Ontological mapping between different higher educational systems

- The mapping of academic educational system on an international level

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Abstract

This Master thesis sets its goals in researching and understanding the structure of different educational systems. The main goal that this paper inflicts is to develop a middleware aiming at translating courses between different educational systems.

The procedure is to find the meaning of objects and courses from the different educational systems' point of view, this is mainly done through processes such as identifying the context, semantics and state of the objects involved, perhaps in different activities. The middleware could be applied, with small changes, to any structured system of education.

This thesis introduces a framework for using ontologies in the translation and integration of course aspects in different processes. It suggests using ontologies when adopting and structuring different educational systems on an international level. This thesis will, through an understanding of ontologies construct a middleware for the translation process between different courses in the different educational systems. As an example courses in Sweden, Germany and Tajikistan have been used for the mapping and constructing learning goals and qualifications.

Keywords: ontology, mapping, integration, method for ontology, Middleware, The Bologna process, learning goal and qualification.
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1. Introduction

There are many changes taking place in the world today, especially when looking at higher educations around the world. Completely new perspectives and models have bloomed in terms of education design and structure of the educating. In today’s Europe, we can identify significant changes made, in the educational systems. The main process in Europe today concerns the topic of the Bologna Process. The Bologna Process is a Framework for the higher educational systems in Europe. The main idea of the Bologna Process is the converging of countries educational system towards a more transparent system, which the different national systems would use a common framework. The framework basis is a general structure of three education levels – the Bachelor, the Master and the Doctorate.

This new system, might give birth to a common kind of education that will hopefully follow the thoughts and visions of Johann Heinrich Pestalozzi, Pestalozzi was an ideologist in the nineteenth century, Kilpatrick (1951). Pestalozzi’s principle of Education is based on the importance of a pedagogical method that corresponds to the natural order of individual development and of concrete experiences. Pestalozzi was, according to Forbes (2003) one of the founding fathers for the holistic education, irritated by the educational system where students were supposed to memorize their education. He wished to replace that system with a more academic kind where understanding is central and through high educated and academic scholars, erase international borders. To understand is not only process that is applied in the university but also on the career market, today an observation of many different education is possible. But the understanding must be applied to the real life and therefore it is to very important for not only the student but also the education systems to help the process.

The Bologna Process declared the different goals and objectives with the new educational systems in the 1990’s. Since then we can see that many countries have become memberstates and started adapting accordingly to the Bologna declaration, according to Guerzoni (1999).

Figure 1.1: Member states of the Bologna Process (marked in orange)
The European countries, which are marked with orange colour, are today member states of the Bologna Process. There are also countries that do not reside in the Europe but are members, and furthermore if not they are welcome to join. In September 2005, there were 40 member states; Belarus is the only country in Europe not included. The main ideas are creating a standard for educational systems, more exhaustively for the degree- and credit structures. Other important objectives are the quality insurance programs and the mobile possibility that follows with the standard. A great issue today concerns professionals not being able to make a career within their line of profession in countries other than their own, for the simple reason that their diplomas and educations cannot be translated and therefore not accepted.

The Bologna Committee declared at first six steps in work programme, Work-programme (2004). The three first steps are the most important steps of this programme. Because these steps regard the analysing and changing of a system, which consequently are also the most difficult parts of the Bologna Work-programme (2004):

1. Adoption of a system of easily readable and comparable degrees
2. Adoption of a system essentially based on two cycles
3. Establishment of a system of credits
4. Promotion of mobility
5. Promotion of European co-operation in quality assurance
6. Promotion of the European dimension in higher education

The steps mentioned above will promote the compatibility of the educational systems between different countries. The steps set education standards of types that allow them to be understood on a regional level, if not a global. These standards helps to increase the capability of the educational system.

It is rather simple to understand the, almost flawless, goals of the Bologna process. The different members along with becoming members are today faced with different issues, such as difficulties concerning evolving and redeveloping their old system’s grading to the ECTS (European Crediting Transferring System). The understanding process is rather difficult, where different concepts of each institution are more difficult to understand than the next, when reorganizing or restructuring the design. During this procedure, the systems often face difficulties such as misunderstanding and reoccurring missteps when explaining the true meaning of their own educational systems.

There is an ongoing discussion on if there should be a standardized structure of educational systems. Meaning that the designs of the structures that apparently are dominant in the education structures would be re-structured and adapted. I believe that this thesis will be able to create an understanding of interpretation processes in between the systems after studying and researching three different educational systems in terms of similar conceptualisation. One reason for this is that the thesis will concentrate on finding the basic design in each system and thereby having the opportunity to perform a several level analysis on the system instead of a foggy abstract. The main focus is to present the structure of the education systems present structure. The essentials of a system that promotes and sustains certain criteria in the education that are compatible with other education systems may be one of the most important, if not the most important, aspects when developing or redeveloping an educational system.

All present systems focus today on the student’s future as central for the education structures. This thesis will present the different types of facilitating an education. The grave importance of well-structured design that m compared and transferred between education
systems is the central focus of this thesis. To better understand the different structures we may study the semantically underlying truth in the different objects and their relation in between, in order to test and foresee structural evidence for a strong base of further conceptualisation we must understand semantics, my interpretation of Semantic can be as the teaching of meaning, the national encyclopaedia elaborates on the subject as presented below.

“Semantics is the study of the linguistic expressions meaning or intention. The semantic have been an object of interests within branches of learning, especially in linguistics, philosophy and logics but also in anthropology, psychology, comparative literature and lately in cognitive research and artificial intelligence.”

Loosely translated from National encyclopaedia (2005:03-09).

In order to experience the true meaning of the different educational systems, we must visualize and explain the different educational systems from perspectives that will show us their ideologies behind different activities and course related subjects. Today's existing education systems should in different ways be adaptable to the Bologna system. Conceptualizations are different forms of manifesting the concepts and relations in the educational systems structures. One way of conceptualizing the structure and design of a system is by ontologies.

“Ontology is the teaching of existing, it is a part of the metaphysics: in modern meaning the teaching of concepts and categories that that are needed to be assumed to give a coherent, without contradictions and exhaustive explanation of (some part of) reality. By that one can differentiate between two ontology in two meanings: (1) A metaphysical discipline that differentiate between “appearance” and “reality” and investigates the different ways different physical objects, experiences, thought, speech, general concepts, generalizations etc. could exist and eventually thereto seeking to determine that which is in common or lays the ground for all the different forms of existence, the nature of existence;(2) The system of assumptions regarding that which existing respectively not existing as presupposed by every single conceptual device, theory or idea system. Such assumptions of different kinds are pronounced or understood in philosophical as well as natural science theories.”

Loosely translated from National encyclopaedia (2005:03-02).

Tom Gruber (2003) explains that ontology defines the vocabulary used to exchange questions and mutual understandings between the different conceptualizations. A conceptualisation is the structure in a system where the content of the system is in focus by the different relations between the different components. This is the area where the educations are in great need of being structured and re engineered when implementing the principles of Bologna Process within the 6 steps work programme, concerning the first three steps. Gruber (2003) explains that ontological relations in between different domains are agreements between the domains, to use the same vocabulary in a coherent and consistent way. The different groups or intended
object involved in this process has the same vocabulary but not required, or have not, the same foundation of knowledge. This is the main idea of the Bologna Process, declared according to the work programme.
1.1 Background

The European commission, Directorate- general of Education and Culture, issued the project “Structural and Complementary measures Project- KBTUT on the Way to Credit System”. This project was supposed to help The Khujand Branch of Technical University of Tajikistan, in this study referred to as KBTUT, in the process of redeveloping their current educational system towards a European (The ECTS and The Bologna) manner of education.

KBTUT have along with representatives from Fachhochschule Heidelberg of applied science and the institution of Mathematical and Systems Engineering, part of University of Växjö, developed two education programs that may be adapted to a Tajikistani university’s current educational system. These educational programs have to adjust them selves according the main principles of The Bologna system. All the parties involved are well aware of the problems that occurring during a development procedure. I hope that this thesis will result in identifying new concepts and affects of different structures. The goal is to find a method to maintaining and giving an opportunity to perform these translations.

The major challenge in the developing process has been to understand how to develop courses reasonably compatible to the Bologna standards. However, there are not any transition guidelines for this process so there is a tremendous need for some type of structured guidelines that must pursue to portrait a well-suited standard system in a manner consistent to the education system’s perspective, terminology, logic etc.. This portrayal would (A) help to understand the profound underlying truth of the education system but and (B) help in the translation process between the education systems.

The focus should, regarding the circumstances be on evaluating the current situation of directing their attention toward structural measurement concepts for the implementation of an educational system. In order to enable this we must first understand the existing systems running and that have already adapted to the ECTS requirements.

1.2 Purpose

The purpose of this thesis is to evaluate and describe a tool for translating different concepts between educational systems. The objective is to standardize the concepts revealed, through different approaches in terms of structural measurements and thereby map between certain individual organisational structures.

The main argument is to revise the different terminology used and through this find concepts and not in only explaining how things are, but also to some extent “Why” things are as they are, and thus studying their semantics. Once understanding the semantics, this thesis should be able to consider the main purpose of the educations and concepts that in this thesis referred to as Weltanschauung. The ambition with the thesis is to study three educational systems. Finally, through the identification of the different Weltanschauung, this thesis should find a method for structuring and mapping a middleware for translating the concepts of course between the different systems.

This thesis aspires to construct a system that can act as a middleware for the present educational system, and furthermore to facilitate the translation between them.
1.3 Demarcating

This thesis is to study characteristics of the general education and course descriptions used for the education programs. The thesis is therefore limited to the educating structure of three higher educational programs.

1.4 Problem discussion:

There is a great need to understand these structures when translating. To do this we must understand the idealism of the structures that the systems are based upon. The meaning of a discipline might not be the same in Sweden as it is in Tajikistan or Namibia and perhaps the whole meaning of the word discipline may have changed in 50 or maybe 100 years. Furthermore, a word such as “discipline” has different meaning depending on where the word is used. For example the usage of the word in Sweden would be different from Germany (in the future), it might be the same as it is in Sweden (in the present) or the other way around.

These areas of the study and problem will provide a somewhat positive and precise assessment of the different concepts and contexts used for my conclusions that will be a leading factor of a suitable understanding when translating between the different educations systems.

In order to aid the process of choice and development in an education, we can study other educational systems that may have traits of the system, which one endeavours to study, the structure and its different concepts. One must first understand the terminology that is used. Each system is special depending on its different characteristics that tolerates and differentiates it, from other systems. To understand this we would need mapping in between the different systems structures and most importantly the Weltanschauung of each educational system.

Today we can see that the Bologna committee have developed a certain model for measuring and ensuring that the education/courses are on the right level. The Dublin descriptors represent information on the knowledge that the student should have when clearing a course. This model builds on Bloom (1984), and is in need of evolution, the reason being, to be able to measure and control the evaluating and translating from the second to the native structures and the other way around. At the same time, during the construction, we must allow keeping score and equanimously approaching the purpose of the different courses. The different educational systems need proper guidelines for adopting and acknowledging a structure in their current structure that is accurate to the Bologna. The problem surrounds the uncertainty of how the structure of the Bologna System.
1.5 Problem formulation

The main goal of this thesis is to conduct a research in the area of educational systems. The purpose of this thesis builds on an ontological mapping for translation use. A summarization and concretization of the research idea is in the following statement:

*To construct a model for mapping different higher educational systems between each other.*

1.6 Disposition

The construction and realisation of each chapter holds a series of main principles, before acknowledged and realised. The principles used, are in accordance with Järvinen (2001), on the topic of patterns for study approaches.

1. Problem presentation - *To introducing the problem and the basic axioms and assumptions regarding the purposes of the thesis.*
2. Application and synthesis - *To apply the theories and ideas to the purpose of the section, and thereby trying to synthesise new or adapted theories.*
3. Problem evaluation - *To compare the new information to then previous proposed facts and through that emphasize on the pattern, as a postulate for the problem area.*

These three principles have helped in the designing and configuration of each subject brought to this thesis.

Figure 1.3, illustrates the order and meaning of each section of the thesis.
This paper starts with an introduction of the research, starting with the background and idea after which the purpose is presented to move along to the problem areas that will be researched for this for this thesis. The next chapter presents a section that presents my methods for this research. Following these subjects is different theoretical background in this area. The theoretical chapter will present both a philosophical and technical approach of finding the values for the problems and purposes of the study.

In this chapter, I will present the information regarding the different education systems studied.

The fifth section will regard the congruent of the different theories towards my empirical data against the problem formulation. This chapter synthesizes the different results that I believe

In Chapter 6, there is an outlined presentation of the concluded result, which I find essential to give solutions to my problem formulations presented in the first chapter of this paper.

The fifth section will regard the congruent of the different theories towards my empirical data against the problem formulation. This chapter synthesizes the different results that I believe

Figure 1.3: thesis disposition
2. Chapter two - Methods of research

A method uses a framework as a tool for the scientist. The choice of method is dependent on the purpose of the research and the objectives. In this chapter, I will present my point of view on different methodology that may relate to my work and the ones chosen for this thesis.

2.1 My choice of subject

The main reason why I have chosen to study this subject was my own curiosity. By choosing to investigate the educational reformation, I believe that I am touching one of the areas closest to informatics, the design of different systems. I am excited to bring out the different structural- and apparently non-structural differences that may occur. The Bologna structure and system could apply to most higher educational systems in Europe although the European educational ministry or institution have yet to perform any exhaustive research regarding the exact mapping of the educations in thoughts of organisational or ontological concepts, which could facilitate the translation process. The Bologna Process involves many other different areas such as pedagogic and quality studies and precautions studied, to structure and map the different system, in order to keep the educations at a good level. This idea of the thesis brings forth the difficulties, faced when implementing, and/or re-engineering a system and possibilities when designing the education. Informatics, in this thesis, is to the greatest extent represented through data modelling and mapping where the usage of different techniques and methods are outside their intended areas.

2.2 Different methods

My literature study is narrowed down to a few books concerning scientific methodology. Amongst these books Järvinen’s book On Research Methods (1999) have been constructively helpful throughout the research, because the methods described there are appropriate design. The orientation should allow an immanent bottleneck approach and method.

There are originally two alternate paths to choose between when evaluating a scientific problem. One is through investigating the mathematical logical field. The second path concerns studies of reality. Järvinen (1999) continues, when a researcher within the area of mathematical argues for his theory, there is a characteristic foundation of his theory being bulletproof, almost all his mathematical colleagues therefore approve it. The cause being that the mathematical method has no connection to reality, according to Järvinen (1999). The aim of the project at hand is to study reality. Therefore, I have excluded the mathematical method from this research.
My belief is that in order to find the best relevant research methods for this study. I must divide my research into several areas of study, areas that will assist in illustrating and researching each area of research. The first area is an analysis of the theories regarding educational systems. The second area is to study important aspects of the different educational systems and the last and third area is a modelling research of the different systems according to my problem formulation. The exhaustive methodical research should aid in the artefact building process in terms of not only creation but also evaluation of the different systems to build a conceptual model in an ontological map for the different systems.

When evaluating different scientific methodologies that could be adaptable in this study, I found the artefact evaluating approach as the obvious methodology to follow. Since the artefact evaluating and creation methods are best applicable when approaching a development process, I believe it to best satisfy the purpose of translating between the different educational systems. A development process often requires the researcher approaches the problem from, not only a theoretical, but also from a practical point of view. My approach will be the first evaluate different problem areas and thereby try to determine to what extent semantics and ontology can support a final product, which could serve in assisting some procedures and areas of the problem.

My understanding of this research is relies on the impact of different systems design and structure. This is binding me to perform a certain amount of theoretical studies. meaning I will also choose to investigate in theory testing and to some extent theory-building methods. My personal belief is that with this type of combination in my methods, I will be able to find theories, relevant to part problems, surrounding the part subjects of different types of mapping and furthermore clearing the path on how one may be able to structure a system in this type of mapping.
I believe that the connection between data and the interpretation of the researcher is quite important. Therefore, there should not be any miss interpretations in case of specifying and explaining the exact actions and purpose. Through thoroughly explaining the different systems and finding their Weltanschauung, I believe that this thesis reveals different underlying structural similarities in the systems.

### 2.4 Habermas learning social science research

Jurgen Habermas learning social science research is compiled and presented by May (2001). In the methodology literature of Social Science we can find a short analyse of Habermas and his work in the area of building bridges, in the sense of perhaps a comparative study across borders. May (2001) explains Habermas’s thoughts and argumentations around the issue of different needs, May (2001) then concludes the research in finding two types of needs that must be satisfied according to Habermas, the first being the need to understand the difference of knowledge and thinking that occurs in different cultures. This thesis does not encounter the social or cultural aspects, such as their influences on the education systems.

Habermas has theorized the main objectives on the subject of building bridges, which is the lack of understanding. Furthermore, Habermas’s outlines his main ideas about humans coming to agreements on what is accurate or true about the social world between the different cultures. Habermas produced two ideas that would be followed by the individual, from a pedagogical point of view.

- The how? A question of discovering and the area of understanding
- The Why? A question that reveals the formal explanations

The two ideas are fundamental in every research, firstly understand it and then to be able to explain it. To understand would for the subject to mean to be able to specify the information or knowledge given. The specifying process regards a decomposition of knowledge and a phase for storage, by the individual. For the subject to explain certain knowledge and information we find certain aspects that go beyond just the understanding. She must also have the ability to present and represent the different knowledge for the purpose of evolving and building on the present knowledge.. These topics are also very much relevant to the uncovering of the ontologies and the semantics. I will argue that Habermas theory is a main approach when to my conclusions. Habermas theory is relevant in all types of research because of the intense underlying truth that is based upon.

When implicating the different theories and the method, in areas such as the development of ontological structural maps and the mapping between the systems, I have chosen elaborate on the different subjects in two different ways.

The first, understanding what the subject has to do with the purpose of this thesis and in which way and the second way is to always question my own personal subjectivity. These points have been simpler to undergo by enforcing Habermas’s methodology, not only in terms of understanding but also in explaining.
2.5 Compilation of empirical material

There are certain procedures pursued when performing a study, depending on the goals the set the methodology can be chosen. The acquired empirical data collected and studied in this thesis is from diverse presentations given by representatives for the educational systems in the involved countries. These being the primary source of data, I have contacted the representatives in case of further questioning when uncertainty has arisen. The main idea has been to focus on the problem description during the process of collecting the data, where different aspects of an educational system where to be ruled out. In this way, the whole concentration has been on the organizational perspective etc., where mainly figured in great understanding of Jurgen Habermas theory on learning, understanding, and finally explaining the facts.

In the empirical data, I plan to collect information from the areas of curriculum, syllabuses, disciplines, courses and workload in the different educational systems. Also the methods of collecting the data has been ensured, which may be done through the above stated presentations and conference discussions of the different aspects of each educational system. Most of the information has been double-checked; either through checking documents, received by the University, through their web pages or even through email contact thus giving a high reliability for the empirical material used. The product of the empirical material may be a conceptual model that may help in the mapping or suggestions for a new theory, that in the future may provide assistance in building better an educational system development.
3. Chapter three – My frame of reference

A theoretical frame aims to offer a broad image of the studied area. In this section, I will present the theories and models from which I have drawn my conclusions and from which my results is based on. This will be my frame of reference into two different areas, the first is principles on higher education, and the second is the different meaning and structures involving ontology and semantics.

3.1 Educating and learning theories:

The following section will discuss different theories and facts about the principles of educational systems. It also offers different tools to ensure the probable learning methods, and a representation of the types of practical learning forms in higher academic educational systems. The sections should present both an external and an internal representation of different part of the educational systems, such as principles, objectives and the contexts of objects and attribute. These sections will also point out the different procedures and objectives that are emphasized by the educational systems.

3.1.1 Wilhelm von Humboldt’s three principles on higher education system

Wilhelm von Humboldt (1767-1835) was a German statesman and a philologist. As Preussian minister of education, during the years of 1809 and 1810, Humboldt thoroughly reformed the educational system; largely based on the ideas of Johann Heinrich Pestalozzi (1746 - 1827). Wach (1988) explains that Humboldt choose metaphysical and philosophical paths towards enlightening the educational systems’ objectives. Humboldt sent the Prussian teachers to study the methods of Pestalozzi’s school in Switzerland. Pestalozzi was a Swiss educational reformer whose teaching theories were based on respect and attention to the individual. These theories would set out a foundation for the reform of education in the 19th century. Bellatalla (1999) explains the whole scenario as “From Elitism to Democracy”, to not only encouraged but also give people an opportunity they did not enjoy before; participation. These theories would lay the foundation for the reform of education in the 19th century.

The charter of Berlin University was revolutionary; the charter based on three fundamental principles dictated by von Humboldt. The first principle was the inseparable unity of education and research. The research activity would be what distinguished a university from other institutions of education and in the University of Berlin all known subjects where educated.

Professors and students at the University were constantly engaged in research. There would be no acceptance for any theory or idea, stated or given, without subjecting the theory or idea to critical reasoning and furthermore elaborated an understanding and not only mechanical memorization of passages from the Bible, catechism and hymnbook.

