in other group both on the individual and on the group level. The standard for the evaluation of contributions are presented in the subsection 8.

A.4.4. Evaluation model of the seminar
See appendix E.

A.5. Theme and subtopics of the seminar

1. Keywords of the seminar

2. Organisation of theme and subtopics

3. Bibliography and additional resource

A.6. Prepared resources and templates

1. Microinstructions for phase of the seminar (see appendix B)
   - Micro-instructions for the presentation of stakeholders of the seminar
   - Micro-instructions for the individual subtopic analysis
   - Micro-instructions for the group subject matter analysis
   - Micro-instructions for the writing of group report
   - Micro-instructions for individual the intra-group regulation and control

2. Guideline and template of the seminar (see appendix C)
   - Guideline and structure for writing of synopsis
   - Guideline and structure for writing a group report on topic analysis
   - Guideline and structure for writing of articles
   - Guideline and structure for writing of groups-articles
   - Guideline and structure for writing the book of the seminar

3. Reviewer evaluation form (see appendix D)
   - Reviewer evaluation form for synopsis
   - Reviewer evaluation form for group-reports
   - Reviewer evaluation form for articles
A. Guideline for the virtual seminar

- Reviewer evaluation form for group articles

4. Sample of document of the seminar
- Sample of introduction of participant to the audience
- Sample of synopsis
- Sample of review of synopsis
- Sample of group report
- Sample of review of group report
- Sample of article
- Sample of review of article
- Sample of group article
- Sample of review of group article
- Sample of booklet of a seminar
- Sample of journal of a group

A.7. Timetable of the seminar

1. Introduction to the seminar (6.5% - 2 Days/8 Hour)
   - Deadline for the presentation of responsible (25% - 0.5 day/2 Hour)
   - Deadline for the presentation of the concept of the seminar (25% - 0.5 day/2 Hour)
   - Deadline for the presentation of the participants (25% - 0.5 day/2 Hour)
   - Deadline for the presentation and repartition of the subtopics (25% - 0.5 day/2 Hour)

2. Structuring of the work (45% - 13.5 Days/54 Hour)
   - Delivery of subtopic analysis (22.2% - 3 days/12 Hour)
   - Deadline of group thematic analysis (7.4% - 1 day/4 Hour)
   - Deadline for the feedback of the responsible (14.8% - 2 days/8 Hour)
   - Deadline for the delivery of synopsis (7.4% - 1 day/4 Hour)
   - Deadline for the delivery of group report (7.4% - 1 day/4 hour)
   - Deadline for the intra-group regulation and control (7.4% - 1 day/4 hour)
   - Deadline for the inter-group regulation and control (14.8% - 2 days/8 hour)
   - Deadline for the supervisor feedback (14.8% - 2 days/8 hour)
   - Deadline for the revision of contribution (3.7% - 1 day/4 hour)

3. Writing of articles (35% - 10.5 Days)
   - Deadline for the writing of articles (28.6% - 3 days/12 hour)
   - Deadline for the group topics analysis (4.8% - 0.5 day/2 hour)
   - Deadline for the delivery of group-articles (4.8% - 0.5 day/2 hour)
A.7. Timetable of the seminar

- Deadline for the inter-group regulation and control (9.5 % - 1 day/4 hour)
- Deadline for the inter-group regulation and control (19 % - 2 days/8 hour)
- Deadline for the supervisor feedback (19 % - 2 days/hour)
- Deadline for the revision of contribution (4.8 % - 0.5 day/2 hour)
- Deadline for the elaboration of the seminar booklet (9.5 % - 1 day/4 hour)

4. Preparation of presentation (6.5 % - 2 days/8 hour)
   - Deadline for the preparation of presentation (50 % - 1 day/4 hour)
   - Deadline for the preparation of group presentation (25 % - 0.5 day/2 hour)
   - Deadline for the intra-group regulation and control (25 % - 0.5 day/2 hour)

5. Presentation and discussion (5 % - 1.5 days/6 hour)
   - Deadline for the presentation (0.5 day/2 hour)
   - Deadline for the feedback of audience (1 day/4 hour)

6. Evaluation (1.5 % - 0.5 day/2 hour)
   - Deadline for the evaluation of the seminar (0.5 day/2 hour)
A. Guideline for the virtual seminar
B. Micro-instructions of the seminar

B.1. Micro-instructions for the presentation of stakeholders

B.1.1. Personal history and hobby

1. Introduce yourself to the audience with a small story that you can link to the seminar.
2. Name at least three of your hobbies

B.1.2. Personal background and experience

1. What is your academically background?
2. Which know how and experience do you have related to this seminar?
3. Evaluate yourself according to the following key qualification: communication, cooperation, conflict management, personal management, empathy, rhetoric, self learning and self discipline.

B.1.3. Technical and scientific focus and interests

1. What are your scientific foci and interests within the scope of the seminar?
2. What are your scientific foci and interests beyond the scope of the seminar?

B.1.4. Personal setting and motivation

1. What is your motivation to participate in the seminar?

B.1.5. Expectations to the seminar

1. What is your expectation regarding in the seminar?

B.2. Micro-instructions for the individual subtopic analysis

1. Which problems are covered by your sub topics and why?
2. Evaluate each resource proposed by the remote expert related to your topic and give at least one argument why this resource was useful or not.
3. Propose and publish four additional sources related to your sub topic.
4. Formulate at least two open questions and maximum four questions related to your sub topic to the remote expert.
B. Micro-instructions of the seminar

5. Formulate your questions related to any organizational problem at this phase of the seminar. The questions are published on a shared area of the learning environment so that other participants and the seminar responsible can give answers.

B.3. Micro-instructions for the group subject matter analysis

1. Formulate at least two open questions related to your sub topic for your group mates
2. Formulate at least two open questions to your group mates related to their topics.
3. Propose at least five resources (Bibliography, table, etc.) to your group mates
4. Answer questions formulated by your group mates related to their sub topics
5. Answer questions formulated by your group mates related to your sub topics
6. Publish and explain (at least four) relevant terms and definitions of your subtopic on the common glossary of your group

B.4. Micro-instructions for the group report

1. Each participant reflects his/her subtopic in relation to other sub topics in his/her group, to the whole group topic ant to the group subject matter covered in other group.