1 Pestalozzi’s theory of education is based on the importance of a pedagogical method that corresponds to the natural order of individual development and of concrete experiences. Pestalozzi opposed the systems where the students where to memorize their education and he wished to replace it with a more academic system where understanding would be centred.
The second fundamental principle concerned academic freedom or the concept of Allgemeine Bildung, was according to Wert (1993), central to Humboldt's approach and was based on his own lifelong learning process. Bildung was not a utilitarian enterprise that prepared students for a set of particular ways of earning a living. Rather, he implied that learning is a lifelong process, distinct from vocational or professional training. He also claimed to inform teaching at all three levels of the Prussian school system--elementary, secondary, and University. Berlin University became an arena of intellectual freedom. The activities of the university would be conducted without any influence or interference of external sources of authority. This principle, according to Terziodlu (2002), the German motto “Lehrfreiheit und Lernfreiheit” meant the freedom to learn and the freedom to educate is not going to be affected in this paper.

The third fundamental principle of von Humboldt was that the students were obliged to have a fundamental education in natural sciences, philosophy and humanities in their first years of education. This basic or general education was the same for all students at the University and thus fundamental in Von Humboldt’s theory. After the first 2 years of study, the students were to specialize in their respective degree areas.

Von Humboldt hoped that the students, which graduated from Berlin University, would be universal intellectuals and propagators of illumination, Terziodlu (2002). This hope was the opposite of that times different higher educational systems whose soul purpose was to educate expert professors. Von Humboldt’s argument was that in the new universities, modelled on his fundamental principles, a unified grand theory of knowledge should be developed over time, transcending all national or physical borders. With a universal culture based on similar general courses taken in the initial years of their universities, the age of enlightenment would produce a new generation of professionals, who would also be academic graduates equipped with all tools required for critical thinking.

The principles of Humboldt’s, inflicts the great importance of a more human educational system. An educational system from which the students were educated simultaneously as the professors could acquire new knowledge through both research and lectures through not only research but also the students. The new educational system would allow the teachers to pursue their own research at the same time as their teachings. This system came to award many of the researchers in Germany, including Alfred Einstein. The educational system forced the student to see beyond prejudice and created new spheres for science.
3.1.2 Bloom's taxonomy

Benjamin Bloom (1984) developed Bloom’s taxonomy intended for placing and understanding the different levels of educations and abstraction within the different types of learning. Bloom (1984) identified three domains of educational activities or learning types:

- **Cognitive**: mental skills *Knowledge*
- **Affective**: growth in feelings or emotional areas *Attitude*
- **Psychomotor**: manual or physical skills *Skills*

The objective of each type of knowledge is the student should acquire certain new knowledge or education. The new knowledge may change his attitude concerning certain issues or maybe improving some skills that he have trained, an objective referred to as “the goals of the training process”. Bloom divides the different domains into subfields, starting with knowledge within common realms, and in that manner better explains the subjects.
The first domain, cognitive learning, involves an individual’s knowledge and the development of these skills.

The knowledge domain includes recalling or recognitions of data and information. Bloom’s taxonomy defines six major categories that can be assumed to be a hierarchic level achievement process, meaning that if one level is not achieved the next level cannot be reached (see Appendix III).

The domain of affective includes categories that touch subjects like emotions, feelings, values, appreciation, enthusiasms, motivations and attitude. The categories presented to this domain are not relevant to this thesis, therefore I disregard the affective domain. Regarding the psychomotor domain, I have concluded the same as for the affective domain, which regards mostly the science of mobility in a physical perspective. Bloom (1984) developed and researched these areas for children and education on very low levels, the taxonomy, not intended for higher educational systems.
Practical learning forms in correspondence with Bloom’s Taxonomy

In all systems, there is a close relation between the objectives and education. The ways of learning may look different from system to system but the fundamentals remain the same. I have created figure 3.3 modelled to apprehend Bloom’s Taxonomy and implement the different types of knowledge into the practical components of the education. Figure 3.3 fundamentally builds on the different knowledge forms, the model shows the areas that tests and integrates knowledge.

<table>
<thead>
<tr>
<th>Learning forms</th>
<th>Area of use:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning form 1: Learning form 2:</td>
<td>Lectures</td>
</tr>
<tr>
<td>- The adding of new knowledge is the first form of learning New knowledge is added to existing</td>
<td>Preparations, examinations and lectures</td>
</tr>
<tr>
<td>- Learning through memorizing For example memorizing some parts of a text.</td>
<td>Assignments, practical-theoretical-Thesis and paper works</td>
</tr>
<tr>
<td>Learning form 3:</td>
<td>Thesis and some paper works.</td>
</tr>
<tr>
<td>- Learning through acquisition of facts To be able to differentiate the importance of different thing in upcoming practical situation</td>
<td></td>
</tr>
<tr>
<td>Learning form 4:</td>
<td></td>
</tr>
<tr>
<td>- Learning as an abstraction of meaning To interpret the knowledge and facts which are available as products for learning.</td>
<td></td>
</tr>
<tr>
<td>Learning form 5:</td>
<td></td>
</tr>
<tr>
<td>- Learning as an uncovering process The thing that are learned is to be of help to translate and interpret the reality as it appears</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.3: the five learning form in acquaintance with Bloom’s taxonomy

The knowledge-acquiring theories presented I figure 3.3, may analyse the different activities next to Bloom’s taxonomy. As far as my understanding, these aspects are of great importance when understanding the proper definitions of each system.

3.2 Theories of structure and meaning

The meaning of an object is rather unexplainable for a person that does not understand it as it is “supposed” to be understood. One can refer to the New Guinean that had an encounter with a European man explained by Flensburg (1986). The scenario revolved around the European man, trying to explain what a table was to the man from New Guinea. The reason why I have chosen a theory of this type and calibre for this study it is simply my desire to explain and define the different concepts and principles in the educational system, which I must inflict the importance of certain aspects of reality that will always stand in the way of progress.

First is the aspect of one self-understanding, the second being the ability of to explain and to summarize, we simply must understand that semantics and understanding is quite important in relevancy to explaining and adopting knowledge. Understanding does not come out of a structure, only objects and relations.
3.2.1 Ontology

One development theory regarding structure and organisation is the theory on ontology. Sofia Pinto (1999) models the different stages in creating ontologies (See Appendix II). Figure 3.3 illustrate, generally, different stages in an ontology lifecycle plus three activities that proceeds throughout the lifecycle. Pinto (1999) has specialised on the subject of reusing ontologies. When systematically redeveloping a structure that may be similar to the fundamental ideas of the Bologna Process where education structures in terms of degrees and credits standardised would help settling the structures. This thesis will only regard the parts on specification, conceptualisation and parts of the formalization, plus a set of lifelong activities furthermore the areas of implementation and maintenance are in this research not regarded.

One of the hurdles to overcome in the phase of conceptualisation is the selection of source texts that are analysed. The conceptualisation phase, by Sofia Pinto (1999), lack a sense of thorough researching and is therefore insufficient when consulting the issue of mapping the system to cover the normal factors and areas. Aspects such as relations and object specifications are not generalised and considered by Sofia Pinto (1999). This is the reason why I have chosen to elaborate on this particular subject using another modelling method created by the IDEF group (IDEF -“Integrated DEFinition Methods”). The IDEF group has engaged an efficient method that can help in the understanding of a system’s structure, Sarris (1992). The IDEF method should only operate during the conceptualisation phase, because of it being an effective tool for construction only stereotyping, standardizing, exploiting and re-packaging the instances.

<table>
<thead>
<tr>
<th>Phase activities</th>
<th>Ontologies activity</th>
<th>Lifelong activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Specification</td>
<td></td>
<td>- Knowledge</td>
</tr>
<tr>
<td>2. Conceptualisation</td>
<td></td>
<td>- Acquisition</td>
</tr>
<tr>
<td>3. Formalization</td>
<td></td>
<td>- Documentation</td>
</tr>
<tr>
<td>4. Implementation</td>
<td></td>
<td>- Evaluation</td>
</tr>
<tr>
<td>5. Maintenance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 3.4: lifecycle of an ontology by Sofia Pinto (1999)*

1. **Specification:**
The ontology building process starts with a general analysis of the area, which the ontology is supposed to build upon. This analysis should help clear the goals and purpose of the future development; it is easy to understand the necessity of action in the development process when trying to identify relevant aspects in the educational systems and designs. It may be relevant to analyse different documentation of the system where the different properties, actions etc. may be stated.
2. Conceptualisation and formalisation:
The second stage, which is conceptualisation, outlines the work when creating a conceptual model that describes the attributes and structures in the ontology. Sofia Pinto (1999) has developed a set of questions:

1. What should be represented in the ontology?
2. How should it be represented?
3. Which relation should be used to structure knowledge in the ontology?
4. Which structure is the ontology going to have?
5. Which ontological commitments and assumptions should the ontology comply with?
6. Should the ontology be divided in modules?
7. If so in which modules should the ontology be divided?

The answers to the questions above are necessary in order to make an accurate conceptualisation for the ontology. The answers should also reveal the essential concepts and structure for the ontology. This question may advise in helping to set up rules or schedule, from which the different relation between components can be drawn, similar to the Unified Modelling Language (UML).

Different tools coexist here as well as in UML, such as aggregation, combination, assembling relations and object states. Gruber (2003) claims the ontology can be used as a representation language. The ontology would be very unclear unless these tools help identifying different attributes and relations in the ontology.

The IDEF Groups solution
The method brought by the IDEF group can effectively aid in the implementation of ontology. The IDEF method used here during the conceptualisation phase, along with Sofia Pintos theory (1999), answers the questions in the conceptualisation phase. I firmly believe that the IDEF approach allows us to model and structure the educational systems even better. From the IDEF method, I can find four types of areas or structures that used in this thesis to transmit the questions of Sofia Pinto (1999) and answering them.

1. Classification is the major type of identification and structuring regarding different objects and concepts. The concept of classification placing an object remains the same in the same hierarchical composition where an object can be an identifier for the rest, as an example we may use metal, which is the identifier of all kinds of metal including aluminium, bronze and gold.

2. Composite, is a structure process where the different relations are strictly composite, meaning that the subordinate object has to have at least the same values as ordinate. In addition, there must be a domain explanation.

3. Object state, is another conceptualisation which can be done for a certain concept, the concept is to illustrate the formation about objects and the various states they can be in relation to certain processes or activities. Diagrams built from these constructs are as Object-State Schematics.
4. Different relations are created between the different classes and instances of a class. The environment of the objects ontology and from here creates a structure from which other may easily understand these objects different properties and relations explain the reason here.

**Figure 3.5: Gruber (2003) and the IDEF Group: Conceptualization and modelling**

**Formalization:**
For this phase, we start formalising according to Sofia Pinto (1999)
The information documented in the different structures must go through different evaluation procedures that consider the reliability and validity factors.

The greatest aspects, tackled here, are compatibility and completeness of the ontology. During the beginning stages the project is to have developed their own vocabulary for the ontology, where different classifications and objectifications has been made of words and meaning.

The vocabulary states a set of logical structured entities used, much like a database system where the normalisation forms apply. The developing of logic-structured ontology is in need of meaning and explaining brings us into the subject of semantics.
3.2.2 Semantic truth

The area which is most regarded here is the one concerning the meaning of a word, and its components. So perhaps we can exemplify the semantics as the sense of that a lamb would not be a sheep but certain components explaining it as a sheep and also a young - / child sheep. This form of analysis, called *component analysis* and to some extent is regarded in the constructing process of the ontologies. There are many methods to understand the semantical truth of an object, but these may not always work, the true meaning of an activity explains very much regarding the different parties and purpose of the activity. Charles Sanders Peirce constructs a conceptual graph on existential graphs and the conceptual graph is a system of logic based on semantics, meaning the definition of objects, Irving (1995). In this system of logic and defining the different concepts, we can find that ontology may play a rather important role. In my analysis, I will use conceptual graphs when defining semantics and context of an object. The semantics will help understand the underlying truth of the Ontologies and simplify the process of translation in terms of settling the Weltanschauung. The Weltanschauung would also help settling the context of the different domains used in the conceptual graphs. A conceptual graph illustrates the flow of activity. An example of a description may be:

"A bird is in a sycamore"

&

"A cat is on a mat"

The different statements made on the right left been set into graph-forms/ formal representation on the right. This type of modulation is regarded as conceptual graph modulation and is rather complex but insures quality in the work developed by John F. Sowa who has based his work on the work of Charles Sanders Peirce. The conceptual graphs will bring fourth the important aspects that the metrology to some extent in this thesis will build on.

3.2.3 Börje Langefors theory on Infology

In the early parts of 20th century, professor Börje Langefors started to explore and investigate the different parts of information systems. Langefors outlines his theories in "Theoretical analysis of information systems" from 1966. Many of the information system educators today consider Langefors to be the founder of modern information system. Langefors (1966, 1969) pioneered the infological approach in information systems. Furthermore, Langefors distinguish between info- and data- logical areas of work, meaning that there is a characteristic difference between information and data. Langefors (1966) presents four methods in the information system (in short IS) development cycle:

1. *Object system analysis and design*
2. Information analysis
3. Data system architecture, and construction
4. Realization, implementation, and operation

The first two steps, were not put into content before Langefors advancements.
Langefors explains his famous theory on the infological equation as follows:

\[ I = I(D, S, t) \]

The equation above interprets in the following manner: \( I \) being information produced from \( D \) (the data). The recipients prior knowledge is \( S \), by the interpretation process, \( I \), during this time, \( t \).

So generally, \( S \) is the result of life experience of the individual. Furthermore, one person’s way of interpreting the data will almost certainly differ from another person’s, even if the data is in its simplest output.

The equation is possible to implement in the process of creating information systems as well as in forming ontology. Langefors (1995) claim decentralizing is a necessity, and only through this process the possibility of designing systems can stay stabile, in order to know what one is designing.

Langefors explains different standardized aspects, for example, the relevant properties of the system or the component of the business from what the system or idea constructs even better on. Langefors explains that the standardisation on higher-level hierarchy will reduce the flexibility which is better when constructing the higher level processes, according to Langefors (1995).

**Comments on Infology theory by Langefors**

The theory of Infology may seem as the ideal of development procedure, because of the thoroughness when analysing and developing an information system. This may be because of Langefors simply bringing out the most basic needs for a development lifecycle. Even though Langefors has developed many other theories concerning the creation and management of business from managerial perspectives I find this theory to be relevant in building proper ontologies and also when operating the translation.

**3.2.5 The adaptation of Börje Langefors’s theory**

My firm understanding is that the infological equation will help acquire the data needed for my investigative areas. The infological equation will later be involved in a metrological theory, used to bring forth different data and Meta data from the educational systems. The equation, will settle on a rather abstract level the goals and the procedures to reach the goals in a course from the different educational systems, cooperation with the conceptual graphs.

The kind of information I attempted to study in this thesis is information regarding the different educational systems from which I hope to generalize and standardize the different data in abstract models. The abstract models consist of different concepts and relation that to some extent derived according to the infological equation.
3.2.6 The meaning of things

My belief is different attributes of a course can be presented in metrological subject and may illustrate some kind of shell objective illustration, which can have a general purpose. The main problem would then be the tool that developed, could only be in use for the University of Växjö, and probably worthless in Tajikistan. With the purpose of clarity and cross-cultural vision, I hope to define the different concepts used and then measure them. We will no try to engrave this to my work by the creation of a metrological equation, but rather an abstract tool for understanding the Weltanschauung behind the metrology.

First defining metrology: metrology is the science of dealing with measurement. It can also be a system of measurement. Usually when referring to measurements the thought of are accreted measuring with weights or distances etc. The importance of measurement is a tool that used to develop a system for measurement of different aspects or activities in its surrounding. A question that would appear in this situation could be “Why is this done?” Flensburg (1999) tells of a story of brought form one of his previous works Flensburg (1986) where a Scientist is trying to explain to an inhabitant of New Guinea, what a “table” is!. The dialogue set forth by Flensburg (1999) is very interesting and furthermore helps one understand the importance of concepts and definitions.

The proposed equation by Langefors (1966) is a rather unique, because Langefors being the first in this area to point out the importance processes of identifying and defining knowledge. The general idea outlines the attributes different properties, for example knowledge. Flensburg (2005) elaborates on this subject. Flensburg (1999, 2005) explains that there is an immense need of being able to relate the semantics for the different objects. Flensburg (1999, 2005) has ignored the idea of classification when introducing the definition of knowledge. A solution is to supplement this through an integration of the Bloom’s taxonomy, mainly for the cognitive area of knowledge classification. For example if we would like to know how knowledge is measured, we would be in need of knowing the state of knowledge.

The educational systems presented are understandably rather different in terms of purpose for the courses, or at least how the purpose. This thesis must simplify the whole attribution theory used by the different systems in order to create some type of middleware. The formula, should be able, to be applied. For example, if we would like to know how knowledge is measured, then we would be in need of knowing the purpose and goal of knowledge. The purpose and goal may often be inclined in time factors or the content of the course and thus creating a great need for simplification and standardization.

The important aspects needed for this metrological process, may first start with the purpose of measuring this attribute. The main purpose of these tools is to understand the different systems in a more specific role. To be able to sort out the information regarding a certain subject. For example, how do we measure the length of an education?

There would most certainly be a great set of variation between the different systems ways of making the same statement. This method will settle the basic need for studying different properties of the different educations and instances.

The attribute of an object is very special in this research, the attributes defines different parts specified that may be investigated in the educational systems. These part could in a very specific manner explain and present the most important factors of the object. Before moving on, there is a certain need of apprehending the reason why one needs to define the attribute, or measure it. This is done through the Weltanschauung (view or ideology), which is perhaps a little too abstract but necessary for the process of understanding. Therefore, “what are the
"facts?" is the first question, of the research that needs to be broken down into segments where the different Meta data of the attribute will emerge.

A declared attribute, have often a value that may provide some information regarding the object. One important feature of information here is most certainly information about information, called Meta data, in conclusion data about the data.

The next step was to find the procedure used to evaluate and conclude certain attribute for the system. When structuring up the information there was also a need for understanding. The understanding would be the Weltanschauung or ideology that helps clarify the domain the attribute lies in. In this study a metrological tools is rather necessary, the purpose of the metrological tool is to control the ontological mapping.

The formula may look something like this:

**Attribute:** `<Meas. value><Meas. unit><Meas. procedure><time>< Weltanschauung>`

The formula is assisting when measuring different aspects of the education, necessary to the common mapping. Langefors (1966) desired information system as state variables at a certain time had certain values, meaning that they would be dynamic in the way of dependency. The formula can be explained in the following sequence. It exist an entity and this entity has attributes. The attributes have different properties are time and name of attribute of the course plus a value for the attribute, but this is not enough.

The equation stated above includes furthermore a set of state variables that will help in the process of ensuring the state of the entity’s attribute. A difference in the properties for this attribute would change its form and/or values leading to the objects state are not the same as before and therefore, a totally different object. The objective is the same as it would be on an atomic level. The main reason why the Weltanschauung should be posted is to exclude unrelated subjects that otherwise may enter the study and create complications.

Langefors (1966) explained the great importance of time in the equation because it is always relative to time. Time, can be viewed as progress of science. The instance in our equation named “Weltanschauung” is also a time affected or - implied factor that may ensure the state of time, considered as a factor more than the actual time. This would result in that the Weltanschauung is more informative and helpful than the only time aspect. When we regard the Langefors (1966) equation, in particular the time aspect, against the Weltanschauung, we must understand the variation of explanations that may occur in the Weltanschauung. That will result in a dispersion of the important aspects that need to be considered when understanding the activity. On the other hand, we may consider the time aspect when trying to give the same result as the Weltanschauung, but through the objective of time.

When acknowledging the ideology, we may precede identifying different measure units. These units of an ideology must be identified against their relation to the “Weltanschauung” and activity. Furthermore, the value of the attribute would grade of level that the entity’s units might be on. The facts which lye before the study is of great importance when explaining the metadata of the two properties is only facts, and are not of any use without a purpose for our research.
Comments on this model

Supposedly, there is a set of credit systems in three different systems, the credits are all just simple numbers and they all look the same. Then imagine these numbers selected into an order of that we may for example be able to say: *The first credit system is worth more according to the ECTS system.* Thus creating a relation between the credit systems “worth more”, being the foundation in this thesis when working on metrology and used accordingly throughout this thesis in order to sustain a structure of logical terms in this documentation.

I trust that the different universities practise some kind of management procedure, when introducing or settling the different courses length and size. With these different aspects presented, we must understand the importance of what to not only measure and study, but also how and by which means. The relation that will be important here is that of measuring the entity or attribute playing the greatest role in the different educational systems.

My hope is with the metrological understanding to help explain the different parts of the course structure and strengthen the issues of understanding the meaning of *why*. This means that we have to revise the purposes and worldly view before passing. The objectives explain the main aspect of the education with the purpose of compiling a general ontological mapping that may introduce the fundamentals of different educational systems. I hope that the same process will also reveal the veil that is hiding the differences.
4. Chapter four - My empirical findings

In the following chapter, I will present the empirical findings regarding the different educational systems based on an education program from each country. The information will be presented in an order of each educational system by itself.

4.1 Swedish University of Växjö

The University of Växjö (VXU) in Sweden has over 13000 students. All education provided in Växjö University is free of charge; there are no semester or monthly tuition fee. The educational program studied in this episode is the education program of Business informatics, which is part of the School of Mathematics and Business Informatics and majors in informatics.

4.1.1 Education system of Växjö University

Växjö University is to some extent adapted to the Bologna Process. The University has signed the Bologna Process declaration. The School of Mathematics and Business Informatics has, in the current state, no educations are running under the Bologna declaration system. However, the education program, courses, purposes and credits are evaluated to correspond with the Bologna ECTS system. The program studied is the bachelor program of Business informatics consists of a 6 semesters, which in Sweden is for a candidate diploma and is in correspondence with the Bologna declared Bachelor degree. The reason for this issue is that if the students receive 120 Swedish credit points for a candidate that they automatically are eligible for a bachelor because the amount of Credit points corresponds with 180 ECTS (see appendix IV). The Swedish credit points system evaluated and recognized by the ECTS. One Swedish credit points is equal to 1, 5 ECTS credit points consequently giving the student an awarded a candidate diploma 180 ECTS. One credit points equals one week of study time, where the total time for studying appears, estimated to 40 hours. Therefore, a 40-hour week schedule is equal to fulltime studies, and a 20-hour week is studies at half pace.

The students are eligible for a bachelor degree also when taking their candidacy. However, this is not an area, discussed any further, but considered during the process of evaluating different systems.

An education program running on full pace allows the student to be educated in 20 Swedish higher education credit points, equalling to 30 ECTS credits each semester. These credit points can be divided in different ways and into different courses throughout the semester. There is a standard of two categories of courses; the first a block with courses worth 5 credit points each and the second block with disciplines worth 10 credit points. The possibilities gives a student a choice of 4 courses during one semester sequentially, semi sequentially or simultaneous throughout the semester, and receive 5 credit points for each. Therefore, either a two course parallel structure or a sequential order followed. Every course must have some type of examination.

The program of Business Informatics, at VXU is, as illustrated in the graphical model below, a three year long for the candidate or bachelor degree. There exists two types of courses in this education program, one is compulsory and the other one is free of choice. The different form is integrated into courses that are relevant to the education program. Figure 4.1
shows 130 credit points worth of courses in the subject of business informatics, from which only 60 credit points is compulsory for graduating with a bachelor degree (marked with dark grey colour). To graduate the student must full fill a certain amount of credit points with the degree in informatics (see appendixes IV & VI). Please be aware of the figure below only represent the education component in Business Informatics and not free courses. There are also, the equivalents to the amount of credit points for the courses in informatics, 60 credit points, which are up to the student to choose disciplines for. The disciplines the students choose, does not necessarily need to be in the subject of informatics or IT-related, these may be psychology, sociology, economics or design. It is up to the student to choose his direction in these free courses.

The main aspect of the Swedish education is to produce students to think in relative terms. The student should be able to analyse and criticize different solutions and opportunities in the procedure and activity. The student is educated and trained in the related technical subjects and therefore allowing the students an academic education with a technical professional background.

The first two years are part of the basic block, which intend to educate the student in the general region of informatics and applied science. When entering the specialisation period,
the third year of the Business Informatics program, the student is obligated to choose a direction for future education. This does not mean that the education only regards advanced disciplines in the third year, only that the students are now becoming professionals with their own objectives in mind.

The courses in Sweden are, in general, incredibly similar in comparison when regarding the structure and length of the course. There are certain ways of stating length and volume of the course and content of it in regard of the purpose and objectives. The syllabus sets the purpose of course, which in turn is set through the objectives of the education in the curriculum. There is also another type of education, which is consistent of self-chosen courses, where the student can study 60 credit points, 20 credit points on each level, of informatics and therefore receive the diploma. The latter type of education is differentiated from the education program of informatics.

The different components define a course, meaning different parts or stages. Course components may be such as lectures that often are non-mandatory and selective in the subject of attendance. The next component of a course is practical works, which often are mandatory and required to passed, in order for the student to pass the course. Even though a course is not obligated to have all components, it is required to have some form of examination for the different knowledge components in the course.

A combination of tests, reports, lab work, degree projects, written - and/ or oral examination, examines the acquired knowledge. The exact type and combination may vary between examiner and course but an examination is always required. Most frequent are written examinations that makes up of the whole course, but there are numerous suggestions for improvement in this area.

The examination may take different amount of credits for the course, for example in some cases both an exam and a paper, where the paper makes up for 40 percent of the grade and the written exam makes up for the remaining 60 percent. On the subject of grading and degree setting, the University follows the National set requirements model (see appendix IV). The course work programme and planning must be stated in the course syllabus and is decided by the examiner at least six month in advanced, the examiner is the person responsible for the course but not always the lecturer.

One important aspect of the educational system is that courses not always run in full pace, for example the first semester is divided into two courses, each estimated credit length is 10 credit points, and they are run parallel through out the semester. The second semester is the opposite of the first, in the second semester there are two courses given sequentially and is each worth 10 Swedish credits.

4.1.2 The purpose and objectives

The third section in the curriculum for the program of Business Informatics presents the goals and objectives in educating and forming the students on a high academic structure. The vision is according to the curricular, to help the student to understand and to enforce, criticize, explain and vitalize all aspects in a development or research. The different areas presented in figure 4.2, is explained thoroughly after. Each domain of knowledge holds a set of areas that is covered.
4.2 The model illustrates the purpose of knowledge goal of different courses

The learning areas in each domain:

1. **The business fundamental areas hold the following subjects:**
   1. Business models, - procedures
   2. Functions and actors
   3. The surroundings
   4. Measurement and control of enterprises
   5. Systems, theories and aspects
   *Makes up between 10-15 % of the total courses*

2. **Interpersonal communications and team skills:**
   1. Communications between humans
   2. Work. in groups and leadership
   3. Cooperation, and coordination
   4. Processes, communication and coordination
   5. Tools for communication
   6. Media technology
   7. Systems, theories and aspect
   *Makes up between 15-25 % of the total courses*

3. **IT, data and media technology**
   1. Application development
   2. Internet architecture and development
   3. Databases- design and administration
   4. System infrastructure and integrations
   5. Media technology- interaction and mobility
   *Makes up between 25-30 % of the total courses*
4. **Analytic and critical thinking**
   1. Problem solving in business and enterprises
   2. Ethics and professionalism
   3. Creativity
   4. Methodism
   5. Reporting
   6. Abstract thinking
   7. Systems, theories and aspects
   *Makes up about 20% of the total courses*

5. **Information systems and business development**
   1. System analysis and design
   2. Design of business processes
   3. Information systems implementations
   4. Information systems projects – leadership and participation
   5. Information systems, to learn, change
   *Makes up about 20% of the total courses*

This section regards the underlying structure of the Business Informatics program that allows the program to be considered as very broad in the goals and knowledge objectives areas. The curricular show the different disciplines utilization upon how much time it has to its disposal. The different attribute of the course such as time affects components such as exercises, lectures and lab works and/or written examinations.

The meaning of a course in Sweden is that the course takers are to achieve some knowledge in a certain amount of time during a given period. A course is made of different components. The first and most common form is by lectures. A lecture is an oral presentation of a scientific area. The second form is exercise, explained in this university as a methodical attempt to enhance or improve a skill through certain adaptive (repeated) activities. Another method is through seminars where the students present and discuss their individual knowledge. The latter type is more common on higher level of courses than on lower.

The main theme through the courses is knowledge objectives; the different objectives may settle which kind of components, which are necessary and unnecessary. There is always a great importance in weighing in the credit point aspect. How much credit points the different course component should have, is a credit point to take under consideration long time before introducing the course. Before introducing a course, several aspects need to define. First, an estimation of the amount of pages a student has to read. The amount of pages is approximately 900 pages for a 5 credit point course. Once the awareness of the amount of pages is acquired, a proper time expression could help in settling hypotheses to test the actual time to spend in a course. Through these definitions and grounds, we are able to assume if the course is credited 5 credit points, it should have literature studies worth approximately 900 pages and 5 weeks of full time studies.

The last form of education is a examination that takes form as a trial of the obtained knowledge in a restricted area, and as mentioned before, a combination stated by the examiner.

Furthermore, it is important to set the amount of hours for lectures, exercises and the examination in each course. For example, a lecture is usually made up of two lecture hours, one lecture hour actually being 45 minutes. There are usually at least 8 hours of lectures per week for the student, most commonly during the first years of business informatics program. An exercise varies a lot in structure and length, but a written examination is often assigned 4-
5 hours of writing time for the student. There are also home written examinations, where the students have everything from one day to two weeks to finish the assignments and then finally turn them in. Another important aspect is the time for preparing and preparing for a class, from the lecturers and the students. This type of time is the hours of work for both the teacher and the student.

The education structure is set to credit point out different aspects of learning for the lectures, where the students are rather active and in many cases, this may be a barrier for passing a course. The student is often to participate in the lectures were he is supposed to have a critical attitude. One course in the sixth semester (Supply Chain Management), the students are required to hold a lecture on their own in groups of maximum three students. There is also the ethics and professions course in the eight semester. That can be studied by students just belonging to the education of business informatics, without any prerequisites for informatics courses.

The resources available for the course, such as staff and time in that matter, but also lecture halls etc. are also important when designing a course. There could be an overload in the teachers schedule and one course in particular is affected. Therefore, the actual lecturer manages to acquire a PhD that will hold lectures. However, a few factors is recognized between the educations, the PhD seldom has good experience in lecturing and pedagogic, a disadvantage. Most often, the content of the course is not the same as it would have been either.

The time students should prepare for a lecture or the time the student puts into his full time education is often overestimated, studies by the Central study-support foundation or CSN have showed that the student’s workload estimates to 20 hours per week. This contradicts the assumption that the students are to have a workload of 40 hours. The courses given in VXU are rather difficult to measure against standards in ECTS. The changes will be in affect by 2007.
4.1 German Fachhochschule of Heidelberg

The Fachhochschule Heidelberg (FH is an acronym for Fachhochschule) is a professional school or university of applied science is a private university. A rather young private university requires tuition by students for each semester. The education program, studied, is the Bachelor program of computer science.

4.2.1 The education system Fachhochschule Heidelberg of applied science

FH is adapting to the European credit system ECTS. FH has in the new system both bachelor and master. The bachelor degree requires a 7 semester’s long education, and the master requires another 4 semesters. According to the Bologna, a bachelor can be 6, 7 or eight semesters long. The reason why FH Heidelberg has 7 semesters bachelor education is most likely the old diploma system. In this new system, each semester is made up of approximately 19 periodic scheduled weeks. The education in a semester, or module, consists of 30 credit points. To attain a bachelor the student is required to accomplish/ pass at least 180 credit points of the 210 credits for the 7 semesters. This means that the student must pass 24 credits out of the 30 in each semester. For the fifth module, 30 credits are awarded, where the student to have a practical semester for a company. The courses in the different modules are worth 2, 4 or 6 credit points, except for the thesis and master course. The latter may be worth 16 credits. The main estimation process in the settling of the extent of a course is through an understanding of the complexity of acquiring the knowledge and qualifications.

Figure 4.3 indicates the different courses in the program. There is information about the courses, such as the anticipated workload and the time of lectures and practice; thus the degree of difficulty in the course. In front of every course the title and course code and to the left you can easily map the course status of which module / semester of the course. The SWS (Semester Wochenstunden, the lecture hours actually only 45 minutes) indicates the amount of education hours set for the component each week. For example, a course may have 4 education hours per week, 3 of these hours are lectures and 1 hour is practical work per week.

<p>| Module 1 | Component: | B10 Mathematics I Lectures: 3 SWS Practice: 1SWS Work load : 110h CP= 4 |
| Module 2 | Component: | B20 Math II Lectures: 3 SWS Practice: 1SWS Work load : 110h CP= 4 |
|          | Component: | B11 Company Architecture Lectures: 3 SWS Practice: 1SWS Work load:110h CP= 6 |
|          | Component: | B12 Applied informatics Lectures: 3 SWS Practice: 1SWS Work load:170h CP= 6 |
|          | Component: | B13 Theoretical CS Lectures: 3 SWS Practice: 1SWS Work load:170h CP= 6 |
|          | Component: | B14 Program development I Lectures: 3 SWS Practice: 1SWS Work load:170h CP= 6 |
|          | Component: | B15 Key qualifications I Lectures: 3 SWS Practice: 1SWS Work load : 50h CP= 2 |
|          | Component: | B21 Program development II Lectures: 3 SWS Practice: 1SWS Work load:110h CP= 4 |
|          | Component: | B22 Databases Lectures: 3 SWS Practice: 1SWS Work load:110h CP= 4 |
|          | Component: | B23 Applied Informatics II Lectures: 3 SWS Practice: 1SWS Work load:170h CP= 4 |
|          | Component: | B24 Software engineering Lectures: 3 SWS Practice: 1SWS Work load:110h CP= 4 |
|          | Component: | B25 Key qualifications II Lectures: 3 SWS Practice: 1SWS Work load:170h CP= 6 |</p>
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<td>B40 Communications and Network</td>
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<td>B41 Project Works II</td>
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<td>B43 Internet Technology</td>
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<tr>
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<td>B35 Data Security and General Security</td>
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<tr>
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</table>
In the Bachelor program, the space in the fifth module is for internship, mandatory for all students and most of the students land a job directly after receiving their education diploma.

During the education a set of key qualifications are to be merged into the curriculum, this framework introduces social management/interaction theories and is purposed to improve the student for the future education/work (English, Business English, Presentation techniques, Rhetoric, Teamwork, Project management, Leadership, guidance). This will help in experiencing and learning the potentials in vocational fields. These moments are applied through other courses and programs offered by Fachhochschule Heidelberg (key qualifications II and I). Furthermore, additive courses offered, takes place parallel to the standard curriculum, characterized in English/Business English, applicant training etc. The students are educated in these areas during the first modules. The actual testing and measurement of skills in these areas measured throughout the education.

4.2.2 The purpose and objectives

The information regarding the teaching of informatics has been, to some extent, from the presentation: “Important Elements of the study in Business Informatics at the Fachhochschule Heidelberg University of Applied Sciences Department of Computer Science” by Prof. Alfred Moos. Furthermore, much of the information was received from Professor Gerd Moeckel, currently a professor at the informatics department in Heidelberg University of Applied Science, during the conference in Växjö held in Mars 2006. The German Diploma supplement has a section regarding the goals and qualifications that will be achieved when graduating, outlined in section 4.2 of the ECTS diploma supplement.

The main goal with the education is to help their “Clients” (students) to get jobs through the different knowledge components, which they learn during their university time. The goals and guidance ideas, which the courses of study pursue, are set to educate the students of practice, internationalization and innovation orientated educations. This objective is upheld, through procedure of enhancing the education and course descriptions in ideas of not only learning goals but also qualifications acquired after the education. The qualifications and learning objectives are in close relation to the different demands from the job-market. The learning goals represent the actual things that the student should comprehend and manage after each knowledge unit, the qualification acquired by the modules and some knowledge
areas. The difference between the two subjects is the latter is more general and abstract than the first.

The main objective with the current curriculum is giving technological knowledge to the student in the different areas, which in the present day is of great importance. The education focuses to educate the student into a basic and general school the first year, which the second year consequently builds upon. In the fourth key module, the students commence into specialising their educations. Therefore, most disciplines in the fourth module are compulsory where the student combines his ground knowledge in the bases of computer science around a broad knowledge in the methods and application possibilities to mediate in selected current innovative topics, including problem definition subjects.

The methods of educating represent the focus on the students learning to abstractly evaluate and analyse problems and solutions. This method is to help in constructing an approach that creates general problem solution procedures.

FH measures the knowledge through a set of tests in each component. These tests may vary and can be combined in practice work (PRA), written exam (KLS) or/and essay (REF).

The important aspect of this type of module segmentation is that it holds a set of knowledge units/components or qualifications goals for each module that may be referred to as knowledge components. These knowledge components are the same as courses. Before each module starts, a certain amount of hours is pre-set for each knowledge component concerning the lectures that may be given. The knowledge components are examined, through practical assignments and often written examinations. These are always compulsory in a course, separated by a mid-term examination that is in the middle of the semester, and a final examination. The students are obligated to pass the mid-term exam and they may not write the final examination if she does not pass the mid-term examination. Although this may seem rough, the student can to redo the examination when the student passed the mid-term during that period before the final examination, if the student fails to pass the final examination. All courses final examination is at the same time, consequently for the reason of them running parallel.

The distribution of credit points between the different knowledge components is done through measuring the workload and the level of complexity the component would have on the student. According to the ECTS the student are to learn maximum 30 ECTS per semester, one ECTS equals an amount of 28 learning hours. A lecture hour is one type of learning hour and one lecture is mainly 45 minutes and is often given in pairs so that makes up a total of 90 minutes. One main issue is to calculate the amount of hours the teacher has to put in when having a lecture hours or SWS for the students. In FH’s model, the amount of the workload for a student calculates to 38 % of the learning time for the student is against the teachers, meaning an interaction between student and teacher/lecturer.
4.3 Technological University of Tajikistan (and its Khujand Branch)

The Khujand branch of technological university of Tajikistan (Acronym KBTUT) started in March of 1993. There are approximately 1340 students residing at KBTUT. The university makes up of three faculties one of which is the Informatics and technology faculty. Within informatics, there are three departments, programming and IT, Higher mathematics and Physics and Chemistry and technology of food production. After entering the 21st century, the Tajikistani ministry of education introduced new educations and more students have applied to the university. The Educational system at KBTUT build on the old soviet educational system, Tajikistan once where a part of the Soviet Union.

4.3.1 Education system of KBTUT:

At the present, there is a process of development for two new education programs. The bachelor education program, which is studied, is Software of calculating techniques and automated systems. Structuring of the disciplines is the most common aspect when structuring the education. The curriculum presents different disciplines as part of three different modules. There are three different modules within the education, General educational module disciplines, General professional module (basic) disciplines and Profile module discipline. All the disciplines follow under these three modules, which set the different disciplines in general-, compulsory-, professional- and advanced categories. It is a four-year education for diploma, branched in eight sequential semesters. One aspect would be the time appliance. The time appliance is that the education time for each student is of a total 19 weeks per semester. These 19 weeks are to be divided according to the following: the semester starts with 6 weeks of education followed by 1 week of examination, meaning that the students knowledge is tested in some kind of laboratory work or paper assignments. After passing this part, the students have another 6 weeks period of education for the same courses. After these weeks, an examination is to measure the student’s knowledge, once again by one week of examination work. After this examination, the student is educated in a final set of 3 weeks education period to finish off with 2 weeks of final examination. If the student does not pass any of the first exams, he/she is to redo them until he passes. Unless the student has not passed all the exams, he/she is justified to pass the entire course.

The main objective, with the education of Tajikistan, is to offer a professional education to their students. By allowing, the student to choose a sum of credits to their own profile that would ensure certain qualification and knowledge, and therefore being the possibility of being educated in their respective areas to some extent.
Figure 4.4 illustrates the overlapping in the courses presented in the curricular for the educational system. The main idea is to create a stable foundation that the profile education can build on.

The General educational is made up of general disciplines as a part of the basic education that all Tajikistani students must study. These courses are the same for the education programs across Tajikistan. These basic, but compulsory, disciplines are implemented through the education mostly during the first year. This module sets 30 percent of the educations disciplines.

The General professional (basic) disciplines, makes a total of 50 percent of the education and is set on educating the students in such things as economics and mathematics.

The Profile disciplines, profiles the student to their area of specialization. These disciplines are best relevant to the subject that advances the student into a greater practical education such as design or consultant. These modules are disciplines, in the 7th and 8th semester. This module makes up of 25% of the education and is set on four different areas, presented in the curriculum. The education plan for these semesters are that 50% of the education is compulsory and that 50% is free of choice, so each of the last two semesters, the student is free to choose eight credits in some terms and 7 credits in others.

The last year is for the student to specialize the acquired knowledge throughout the education. There are a variety of courses that lets allows the student to specialize, which can be within the two subjects presented in figure 4.5.

Every discipline is a part of a program. The courses are held through the whole semester including one midterm examination, and one final exam for each course. The courses examinations are at the same time, three times each period. The examination evaluation procedure is to grade the student between 0 and 10 points, 3 and above meaning passed. A Tajikistani credit estimates to be worth approximately 2 ECTS credits.
Curriculum of 2204-Software of calculating techniques and automated systems”

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<tr>
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<th>Credit points</th>
<th>Distribution of credits between courses and semesters</th>
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**Basic disciplines**

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<td>Basics of Web-design (Macromedia Dreamweaver)</td>
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**Profile disciplines**

**Direction 1: Web – programming**

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Figure 4.5: The courses and semesters of the education program of “2204-Software of calculating techniques and automated systems”

All the disciplines are measured by credit hours, meaning the hours required for a credit. One credit point equals 50 minutes of auditory lectures each week for 15 weeks of lecture excluding the examination periods. This means disciplines that holds three credits has three lecture hours per week for the duration of the 15 weeks, making the 45 lecture hours. There is also the same amount on the side for “self study time” during these 19 weeks of education. Nevertheless, there is also one hour per week for consultation and handling over tasks, lasting 19 weeks. These numbers would make up of a total of 53 hours of workload for the student per KBTUT credit. The syllabuses illustrate the different courses are task orientated, and by this, one must understand the task. Figure 4.6 explains the Tajikistani rules of engagement in the educational system.
4.3.2 The purpose and objectives

The objective with the education is set through the course of the student collecting points through the process of studying and learning. The different areas, studied, are the ones indicated by figure 4.5. To ensure that the students are studying and upholding a good quality for their studies there is currently a system for controlling and grading the students, through a 600-credit point semester presented in figure 4.6. The points referred to here in this section regarding the control form and measuring of the education accomplishments is not the same as the credit points issued for a course, these credit points are to measure the accomplishments and participation of the student during the semester in courses.