B.5. Micro-instructions for the intra group regulation and control

B.5.1. Personal development

1. How do you assess your evolution from the beginning of the seminar until now?
2. Are you satisfied with your personal progression and why?

B.5.2. Teamwork

1. Evaluate your group mates according to the following key qualification: communication, cooperation, conflict management, personal management, empathy, rhetoric, self learning and self discipline.
2. Give at least three positive aspect of the participation of each member of your group
3. For each members of your group, list at least three aspects, where he/she can improve
4. Do you think the workload in the group is fair and why?

B.5.3. Technical evaluation

1. Evaluate resources proposed by your group mates and give at least one argument why this resource was useful or not
2. Give five comments on contributions of your group mates that you agree and five that you disagree with.
B.5. **Micro-instructions for the intra group regulation and control**

### B.5.4. Proposition for improvement

1. Make some concrete proposition to improve the work in your group

2. Make some proposition to the supervisor of the seminar to improve the teaching and learning processes
B. Micro-instructions of the seminar
C. Templates/Guidelines for the achievement of tasks and activities of the seminar

C.1. Guideline for writing of synopsis

C.1.1. Cover
The cover of the synopsis is the same as the cover of the proposal and consists of the following parts:

- Title
- Author’s names and affiliations
- Abstract
- Keywords

The cover is presented in detail in the guideline and code for writing article (see appendix B)

C.1.2. Table of content
The table of content presents the structure of the article. Headlines of the article are presented with their related sub sections.
The table of content must not exceed 1 page (Times New Roman; Size-10; Bold)

C.1.3. Background, motivation and Borderline
This section of the synopsis introduces the theme covered by the subtopic. It presents background information about the theme and states the context of the work. Furthermore, the definition of main terms of the article, the borderline and correlation among subtopics in the respective group are presented.
This section must not exceed 1/2 pages (Times New Roman; Size-10; Bold)

C.1.4. Hypothesis
This section of the synopsis briefly presents the hypothesis derived from the literature and the research question covered by the subtopic.
This section must not exceed 10 lines (Heading: Times New Roman; Size-10)

C.1.5. Objective and expected results
This section of the synopsis presents briefly the objective of the work and the expected result.
This section must not exceed 1/2 page (Heading: Times New Roman; Size-10)
C. Templates/Guidelines for the achievement of tasks and activities of the seminar

C.1.6. Method

This section of the synopsis presents the method used in the work. The presentation of method is usual within the scope of scientific experiment or test. This section must not exceed 1/2 page (Heading: Times New Roman; Size-10)

C.1.7. Milestone and time line

This sections of the presents the organisation of the work according to the global chronogram of the seminar. The important deadline and milestones of the individual work are presented. This section must not exceed 1/2 page (Heading 3: Times New Roman; Size-10)

C.2. Guideline and structure for writing a group report on topics analysis

Important parts of the Group topic analysis have already been written in a previous phase of the seminar. The group report summarizes these parts of the documents to build a common and coherent document, which presents the theme covered in a group. Individual subtopics are shortly introduced and the borders and relationship between these subtopics are presented. Furthermore, borders and relationships between themes covered in other groups are presented.

C.2.1. Cover of the group report

The cover of the group report consists of the following elements:

1. Title or theme covered by the group (Times New Roman; Size: 30, Bold).
2. The institution in charge for the organization of the seminar. The name and logo of the institution, the department in charge of the seminar are presented (Times New Roman; Size: 20, Italic).
3. Participants of the group or Author’s names and affiliations and the title of their respective subtopics (Times New Roman; Size: 10)
4. The supervisor of the seminar. The name and contact data of the remote expert and the local supervisor with their respective affiliation are presented (Times New Roman; Size: 20, italic).
5. The period of the seminar (Times New Roman; Size: 20, italic).

C.2.2. Presentation of group theme (Times New Roman; Size: 30 Bold)

The group theme is presented as a part of the main theme of the seminar. The presentation of the group theme is a team work and the document created must represent convergent opinions of all the participants’. This presentation gives background information on the group theme states the theme of the group within the scope of the main theme of the seminar, and presents the link between the group theme and other group theme. This part consists of the following elements:

1. Presentation of the group theme (Times New Roman; Size: 11, normal).
C.2. Guideline and structure for writing a group report on topics analysis

2. Borders and relationships between the group theme and the theme of the second (third) group (Times New Roman; Size: 11, normal).

C.2.3. Presentation of subtopics of the group (Times New Roman; Size: 30 Bold)

Subtopics of the group are introduced or presented briefly. The short presentation of a subtopic can be qualified as the abstract of the subtopic. The abstract states briefly the purpose of the work, the expected results and the major conclusions. Each participant presents his/her subtopic within the scope of the group theme according to the following structure:

1. Presentation of subtopic 1 (Times New Roman; Size: 11, normal)
2. Presentation of subtopic 2 (Times New Roman; Size: 11, normal)
3. Presentation of subtopic 3 (Times New Roman; Size: 11, normal)

C.2.4. Borders and relationships between subtopics (Times New Roman; Size: 30 Bold)

Borders and relationships between subtopics of the group must be presented in a coherent and fluent form. Each participant reflects his/her subtopic in relation to subtopic of his/her group mates according to the following structure:

1. Borders and relationships between subtopic 1 and 2 (Times New Roman; Size: 11, normal).
2. Borders and relationships between subtopic 1 and 3 (Times New Roman; Size: 11, normal).
3. Borders and relationships between subtopic 2 and 3 (Times New Roman; Size: 11, normal).