<table>
<thead>
<tr>
<th>Mark content (control form and criteria of an estimation)</th>
</tr>
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<tbody>
<tr>
<td>Process of study and learning of materials by students is estimated based on 600-credit point system.</td>
</tr>
<tr>
<td>Each week student attendance in lessons is estimated up to 10 points: for lectures-4 points, laboratory-practical-3 points, laboratory- 3 points. Totally, during the summarizing the first current control student can get up to 60 points, the second also up to 60 points, and the third up to 30 points, all up to 150 points, i.e. for attendance in lessons students can get up to 25% from the general possible amount of points.</td>
</tr>
<tr>
<td>The quality of performance of laboratory works is estimated up to 10 points by results of check each week. Totally during summarizing the first current control student can get up to 60 points, in the second also up to 60 points, and in the third up to 30 points. On quality of performance of works student can get up to 150 points during semester, i.e. up to 25 % from the general possible amount of points.</td>
</tr>
<tr>
<td>The result of each current control exams is estimated up to 75 points, i.e. from two current control exams student can get up to 150 points, i.e. up to 25 % from the general possible amount of points.</td>
</tr>
<tr>
<td>After the first current control exam student can get up to 195 points, and after the second one also up to 195 points.</td>
</tr>
<tr>
<td>Before final exam student can get up to 450 points.</td>
</tr>
<tr>
<td>Results of final exam are estimated up to 150 points, i.e. up to 25% from general possible amount of points.</td>
</tr>
<tr>
<td>In the end total amount of received points on all parameters are transferred in a rating scale from 2 up to 10. The student who has from 550 till 600 points gets mark 10, 9 from 501 till 549 points, 8 from 450 till 499 points, 7 – from 400 till 449 points, 6 – from 350 till 399 points, 5 – from 325 till 349 points, 4 – from 300 till 324 points, 3 – from 250 till 299 points, 2 – from 200 till 249 points, 1 – from 150 till 199 points, 0 – from 0 till 149 points.</td>
</tr>
</tbody>
</table>

Figure 4.6: The 600-credit semester.

This controlling system explains the essence of the measurement used in Tajikistan. The 600-credit point system in the education structure can be simplified. As mentioned before, the education is set up to be in 5 periods per semester.

- **6 weeks of education**, this period a student can achieve 60 + 60 points.
- **1 week of examination** - at the end of this week, the student can achieve 75 points
- **6 weeks of education**, this period a student can achieve 60 + 60 credit points.
1 week of examination- at the end of this week, the student can achieve 75 points
3 weeks of education-, this period a student can achieve 30 + 60 points.
2 week of examination- at the end of this week, the student can achieve 150 points

The education weeks constitutes a 300 credit points. 150 of these credits are for attendance and 150 are for the quality of performance (practical works and lectures). Each mid term examination is worth 75 credit points, and the final examinations are worth 150, thus giving a total of 600 credits points. Through this, the final grade is set for the courses. Depending on the results from the examination, the student is given a certain amount of points but maximum for all examinations together is 300 points. A student is able to pass a course without attending certain parts of a course.
5. Chapter five – analysis and results

In this chapter, I will analyse all the empirical data with the purpose of defining the different subjects and activities that exist in the systems. In other words, compare courses and the education program to some extent with the purpose of studying the possibility to translate the courses between the different education systems ontologies.

5.1 The educational systems

The variation between the studied educational systems is quite large in e.g. cultural aspects, size, purposes and education programs. There are different ideologies surrounding different types of educational systems, also concerning the main idea of practice and education program. The main ideology in FH surrounds integrating the students into the present job market, through directing the student’s current education towards an expertise-structured education that will make the student become an expert within his area of education. On the other hand, the education at VXU is rather general in terms of subject of informatics. The business informatics program in VXU, build on the academically training the students in contraire to KBTUT main ideology.

Education is one of the main tools when building an infrastructure of humankind, relating to the Humboldt’s beliefs. Both VXU and FH have a 2-year common basic education structure. During these 2 years, the students are educated in subjects related to the area of expertise (commonly known as general profession). After two years, the student is to advance into more profiled areas within the professions.

The educational system in KBTUT is some type of intermediate version based in which the students are to be educated in general education, such as philosophy and language. The students would receive the exact same education, whether the students are studying metrology or computer scientist, as their major, thus being the only one of the education that really implements the thoughts of Humboldt’s third principle. One main aspect during the first two years in KBTUT is that the students will be educated in self-chosen disciplines. The educational system at VXU is more into the area of educating and producing academics that was a vital part of Humboldt’s research. The differentiation is that, issues that where essential two centuries ago are not the same as today and therefore the education in Växjö have not only implemented the academically higher educational system perspective but also updated it to fit the needs required for the present day of age. Here we may find a strong cultural impact on the education of KBTUT, where the general basic education includes the Tajikistan (Russian) language and history. This is because of the strong structure with disciplines coming probably from their Weltanschauung. The education at FH Heidelberg is currently in an interlude between the former diploma and the ideas of the Bologna Process. FH Heidelberg base the education on the career and qualification principles, but has not yet come to meet some points, such as academically critical and abstract thinking as pointed out by Humboldt.

The basic education in the different academies is according to Humboldt’s principles. The structure of learning and education has differed from system to system, but the empirical data indicated that there are several types of learning related to the knowledge objectives, in the studied systems commonly as different types of cognitive knowledge in Bloom’s Taxonomy.
Another important issue regards the meaning of things. For example, the meaning of a course or the things measured in a course to settle the different knowledge components. All of the systems accept the “course” as a distinct related object to the objectives. The objectives could help in the structuring when issuing the level of education that would apply for the knowledge that premeditates if the knowledge or education is on the right level.

Another important aspect in measuring knowledge units and components is the examination. There are a few types of measuring steps when measuring the examination. VXU and FH follow a structure that already is adapted to the ECTS standard. The knowledge acquired by the student is in different ways examined. VXU, offer their students many different types of examination forms. The student are in some cases able to influent the different examination forms, both FH and KBTUT tries to examine their students in a process holding at-least one mid term examination and one final examination. Furthermore, the findings show that the knowledge measured in VXU and FH differs slightly from KBTUT, because KBTUT measures the education through a continuous tool of crediting. Furthermore, KBTUT measures not only the examinations and lab results but also presence (in lectures, laborations and examinations) but also to the extent the student is efficient in conveying the knowledge. The main question here have been “what is measured in different the educational systems?”. We may incline standardization, by deriving data from our metrology theory in accordance with Langefors (1966) and through this mapping different views and concepts in each system. In both VXU and FH, we find important aspects of the courses that are relevant when introducing the courses and knowledge units. The important aspects here are under consideration when evaluating the volume of the course.

Throughout the education, focus is on the students ability to collect, analyse, communicate and implement problems and solutions and this is thought through the different parts of the knowledge component. This focus aligned with Blooms taxonomy of cognitive knowledge will help to ensure the structure for good goals in a course.

5.1.1 The formation and objectives

Even though there is a great variation between different systems, we can find a common basis from where the system would be analysed. Though analysing each system with the purpose of describing all the system, I was able to design the structure of the education systems, according to Sofia Pinto (1999). By using the different questions presented by Sofia Pinot (1999), I was able analyse the different educational system. My approach has been to analyse different aspects of the educational systems from the perspective of Sofia Pinto (199) and at the same time apply another model for developing the framework. The Framework builds on the IS development model by Langefors (1966). The structure developed, is main structured according to the assumption of finding the most relevant facts of all the educational systems. My first assumption was obvious in finding the relevant purpose of the educational systems; this aspect brings fourth ways for understanding from the different systems but is never the less of great importance when explaining the Weltanschauung. The second assumption regards the time aspect that connects the purpose and fulfilment criterias of the education. The different forms and activities in the education should be part related to each other in a general perspective. These aspects of knowledge should implicate the meaning of more specific components, while the purpose is the final goals with the whole education.

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<table>
<thead>
<tr>
<th>Name:</th>
<th>Education at Växjö University</th>
<th>Education at FH</th>
<th>Education at KBTUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose:</td>
<td>To educate the students in becoming academically highly skilled professional within their area of technical expertise. Relating the subjects of time, course and activity.</td>
<td>To qualify their clients as professionals and also for further education. Restricted by the time expression and domains.</td>
<td>To educate their students in the different areas which seems to be technical prospering for the future? And simultaneously let the students to work on the side. Credits relating to the module in the sense of disciplines</td>
</tr>
<tr>
<td>Time expression:</td>
<td>1 point equals to 1 week of education, or 40 hours of work. 1 point = 1,5 ECTS cp, One semester = 30 ECTS credit points, also 800 h = 20 weeks of education each semester</td>
<td>1 ECTS= 28 h of education, one module is made up of 30 ECTS, that is 8,40 h per semester. Equal to 19 weeks of education.</td>
<td>1 credit = 15 hours of lecture and 15 hours of self study over the whole semester of 15 weeks. On credit is equal to 1,125 ECTS cp. a semester is made up of approximately 18 ECTS equal to 480 h of education in one term.</td>
</tr>
<tr>
<td>Educating forms:</td>
<td>Size is to be At least 5 points, equal to 7,5 ECTS cp. The students are to enrol in 2-4 courses each semester, either parallel - or sequentially ran.</td>
<td>30 ECTS credit point per module, different division, in about 6 different knowledge units that all run parallel for introducing and teaching in the respective area of expertise</td>
<td>15 points per semester, the disciplines come from one of the three module domain, it is about 5 disciplines each semester, all disciplines run parallel.</td>
</tr>
<tr>
<td>Activity Domain:</td>
<td>The different activities are such as, lectures, practical works and examination – all of these activities are closely related to the other domain.</td>
<td>The module is to be finalised by the form of collecting all the related credits in that module. Only the examination counts an activity that is measured</td>
<td>Different activities are as the previous ones, with one certain emphasis on the content and not on purpose. The main aspects that are considered today is the ECTS directives</td>
</tr>
<tr>
<td>Objectives:</td>
<td>To enforce and directs a linear education through course components being measured in not only examinations but also in lectures and involvedness.</td>
<td>The results examinations and thesis makes out of the achievements of the education by the student to uptain the purpose of all knowledge goals for the education.</td>
<td>The objectives are measured by the student completing all disciplines, the 600 credit point system, is used where everything during the semester counts in to the total grade.</td>
</tr>
</tbody>
</table>

Figure 5.1: the education systems of VXU, FH, KBTUT
The recognition of these components allowed us to research the different educations and by these components, we are able to differentiate the semantics and the structure. These components only show us the format of the research and not the content of the information, which we are looking for. Flensborg (2004), explains the need of the context we are in need of understanding. The different system remains to relate, between each other. The relating procedure is through the process of understanding the fundamentals of each formatting object. The information presented in figure 5.1 where the different tables square of information that are filled in and concerns the separate education system.

The different areas in each education system are components extended and developed according to Langefors (1966) on analysing information systems, of main objectives. The method used to explore the area of objectives was generally testing data from an infological perspective. However, when exploring the data we ended up with only one certifiable result that was consistent against the purpose of this thesis, this being the information for the mapping of the courses. The structure and purpose was possible by using Habermas’s principles. By understanding this principle and then explaining the subject, I was able to give concrete subjects at first that really matters in the understanding of the concepts and structures in the education system, and yet being able to construct a formal understanding. An example that may help in understanding this construction occurs in understanding that is considered as the main purpose of the education. The procedure starts with analysing and designing according to the development purpose. The main purpose of the education is mostly a general and collective perspective in understanding the part goals. This takes us to the different parts of the education or and activities. The purpose in Langefors’s formula, would translate into I, the activities and learning methods along with the objectives states the information or D (the content of the courses) and transitions areas. Another main aspect that is brought on by Langefors regards the time is relative to the purpose of knowledge or education, as figure 5.2 indicates. The latter parts of this example show the architecture and construction of the education systems. The construction and analysis approach is following two principles. The first, understanding and decomposing the different models, this principles is most visible in this example. The second principle explains different decomposed structures and components that may be progressed through constructing the main aspects of the systems into ontologies and a formal understanding.

The different components, such as disciplines are associated throughout the sub objectives. My belief is that the structures and basic understanding in the different structures is controlled and an understanding that through this the Weltanschauung of each system be found. Therefore, I have concentrated on this subject, in my analysis in order to get firm and concrete results that may help in solving the different problems regarding conceptual mapping and understanding between different education systems.

A course can through the structure of its component or actually the state of its components, be defined, according to Langefors (1966). That is, well structured to fit the need of a semantic true description. A course is composed of lectures, exercises and examination, which should represent the purpose of the course. Through these, the purpose or knowledge is supposed to be educated. These three parts of a course are rather regular to the main form of objectives states above. The objectives are purposes to obtain some type of accomplishments during the education. The type and amount of knowledge, which the student is to acquire after the course in different types of learning is completely dependent on the volume of the course in thought of time expression and extent for the education and its courses in specific.
With Bloom’s taxonomy, we can map different learning forms in the courses. Three of the most common founded here are the lectures, the lab works and the examinations. The different education systems measure the knowledge similar. Only that KBTUT has different knowledge components measured and tested throughout the courses instead of just examinations. The procedure in KBTUT also holds other aspects such as presence in class by the students and other similar areas. KBTUT has inserted aspects of examining a course that in some aspects are very different from both the courses in VXU and FH.

One reoccurring subject in all three educations is the time expression aspect. This aspect is rather important and there are three different views on it; one consistent thing in all systems is the amount of credits states the amount of time and often the complexity of the course. The time allows the setting the amount of lectures and helps the forming of the different knowledge components and courses. The time aspect generates yet another aspect that FH differs from the others. This aspect shows that the Weltanschauung is rather complex. An example of this is when a course in FH has been credited the same but have different amount of workload is the specialisation courses in module 6, where MI 4 and GI 5. The different courses are both credited 6 ECTS, but the latter is only provided with 110 hours of workload while the first is provided with 170 hours.

5.2 Structure and meaning

The data structured used in the last section can be to manifest a model for the education systems. The need for an extensive work in constructing an education system was one of the issues this study faced. As mentioned before Langefors’s (1966, 1969) ideas about analysing the state of different attributes properties would help ensure a greater result. The reason being, different structures of courses are different, between education systems. We might be able to apprehend what VXU considers of a course main concepts and goals, through first understanding how the main structure constructed and conceptualised. Before trying to move further, in explaining why a course is structured in a particular way at VXU. These structure ideas is much aligned with May (2001) in harmonisation of Habermas study theory on building bridges. This type of understanding and explaining would help conceptualising the different systems at hand by unfolding the concepts exhaustively so they may not be misjudged or misused.

The IDEF method along with Habermas and Langefors (1966) and Sofia Pinto’s (1999) will be used to integrate the concepts and relations introduced. The design used for the different systems in the upcoming ontology has its basics in the information from figure 4.1. The analysis chapter will be structured based on the information presented earlier. The following section will first regard practical areas of different components in the education systems through conceptual models that should help evaluate the role of a middleware for interpretation and translation.

The conceptual model will be an illustrative model of the different systems and their data, the models relates to practical components of the system in question for the final assessment. There will be some type of hierarchy where different classes are not to be confused with the components of classes or domains Sofia Pinto (1999). The conceptual graph indicates what parts of the education are important in the systems. The semantics between the different objects is stated in a logical prominence to the subjects. In this phase, we must follow the procedures on conceptualising in accordance with the information given in figure 5.1. The data here must be extracted. This may help us in the process of creating different classes and components of education used according to Pinto (1999) and the IDEF method. The
dissemination of objects from the different systems will help us in the process of creating the ontology.

These approaches should help me define and structure the different concepts and later map them between the different systems. The different objects and activities used related to the illustration of the systems different concepts and domains in the development process in the following episodes, the conceptualising of the education systems.

Please observe that the following models only hold different relations and furthermore different objects that I have found as essential to this studies purpose, as coordinated by Sofia Pinto (1999). Furthermore, a structure do not explain anything, it is only a set of concepts with relating subjects and objects.

5.2.1 Conceptualising VXU

The different concepts acknowledged from this education system are objectives, study hour, extent, course components, type of component, lectures, lab work and examination.

Figure 5.2 shows the objectives semantically meaning toward the course component. It does not show the semantics of the certain object but the semantic between the different components. The knowledge objectives from the examination are nevertheless a part of the course’s components. The affect of study hours in a course component is often rather extensive. The extent of a course must be defined accordingly to the amount of hours. When all the segments are presented, we are able to understand the issue regarding object state and perhaps the Weltanschauung.

The model is to specify the different components used. To reach the objectives during the amount of hours provided for the course component. The Weltanschauung in the courses would look something like below.
The conceptual graph structures the different concepts of objectives that define the course components, and instance of this definition is the type of component. The different types of components and the extent are illustrated as instances. These are indirectly related to the *Study Hours*, but directly related to the extent.

The conceptual graph help to understand the state of a course according to the metrological formula, from this existence there is a possibility of mapping the different activities that occurs for a course in VXU.

The formula would look something quite like this for the entity course:

\[
\text{Attribute name: Volume} \rightarrow \text{Meas. value: 5, Meas. unit: points, Meas. procedure: one week, 40 h=1 point, Time: Autumn of 2006, Weltanschauung: Student work}
\]

This conceptual graph aligns with the measurement procedure for VXU. Both show indication of object state, through conducting an illusive calculation we are able to find the different relations and attributes related to the state of a course. As indicated in figures 5.2 and 5.3, the course component have major influence on the education. This great influence comes with the responsibility of holding other different concepts in its domain is implied earlier according to the different education systems. The course must statute the learning goals or objectives from a rather abstract view, and the study hours implemented in the period of time the course have in the semester. The mapping below in figure 5.3 illustrates the course domain and close related subjects. These mappings should in parallel with the conceptual graphs help to understand how the different systems work. Furthermore, there is a possibility that they will in some regards map between each other.
5.2.2 Conceptualising FH

The different concepts acknowledged from the education system of FH are qualification / learning goals, module, workload, complexity, knowledge components and activity components.

Figure 5.3 shows the conceptual meaning of the different knowledge components and their relations to the purpose for the education. FH on one hand has their objectives in the area of knowledge components, which subjected for the student to apprehend when passed this module.

The concepts brought forth in figure 5.4 specify the objectives of FH. Each module is supposed to hold the purpose of education through different knowledge components measured in workload e.g. ECTS credits. The ECTS credits would further along be a great important factor for the ontological mapping of this system, when regarding its great influence and relation to other concepts acknowledged. The structure bases on the learning
goals are the reason for different modules and the extent of a knowledge component is set based on the study hours and the complexity.

The conceptual graph for the FH illustrates the specific aspects implemented in the metrological formula, which will help to manifest an equation that helps state the volume for a course in FH.

The formula would look something quite like this for the entity course:

\[
<\text{Attribute name: Volume}> \rightarrow <\text{Meas. value: 6}>
<\text{Meas. unit: ECTS}>
<\text{Meas. procedure: unknown}>
<\text{Time: Autumn of 2006}>
<\text{Weltanschauung: Qualification units}>
\]

Even in the case of FH, we may observe the conceptual graph aligned with the formula for accessing the object state. The ontology for FH is based on the module structure of qualification and learning goals. Each knowledge components is decided through rough estimations of the workload and the complexity the educations. The main idea with this system is to set the students into a module interpreted purpose objectified domain of education. Meaning that the objectives with the education are divided between the different semesters and furthermore, that the objectives and goals are defined through the content of the course. The difference here is that the content is much based on that of the complexity of
the course instead of just the length, measured in workload or weeks. The objectives are here implemented from the education goals in part goals such as the learning/qualification goals.

**Education System at FH**

![Diagram of education system](image)

*Figure 5.5: An ontological mapping over the education at FH*

The structure of the education system from an ontological organisational perspective shows the figure stated above. The structure shows education and its main relations within the system, as they would look like in a general perspective. The ontology generates the following components: module, workload, knowledge component, Lecture, Practical Assignment and Examination.
5.2.3 Conceptualising KBTUT

The different concepts acknowledged from this education system are module, discipline, purpose, lecture, practice, exams and credit points.

Figure 5.6 shows the conceptual graph for the course and the different relating component that assist in settling the state of the object. Each discipline has goals and purposes, divided into different active components, such as lectures, practice and examination. These three make up of the whole credit point system for the semester, measured in credit points. Figure 5.6 shows the whole process states above, which are in a simple, conceptual manner.

The model specifies the different components used to reach the objectives during the amount of hours applied in the course component.

![Conceptual Graph over KBTUT](image)

Figure 5.7: Conceptual graph over KBTUT

This conceptual graph help understand the state of a course according to the metrological formula. From this existence, there is a possibility of mapping the different activities that occurs for a course in KBTUT. Different aspects that differentiate this graph from the graphs of the other education systems are that measuring of goal and the purpose on the generalised and the specialised instances. Otherwise, we can see that the different conceptual graphs are in many places similar.

The formula would look something quite like this for the entity course, the reason why I choose to elaborate on the volume of the course, was to facilitate a basic understanding of how this subject is structured and measured in all education systems. Another important subject in KBTUT is measuring the students’ efficiency for the semester through the 600 credit system.
Therefore, an understanding must be done of explicitly explaining a division of learning goals and qualifications.

<Attribute name: Volume> \(\Rightarrow\) <Meas. value: 2 >
<Meas. unit: credit points>
<Meas. procedure: \(X\) credit points \(*\ (15*2)\)>
<Time: Autumn of 2006>
<Weltanschauung: Study time >

This metrological formula is set to meet the criteria for setting the attribute volume in the different courses in Tajikistan. The measuring would require the amount of credits needed. There is also a purpose for the courses and this purpose measured through another formula, the 600-credit system. The result for this formula can easily translate a course from VXU to the credit point of KBTUT. The other way around would unfortunately be rather difficult. The component further down in the model obeys the components higher, in some type of dependency relationship. The education system here has a set of direct objectives or goals that help in the controlling of time limit for each credit. The impact from the credit point or the activities surrounding the control of them, on the forming modules in our ontology is therefore rather immense. These credit points are here measuring the training factors and not only the goals, which is a very important aspect of the ontology for KBTUT.

Education system of Tajikistan

![Diagram of Education system of Tajikistan]

Figure 5.7: an ontological mapping over the education at FH
The structure of the education system from an ontological organisational perspective shows the figure stated above for KBTUT. The construction, of this structure, is through a series of procedures, mainly through structuring and conceptualising, according to Sofia Pinto (1999). The ontology breeds the following components; Module (in the since of the disciplines of education, purpose /training factors, workload, discipline (that holds the abstract purpose of advancing), lecture, practice, examination and the 600 credit point system (An achievement measurement tool).

5.2.3 Conceptualising ECTS (Bologna System)

The Bologna System would show to some extent by FH structure and system. The data for ECTS and the bologna is gathered and analysed from the empirical data from FH and the Diploma supplement presented for the Bologna committee, based on the guidelines for important aspects of education programs by UNESCO/Cepes. Please understand that this section regarding the conceptualisation of the ECTS, is not concretely regarded in the empirical chapter, instead this is realised through understanding the different conceptualisations of the educations systems and through them I have created this conceptualisation that may be used as a middleware.

The Bologna System considers an education as means for reaching certain qualifications. The concept of qualifications in this system, are in different areas. These areas can be as courses or subject areas. They also consider learning goals for conceptualising a course. The learning goals are part of a bigger qualification goal represented by the goals of the education. One ECTS corresponds with 25 to 30 hours of study; the students are to study a maximum of 30 credits per semester. The learning goals inflict the most important aspect of the ECTS, from these the course content is set and furthermore from the course content the course workload and complexity can be set.

The guidelines that exist today according to the UNESCO present strong recommendations concerning the principles and good practice behind effective education. The education system is much like the one at FH, so the same differences occur between the other systems. The structure illustrated by the conceptual graph is that the qualification is a rather general goal with the course, while the content of the course derives from the different learning goals. The content of a course is realised through a series of methods or moments that should help the students acquire the right qualification in the end.
The structure presented in the Conceptual graph allows us to conceptualise the ontology for the ECTS, the main concept here is the goal and purpose of the education.

\[
\text{<Attribute name: Volume> } \rightarrow \text{<Meas. value: 5>}
\]
\[
\text{<Meas. unit: ECTS credits>}
\]
\[
\text{<Meas. procedure: Learning Units (content*workload)>}
\]
\[
\text{<Time: Autumn of 2006>}
\]
\[
\text{<Weltanschauung: Study time for qualifying>}
\]

This metrological formula is set to meet the criteria for setting the attribute volume in the different learning goals in the Bologna system. The measuring would require the content of the course to start the formula from the content and factors regarding them an estimate of workload settled for the course. From the estimated amount of hours for the course the amount of ECTS credit points, can be derived. One ECTS is a maximum of 30 hours of study hours for the student.

The different conceptualisations can be directly compared against Bologna systems.
The structure of the education system from an ontological organisational perspective shows the figure stated above for the bologna. The ontology breeds the following components for the Bologna system: Module, Content, workload, Acquiring methods (lecture, practical assignment and examination), learning goal and qualification.

5.3 Mapping the concepts between the different systems

The last section, inflict different objects and structure for each education system. The next step uses these negotiable instruments for creating a terminology between the different education systems. This means that a set of terms and concept should be standardized may apply for all different systems involved. To do this we must analyse the concepts brought by the different conceptual graphs and ontologies. The aspects, which are compatible, are explained first, then moving on to subject of purpose and time expressions.

The different objects and their attributes must be set into a common terminology, the one used here is ECTS (see appendix VII). In the table below, we can observe the illustrated
attributes and values brought from the conceptual graph and ontologies along with the metrological equations. These different values represent the transformation over to what they look like in the light of the ECTS system. The metrology bases on the different conceptual graphs as concepts, these concepts are formalised and translated between each other. These subjects need to be clarified. Through this understanding, one is able to elaborate on subjects such as stating a common terminology for the different systems for an ontological mapping where we map and translate the subject of volume in the different courses.

<table>
<thead>
<tr>
<th>Cp = ECTS credit points</th>
<th>Sweden</th>
<th>Germany</th>
<th>Tajikistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit form</td>
<td>1 point = 1,5 ECTS</td>
<td>1 cp = 1 ECTS</td>
<td>1 cp = 2 ECTS</td>
</tr>
<tr>
<td>Study hours / CP</td>
<td>1 ECTS = 26,67 h</td>
<td>1 ECTS = 28 h</td>
<td>1 ECTS = 30 h</td>
</tr>
<tr>
<td>Total ECTS / semester</td>
<td>30 ECTS</td>
<td>30 ECTS</td>
<td>30 ECTS</td>
</tr>
<tr>
<td>Total amount of weeks</td>
<td>20</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Total study hours / semester</td>
<td>800 hours</td>
<td>900 hours</td>
<td>900 hours</td>
</tr>
</tbody>
</table>

The components correspond to the recalling of a particular aspect of the European education systems. Most importantly, the learning goals set the content of a course and thereby understand the amount of time needed for the course. In addition, there must exist overall objectives of the education that the qualifications derive from. The qualifications could be considered as an abstract explanation of the understanding, which the students receive. The main correspondence between the ECTS and the other systems is the workload in parallel with the goals. The main theme here is the education system decides the extent of each course or knowledge component through a metrology similar to the one used for FH. The model above has translated the different aspects of the credits important from each education system through an ECTS perspective.

The table structures the similarities and differences between the education structures. The first acknowledgement is in the credit forms. After understanding the different crediting systems in all three educational systems we might consider including a general or standard way of crediting. To be able to relate different object and domain states we may use the education systems of Sweden and Tajikistan against a general system's model according to the ECTS system. This requires a translation from the standard terminology to the one used of ECTS. To apply the standardisation, an understanding of the education in general must be founded. In the case of VXU, a simple translation is in process towards the ECTS. The figure below illustrates the Swedish mapping towards the ECTS, the same can also be applied when mapping between the KBTUT and the ECTS. This would then have a number of 2 to multiply with instead of the 1,5 given for VXU.
When translating from a Swedish education to KBTUT, we apply a multiplication number of multiplying Swedish points by 0.75 to achieve a KBTUT credit point. However, as illustrated in this chapter, this is not enough. There is a tremendous need for applying the learning goal of the courses to understand what is the content of the courses is a great tool for doing this.

The ECTS education emphasizes on giving the education purpose from the start through the achievement of qualifications and not only by giving the education in a good way educating and giving the chance for improvement. One aspect here is that the ECTS system follows under strict supervision of the educations stated clearly in advance, the different modules and the objectives and so on, settled through the Diploma supplement provided by European education council (see appendix VII). In this document the objectives for an education, or rather the goals achieved by this education, are well defined. These subjects help very much in understanding the translation for the ECTS.

The structures studied have helped in conceptualising and giving meaning to different subjects and objectives. In each university, there are different measures to make acquaintance to these activities, such as exercises, lectures and examinations.

The most common illusion in Sweden is that one lecture hour is one hour. In real life, one lecture hour is 45 minutes of auditory lesson. Also in FH, we find the lecture hours, to be only 45 minutes. In Tajikistan the credit hours per course is to state the amount of lectures hours per week. These lecture hours are actually 50 minutes out of one hour.

The different ontological mapping of each education system has helped on the aspects of translating and explaining each system, in accordance with the middleware. A course in Sweden represents a certain amount of weeks. When translating this course into FH’s system we may use the Bologna, imperative factors in this process is that of explaining the different contents in the course. The content of a course helps to settle, through the Bologna system, the complexity and structure of a course. If the course from Sweden explains in terms of the purpose and goals, the translation should hold a similar structure as of a course in the Bologna. When translating from KBTUT to FH, a similar procedure as the Sweden to FH is applied. This translation transcends the simple mapping done in figure 5.10.

The new translation is a more exhaustive and here we find different Weltanschauung to be adapted and remain as they once were. The components and grave aspects of the Weltanschauung are of knowledge and the subjects (the content) that the course contains and
which level of qualification the students is to acquire from this content. These factors presented in the middle in figure 5.11 are important in the bologna system, which is our middleware when translating between the different systems.

![Correct mapping](image)

*Figure 5.11: The correct mapping from VXU to ECTS.*

We have already identified the different component in each system. There is now a firm understanding of the preferred design structure, from which the development should occur according to the ECTS standards. First, we must identify different components of the educations and their closes relation for extraction for further use in the Bologna.

The results of the conceptual graphs indicate a relation and similarities between the systems, in the context of data. The context of the different similarities, or data, must be under consideration of the Weltanschauung. Figure 5.11 presents the structure of more extensive translation process, as considered with the Bologna systems Weltanschauung. The objects and concepts for this formula represent the normalising of education standards for all 3 educational systems. In this system, we consider a logical instance of the education from the Bologna Process that would implement the standard mapping between the different education systems. The desired system would in this scenario function as a true middleware. Where the “performance of the student” translates in terms of learning goals for a course, rather than a system that incline to a structure where the education measures in hours and weeks. The work that would be needed here is rather extensive, regarding the subject of exactly what to translate.

The *European Credit Transfer and Accumulation System* integrates the education and divides it into structured knowledge units. These knowledge units represent the objectives and qualifications measured. The qualifications of a course are what the student will acquire in form of professional skills. These skills should be implemented in the course plan through modules and thereby “courses”, or knowledge units. The main idea so far is to be able to set measure and insure the students have acquired certain qualifications that are one of the purposes of the main education. This qualification derives from special composed knowledge components or educating methods that should help realize the terms of education or qualification of the purposed learning. The *ECTS* does not allow the student to pass a course
without an examination. Therefore, we must have a method for testing the process that may ensure the student receives the basic qualifications.

This also brings up other interesting subjects, like the Dublin descriptors for instance. The Dublin descriptors allow specifying and understanding whether a knowledge component or unit, measures on the right scale, meaning if the unit belongs in a bachelor education.
6. Chapter six - Conclusion

In this section, I will account for the conclusions that I have reached through my study. These conclusions are to suggest proper solutions for the translation between the different education systems.

6.1 The education system

The education systems studied are very alike in both meaning and to some extent structure. The orientation of the design of the system is often the base for education, considered as the Weltanschauung of the education system. In the case of KBTUT I found a strong task oriented Weltanschauung that is willing to change towards a more European. In Germany we found also a relatively great amount of process / task orientation throughout the Weltanschauung where the students are prepared for the job market and so fourth. The Weltanschauung of Sweden is a little bit more abstract than the others. This Weltanschauung represent and evolution for their students, in not only professional studies but also social sciences and thus considering them selves to have a high academic standard on the education.

Another major difference that I found was in the area of learning. The learning process is different in different Weltanschauung, and therefore a considerable amount of time should be placed on evaluating a course educating procedures to settle standards. This is the next step from this thesis and it must build on main subjects such as the learning goals, the content of the course, the qualification and the acquiring methods. The translation of the different systems should therefore not be as difficult as before. Our middleware should help in the understanding of the suitable measuring procedures between the different systems. This creates the immense need for a suitable examination form that measure in the right ways. The important aspect of this statement is the question “what should be measured?” comes up. Often stated by the learning goal of the content, which relates the subject of qualification to the course goals and extent, this helps settle whether knowledge is measured in the right way.

The actual time aspects of the systems could be designed by each education for it self, this does not really matter. The important subject here is crediting the knowledge, there are different types of grading in the systems, this need to be standardised to the proportion where the adaptation between systems would affect the purposes. The extent could measured by, a standardised point measuring system according to the metrological theories where the semantics are set into account and the attributes of the course are measured. As stated by the different conceptual criteria’s in the analysis, we are able to use the metrological formula created to set the standard. When translating and understanding the different concepts and the contexts of data, which was found relatively easy.
This model represents the different course / educating structures that illusively have parted from the different Weltanschauung. These representations in figure 6.1 are in the form of Lattices. This representation shows the result of the unfolding and structuring of the different courses structures in the different ontologies. The structures are in components and domains that facilitate the mapping between the higher academic education systems by showing the relations we need.

I have encountered a multitude of interesting subjects in the systems structures, presented in figure 6.1 that I have tried to translate and use in the ontologies.. The different ontologies presented in the forms of lattices in figure 6.1. The model presents the result from the infological study on the education system, illustrated in the ontological map of all three education system individually that where presented in the last chapter. The specific amount of information presented for each case in figure 6.1 allows one to understand the main similarities and individual aspects in mapping between the systems. One may observe the
actual lattice formatted ontologies and find the general classes to the more specialised properties of some classes. There is a pattern throughout all the ontologies, this pattern represents the fundamental in the specific system that also gives, if needed, certain opportunities for change. Thus manufacturing a blueprint, the blueprint states the present ontology for the universities in some way and their domains in having a certain modular education plan on a top level in the respective ontology. The reason for each university having the different types of modules is that they wish to implement their objectives in some type of course of action that consequently show their purpose with the education. However, through the different conceptualisations I have been able to find that the different course structures do not need to be different, even though they have different design and structure, we can find fundamental principles followed by the different course. A procedure might be near when mapping the previous soviet to a standard of ECTS without any greater damage to the existing education structure. According to the Weltanschauung this thesis have processed a mapping between the different courses should be rather understandable, if following a correct mapping.

In relative terms, there are many loose ends still, some which are tied up in next section. The different purposes and goals must now be generalised according to their Weltanschauung. Naturally, there are similarities between the systems. Figure 6.2 shows the three structures, where the systems overlap each other one may find the common ground for development. It is in the exact middle of this figure where the different educations have a common understanding.

Figure 6.2: The integration of Växjö, Heidelberg and Khujand

Figure 6.2 shows that some parts of the systems are alike, the different systems are alike in some part, but are need of adaptation in others. The main implication of the structures are rather unique, the changes would not affect the purpose of the educations but merely the structure in the systems so that they are reliable and adaptable to other systems. During the translation process, we were able to procedure the main activities and areas, resulting in that the different concepts and so fourth to be maintained according to a common understandings.
6.2 Structuring the suitable system:

One of the main differences that occurred while studying the different systems regarded the understanding between the different systems. To put this into perspective one must not only see the organisational structure but also the different purposes of each university and their current status in this study, figure 6.1 and figure 6.2. The different domains occur in the systems are amongst others the domain of education, which is a rather abstract statement. In the process of breaking it down into the system domains one can easily find the temporal expressions that are used in each system. The temporal expressions mean the ECTS and point systems etc. Now we must consider what they are used for, that is, the whole purpose of the knowledge objectives.

After learning of these aspects, we are able to conclude that there is a great need of a general modelled education system or that would help understand and provide with a simpler model for the process of adapting the development. We will use the ECTS system developed by the European commission as a standard system. There is only one problem with the European Credit Transfer and Accumulation System is that it is for now just regarded as the solution for the European countries, the possibility for developing this tool of application is great and it should instead, be referred to as ICTS or International Credit Transfer and Accumulation System.

Figure 6.3: The structure of ICTS (International Credit Transfer and Accumulation System)
Figure 6.3 indicates that the future standard would have a great concentration within the educations profile being set on education for the student after their needs. The meaning or relations here apply to that, the education has the possibility evaluation, by the students before studying the program or the course. This structure should ensure that the education always holds a rather impeccable design. The education should develop types of knowledge acquiring techniques that applies throughout involved organs, such as the knowledge units and the different course components (lectures, lab works and examination). A side aspect of all three educations that was studies and that turned out to be rather extensible throughout the educating process.

As pointed out by figure 6.3 there is a great need amongst the different system to acknowledge their respective components in the related system. This is fairly well obtained in figure 6.3, the intensions of this structure is to bring fourth the main components that would be needed in order to not manipulate the current systems too far, to reach its goals. This achieved design as mentioned built upon previous designs and structures applied towards the ECTS system.

To conclude this, we can illustrate the different aspects in a course to represent and analyse. The different aspects represented above relates to the structure of the different education systems studied. In order for an education system to adapt, it must only withdraw certain aspects from their structure and put it in this model. This model can help in the process of adopting the ECTS system and, as the purpose of this thesis being, to ensure the translation and mapping between different educations systems. The following are consequently the ones that are imperative for this thesis, all factors must be advised in the bologna system. This is why I find the bologna system to work best as a middleware. I have chosen to present my model as for an education, which bases on that different courses in an education has different levels and therefore there is certain needs for prerequisites, informatics is not such a subject. However, many other subjects are and therefore this may better be integrated. The courses in the subject of informatics are not under specific after the precise chronological approach according to this model.

<table>
<thead>
<tr>
<th>Knowledge unit title</th>
<th>Type of course</th>
<th>This should present facts regarding if the course is compulsory or elective and the relevance to the specialty of the education. This should also help in restraining the level of the course.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of course</td>
<td>This should present the level of difficulty of the knowledge unit. Furthermore, which module and the year it belongs.</td>
</tr>
<tr>
<td></td>
<td>Number of credits</td>
<td>The number of credits may present the student workload, meaning the workload that is required to achieve the objectives or learning goals in the knowledge unit, often stated in hours of study.</td>
</tr>
<tr>
<td></td>
<td>Number of ECTS credits</td>
<td>The ECTS representation of the credit points from the university.</td>
</tr>
<tr>
<td></td>
<td>Objective and learning goals of the course</td>
<td>This section should present the main purposes of the knowledge unit or course. It should also explain what type of qualifications that the student is to have after...</td>
</tr>
</tbody>
</table>
finishing the course. The learning goals are best set, when start with the meaning “after this course the student should be able to....”.
Other main aspects, that must be represented, that implied by Bloom’s Taxonomy, which may help in the exhaustive reinsertion of education measuring procedure. Blooms taxonomy should here able the education transition be modelled.

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>This shows the knowledge that the student is required in order to take this course. This could be a comprehensive aspect of the mobility of educations. This part could present the pre obtained knowledge that is required from the students that wishes to enrol.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course contents</td>
<td>This part should present the different study areas which are to be educated throughout the course. These are course goals, meaning that the course is to regard the following subjects. This part may look similar to the Learning goals of the student. These aspects must not be mistaken, because they represent major aspects that are of great importance when explaining the meaning of the course and its purpose.</td>
</tr>
<tr>
<td>Assessment methods</td>
<td>The type of examination for the knowledge unit, this would help ensure the obtaining of the learning goals.</td>
</tr>
</tbody>
</table>

*Figure 6.4: Knowledge and education unit description*
7. CHAPTER SEVEN - Discussions and reflections

This section of the thesis will regard the different aspect of this thesis that really affect this thesis in the matter of conclusions making and my different reflections on theories, results and analysis’s. First, I will have a general discussion about the study. Then I will discuss a little about sources as well as discussions about the problems that I have set out to research.

7.1 Discussions:

In this paper, I have viewed the field of education system as a practical and organisational field, pummelled by the fast moving and ever changing education structure innovation. Education is today, in most part of the world, considered as something academically with its own methodical persuasions, constantly debated and augmented. The concept of this thesis has been to clarify three different systems in the process of ontological development and during this process trying to perceive and understand the true meaning the ontologies hold. Furthermore to research the idea of setting these in perspective through the interface with different systems academia and practise, in the process of helping to understand better how the one would be able to map between the systems influenced by the constant growing and evolving of an international ideological education standards.

The evolution considered as the survival of the fittest, because if the one coherent stream is not tended to there may be great losses in the cultural evolution, which may be seen as a multitude of loss in sub streams of society.

I argue that we should study and research the area of mapping between the different systems, the organisational structure. The design of the education system and the different component needs to be studied, how one can context relate data between the systems? That may span over many layers of the ontological mapping’s constant evolving.

In short, my arguments are strengthened by Flensburg (1999, 2005) regarding semantics and the contextualisation of data. The process of defining data is rather compatible to the development of a design or understanding as of Sofia Pinto (2001), relating to grasping the fundamental issues in each system in order to proceed with accumulating knowledge from the development as a proactive development, thus allowing the development in order for its existence and future evolving.