C.2.5. Borderline and correlation among subtopics and other group theme (Times New Roman; Size: 30 Bold)

Links between subtopics of the group and themes covered in other groups is presented. Each participant reflects his/her subtopics in relation to the theme covered in other groups of the seminar according to the following structure:

1. Borders and relationships between subtopic 1 and theme of the second (third) group (Times New Roman; Size: 11, normal).
2. Borders and relationships between subtopic 2 and theme of the second (third) group (Times New Roman; Size: 11, normal).
3. Borders and relationships between subtopic 3 and theme of the second (third) group (Times New Roman; Size: 11, normal).
C. Templates/Guidelines for the achievement of tasks and activities of the seminar

C.3. Guideline to write an article

See:

1. Scientific writing booklet (see [Tischler, 2010])

2. How to read a scientific article: the Cain project in engineering and professional Communication [Purugganan and Hewitt, 2004]

C.4. Guideline and structure for writing of group-articles

Articles of a group are organized according to the partition scheme of the seminar. They constitute a chapter of the book of article of the seminar. Individual articles were already written in a previous phase build the body of the group article or chapter of the book of article. The group article consists of the following parts:

- Cover of the group articles or part of the book of articles;
- A common table of content;
- A common introduction;
- Individual articles of the group;
- A common conclusion;
- Common references;
- Common appendixes.

The writing of the table of content, introduction, conclusion, references and appendixes of the chapter is done in teamwork, which requires key qualifications such as collaborative and cooperative competences, communication and team management. The group articles must represent convergent opinions of all the participants’.

C.4.1. Cover of the group articles

The cover of the group article consists of the followings elements:

- Title of the chapter or theme covered by the group (Times New Roman; Size: 30, Bold).
- The institution in charge for the organization of the seminar. The name and logo of the institution, the department in charge of the seminar are presented (Times New Roman; Size: 20, Italic).
- Participants of the group or author’s names and affiliations and their respective subtopics (Times New Roman; Size: 10).
- The supervisor of the seminar. The name and contact data of the remote expert and the local supervisor with their respective affiliation are presented (Times New Roman; Size: 20, italic).
- The period of the seminar (Times New Roman; Size: 20, italic).
C.4.2. Table of content of the chapter (Times New Roman; Size: 30 Bold)
The table of content of the chapter summarizes the individual table of content of articles of the group.

- Structure of the first article (Times New Roman; Size: 12, normal)
- Structure of the second article (Times New Roman; Size: 12, normal)
- Structure of the third article (Times New Roman; Size: 12, normal)

C.4.3. Introduction of the chapter (Times New Roman; Size: 30 Bold)
The introduction to the chapter is a document, which briefly presents the theme covered by the group and its pertinence. Furthermore, the borders and relationships between individual articles and the structure or organization of the chapter must be presented.

C.4.4. Article 1-3
Each member of the group is responsible for the writing of his/her article. The guideline for writing of article is presented in detail in the appendix C.

C.4.5. Conclusion of the chapter (Times New Roman; Size: 30 Bold)
The conclusion of the chapter is a document which summarizes findings of the individual articles. Furthermore, the relationships between the group theme and the findings in each papers must be presented briefly.

C.4.6. Appendixes of chapter (Times New Roman; Size: 30 Bold)
The appendix of the chapter summarizes appendixes of individual articles.

C.5. Guideline and structure for writing the book of articles
Guideline for writing the book of articles of the seminar The book of articles of the seminar collects all articles of participants. The chapter of the book were already written in a previous phase. The book of articles consists of following part presented in detail in the subsequent paragraph:

- Cover of the book of article
- Table of topics
- Introduction or foreword of the seminar
- Chapters of the seminar
- Conclusion of the seminar
C. Templates/Guidelines for the achievement of tasks and activities of the seminar

C.5.1. Cover of the book

The cover of the book is written by the remote expert and consists of the following elements

- The title of the book which corresponds to the central theme of the seminar (Times New Roman; Size: 30, Bold).

- The institution in charge for the organization of the seminar. The name of the institution with its logo and the department in charge of the seminar are presented (Times New Roman; Size: 20, Italic).

- The supervisor of the seminar. The name and contact data of the remote expert and the local supervisor with their respective affiliation are presented (Times New Roman; Size: 10).

- The period of the seminar (Times New Roman; Size: 10).

C.5.2. Table of topics

The table of topics presents the subtopics covered in the seminar organise in chapter with their corresponding author or editor (Times New Roman; Size: 12, bold).

C.5.3. Introduction or foreword of the seminar

The foreword or introduction of the book of the seminar is written by the remote expert. The foreword briefly introduces the central theme of the seminar with its related subtopics. The foreword must not exceed one page and uses the same font as the article (Times New Roman; Size: 11, normal).

C.5.4. Chapters of the seminar

Chapters of the seminar were already written in the phase of writing of group articles (see appendix C).

C.5.5. Conclusion of the seminar

The conclusion of the seminar is written by the remote expert. The conclusion presents the result of the evaluation of the seminar from the remote supervisor view and his/her impression with regard to the achievement of goals and objectives of the seminar. The conclusion must not exceed one page have the same font as the article (Times New Roman; Size: 10).

C.5.6. Structure of the Book of the seminar

- Cover of the seminar

- Table of topics

- Introduction or foreword of the seminar

- Chapter 1 (group-articles of participants of the first group)
  - Table of content of chapter 1

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C.6. Guideline for preparing and writing of presentation

– Introduction of chapter 1
  * Article 1
  * Article 2
  * Article 3
– Conclusion of chapter 1
– Appendixes of chapter 1

• Chapter 2 (group-articles of participants of the first group)
  – Table of content of chapter 2
  – Introduction of chapter 2
    * Article 1
    * Article 2
    * Article 3
  – Conclusion of chapter 2
  – Appendixes of chapter 2

• Conclusion of the seminar

C.6. Guideline for preparing and writing of presentation

See:

• Guidelines for preparing presentations for conferences (see Edmans, 2006).
• Preparing your slides and presentation (see Hughes, 2002)
C. Templates/Guidelines for the achievement of tasks and activities of the seminar
D. Reviewer evaluation form

Reviewer evaluation forms of the virtual seminar based on the submission guide of papers of the Canadian Center of science and education (see [CCSE, 2010]).

D.1. Reviewer evaluation form for synopsis

Please rate the synopsis on a scale of 1 to 5, where 5 represents a maximum point and 1 the minimum point, in each of the following areas.