I also believe that the conceptualisation of a system allow redefining the structure in different common understanding, which may allow future partnerships and co-operations, from a utilitarian perspective. The conclusions have secured a middle ware for the translation between higher education systems.

7.2 General reflections

The subject of this research study has been very interesting and given me experiences, which I will probably develop in the coming years. The education systems have been very appropriate for the study. The different mapping has been made between systems to some extent, turned out as I expected, but mostly the precise opposite of my expectations. I am satisfied with the
results of this research. Even though all seemed cloudy at first I believe that I have managed
to clear up most of the smoke surrounding the core and found the fundamentals, which my
results are based upon.

One aspect of the different educations has been the differences could vary to the degree
that would have been rather unthinkable for me at first. Making this a reason why this study
has been so interesting. These different aspects have encouraged in my research along the
way. It was interesting to observe the different systems and find the common understandings
that they had.

I still believe after reading a lot of cases and theories that people has not really understood
the capabilities of a good and firmly structured education system. Many educations still run
under the old applied way of presenting facts and that the students should remember to
represent it. The method used in these education programs that holds the aspects these
factors as relevant should try to change and replace their current design, in those cases that
still structured according to ancient procedures. I finally composed two studies of cases that
have been revised in this thesis. Most of theories by Börje Langefors have been very
interesting to study; furthermore, Langefors directs its research not only to information
systems that it may seem like. Langefors’s theories are studied from an organizational
perspective of the formation of organisations and relates very much to the purpose of this
thesis. The theories presented from Flensburg have also been very interesting to work by,
mostly because of their unusual and quite interesting perspective on system designs and
prospects.

7.3 Believability factors

I have had much respect for the authors and made comparative studies by trying to find
different theoreticians that theorized in the same area. This has leaded me to find areas most
relevant and imperative in the different theories, thus a better believability.

I always held in the back of my mind that the information would probably be subjective in
such manner, which mostly did not concern the investigation. A good point here was that the
subjective factors allowed me to better map the education systems structures. Faced with a
situation as the one posed above, I tried to explore the answer through other enquiries about
the same issue. However, one aspect that has been very interesting is the group of people
involved in this project have been amongst the greatest thinker that I have encountered and
worked with and therefore a great apparent respect from my academic point of view.

7.3.1 Sources

Researched in different areas of this thesis have been done, separately, and never from the
point of view that this research was conducted. I found much of the literature, regarding both
ontologies and educations systems. However, I was not able to locate any information that
regarded ontological design or structural schemas/ design of education system. Most of my
Internet sources are well respected and thoroughly used by others on the World Wide Web,
and comes from respected journals and databases.

The different literature used have all been quite impressive in the manner of objectivity that
the writers most of the time have had, which is rather improbable in my case. The theories
I’ve based this study upon have all been studied in advance, so they would meet some
criteria’s, first of all, they should be comprehensive, and well written. The relevancy of the
theories has been interesting from the perspective of choice. My choices have been rather complex, but I have managed to operate my conclusions and results in a great process of relating the areas.

7.3.2 The Method

When choosing a method to work with, there is always a problem. By choosing one method, you probably exclude another. I have tried to keep an informal perspective of looking at this. The paths, which I chose to work from, has been of great help, furthermore I found in an early state that they allowed me to perform the whole research through a better approach. During the study, I have encountered a few problems. Initially I had difficulties with finding relevant literature and information to connect to the facts lying before me. The solution came through an expansion of the horizons regarding the areas of research. This allowed me to redevelop my previous founding in a methodical way that would cooperate with my goals. I believe that the studies I made performed are more than adequate to fully explain and provide proof for fulfilling the purpose for this thesis. In addition, the results have helped finding solutions for further development.
8. List of references

**Literature**


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Langefor (1966): B. Langefor, ”Theoretical Analysis of Information Systems”, Student literature 1996, Auerbach,


Web sites:


http://www.bologna-bergen2005.no
Appendix I: Methodology for Ontology Integration by Helena Sofia Pinto et al.
## Appendix II: Blooms Taxonomy, the categories

### 1. Categories of cognitive

<table>
<thead>
<tr>
<th>Categories</th>
<th>Examples and keywords</th>
</tr>
</thead>
</table>
| **Knowledge**   | Examples: Recite a policy. Quote prices from memory to a customer. Knows the safety rules.  
**Key Words:** defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states. |
| **Comprehension** | Examples: Rewrites the principles of test writing. Explain in one's own words the steps for performing a complex task. Translates an equation into a computer spreadsheet.  
**Key Words:** comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives examples, infers, interprets, paraphrases, predicts, rewrites, summarizes, and translates. |
| **Application**  | Examples: Use a manual to calculate an employee’s vacation time. Apply laws of statistics to evaluate the reliability of a written test.  
**Key Words:** applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses. |
| **Analysis**    | Examples: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training.  
**Key Words:** analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, and separates. |
| **Synthesis**   | Examples: Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises and process to improve the outcome.  
**Key Words:** categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes. |
| **Evaluation**  | Examples: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget.  
**Key Words:** appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, and summarizes, supports. |
## 2. Category of Affective

<table>
<thead>
<tr>
<th>Categories</th>
<th>Examples and keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receiving Phenomena:</strong></td>
<td><strong>Examples:</strong> Listen to others with respect. Listen for and remember the name of newly introduced people. <strong>Key Words:</strong> asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erected, replies, uses.</td>
</tr>
<tr>
<td><strong>Awareness, willingness to hear, selected attention.</strong></td>
<td><strong>Responding to Phenomena:</strong> Active participation on the part of the learners. Attends and reacts to a particular phenomenon. Learning outcomes may emphasize compliance in responding, willingness to respond, or satisfaction in responding (motivation). <strong>Examples:</strong> Participates in class discussions. Gives a presentation. Questions new ideals, concepts, models, etc. in order to fully understand them. Know the safety rules and practices them. <strong>Key Words:</strong> answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.</td>
</tr>
<tr>
<td><strong>Valuing:</strong> The worth or value a person attaches to a particular object, phenomenon, or behaviour. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learner's overt behaviour and are often identifiable.</td>
<td><strong>Examples:</strong> Demonstrates belief in the democratic process. Is sensitive towards individual and cultural differences (value diversity). Shows the ability to solve problems. Proposes a plan to social improvement and follows through with commitment. Informs management on matters that one feels strongly about. <strong>Key Words:</strong> completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.</td>
</tr>
<tr>
<td><strong>Organization:</strong> Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system. The emphasis is on comparing, relating, and synthesizing values.</td>
<td><strong>Examples:</strong> Recognizes the need for balance between freedom and responsible behaviour. Accepts responsibility for one's behaviour. Explains the role of systematic planning in solving problems. Accepts professional ethical standards. Creates a life plan in harmony with abilities, interests, and beliefs. Prioritizes time effectively to meet the needs of the organization, family, and self. <strong>Key Words:</strong> adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.</td>
</tr>
<tr>
<td><strong>Internalizing values (characterization):</strong> Has a value system that controls</td>
<td><strong>Examples:</strong> Shows self-reliance when working independently. Cooperates in group activities (displays teamwork). Uses an objective approach in problem solving. <strong>Key Words:</strong> demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.</td>
</tr>
</tbody>
</table>
their behaviour. The behaviour is pervasive, consistent, predictable, and most importantly, characteristic of the learner. Instructional objectives are concerned with the student's general patterns of adjustment (personal, social, emotional).

solving. Displays a professional commitment to ethical practice on a daily basis. Revises judgments and changes behaviour in light of new evidence. Values people for what they are, not how they look. **Key Words**: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.

### 3. Category of Psychomotor

<table>
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<tr>
<th>Category</th>
<th>Example and Key Words</th>
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<tr>
<td><strong>Perception</strong></td>
<td>The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation. <strong>Examples</strong>: Detects non-verbal communication cues. Estimate where a ball will land after it is thrown and then moving to the correct location to catch the ball. Adjusts heat of stove to correct temperature by smell and taste of food. Adjusts the height of the forks on a forklift by comparing where the forks are in relation to the pallet. <strong>Key Words</strong>: chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects.</td>
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<tr>
<td><strong>Set</strong></td>
<td>Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person’s response to different situations (sometimes called mindsets). <strong>Examples</strong>: Knows and acts upon a sequence of steps in a manufacturing process. Recognize one’s abilities and limitations. Shows desire to learn a new process (motivation). <strong>Key Words</strong>: begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers.</td>
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<tr>
<td><strong>Guided Response</strong></td>
<td>The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing. <strong>Examples</strong>: Performs a mathematical equation as demonstrated. Follows instructions to build a model. Responds hand-signals of instructor while learning to operate a forklift. <strong>Key Words</strong>: copies, traces, follows, react, reproduce, responds.</td>
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<td><strong>Mechanism</strong></td>
<td>This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency. <strong>Examples</strong>: Use a personal computer. Repair a leaking faucet. Drive a car. <strong>Key Words</strong>: assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.</td>
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**Complex Overt Response:**
The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players are often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce.

**Examples:** Maneuvers a car into a tight parallel parking spot. Operates a computer quickly and accurately. Displays competence while playing the piano.

**Key Words:** assembles, builds, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.

**Adaptation:** Skills are well developed and the individual can modify movement patterns to fit special requirements.

**Examples:** Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners. Perform a task with a machine that it was not originally intended to do (machine is not damaged and there is no danger in performing the new task).

**Key Words:** adapts, alters, changes, rearranges, reorganizes, revises, and varies.

**Origination:** Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.

**Examples:** Constructs a new theory. Develops a new and comprehensive training programming. Creates a new gymnastic routine.

**Key Words:** arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates.
Appendix III: Education plan for business informatics.
VÄXJÖ UNIVERSITET UBTILDNINGSPLAN Dnr: MASDA 99/00:7
Institutionen för matematik, statistik och datavetenskap 1999-08-26 Language : Swedish

1. **Beslut om inrättande av programmet**
Institutionsstyrelsen har genom beslut 1998-10-02 inrättat det lokala utbildningsprogrammet Systemvetenskapligt program.

2. **Fastställande**

3. **Mål, innehåll och organisation.**

3.1 **Mål för utbildningen**
Programmets huvudämne är informatik. Informatik innebär studium av metoder för analys, utveckling, användning och förvaltning av datorbaserade informationssystem.

Utbildningen ger kunskap om och förståelse för moderna organisationer och verksamheter och deras informationssystem. Programmet förbereder för kvalificerat arbete avseende utveckling och förvaltning av informationssystem. Informationssystem skall styra och framför allt stödja verksamheter där människor ingår och datorn är en viktig resurs.

Utbildningen lägger stor vikt vid tvärvetenskapliga kunskaper, kritiskt tänkande, kommunikationsförmåga, problemlösningsförmåga och en holistisk kunskapssyn.

Utbildningen är flexibel och anpassad till tekniska och vetenskapliga framsteg och förbereder för forskarutbildning inom informatikområdet.

3.2 **Utbildningens innehåll**
Utbildningen inleds med en gemensam del på tre terminer. Därefter väljer den studerande inriktning och efterhand egen profilering inom magisterexamen alternativt kandidat-examen.

3.3 Utbildningens struktur.
De första tre terminerna syftar till att ge de studerande en bred utbildning som omfattar flera områden med informatik som grund. Sedan väljer de studerande en inriktning som innebär fördjupande studier. Exempel på inriktningar:

- Systemutveckling
- Global infrastruktur och internetteknologi
- Databasdesign

Fler än två inriktningar ges i mån av resurser och behov/intresse.

Åk 1
Det första året är gemensamt för samtliga utbildningsinriktningar inom det Systemvetenskapliga programmet.

20 p Informatik (A-nivå)
10 p Företagsekonomi (A-nivå)
10 p Medie- och kommunikationsvetenskap (A-nivå)

Åk 2
Den tredje terminen är gemensam för samtliga utbildningsinriktningar inom det Systemvetenskapliga programmet.

Termin 3
10 p Informatik (B-nivå)
10 p Datalogi (A-nivå)

Termin 4
10 p Informatik (B-nivå)
10 p Valfria kurser

Åk 3
20 p Informatik (C-nivå)
20 p Valfria kurser

Kandidatexamen 120 poäng
Vid kandidatexamen 120 p så byts 10 p informatik ut mot ett obligatoriskt 10 p examensarbete. (Informatik C-nivå)
Åk 4

Magisterexamen 160 poäng
Syftet med magisterexamen är att ge studenten fördjupade kunskaper och insikter avseende informationssystems egenskaper och roller i ett organisatoriskt perspektiv. Det finns ett varierande antal kurser som kan väljas av den studerande.

10 p Informatik eller (C/D-nivå)
10 p Valfria kurser

5 p Informatik (D-nivå)
5 p Metodkurs (D-nivå)
20 p Examensarbete (Informatik D-nivå)

Obligatoriska kurser är examensarbetet och metodkursen. Examensarbetet kan också genomföras som 10+10 poäng.

4. Förkunskaper
För tillträde till det Systemvetenskapliga programmet krävs - förutom grundläggande behörighet - särskilda förkunskaper enligt standardbehörighet D.4.1.

5. Betyg

6. Examensbevis
Vid avslutad programutbildning erhåller den studerande ett examensbevis efter begäran hos den centrala studievägledningen.

Till examensbeviset skall knytas någon av följande examensbenämningar:

"Filosofie kandidatexamen med systemvetenskaplig inriktning", huvudämne informatik.
"Filosofie magisterexamen med systemvetenskaplig inriktning", huvudämne datavetenskap (informatik).

På utbildningsbeviset skall följande översättning till engelska språket av examensbenämning införas:

"Bachelor of Science in Systems Analysis", Major subject Informatics.
"Master of Science in Systems Analysis", Major subject Computer Science (Informatics).
Appendix IV: The Swedish higher Education System
(The following description is approved by the National Agency for Higher Education)

GENERAL
Higher education institutions have great autonomy in the organisation of studies, use of resources and general organisation. The higher education institutions in Sweden are designated as either university or högskola. The status of university is awarded by the Government to higher education institutions fulfilling certain criteria. Diplomas from all higher education institutions recognised by the Government have equal official value. The same law governs all higher education institutions. Independent higher education providers may be recognised by the Government, obtain the right to award degrees and receive state subsidies. All recognised higher education is funded by the State. All programmes and major subjects are to be evaluated by the National Agency for Higher Education every six years, starting from 2001.

GRADING
The Higher Education Ordinance states that the following grades can be awarded: Pass with Distinction (väl godkänd), Pass (godkänd) or Fail (underkänd) unless the institution decides to grade on some other scale. A number of courses use only two grades: Pass and Fail. Others, like Law and Engineering, traditionally use scales with several levels – expressed as letters or numbers. No overall grade is given for a degree and students are not ranked.

DEGREES
Higher education is provided in the form of courses. These may be combined to constitute degree programmes with varying levels of individual choice. Students themselves are also able to combine different courses for the award of a degree. A course syllabus is required for each undergraduate course and a curriculum for each degree programme. Sweden has a system of credit points (poäng); one week of successful full-time study is equivalent to 1 credit point. One academic year usually yields 40 credit points. In the Degree Ordinance, the Government has laid down which degrees may be awarded and the objectives for these degrees. In the Swedish higher education system there are generally no intermediate qualifications. All degrees are regarded as final qualifications, even if there is a possibility to continue studying. Degrees are divided into general degrees and professional degrees.

GENERAL DEGREES
Högskoleexamen requiring a minimum of 80 credit points.
Kandidatexamen requiring a minimum of 120 credit points with 60 credit points in the major subject including a thesis/degree project of 10 credit points.
Magisterexamen med ämnesdjup (Master of) requiring a minimum of 160 credit points with 80 credit points in the major subject including one thesis/degree project of 20 or two thesis/degree projects of 10 credit points each.
Magisterexamen med ämnesbredd (Master of) requiring a minimum of 40 credit points with specialisation including a thesis/degree project of at least 10 credit points. A prerequisite for Magisterexamen med ämnesbredd is a general or professional degree of at least 120 credit points or a comparable foreign degree.
Kandidatexamen and Magisterexamen med ämnesdjup may indicate the major subject or faculty, e.g. economic magisterexamen (... of Science in Business Administration or ... of
Science in Economics). The most advanced courses (at the 61–80 credit points level) for Magisterexamen med ämnesdjup can be accepted as partial fulfilment of the requirements for a doctoral programme.

PROFESSIONAL DEGREES
Professional degrees are awarded in the fields of engineering, health care, agriculture, law, education, the arts etc. There are around 60 professional degrees. Programmes leading to professional degrees vary in length depending on their character. Some of the professional degrees demand a previous undergraduate qualification as a prerequisite, especially within the field of health care. Institutions have to apply for the right to award professional degrees.

ACCESS AND ADMISSION TO HIGHER EDUCATION
Higher education in Sweden has two strata of eligibility: general/basic and (additional) specific requirements. The general eligibility is the same for all higher education. General eligibility is attained by completing an upper-secondary school programme and obtaining a pass grade or better in courses comprising at least 90 per cent of the credits required for the programme, or by providing proof of an equivalent level of knowledge. People who are at least 25 years old, who have been employed for four years and who have a command of English and Swedish corresponding to that obtained by completing a national upper-secondary programme are also considered to have general eligibility. The specific requirements vary according to the field of higher education and are expressed in terms of upper-secondary school qualifications in specific subjects. Restricted admission is used for all study programmes and courses.

POSTGRADUATE STUDIES
Higher education institutions with the status of universitet have permanent allocations of funds for research and postgraduate programmes and may award doctoral degrees, whereas at institutions designated as högskola these rights may be restricted to specific research areas only or they may have research links with a universitet. For admission to postgraduate programmes undergraduate qualifications of at least 120 credit points are required. Furthermore, the appropriate faculty board may stipulate additional requirements for admission. Postgraduate programmes nominally comprise 160 credit points (four years of full-time study) and lead to a doktorsexamen (PhD). A PhD student must complete a number of taught courses and write a doctoral dissertation. The dissertation must be defended at a public oral examination. A licentiatexamen (licentiate degree) can be obtained after a minimum of 2 years (80 credit points) and requires course work and a thesis. Normally students aim directly for a doktorsexamen but it is also possible to take a licentiatexamen as an intermediate degree. All faculties can award a licentiatexamen or doktorsexamen, in which the discipline is named, e.g. teknologie licentiatexamen (Licentiate in Technology). However a faculty of engineering, like any other, may also award a filosofie doktorsexamen (PhD).

(HSVFS 2003:5)
Appendix V: Fachhochschule Heidelbergs Diploma supplement in Computer Science

Fachhochschule Heidelberg
Staatlich anerkannte Fachhochschule der SRH
SRH Hochschulen gGmbH
Heidelberg University of Applied Sciences

Diploma Supplement

This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO-EIM. The purpose of the supplement is to provide a sufficient independent source to improve the international transparency and the academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgments, equivalence statements or suggestions where recognitions, information or other sections should be provided. Where information is not provided, an explanation should give this reason.

1. HOLDER OF THE QUALIFICATION

1.1. Family Name

1.2. First Name

1.3. Date, Place, Country of Birth

1.4. Student ID Number or Code

2. QUALIFICATION

2.1. Name of Qualification (full, abbreviated; in original language)
Bachelor of Science (B.Sc.)

Title Conferred (full, abbreviated; in original language)

n.a.

2.2. Main Field(s) of Study
Computer Sciences

2.3. Institution Awarding the Qualification (in original language)
Fachhochschule Heidelberg
Heidelberg University of Applied Sciences
Faculty of Informatics

Status (Type / Control)
Fachhochschule Heidelberg / University of Applied Sciences / State Certified Institution

2.4. Institution Administering Studies (in original language)
[same]

Status (Type / Control)
[same]

2.5. Language(s) of Instruction/Examination
German

Certification Date: __________________________

Prof. Dr. Herbert Schuster
3. LEVEL OF THE QUALIFICATION

3.1. Level
Bachelor (first degree), 7 Semester, by research with Bachelor-Thesis

3.2. Official Length of Program
Three years, 210 Credit Points (ECTS)

3.3. Access Requirements
Higher Education Entrance Qualification (HEEQ), Fachhochschulreife (Academic Maturity)

4. CONTENTS AND RESULTS GAINED

4.1. Mode of Study
Full-Time

4.2. Programme Requirements/Qualification Profile of the Graduate
The Graduate is qualified in the basic areas of computer sciences as well as in the chosen specialization (business informatics, media informatics, health care informatics). Besides fundamental theoretical knowledge, practical experience is provided by many applied computer science research and development projects. Due to the taught principles of information technology, the graduate of the Bachelor of Science in Computer Science study course is qualified for a long-term learning. I.e. the postgraduate Master of Science in Computer Science study courses.

4.3. Programme Details
See the following table for the programme details including the learning workload given by the ECTS credit points (CP) as well as the lecture hours per week (SWS).

Table: Subjects in Computer Sciences

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</tr>
<tr>
<td>B44/2</td>
<td>Bi: BWL</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B44/3</td>
<td>Mi: Gestaltung und Design</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B44/4</td>
<td>Mi: Funktional Design</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B44/5</td>
<td>Mi: Entwickeln Multimedia Applications</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B44/6</td>
<td>HIC: Health Care ERP Systems</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B44/6</td>
<td>HIC: Business and Administration</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>B60</td>
<td>Algorithmen und Datenstrukturen (Algorithms and Data Structures)</td>
<td>4</td>
<td>4</td>
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<tr>
<td>B61</td>
<td>Webanwendungen (Web Applications)</td>
<td>4</td>
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<tr>
<td>B62</td>
<td>verteilte Systeme (Distributed Systems)</td>
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<td>Programmierverfeinlung III (Detailed Program Development III)</td>
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<tr>
<td>B64</td>
<td>Spezialisierungsmodule II</td>
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<td></td>
</tr>
<tr>
<td>B64/1</td>
<td>Wi: Workflowsmanagement</td>
<td>4</td>
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<tr>
<td>B64/2</td>
<td>Bi: ERP-System II</td>
<td>4</td>
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<tr>
<td>B64/3</td>
<td>Mi: Medien und Mediatisierung und -psychologie</td>
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<tr>
<td>B64/4</td>
<td>Mi: Media Didactics and Psychology</td>
<td>4</td>
<td>4</td>
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</tr>
<tr>
<td>B64/5</td>
<td>Mi: Entwickeln Multimedia e-Learning Systems</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B64/6</td>
<td>HIC: ERP-System II</td>
<td>4</td>
<td>6</td>
<td></td>
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</tr>
<tr>
<td>B64/6</td>
<td>HIC: Krankenhaus-Informationssystem</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
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<tr>
<td>B70</td>
<td>Unternehmensgründung und -führung (Formation and Management of a Company)</td>
<td>4</td>
<td>6</td>
<td></td>
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<tr>
<td>B71</td>
<td>Thesis Seminar</td>
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<td>B72</td>
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<tr>
<td>B73</td>
<td>Spezialisierungsmodule III</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B73/1</td>
<td>Wi: IT Management</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B73/2</td>
<td>Mi: Grundlagen der ang. Forschung</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B73/3</td>
<td>Mi: Basics of Applied Research</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B73/3</td>
<td>HIC: Health Care Systems</td>
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<td>6</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summen / Sum of SW/SCH/CP</td>
<td>24</td>
<td>30</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

See also ""Studien- und Prüfungsordnung" and ""Prüfungszeugnis" (Final Examination Certificate) for subjects offered in final examinations (written and oral), and topic of thesis, including evaluations.

Certification Date: ____________________________

Prof. Dr. Herbert Schuster
4.4. Grading Scheme

General grading scheme cf. Sec. 8.6 - Grade Distribution (Award year) „Sehr gut“ (7%) - „Gut“ (23%) „Befriedigend“ (30 %) - „Ausreichend“ (15%) - „Nicht ausreichend“ (5%). In addition institutions already use the ECTS grading scheme which operates with the levels A (best 10 %), B (next 25 %), C (next 30 %), D (next 25 %), and E (next 10 %).

4.5. Overall Classification (in original language)

Based on the accumulation of grades received during the study programme and the final thesis cf. Prüfungszeugnis (Final Examination Certificate)

5. FUNCTION OF THE QUALIFICATION

5.1. Access to Further Study

Qualifies to apply for admission to Master study programmes

5.2. Professional Status

The Bachelor of Science degree in the Computer Science discipline entitles its holder to the legally protected professional title “Informatiker/Informatikerin” and to exercise professional work in the field(s) of computer sciences for which the degree was awarded.

6. ADDITIONAL INFORMATION

6.1. Additional Information

On the institution Heidelberg University of Applied Sciences: www.fh-heidelberg.de
and the Faculty of Informatics: www.fbi.fh-heidelberg.de

6.2. Further Information Sources

On the institution: www.fh-heidelberg.de

7. CERTIFICATION

This Diploma Supplement refers to the following original documents:
Urkunde über die Verleihung des Bachelorgrades
Prüfungszeugnis vom _______________________

Certification Date: _______________________

Prof. Dr. Herbert Schuster
Vice Dean
Faculty of Informatics
8. INFORMATION ON THE GERMAN EDUCATION SYSTEM

8.1. Types of Institutions and Institutional Control

Higher education (HE) studies in Germany are offered at three types of Hochschulen:
- Universität (Universities), including various specialized institutions, comprise the whole range of academic disciplines. In the German tradition, universities are also institutionalized of in particular, basic research, so that advanced stages of study have strong theoretical orientations and research-oriented components.
- Fachhochschulen (Universities of Applied Sciences): Programs concentrate in engineering and other technical disciplines, business-related studies, social work, and design areas. The common mission of applied research and development implies a distinct application-oriented focus and professional character of studies, which include one or two semesters of integrated and supervised work assignments in industry, enterprises, or other relevant institutions.
- Kunst- und Musikhochschulen (Colleges of Art/Music, etc.) other graduate studies for artistic careers in fine arts, performing arts and music, in such fields as directing, production, writing in theatre, film, and other media, and in a variety of design areas, architecture, media and communication.

HE institutions are either state or state-recognized institutions. In their operations, including the organization of studies and the designation and award of degrees, they are both subject to HE-legislation.

8.2 Types of programs and degrees awarded

- Studies in all three types of institutions are traditionally offered in integrated "long" (one-tier) programs leading to Diplom- or Magister Artium degrees or completion by a Staatsexamen (State Examination).
- In 1998, a new scheme of first- and second-degree level programs (Bakkalaureus/Bachelor and Master) was introduced to be offered parallel to or in lieu of established integrated "long" programs. While these programs are designed to provide enlarged variety and flexibility to students in planning and pursuing educational objectives, they enhance also international comparability of studies.
- For details cf. Sec. 8.41 and Sec. 8.42, respectively. Table 1 provides a synthetic summary.

8.3 Approval/Accreditation of Programs and Degrees

To ensure quality and comparability of qualifications, the organization of studies, and general degree requirements have to conform to principles and regulations jointly established by the Standing Conference of Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (KMK) and the Association of German Universities and other Higher Education Institutions (HRK). In 1999, a system of accreditation for programs of study has become operational under the control of an Accreditation Council at national level. Programs and qualifications accredited under this scheme are designated accordingly in the Diploma Supplement.

8.4 Organization of Studies

8.41 Integrated "Long" Programs (One-Tier):

Diplom degrees, Magister Artium, Staatsexamen

Studies are either mono-disciplinary single subject. Diplom degrees, most programs completed by a Staatsexamen, or comprise a combination of two major or one major and two minor fields (Magister Artium). As common characteristics, in the absence of an intermediate (first-level) degree, studies are divided into two stages. The first stage (1 to 2 years) focuses - without any components of general education - on broad orientations and foundations of the field(s) of study including propositional subjects. An Intermediate Examination (Diplom-Vorprüfung for Diplom degrees, Vivendoprüfung or credit requirements for the M.A.) is prerequisite to enter the second stage of advanced studies and specializations. Degree requirements always include submission of a thesis (up to 6 months duration) and comprehensive final written and oral examinations. Similar regulations apply to studies leading to a Staatsexamen.

- Studies at Universities last usually 4.5 years (Diplom degree, Magister Artium) or 3.5 to 6 years (Staatsexamen). The Diplom degree is awarded in engineering disciplines, the exact sciences, and economic sciences. In the humanities, the corresponding degree is usually the Magister Artium (M.A.). In the social sciences, the practice varies as a matter of institutional traditions. Studies preparing for the legal, medical, pharmaceutical and teaching professions are completed by a Staatsexamen.

The three qualifications are academically equivalent. As the final (and only) degrees offered in these Programs at graduate-level, they qualify to apply for admission to doctoral studies, cf. Sec. 8.5.

- Studies at Fachhochschulen (FHs) and Universities of Applied Sciences (UAS) last 4 years and lead to a Diplom (FH) degree. While the FH/UAs are non-doctorate-granting institutions, qualified graduates may pursue doctoral work at doctorate-granting institutions, cf. Sec. 8.5.

- Studies at Kunst- and Musikhochschulen (Colleges of Art/Music, etc.) are more flexible in their organization, depending on the field and individual objectives. In addition to Diploma/Magister degrees, awards include Certificates and Certified Examinations for specialized areas and professional purposes.

8.42 First/Second Degree Programs (Two-tier):

Bakkalaureus/Bachelor, Magister/Master degrees

These programs apply to all three types of institutions. Their organization makes use of credit point systems and modular components. First degree programs (3 to 4 years) lead to Bakkalaureus/Bachelor degrees (B.A., B.Sc.). Graduate second degree programs (to 6 years) lead to Magister/Master degrees (M.A., M.Sc.). Both may be awarded in a dedicated form to indicate particular specializations or applied/professional orientations. In the UAS, B.A. and B.Sc., M.A. and M.Sc. in ... All degrees involve a thesis requirement.

8.5 Doctorate

Universities, most specialized institutions and some Colleges of Art/Music are doctorate-granting institutions. Formal prerequisite for admission to doctoral work is a qualified Diplom or Magister/Master degree. A Staatsexamen, or a foreign equivalent. Admission further requires the acceptance of the dissertation research project by a supervisor. Holders of a qualified Diplom (FH) degree or other first degrees may be admitted for doctoral studies with specified additional requirements.

8.6 Grading Scheme

The grading scheme usually comprises five levels (with numerical equivalents: intermediate grades may be given): 1) Very Good: "Sehr Gut" (1) 2) Good: "Gut" (2) 3) Satisfactory: "Zufrieden" (3) 4) Sufficient: "Nicht ausreichend" (4) 5) Non-Sufficient/Fail: "Unzureichend" (5) The minimum passing grade is "Zufrieden" (4). Verbal designations of grades may vary in some cases and for doctoral degrees. Some institutions may also use the ECTS grading scheme.

8.7 Access to Higher Education

The General Higher Education Entrance Qualification (Allgemeine Hochschulreife) after 12 to 13 years of schoolin gives access to all Higher education studies. Specialized variants (Fachhochschulreife Hochschulreife) allow for admission to particular disciplines. Access to Fachhochschulen (FHs) is also possible after 12 years of schoolin. Admission to Colleges of Art/Music may be based on other or require additional evidence demonstrating individual aptitude.

1) Hochschule is the generic term for higher education institutions.
8.3 National Sources of Information

- Kultusministerkonferenz (KMK) [Standing Conference of Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany] - Lennestrasse 6, D-53113 Bonn; Fax: +49(0)228/501-229; with
- Central Office for Foreign Education (ZaE) as German NARIC and ENIC; www.kmk.org; E-Mail: zob@kmk.org
- "Documentation and Educational Information Service" as German EURYDICE-Unit, providing the national dossier on the education system (EURYBASE; annual update; www.eurydice.org; E-Mail: eurydice@kmk.org).

- Hochschulrektorenkonferenz (HRK) [Association of German Universities and other Higher Education Institutions]. Its "Higher Education Compass" (www.higher-education-compass.hrk.de) features comprehensive information on institutions, programs of study, etc. Ahnstrasse 39, D-53175 Bonn; Fax: +49(0)228 / 887-210; E-Mail: sekr@hrk.de

Institutions, Programs and Degrees in German Higher Educations
Appendix VI: List of subjects, KBTUT

KHUJAND BRANCH
TECHNOLOGICAL UNIVERSITY OF TAJIKISTAN

List of subjects of specialty
“2204 – (Software of computer techniques and automated systems) PROGRAMMNOE OBESPECHENIE VICHISLITEL’NOY TEKHNIKI I AVTOTMATIZIROVANNIKH SISTEM”

Study semester lasts 19 weeks. After first six weeks of studying there is one week of first current exams, the second current exams take place in 14th week. After 17 weeks there are final exams, which last during two weeks. Generally, lessons are held in 15 weeks and one credit is 15 hours of studying and 15 hours of independent work (1 hour is 50 minutes), and also corresponding occupation during the semester.

<table>
<thead>
<tr>
<th>Name of block</th>
<th>Total credit points</th>
<th>Obligatory</th>
<th>Chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>General educational disciplines</td>
<td>32</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Basic disciplines</td>
<td>64</td>
<td>40</td>
<td>24</td>
</tr>
<tr>
<td>Profile disciplines</td>
<td>32</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>128</td>
<td>80</td>
<td>48</td>
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</tbody>
</table>

**2204 General educational disciplines**

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<thead>
<tr>
<th></th>
<th>Credit points</th>
<th>ECTS credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obligatory disciplines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) State language</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>2) Foreign language</td>
<td>9</td>
<td>10.125</td>
</tr>
<tr>
<td>3) Informatics</td>
<td>6</td>
<td>6.75</td>
</tr>
<tr>
<td>4) The history of Tajik nation</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>5) The basics of mathematics</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>27</td>
</tr>
</tbody>
</table>

Chosen disciplines
Consists of disciplines offered by the Ministry of Education of Republic of Tajikistan and disciplines offered by the departments of high schools for increasing general level of education and getting skills on different directions not belonged to the specialty.

Totally can be chosen

<table>
<thead>
<tr>
<th></th>
<th>Credit points</th>
<th>ECTS credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
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<td>8</td>
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</tbody>
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<table>
<thead>
<tr>
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<th>Credit points</th>
<th>ECTS credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
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<td>32</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>36</td>
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</tbody>
</table>
### Basic disciplines
(disciplines, belonged to general direction of specialty and list of obligatory disciplines of the current block is similar for each specialties of this direction)

<table>
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<th>Discipline</th>
<th>Credit points</th>
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<tbody>
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<td>1</td>
<td>Higher mathematics</td>
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<td>4.5</td>
</tr>
<tr>
<td>2</td>
<td>Computing mathematics</td>
<td>3</td>
<td>3.375</td>
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<tr>
<td>3</td>
<td>Course work on computer technologies</td>
<td>1</td>
<td>1.125</td>
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<tr>
<td>4</td>
<td>Marketing</td>
<td>2</td>
<td>2.25</td>
</tr>
<tr>
<td>5</td>
<td>Object-oriented programming</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>6</td>
<td>Basics of Web-design (Macromedia Dreamweaver)</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>7</td>
<td>Basics of programming (Microsoft Visual Basic)</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>8</td>
<td>Office programming (Microsoft Visual Basic for Application)</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>9</td>
<td>Programming in Internet</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>10</td>
<td>Database design (MS Access)</td>
<td>6</td>
<td>6.75</td>
</tr>
<tr>
<td>11</td>
<td>Technology of creating of computer networks</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>12</td>
<td>Econometrics</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>13</td>
<td>Theory of economy</td>
<td>3</td>
<td>3.375</td>
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<tr>
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<td><strong>Total</strong></td>
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#### Chosen disciplines

**Disciplines of a series of development of applied programming on tools of disciplines of the obligatory block**

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<th>Discipline</th>
<th>Credit points</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Practical work on programming</td>
<td>8</td>
<td>9</td>
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</table>

**Disciplines of series of development of technology of programming in C++ language**

<table>
<thead>
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<th>#</th>
<th>Discipline</th>
<th>Credit points</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Programming in C++</td>
<td>6</td>
<td>6.75</td>
</tr>
<tr>
<td>3</td>
<td>Programming in Borland C++ Builder</td>
<td>6</td>
<td>6.75</td>
</tr>
</tbody>
</table>

**Disciplines of series of development of technology of programming in Pascal language**

<table>
<thead>
<tr>
<th>#</th>
<th>Discipline</th>
<th>Credit points</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Programming in Delphi</td>
<td>6</td>
<td>6.75</td>
</tr>
</tbody>
</table>

**Disciplines of series of development of data structure**

<table>
<thead>
<tr>
<th>#</th>
<th>Discipline</th>
<th>Credit points</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Mathematical logic</td>
<td>2</td>
<td>2.25</td>
</tr>
<tr>
<td>6</td>
<td>Structures and algorithms of data processing with elements of discrete mathematics</td>
<td>6</td>
<td>6.75</td>
</tr>
</tbody>
</table>

**Disciplines of series of development of intellectual systems**

<table>
<thead>
<tr>
<th>#</th>
<th>Discipline</th>
<th>Credit points</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Method of artificial intelligence</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>8</td>
<td>Expert systems</td>
<td>3</td>
<td>3.375</td>
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**Independent disciplines**

<table>
<thead>
<tr>
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<th>ECTS</th>
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</thead>
<tbody>
<tr>
<td>9</td>
<td>Basics of HTML</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>10</td>
<td>Programming in Javascript</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>11</td>
<td>Interactive graphical systems</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>12</td>
<td>Processing of experimental data</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>13</td>
<td>Information technologies of accounting, analysis and audit</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>14</td>
<td>The concept of modern natural sciences</td>
<td>2</td>
<td>2.25</td>
</tr>
<tr>
<td>15</td>
<td>Physics</td>
<td>4</td>
<td>4.5</td>
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**Totally can be chosen**

<table>
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<th>Discipline</th>
<th>Credit points</th>
<th>ECTS</th>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>64</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>

95
### Profile disciplines

*disciplines, belonged to specific specialty and each high institution can develop list of disciplines of the current block at its own convenience depending on its strategy in education market*

<table>
<thead>
<tr>
<th>Credit points</th>
<th>ECTS Credit points</th>
</tr>
</thead>
</table>

#### Direction 1: Web – programming

Obligatory disciplines

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Database MySQL</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>2) Computer graphics</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>3) Course work</td>
<td>1</td>
<td>1.125</td>
</tr>
<tr>
<td>4) Programming in PHP</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>5) UML technology</td>
<td>6</td>
<td>6.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

#### Direction 2: System administration

Obligatory disciplines

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Network administration</td>
<td>6</td>
<td>6.75</td>
</tr>
<tr>
<td>2) Selection and installation of hardware</td>
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<td>3.375</td>
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<tr>
<td>3) Selection and installation of software</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>4) Course work</td>
<td>1</td>
<td>1.125</td>
</tr>
<tr>
<td>5) Operation systems</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

#### On expansion of system administration direction

16) Circuitry | 2 | 2.25 |
17) The organization and functioning of the computer | 3 | 3.375 |
18) Computing systems, networks and telecommunications | 3 | 3.375 |

#### On expansion of Web-programming direction

19) Dynamic HTML | 3 | 3.375 |
20) Basics of XML | 3 | 3.375 |
21) Programming in Java | 3 | 3.375 |
22) The distributed information systems | 3 | 3.375 |
23) Development of server applications | 4 | 4.5 |

#### On expansion of technical designing specialization

24) The analytical geometry | 2 | 2.25 |
25) Working in system Maple | 3 | 3.375 |
26) Geometrical constructions with use of system AutoCAD | 3 | 3.375 |

#### On expansion of art designing specialization

27) Basics of Photoshop | 2 | 2.25 |
28) Basics of CorelDraw | 3 | 3.375 |
29) Basics of 3D Max | 3 | 3.375 |
<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>The mathematical statistics</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>31</td>
<td>MATLAB and Simulink</td>
<td>6</td>
<td>6.75</td>
</tr>
<tr>
<td>32</td>
<td>The system modeling</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td></td>
<td>On expansion of IT consultant specialization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>The copyright and standardization of software</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>34</td>
<td>The development of electronic shop</td>
<td>3</td>
<td>3.375</td>
</tr>
<tr>
<td>35</td>
<td>How to become IT consultant</td>
<td>2</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>Totally can be chosen</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>32</td>
<td>36</td>
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</table>
### Distribution of credits between courses and semesters

<table>
<thead>
<tr>
<th>№</th>
<th>The name of disciplines by cycles</th>
<th>Credit points</th>
<th>1st course</th>
<th>2nd course</th>
<th>3rd course</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-semester</td>
<td>2-semester</td>
<td>3-semester</td>
<td>4-semester</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 weeks</td>
<td>15 weeks</td>
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<td>15 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5-semester</td>
<td>6-semester</td>
<td>7-semester</td>
<td>8-semester</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 weeks</td>
<td>15 weeks</td>
<td>15 weeks</td>
<td>15 weeks</td>
</tr>
</tbody>
</table>

#### General disciplines

6. Foreign language | 9 | 3 | 3 | 3
7. State language | 3 | 3
8. The history of Tajik nation | 3 | 3
9. Informatics | 6 | 3 | 3
10. The basics of mathematics | 3 | 3

Chosen disciplines | 8 | 3 | 3 | 2

Total for general disciplines | 32 | 15 | 9 | 6 | 2

#### Basic disciplines

14. Higher mathematics | 4 | 4
15. Computing mathematics | 3 | 3
16. Course work on computer technologies | 1 | 1

17. Marketing | 2 | 2
18. Object-oriented programming | 3 | 3
19. Basics of Web-design (Macromedia Dreamweaver) | 3 | 3
20. Basics of programming (Microsoft Visual Basic) | 3 | 3
21. Office programming (Microsoft Visual Basic for Application) | 3 | 3

22. Programming in Internet | 3 | 3
23. Database projecting (MS Access) | 6 | 3 | 3
24. Technology of creating of computer networks | 3 | 3

25. Econometrics | 3 | 3
26. Theory of economy | 3 | 3

Chosen disciplines | 24 | 3 | 5 | 6 | 10

Total for basic disciplines | 64 | 7 | 10 | 14 | 17 | 16

#### Profile disciplines

**Direction 1: Web — programming**

<table>
<thead>
<tr>
<th></th>
<th>1-semester</th>
<th>2-semester</th>
<th>3-semester</th>
<th>4-semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Database MySQL</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Computer graphics</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Course work</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Programming in PHP</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. UML technology</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Direction 2: System administration**

<table>
<thead>
<tr>
<th></th>
<th>1-semester</th>
<th>2-semester</th>
<th>3-semester</th>
<th>4-semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Network administration</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Selection and installation of hardware</td>
<td>3</td>
<td>98</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8. Selection and installation of software</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix VII: ECTS - Glossary and structure for diploma supplement

I. OUTLINE STRUCTURE FOR THE DIPLOMA SUPPLEMENT

This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international ‘transparency’ and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION
1.1 Family name(s):
1.2 Given name(s):
1.3 Date of birth (day/month/year):
1.4 Student identification number or code (if available):

2 INFORMATION IDENTIFYING THE QUALIFICATION
2.1 Name of qualification and (if applicable) title conferred (in original language):
2.2 Main field(s) of study for the qualification:
2.3 Name and status of awarding institution (in original language):
2.4 Name and status of institution (if different from 2.3) administering studies (in original language):
2.5 Language(s) of instruction/examination:

3 INFORMATION ON THE LEVEL OF THE QUALIFICATION
3.1 Level of qualification:
3.2 Official length of programme:
3.3 Access requirements(s)

4 INFORMATION ON THE CONTENTS AND RESULTS GAINED
4.1 Mode of study:
4.2 Programme requirements:
4.3 Programme details: (e.g. modules or units studied), and the individual grades/marks/credits obtained: (if this information is available on an official transcript this should be used here)
4.4 Grading scheme and, if available, grade distribution guidance:
4.5 Overall classification of the qualification (in original language):

5 INFORMATION ON THE FUNCTION OF THE QUALIFICATION
5.1 Access to further study:
5.2 Professional status (if applicable):

6 ADDITIONAL INFORMATION
6.1 Additional information:
6.2 Further information sources:

7 CERTIFICATION OF THE SUPPLEMENT
7.1 Date:
7.2 Signature:
7.3 Capacity:
7.4 Official stamp or seal:

8 INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM
(N.B. Institutions who intend to issue Diploma Supplements should refer to the explanatory notes that explain how to complete them.)