D.1.1. Content evaluation

1. Table of content of the work
   a) Is the table of content adheres to the layout guidelines?
   b) Does the table of content fit to the theme covered in the subtopic?

2. Background, motivation and borderline
   a) Is the background of the work well presented?
   b) Are the motivations for the work understandable?
   c) Are the borders of the topic in relation to other topics clearly presented?
   d) Are the relationships to other topics and to the general theme of the seminar clearly presented?

3. Formulation of hypothesis
   a) Are the formulated hypothesis derived from the theme covered in the subtopics?
   b) Are the hypothesis clearly formulated?

4. Objectives or expected results
   a) Are the objectives of the work clear?
   b) Are the addressed questions of the work formulated clearly?
   c) Are the expected results of the work well formulated?

5. Method used for the work
   a) Are methods appropriate for the work? If not why?

6. Milestone and timeline according the global chronogram of the seminar.
   a) Are the milestone and the timeframe realistic?
D. Reviewer evaluation form

D.1.2. Text evaluation and suitability

1. Presentation of the Text
   a) The synopsis is well-organized and conforms to the specified structure
   b) The synopsis length is appropriate to the standard defined for the seminar
   c) The references used are up-to-date and the format of the citations follow the standard defined for the seminar
   d) The synopsis is written in standard language, free of spelling and grammar mistakes, interesting and relevant for local and international readers

2. References
   a) Do authors cite appropriate papers?

3. Figures and tables
   a) Are all graphs and tables labelled correctly?
   b) Are the figure and table legends clear?
   c) Are all figures referenced and completed with a text?

D.2. Reviewer evaluation form for the group report on the topics analysis

Please rate the group report on a scale of 1 to 5, where 5 represents a maximum point and 1 the minimum point, in each of the following areas. X and Y are variable according to number of participants and groups.

D.2.1. Content evaluation

1. Presentation of the group theme
   a) Does the presentation of the theme give relevant background information that helps you understand what the theme is about and why?
   b) Do you find the link between the group theme and subtopics covered in group accurate? Why?

2. Presentation of sub topic of the group
   a) Is the presentation of the subtopic precise and concise? Why?
   b) Does the presentation of the subtopic X state the purpose of the work? Why?
   c) Does the presentation of the subtopic X describe the objectives and results of the work accurately? Why?
   d) Do you consider the presentation of the subtopic X within the scope of the group theme accurate? Why?

3. Borders and relationships between subtopics
   a) Is the border between the subtopic x and the subtopics Y accurate? Why?
   b) Is the relationships between the subtopic x and the subtopics Y accurate? Why?
D.3. Reviewer evaluation form for articles

4. Link between subtopics and other group theme(s)
   a) Do you regard the link between the subtopic X and the theme covered in group Y
      accurate? Why?

D.2.2. Text evaluation and suitability

1. Presentation of the text
   a) Is the group report well-organized and conforms to the specified structure?
   b) Is the group report length appropriate to standards defined for the seminar?
   c) Are references used up-to date and the format of the citations follow the standard
      defined for the seminar?
   d) Is the synopsis written in standard language, free of spelling and grammar mistakes,
      interesting and relevant for local and international readers?

2. References
   a) Do authors cite appropriate papers?

3. Figures and tables
   a) Are all graphs and tables axes labelled correctly?
   b) Are the figure and table legends clearly understand?
   c) Do the figures clearly explain the results?

D.3. Reviewer evaluation form for articles

Please rate the article on a scale of 1 to 5, where 5 represents a maximum point and 1 the
minimum point, in each of the following areas.

D.3.1. Content evaluation according to the AIMRaD model for the writing of
the scientific article

1. Abstract
   The abstract serves as a summary of the paper, presenting the purpose, scope, and
major findings. The title and the abstract are often all that people will read, using this
information to decide whether they want to continue. What did you do? What are the
main results? What are your conclusions?
   a) Is the abstract intelligible?
   b) Does the abstract describe the objectives & results of paper accurately?
   c) Does the abstract include data not presented in the paper?
   d) Does the abstract include material that cannot be substantiated (conclusions un-
supported by results)?
   e) Is the abstract concise and relevant (up to 150 -200 Words)
D. Reviewer evaluation form

2. Introduction
The introduction serves to present the background information logically / provide context for the study. What is the question (research/scientific hypothesis)? Why is it important (rationale & justification)? What are the alternative hypotheses & how do you test them (statistical hypotheses)? Remember that a lot of studies begin by observing a pattern (correlation/association). Your research hypothesis states an explanation for this pattern (story), and a statistical hypothesis determines the generalities of the pattern. Hence, we test our predictions (statistical hypotheses) using statistical tests & use results of these tests to either support or refute the research hypothesis.

a) Does the key words provide adequate index entry for the article (up to 5 words)
b) Does the introduction give relevant background information that helps you understand what was studied, and why?
c) Was the background information adequate to understand the aims & objectives of the study?
d) Is the specific hypothesis (and alternative hypothesis) clearly presented and does it relate to the question? (For example, 'My study compared feeders at two heights to measure the effect of feeder height on the number of birds visiting the feeder.' (The 'question' in this case would be, "What is the effect of feeder height on the number of birds visiting a feeder?")
e) Do these hypotheses/questions logically follow from the background material (usually presented in the Introduction)?
f) Do the authors discuss how well their hypotheses did in light of their data? This is very important. Most authors are aware of the importance of stating their hypothesis in the introduction but a surprising number do a poor job of returning to these hypothesis (and whether they were refuted or supported) in the discussion.
g) Is there a "big picture" presented, i.e. a general underlying theory? Consider whether the results can be generalized to other groups (usually done in the discussion) or whether the results are really only applicable to the species/groups being considered?

3. Methods
The methods section should be a clear & succinctly stated, chronological description of what you did & how you did it. Could someone else repeat the research with the information provided? If the answer is 'no', your methods section is incomplete. The method section is very important in cases the seminar focuses on the presentation of findings of a scientific experiment or work.

a) Have methods (procedure) clearly been stated and described in sufficient detail for others to repeat or extend the study?
b) Were adequate references cited if standard methods were used?
c) If methods have been modified, have these happened carefully?
d) Have the authors indicated why particular procedures were used, the potential problems of the methods used, & limitations of their methods?
e) Are all the variables (independent, dependent) clearly defined? And did they compare like units?
D.3. Reviewer evaluation form for articles

f) Read over the statistical analysis carefully (and examine any visual presentations of the data. Do the data meet the assumptions of the tests used (e.g. parametric statistics requires normally distributed data etc.)?

g) Are there more appropriate statistical method or tests that could have been used?

4. Results

The results section is meant to highlight trends in the data (most often presented in figures and/or tables) or to present or summarize important finding of related work and the available literature. In case that the seminar focuses on the analysis and presentation of existing facts, the result section constitutes the main part of the body of the article. In case that the seminar focuses on the presentation of a performed experiment or work, the result section present the findings of this experiment respectively work.

a) Are the results appropriate for the stated objectives?

b) Are the research results valid with respect to the relevance of the methodology applied, conclusions and recommendations

c) Do the result support or refute the question or hypothesis?

d) Do tables & figures clearly describe the data?

e) Have the appropriate statistical analysis been performed on the data?

f) —————————–

g) Do the sections and sub sections of the result correspond to the theme to be covered?

h) Do the section and subsection cover all aspects of the theme?

5. Discussion

This section analyses if the result are synthesized and if they are tied to the literature. The results must be related to other studies. What are the potential explanations for the results? Have other studies come to similar/different conclusions? How can those discrepancies be accounted? WHAT is the take home message? WHAT is the 'so what' about your work? Remember the scope of inference (are the results stretched too far?).

a) Have the objectives of the study been met? If not, do authors have an explanation as to why?

b) Have statistical hypotheses clearly been supported or refuted?

c) Are results discussed in relation to similar studies?

d) Do authors indulge in needless speculation?

e) Do authors adequately interpret their data & discuss the limitations of their study?

f) Do you agree with the conclusions?

g) What would you add or say differently?

h) Did conclusions illustrate the research results, findings and recommendations showing what is new and giving suggestions for future research?

i) Is the article original and presents an important and suitable contribution to theory and practice?
D. Reviewer evaluation form

D.3.2. Text evaluation and suitability

1. Presentation of the Text
   a) Is the article well-organized and adheres to the AIMRaD structure?
   b) Is the article's length appropriate?
   c) Does the article make an appropriate use of graphs, diagrams and tables?
   d) Are the references up-to-date and well cited?
   e) Is the article written in standard language, free of spelling and grammar mistakes, interesting and relevant for local and international readers

2. References
   a) Do authors cite appropriate papers?
   b) Do authors cite their own publications needlessly?

3. Figures and tables
   a) Are all graphs and tables labelled correctly?
   b) Are the Figure and Table legends clearly formulated?
   c) Do the figures clearly explain the results?

D.4. Reviewer evaluation form for group-articles

Please rate the group-article on a scale of 1 to 5, where 5 represents a maximum point and 1 the minimum point, in each of the following areas.

D.4.1. Content analysis

1. Introduction to the chapter
   a) Does the introduction of the chapter give relevant background information that helps you understand what the theme is about? Why?
   b) Does the introduction of the chapter give you an overview on the borders between articles of the chapter? Why?
   c) Does the introduction of the chapter give you relationships between articles of the chapter? Why?
   d) Does the introduction of the chapter give you an overview on the article of the chapter? Why?

2. Conclusion of the chapter
   a) Does the conclusion of the chapter illustrate the research results, findings and recommendations?
   b) Does the conclusion of the chapter show what is new?
   c) Does the conclusion of the chapter give suggestions for future research?
   d) Does the conclusion of the chapter present the findings of the group in relation to the theme covered by the group?
D.4.2. Text evaluation and suitability

1. Presentation of the Text
   a) Is the document well-organized and adhere to the structure and standards of the seminar?
   b) Does the cover of the group-article adhere to the structure and standards of the seminar?
   c) Are the tables of content consistent with the structure of articles and adhere to standards of the seminar?
   d) Are the tables of content consistent to the respective articles?
   e) Are the appendixes consistent with the structure and adhere to standards of the seminar?
   f) Are the appendixes consistent with the respective articles?
   g) Is the document length appropriate to the standards defined for the seminar?
   h) Is the text written in standard language, free of spelling and grammar mistakes, interesting and relevant for local and international readers?

D.5. Reviewer evaluation form for Presentations

Please rate presentations on a scale of 1 to 5, where 5 represents a maximum point and 1 the minimum point, in each of the following areas.

D.5.1. Content evaluation according to the AIMRaD model used to write the scientific article

1. Introduction
   a) Does the presentation give relevant background information that helps the audience to understand what was studied and why?
   b) Is the hypothesis clearly presented and does it relate to the research questions?
   c) Does the presenter discuss how well its hypothesis did in the light of its data?

2. Method of the work
   a) Were methods clearly stated and presented?
   b) Have the presenter cited adequate reference if standard methods were used in the paper?

3. Results of the work
   a) Are the results clearly presented and well argued?
   b) Does the presenter adequately interpret the data of the presentation and discuss the limitation of the study?
   c) Are the tables and figures clearly presented and explained?

4. Conclusion of the work
   a) Are results presented in relation to similar studies or work?
D. Reviewer evaluation form

b) Did the presentation illustrate the research results, findings and recommendations? Showing what is new and giving suggestions for future research?

c) Was it clear if the objective of the study was met? And if not why?

D.5.2. Evaluation of the presentation related to the form

1. Was the presentation simple according to KISS (Keep it Simple as Stupid)?
2. Does the presentation use clear concise statement?
3. Are the information limited and key points highlighted?
4. Are figures/tables of the presentation easy to understand?
5. Were the quality of figures/tables/photographs well and clear for the audience?
6. Were acknowledgements included in the appropriate places?
7. Was the timing for the presentation of slides ok?
8. Were all technical terms comprehensive for the audience?
9. Did the speaker use colloquialism /jargon/ catch phrases?
10. Were fonts chosen readable by the audience?
11. Is the background of the presentation adequate?
12. Was colour consistently used throughout the presentation?
13. Are animations and sound used properly?
14. Is the presentation well structured using different font for title and body text, bullet and sub-bullets?
15. Were the important statements or words emphasized?
16. Was there too much information in slides?
17. Did the speaker use long sentences and paragraphs in the presentation?
18. Are only key words listed on slides?

D.5.3. Evaluation of the body language

1. Did the presenter stand reasonably still so that body movement did not distract the audience from the presentation?
2. Was the speaker to quickly?
3. Did the presenter look at the audience during the presentation?
4. Was the presenter enthusiastic and captivated the audience?
5. Did the presenter read from the script?
E. Benchmarks for the evaluation of the virtual seminar

E.1. Evaluation Template

1. Acquisition of knowledge (S1): 60 %
   - Individual (S1_A): 60 %
     - Subtopic analysis and Quality of synopsis (S1_A_a): 15 %
       * Comprehension of the individual topic and group subject matte
       * Structure of the Work
     - Quality of Scientific article (S_A_b): 45 %
       * Content
       * Form
     - Quality of Slide (S1_A_c): 20 %
       * Content
       * Form
     - Evaluation of work of other participants / Inter group regulation and control (S1_A_d): 15 %
     - Presentation and introduction to the seminar (S1_A_e): 2 %
     - Revision of contributions (S1_A_f): 3 %
   - Group (S1-B): 40 %
     - Subtopic analysis and Quality of compendium of synopsis (S1-B-a): 40 %
       * Subtopic analysis
       * Compendium of synopsis
     - Quality of the book of articles (S1-B-b): 40 %
     - Quality of the group slides (S1-B-c): 20 %

2. Acquisition of key qualification (S2): 40 %
   - Individual (S2-A): 40 %
     - Team management (S2-A-a): 25 %
     - Quality of the diary on the personal development (S2-A-b): 15 %
     - Quality of the report on the group dynamic and development (S2-A-c): 60 %
   - Group (S2-B): 60 %
     - Learning competence (S2-B-a): 50 %
E. Benchmarks for the evaluation of the virtual seminar

* Shared lexicon and Glossary (S2-B-a-1): 20 %
* Sharing of knowledge (Proposition of learning resources) (S2-B-a-2): 50 %
* Group mates support and assistance (S2-B-a-3): 30 %
  - Emotional and motivational cohesion within the group (S2-B-b): 50 %
    * Rhetoric competence (S2-B-b-1): 25 %
    * Problem and conflict management (S2-B-b-2): 25 %
    * Motivation (S2-B-b-3): 25 %
    * Communication and cooperation (S2-B-b-4): 25 %

Equation and repartition scheme for the evaluation

\[
S = 0,6 \times S_1 + 0,4 \times S_2 \\
S_1 = 0,6 \times (S_1 - A) + 0,4 \times (S_1 - B) \\
S_1 - A = 0,15 \times (S_1 - A - a) + 0,45 \times (S_1 - A - b) + 0,2 \times (S_1 - A - c) + 0,15 \times (S_1 - A - d) + 0,02 \times (S_1 - A - e) + 0,03 \times (S_1 - A - f) \\
S_1 - B = 0,4 \times (S_1 - B - a) + 0,4 \times (S_1 - B - b) + 0,2 \times (S_1 - B - c) \\
S_1 = 0,4 \times (S_2 - A) + 0,6 \times (S_2 - B) \\
S_2 - A = 0,25 \times (S_2 - A - a) + 0,15 \times (S_2 - A - b) + 0,6 \times (S_2 - A - c) \\
S_2 - B = 0,5 \times (S_2 - B - a) + 0,5 \times (S_2 - B - b) \\
S_2 - B - a = 0,2 \times (S_2 - B - a - 1) + 0,5 \times (S_2 - B - a - 2) + 0,3 \times (S_2 - B - a - 3) \\
S_2 - B - b = 0,25 \times (S_2 - B - b - 1) + 0,25 \times (S_2 - B - b - 2) + 0,25 \times (S_2 - B - b - 3) + 0,25 \times (S_2 - B - b - 4)
\]
F. XML Schema of a "tool object" or interface of a service

see CDROM
F. XML Schema of a "tool object" or interface of a service
G. Questionnaire used in the Empirical Analysis

G.1. Evaluation de l’état de lieux relatif a la realisation de séminaire electronique á l IUT de Bandjoun

G.1.1. Questions generales

1. Quelle sont les cours dispensés à l’université à travers le E-Learning
2. Dans quelle faculté et pourquoi ?

G.1.2. Cas d’un Séminaire Electronique

1. Quelle approche didactique correspond à un séminaire dans le système académique particulièrement à l IUT ?
2. Comment est il structuré ?

But

1. Quelles est le but des séminaires électroniques ?
   a) Organiser ses idées en suivant une démarche scientifique,
   b) Chercher des idées semblables aux siennes et les comparer à d’autres modèles,
   c) Chercher et analyser la littérature scientifique,
   d) Résumer ou encore rédiger le résultat de ses recherches,
   e) Présentation des résultats de ses recherches
   f) Autre: ...........
2. Dans quel contexte sont organisés les séminaires électroniques ?
   a) Compléter les connaissances acquises pendant un cours,
   b) Cours,
   c) Autres: .......... 

Didactique

1. Quelle approche didactique sIUT le séminaire ?
   a) Discussion,
   b) Conférence,
   c) Basar / Poster-Session,
   d) Colonies de Fourmies,
G. Questionnaire used in the Empirical Analysis

e) Projet,
f) Workshop,
g) Tutoriel,
h) Cours,
i) Décrivez votre approche ou encore la métaphore utilisée dans le cas où aucune des propositions ci-dessus ne colle avec votre approche.

2. Comment vous représentez vous la méthode didactique idéale par rapport aux besoins des universités au Cameroun?

3. Quelles sont les différentes phases du séminaire et comment sont elles repartiées dans le temps?
   a) Présentation et distributions des thèmes,
   b) Table de matières,
   c) Traitement du sujet,
   d) Remise des résumés et des présentations powerpoint,
   e) Présentation
   f) Etc.

4. L’organigramme répond il aux besoins de l universités ou y aurait il un organigramme souhaités mais malgré diverses contraintes irréalisables ?

5. Quel environnement a été choisi pour les séminaires électroniques et quels étaient les critères de choix?

6. Quelles propriétés de travail collaboratif (Computer Supported Collaborative Work/Learn) sont supportées par l’environnement du séminaire et à quelles phases?

7. Quelles sont les différents acteurs liés à la tenue d’un séminaire et quels sont leurs rôles?
   a) Étudiants
   b) Superviseur (Expert, Organisateur etc.)
   c) Support Technique
   d) Autre:............

8. Quelles sont les particularités de ces différents acteurs?
   a) Sociodémographique (Age, Sexe, Lieu de résidence, Budget mensuel)
   b) Statut académique (Niveau, Faculté, Diplôme de fin d études, nombres de semestres)
   c) Autre:............

9. Quelles mesures sont prises pour familiariser les étudiants comme les enseignants avec le l’environnement de travail ?

10. Combien de personnes participent généralement au séminaire ?

11. Quel est le ratio du nombre d étudiants par superviseur ?
G.1. Evaluation de l’état de lieux relatif à la réalisation de séminaire électronique à l’IUT de Bandjoun

12. Quelles sont les particularités des superviseurs et quels problèmes y sont liés ?

**Accessibilité**

a) Le superviseur n’est accessible que durant le déroulement du séminaire c’est à dire rarement accessible,

b) Les superviseurs sont des employés de l’université,

c) Les superviseurs sont disponibles et accessibles hors du cadre du séminaire,

d) Le superviseur est toujours disponible et accessible,

e) Le superviseur vis à l’étranger et n’est accessible que par mail,

f) Le superviseur vis à l’étranger et est de temps en temps à l’université,

g) Autres: ...........

**Expertise**

a) Le superviseur a les compétences requises et coordonne la tenue du séminaire sur place,

b) Le superviseur a les compétences requises et coordonne la tenue du séminaire à l’étranger,

c) Un superviseur a les compétences requises et réside à l’étranger pendant que le coordonnateur est sur place,

d) Le superviseur n’a pas l’expertise mais coordonne la tenue du séminaire

e) Les superviseurs ne sont que des enseignants,

f) Il n’y a pas de distinction entre l’expert et le coordonnateur,

g) Autres: ...........

13. Quelles sont les solutions envisageables à fin de résoudre les problèmes évoqués ci-dessus

14. Y a t il des aspects améliorer?

**Présentation / distribution des thèmes**

1. Comment se font les enregistrements ou encore inscriptions pour les intéressés (Virtuelle ou présentielle)

2. Les thèmes sont il traités en groupe ou individuellement, et pourquoi ?

3. Les souhaits des étudiants (insatisfaction par rapport à la répartition des thèmes, etc.) sont-ils pris en considération, et comment ?

4. Quelle sont les problèmes récurrents à cette phase et comment vous représentez vous une solution?

**Traitement des sujets:**

1. Comment peut-on décrire la communication virtuelle durant cette phase du séminaire? Quelles sont ces différentes formes (Synchrone vs Asynchrone, Étudiant-Étudiant, Étudiant Superviseur etc.) ? À quelle fin ? (Littérature, Question sur Forum, Question aux Superviseur, Coordination des tâches, etc.)

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G. Questionnaire used in the Empirical Analysis

2. Ou se situe les problèmes récurrent et comment peut on améliorer la communication?

3. Comment peut-on décrire la Coopération virtuelle durant cette phase du séminaire ? Quelles sont ses manifestations et à quelle fin (Développement d idées, Rédaction partagés, Coordination des taches, etc.)

4. Ou se situe les problèmes récurrent et comment peut on améliorer la coopération?

5. Sous quelles formes est intégrée la littérature pendant le séminaire?
   a) Media Imprimés,
   b) Bibliothèque digitale,
   c) Bibliothèque classique,
   d) CD Rom et autre support,
   e) Internet (Moteur de recherche, Wikipedia, Blogs),
   f) Autres .......... 

6. Y a-t-il des possibilités d’amélioration et pourquoi ?

7. Comment et dans quelle dimensions se fait l assistance au étudiant pendant cette phase
   a) Réponse aux questions des élèves,
   b) Motivation,
   c) coordination des taches et des procédés,
   d) Suivi de rapport partiel,
   e) Contrôle de l’ évolution des étudiants,
   f) Feedback et Monitoring,
   g) Autres: ..........

8. Y a-t-il des possibilités d’amélioration, pourquoi et quelles sont vos propositions ?

9. Quelles possibilités ont les étudiants de configurer leur espace de travail et quelles sont les options les plus utilisées ?

10. Quelles sont les autres propriétés du système par rapport au Séminaire? (Calendrier, Système décisionnel etc.)

11. Dans quel ordre et dans quel but sont t-il utilisés? (Calendrier, Système décisionnel etc.)

12. Pouvez vous vous représentez des propriétés manquantes au système qui améliorerais la qualité des séminaires électroniques?

Présentation et Discussion:

1. Comment sont organisées les présentations et les discussions (Présentielie ou virtuelle) et pourquoi ?

2. Où surviennent les différents problèmes?
G.1. Évaluation de l’état de lieux relatif à la réalisation de séminaire électronique à l’IUT de Bandjoun

3. Pouvez-vous vous représenter une autre forme de présentation et de discussion adaptées au contexte de l’université dans le cadre du séminaire électronique, et pourquoi ?

4. Quels aspects du séminaire sont évalués chez les étudiants et quel est le barème de notation ?

5. Comment se fait le contrôle de l’évolution des élèves ?

6. Quels sont les différents problèmes liés à cette phase du séminaire et que proposez-vous comme solution pour une amélioration ?

7. Comment est réglé l’accès aux ressources du système (Rôle et Droit etc.) ?

8. Comment le système assiste-t-il le passage aux différentes phases du séminaire (Workflow) ?

9. Comment se fait l’intégration de l’environnement du séminaire avec les autres modules de l’environnement virtuel global de l’université ?

10. Peut-on générer des masques du système pour des informations ou des processus standard pendant le séminaire ?

11. Comment sont sauvegardées les données et sous quelles formes sont-elles accessibles ?

12. Comment se fait le travail en off-line et comment se fait la synchronisation avec l’Internet ?

13. Comment peut-on contrôler, coordonner, et administrer les activités liées à des contraintes de temps ?
G. Questionnaire used in the Empirical Analysis
H. Results of the Evaluation of the Conceptual Solution (Staff-Cameroon)

This appendix presents the average answers given by person in charge of eLearning programme in Cameroon related to the evaluation of the conceptual solution proposed in the thesis.

H.1. Social component of the conceptual solution

H.1.1. Organizational and didactical methods.

1. Does the approach of collaboration, interaction and participation based on self regulation and self control helps to solve the problem of lacking human resources in terms of supervision? (refers to appendix 1)?

| Not Helpful | 1 | 2 | 3 | X | very Helpful | 5 |

2. Are the peer review process, the group report and journals of participant’s appropriate measure to control and monitor the development of participants? (refers to appendix A)?

| Very Inappropriate | 1 | 2 | 3 | 4 | X | very Appropriate | 5 |

3. Do the participation, collaboration and interaction models and micro-instructions of the process of intra-group regulation and control help to improve the acquisition of key qualification (refers to appendix A)?

| Not Helpful | 1 | 2 | 3 | 4 | X | very Helpful | 5 |

H.1.2. Process of virtual seminar

1. Do micro-instructions of the group subject matter analysis and the intra-group regulation and control support students to perform cooperative and collaborative activities (refers to appendix B)?

| Very Inappropriate | 1 | 2 | X | 4 | 5 | Very Appropriate |
H. Results of the Evaluation of the Conceptual Solution (Staff-Cameroon)

2. Does the proposed approach of collaboration, interaction and participation help participants to perform cooperative and collaborative activities (refers to appendix A)?

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<td>3</td>
<td>X</td>
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3. Is a presence meeting necessary to help participants to become familiar with the seminar with its approaches, goals and expectations?

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4. Does the presentation of the aims and goals of the seminar particularly the evaluation model helps participants to understand expectation and evaluation criterion of the seminar?

<table>
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<tr>
<th>Not Helpful</th>
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5. Does the integration of experts helps to deal with the problem of human resources in your institution?

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6. Is the nature of the subject matter (e.g. authentic problems, multiple perspectives, etc.) proposed by the remote experts and the social learning arrangement (e.g. contact with experts, group work, etc.) appropriate for the eLearning context in your institution?

<table>
<thead>
<tr>
<th>Very Inappropriate</th>
<th>very Appropriate</th>
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<tr>
<td>3</td>
<td>X</td>
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</table>

7. Is the integration of the virtual seminar in the curriculum as a complete and independent didactical unit possible in your institution?

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<tr>
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<tbody>
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<td>X</td>
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H.2. Technical component of the conceptual solution

System architecture
H.2. Technical component of the conceptual solution

1. Does the design of the technical system based on a 'Personal Learning Environment' (use of widgets to perform activities, system based on decentralized in opposition to LMS) fit to the eearning context in your institution?

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Networking component

1. Does a social networking platform like 'linkedIn' helps to improve the contact and networking among stakeholders of the seminar?

<table>
<thead>
<tr>
<th>In no way</th>
<th>very Much</th>
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</table>

2. Does the social networking platform helps to improve the building of a community of practice and interest?

<table>
<thead>
<tr>
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Presentation and publication component

1. Does the social publishing platform helps to improve the networking among stakeholders of the seminar?

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2. Does the social publishing platform helps to improve the building of a community of practice and interest?

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Communication component

1. Does the face to face communication approach among participants on campus fit to the need of communication in virtual seminar in your institution?

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2. Does the integration of micro-blogging tools (twitter, google buzz, etc.) supporting GSM standard helps to improve the communication among stakeholders of the seminar?
H. Results of the Evaluation of the Conceptual Solution (Staff-Cameroon)

<table>
<thead>
<tr>
<th>Not Helpful</th>
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3. Are additional tools for the communication such as web conferencing, shared white board cooperative editing tools, student homepages, etc. required for the virtual seminar?

<table>
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<tr>
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Widgets for collaborative and cooperative activities

1. Is the use of a wiki appropriate to support collaborative and cooperative activities among participants of the virtual seminar?

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2. Is the use of blogs appropriate to log the personal development of participants and the development of groups in the virtual seminar?

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Widgets for task and event management

1. Does the distributed calendar help to facilitate the management of tasks and events of the virtual seminar?

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Rich mobile learning client

1. Does a portable environment (Memory stick) help to perform activities of the virtual seminar and improve the flexibility of participants to work anywhere at any time?

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2. Does the performing of off-line activities on a local environment improve the participation of students and the quality of their contributions?

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<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
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</table>
H.2. Technical component of the conceptual solution

3. Does the off-line environment reduce cost related to the access to the Net?

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<thead>
<tr>
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<tbody>
<tr>
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4. Does the off-line environment represent a solution for the problem of the instability of power supply?

<table>
<thead>
<tr>
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5. Does the off-line environment represent a solution for the problem of the instability of internet connection?

<table>
<thead>
<tr>
<th>very Bad Solution</th>
<th>very Good Solution</th>
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6. Evaluate the use of web based technologies (Open source) for the development of the learning environment according to the following aspects:

- Facilitate the development of further components of the learning environment by developers in your institution

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- Facilitate the maintenance of the learning environment by technical responsible / administrator in your institution

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- Fits to hardware used by stakeholders involved in eLearning in your institution

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H. Results of the Evaluation of the Conceptual Solution (Staff-Cameroon)
I. Learning Design of the prototypic seminar

see CDROM