II. EXPLANATORY NOTES ON COMPLETING SUPPLEMENTS.
1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION
1.1 Provide the full family or surname.
1.2 Include all given/first names.
1.3 Indicate day, month and year of birth.
1.4 This should identify the individual as a student enrolled on the particular programme which is covered by the Diploma Supplement. A national or State personal identification number could be included for those countries that have such systems of identification.

2 INFORMATION IDENTIFYING THE QUALIFICATION
2.1 Give the full name of the qualification in the original language as it is styled in the original qualification e.g. Kandidat nauk, Maîtrise, Diplom, etc. If the qualification is a dual award this should be stated. Indicate if the award confers any nationally accepted title on the holder and what this title is e.g. Doctor, Ingénieur etc. Indicate if the title is protected in law.
2.2 Show only the major field(s) of study (disciplines) that define the main subject area(s) for the qualification e.g. Politics and History, Human Resource Management, Business Administration, Molecular Biology etc.
2.3 Indicate the name of the institution awarding the qualification. This is often, but not always, the same as the institution administering the studies and delivering the programme (see 2.4 below). Qualifications may be delivered by a sub-contracted institution that has been given a ‘franchise’ or some type of ‘accreditation’ by a senior competent authority. This might be the state, a university or a professional institution. Sometimes the senior authority may be a foreign institution. If this is the case it should be indicated here. Also indicate the status of the awarding institution: Private/Independent, Private and State recognised, State, and if applicable who it is accredited by etc. Finally, indicate the general national educational classification of the awarding institution e.g. University, Fachhochschule, Professional Body, Technical College, Grande Ecole etc. If there is a difference between the awarding institution and the institution delivering the qualification indicate the status of both.
2.4 This refers to the institution which is responsible for the delivery of the programme. In some cases this can be different from the institution awarding the qualification (see 2.3 above). Also indicate the status of the institution delivering the studies: Private/Independent, Private and State recognised, State, and if applicable who it is accredited by etc. Finally, indicate the general national educational classification of the administering institution e.g. College of Higher Education, Private Institute etc.
2.5 Indicate the language(s) by which the qualification was delivered and examined.

3 INFORMATION ON THE LEVEL OF THE QUALIFICATION
3.1 Give the precise level of qualification and its place in the specific national educational structure of awards (explained and cross-referenced to the information in section eight). The local educational framework should be explained, e.g. University Undergraduate/Postgraduate, Baccalaureate + x years etc. Include any relevant information on ‘level indicators’ that are nationally devised and recognised and which relate to the qualification.
3.2 Explain the official duration of the programme in weeks or years and the actual workload including information on any major sub-components i.e. practical training. Preferably, the workload should be expressed in terms of total student effort required. This consists of the normal designated time on the programme including taught classes and private study, examinations etc. This can be expressed as x hours per week for x weeks, or just by using the normal local description of the length e.g. one year full-time study.
3.3 List or explain the nature and length of access qualification(s) or periods of study required for access to the programme described by this Diploma Supplement e.g. Bachelor Degree, Baccalaureate etc. This is particularly important when intermediate studies are a prerequisite to the named qualification.
4 INFORMATION ON THE CONTENTS AND RESULTS GAINED

4.1 The mode of study refers to how the programme was undertaken e.g. Full-time, Part-time, Intermittent/Sandwich, Distance, including Placements etc.

4.2 If applicable, provide details of the regulations covering the minimum standards required to secure the qualification, e.g. any compulsory components or compulsory practical elements, whether all elements have to be passed simultaneously, any thesis/dissertation regulations etc. Include details of any particular features that help define the qualification, especially information on the requirements for successfully passing it. If available, provide details of the learning outcomes, skills, competencies and stated aims and objectives associated with the qualification.

4.3 Give details of each of the individual elements or parts of the qualification and their weighting. List the actual marks and/or grades obtained in each major component of the qualification. Entries should be as complete as possible and in accordance with what is normally recorded at the institution concerned. Cover all examinations and assessed components and/or fields of study offered in examination, including any dissertation or thesis. Indicate if the latter were defended or not. All this information is often available in the form of a transcript (a useful format for transcripts was developed for the European Credit Transfer System [ECTS] (1)). Many credit-based systems employ detailed transcripts that can be integrated into the wider framework of the Diploma Supplement. If information on the credit allocation between course components and units is available it should be included.

4.4 Provide information on the grading scheme and pass marks relating to the qualification e.g. marks are out of a possible 100% and the minimum pass mark is 40%. Tremendous variations in grading practices exist within and between different national higher education institutions and countries. A mark of 70% in some academic cultures is highly regarded whilst in other countries it is regarded as average or poor. Information on the use and distribution of grades relating to the qualification in question should be included.

4.5 If appropriate, indicate the overall classification for the final qualification i.e. First Class Honours Degree, Summa Cum Laude, Merit, Avec Distinction etc.

5 INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 Indicate if within the country of origin, the qualification normally provides access to further academic and/or professional study, especially leading to any specific qualifications, or levels of study e.g. access to Doctoral studies in Hungary. If this is the case, specify the grades or standards that have to be obtained to allow progression. Indicate if the qualification is a terminal (end) award or part of a hierarchy of awards.

5.2 Give details of any rights to practise, or professional status accorded to the holders of the qualification. What specific access, if any, does the qualification give in terms of employment or professional practice and indicate which competent authority allows this. Indicate if the qualification gives access to a ‘regulated profession’.

6 ADDITIONAL INFORMATION

6.1 Add any additional information not included above but relevant to the purposes of assessing the nature, level and usage of the qualification e.g. the qualification involved a period of study/training in another institution/company/country and/or, include further relevant details about the higher education institution where the qualification was taken.

6.2 Indicate any further useful information sources and references where more details on the qualification could be sought e.g. the higher education institution web site; the department in the issuing institution; a national information centre; the European Union National Academic Recognition Information Centres (NARIC); the Council of Europe/UNESCO European National Information Centres on academic recognition and mobility (ENIC).

7 CERTIFICATION OF THE SUPPLEMENT

7.1 The date the Diploma Supplement was issued. This would not necessarily be the same date the qualification was
awarded.
7.2 The name and signature of the official certifying the Diploma Supplement.
7.3 The official post of the certifying individual.
7.4 The official stamp or seal of the institution that provides authentication of the Diploma Supplement.

8 INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM
Give information on the higher educational system: its general access requirements; types of institution and
the qualifications structure (2). This description should provide a context for the qualification and refer to it. A
standard framework for these descriptions together with actual descriptions should be available for many
countries.
These are being created as a follow-up to this project and with the co-operation of the relevant National
(European Union and European Economic Area) Academic Recognition Information Centre (NARIC),
European (Council of Europe/UNESCO) National Information Centre on Academic Recognition and
Mobility (ENIC), Ministries and Rectors’ conferences.

III. EXAMPLES OF DIPLOMA SUPPLEMENTS.
IV. FOUNDING PRINCIPLES AND GENERAL GUIDELINES FOR THOSE PRODUCING SUPPLEMENTS

The following founding principles and general guidelines are designed to help the production of concise and effective supplements. They result from the work of a joint European Commission Council of Europe UNESCO/CEPES working group that in 1997-1998 piloted and evaluated the Diploma Supplement. The guidelines make strong recommendations concerning the principles and good practice behind effective supplements and the explanatory notes give further detailed advice to higher education institutions who create supplements. All documents are available in all EU/EEA languages and Russian. A range of good practice examples of completed Diploma Supplements can be found on the servers of the European Commission, DG22 (http://europa.eu.int/en/comm/dg22), the Council of Europe (http://culture.coe.fr) or UNESCO/CEPES (http://www.cepes.ro). The Diploma Supplement is intended to facilitate the implementation of the Convention on the Recognition of Qualifications Concerning Higher Education in the European Region, Lisbon 1997. It was further tested as part of the Phare Multi-Country Project, Recognition of Higher Education Diploma and Study Credit Points Across Borders.

Founding Principles:
The Diploma Supplement is based on the following important founding principles that respect national and international academic autonomy. These principles also give some further explanation of the purpose and nature of the new version. The Diploma Supplement is:

1. A flexible, non-prescriptive tool, capable of adaptation to local needs. It can be used to replace or augment current approaches. Existing transcripts and explanatory systems can be integrated into the framework or be superseded by it. The supplement uses a sequence for the information that it is strongly recommended should be followed.

2. A device that has national and international applications. It has been designed to aid the resolution of international recognition problems as well as domestic ones. These have both been intensified by increasingly fast-changing and complex qualification and award structures.

3. A system to aid recognition for academic and professional purposes. It is potentially useful for all higher education institutions, professional bodies, students, employers, public bodies, governments and citizens.

4. An approach that specifically excludes claims and value-judgements concerning equivalence by providing sufficient objective information to allow the recipient to make his or her own judgements about the qualification in question. It is a system that does not guarantee automatic admission or recognition. It facilitates the process whereby judgements are made by autonomous national or local bodies (academic, professional, governmental, etc.) and therefore does not infringe local rights of judgement. It eases the process of access and recognition.

5. A tool that should be used with sensitivity. The recognition of foreign qualifications should be viewed as a process for the assessment of the competence, experience and knowledge acquired, recognising that ‘fair recognition’ and not exact equivalence should be sought. Users of the supplement are encouraged, where possible, to focus on the outcomes of the learning that has taken place and to make their judgements using the qualitative and quantitative information provided.

6. A set of guidelines that avoids the inclusion of so much detail that it confuses the user. This minimalist approach acknowledges the cost of producing the supplement and wherever possible advocates referral to other information sources that could be consulted. However, the Diploma Supplement should provide all the necessary information for a judgement to be made without repeated demands for more data.

7. An addition to the original credential. The credential should remain unchanged from its normal state (in its approved language and textural form). The Diploma Supplement should accompany the authentic credential that certifies the award. It is not a substitute for it. Furthermore, the Diploma Supplement can be used in conjunction with other appropriate documentation, including curriculum vitae, etc. a person may well have several Diploma Supplements, each accompanying an individual qualification.
General Guidelines
It is strongly recommended that supplements should conform with the following:

1. The brief explanatory note (In the box at the head of the sample supplement) should be reproduced as part of each completed Diploma Supplement, in order to guide higher education institutions, citizens, employers and other potential users of the information.

2. Institutions should follow the structure and sequence of information carefully developed and tested by the pilot project. Various customised versions were tested and found not to be as clear and user-friendly. In the cases where sections were omitted altogether, these supplements were invariably found to be ineffective. Great care needs to be taken in compiling supplements in order to avoid imprecise, missing or confused information. Overylong and over-complicated supplements should be avoided. They irritate those who receive them. Avoid information overload and present information as concisely as possible. The examples of good practice supplements show how this can be done. The use of a transcript clearly helps provide detailed information in a concise way.

3. In combination with the credential itself, the supplement should provide sufficient information to enable the reader to make a judgement about the qualification and whether it is appropriate for the purpose for which the holder seeks to use it (e.g. for access to an academic programme, exemption from part of a programme, employment/right to practise a profession, etc.). It is not designed to replace a curriculum vitae but to provide additional information.

4. The supplement should always be accompanied by the original qualification as supplements normally have no legal validity. The existence of a Diploma Supplement does not guarantee the status of an institution, its awards, or whether it is recognised as part of a national higher education system. However, it should contain information on these aspects.

5. The supplement should always have the name and title of the qualification, the name and status of the institution awarding/administering it, and the classification of the award all presented in the original language. Incorrect translations mislead those making judgements about qualifications. Transliterations are permissible in the case of scripts other than the Latin alphabet. It should be possible to relate the names of degrees and awards to the description of the higher education system under section eight.

6. Supplements should be free from any value judgements, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

7. The production of supplements is best done centrally and not devolved to different parts of academic institutions. This keep costs down and minimises variation in content and approach.

8. Institutions should take appropriate action to minimise the possibility of forgery and misrepresentation of their supplements.

9. Information on the higher education system (section eight) should be kept to a two-page maximum. Where possible, information could include diagrams and charts to aid clarity. As a follow-up to the pilot Diploma Supplement project, finalised versions of this information are to be produced for each country with the help of national ENICs/NARICs (national information centres), Ministries and Rectors’ Conferences.

10. It is best to issue supplements automatically at the time the qualification is completed. This is preferable to retrospective issue which becomes more difficult as programmes and educational awards are subject to continuous evolution and change. It is particularly important that section eight of the supplement describe the national higher education structure in force at the time the qualification was awarded.
11. Great care should be taken with translations and terminology as many problems exist in this area. In order to overcome these, it is essential that the original language is used where indicated in the supplement. In addition, the glossary of terms associated with the supplement has been specifically produced to overcome linguistic confusions. Supplements may be produced in whatever language(s) institutions think appropriate.

12. Where they exist, institutional, regional and national quality assurance systems should include Diploma Supplements in their activities. This will help ensure the quality of supplements.

13. Supplements are designed to be used with sensitivity. The evaluation of qualifications from another country should concentrate on the competence; experience and knowledge acquired, recognising that ‘fair recognition’ and not exact equivalence should be sought.
V. GLOSSARY.

**ACADEMIC RECOGNITION** refers to the recognition of courses, qualifications or diplomas from one (domestic or foreign) higher education institution by another. Usually this is sought as a basis for access to further new study at the second institution (cumulative recognition) or, as recognition allowing some sort of exemption from having to re-study elements of a programme (recognition with advanced standing). A further type of academic recognition is recognition of studies taken elsewhere in another institution (recognition by substitution) that replace a comparable period of study at the home institution (see PROFESSIONAL RECOGNITION).

**ACCESS** (to higher education) refers to the right of qualified candidates to apply and be considered for admission to higher education. Access is distinct from admission, which concerns the individuals' actual participation in the higher education programme concerned.

**ACCREDITATION** is the process by which one higher education institution gains authority to award, and/or gains recognition of, its qualifications from another senior competent authority. This might be the State, a government agency or, another domestic or foreign higher education institution (see FRANCHISE). The term has its origins in the American system and is used in some European countries in the same way as 'recognition'.

**ADMISSION** the act of, or system for, allowing qualified applicants to pursue studies in higher education at a given institution and/or a given programme.

**ASSESSMENT** (of institutions or programmes) is the process for establishing the educational quality of a higher education institution or programme; ii) (of individual qualifications) the written appraisal or evaluation of an individual’s foreign qualifications by a competent authority; iii) (of individual students) the actual testing of a student’s ability and skills within a programme (e.g. by examination).

**AWARD** this is used synonymously with qualification.

**COMPETENT RECOGNITION AUTHORITY** a body officially charged with making binding decisions on the recognition of foreign qualifications.

**COURSE** a part of a programme of studies that is normally self-contained and assessed separately. Complete study programmes are normally composed of several courses.

**CREDENTIAL** a term sometimes used to refer to a qualification (see QUALIFICATION).

**CREDENTIAL EVALUATOR** the individual who makes a judgement on the recognition of foreign qualifications (see COMPETENT RECOGNITION AUTHORITY).

**CREDIT** the 'currency' providing a measure of learning outcomes achieved in a notional time at a given level. Usually associated with credit-based modular courses (see ECTS).

**DE FACTO RECOGNITION** refers to situations of unregulated recognition for professional purposes, such as where no national legal authorisation to practice a particular profession exists or is required. This is the most problematic area of professional recognition (see PROFESSIONAL RECOGNITION and RECOGNITION).

**DE JURE RECOGNITION** refers to the recognition of the right to work in a specific country in a regulated profession (e.g. medical doctor) in the European Union or European Economic Area. These situations are subject
to various European Union Directives whereby if a citizen is a fully qualified professional in one Member State, he or she has a right to exercise that profession and be recognised as a professional in another Member State (see REGULATED PROFESSION, PROFESSIONAL RECOGNITION and RECOGNITION).

**DIPLOMA** here refers to any formally awarded qualification/credential. In some educational systems the term refers to a specific category or type of qualification. It is not being used in this restricted sense here.

**ECTS** the European Credit Transfer System (developed by the European Commission). This is a system based on ECTS credits (student workload), designed to facilitate mobility, credit accumulation and transfer, and the international recognition of periods of study completed abroad.

**ENIC** European National Information Centre on Academic Recognition and Mobility (Council of Europe/UNESCO).

**FRANCHISE** the situation where an institution agrees to authorise another institution (nationally or internationally) to deliver an approved programme whilst normally retaining overall control of the programme’s content, delivery, assessment and quality assurance arrangements. However, significant variations in franchise relationships exist.

**FIELD OF STUDY** the main disciplines or subject areas of a qualification.

**HIGHER EDUCATION** all types of courses of study, or sets of courses (programmes), training, or training for research at the post secondary level which are recognised by the relevant authorities as belonging to its higher education system. Higher education builds on the level of competence, knowledge and skills generally acquired through secondary education (see HIGHER EDUCATION INSTITUTION and PROGRAMME OF STUDY). Higher education normally comes after secondary education in time and is normally offered through higher education programmes at higher education institutions. However, it should be noted that higher education institutions may give courses of study that are not higher education level. Conversely, institutions which are not considered as belonging to the higher education system may offer some higher education programmes. The exact definition of higher education and higher education institutions vary from country to country. For example, in some countries, nursing is considered to be a field of higher education, whereas in other countries, nursing is considered to be part of post-secondary education without being higher education.

**HIGHER EDUCATION INSTITUTION** an establishment providing higher education and recognised by the competent authorities as belonging to its system of higher education (see HIGHER EDUCATION and PROGRAMME OF STUDY).

**LEARNING OUTCOMES** the specific intellectual and practical skills gained and tested by the successful completion of a unit, course or whole programme of study.

**LEVEL** the place of a qualification in the higher education system. Normally, a national hierarchy of qualifications exists. The number of levels of higher education qualifications vary between countries and/or kinds of higher education (see LEVEL INDICATORS).

**LEVEL INDICATORS** these can range from any general information on the role of the qualification to highly detailed specific statements about the nature, skills and competencies associated with the successful completion of parts or all of a qualification (see LEVEL).


**MODULE** a separate and coherent block of learning. Part of a modular programme of studies where the curriculum is divided into a range of similar sized segments. **NARIC** National Academic Recognition Information Centre (European Union and European Economic Area). Some NARICs also have responsibilities for professional recognition.

**PROFESSIONAL RECOGNITION** refers to the right to practise and the professional status accorded to a holder of a qualification. In the European Union recognition for professional purposes is defined as the legal act by which a competent authority in a host Member State recognises that the qualifications obtained by an
applicant in another Member State are suitable for the pursuit on its territory of a professional activity whose practice is legally regulated (see REGULATED PROFESSION, DE JURE RECOGNITION, DE FACTO RECOGNITION and RECOGNITION).

PROGRAMME OF STUDY a set of courses, the various components of which complement and build on each other in order to provide the student with a higher education qualification (see HIGHER EDUCATION, HIGHER EDUCATION INSTITUTION and COURSE). ‘Programme’ also denotes the academic fields of study and requirements that collectively define the qualification (see FIELD OF STUDY).

QUALIFICATION i) higher education qualification: any degree, diploma or other certificate issued by a competent authority attesting the successful completion of a higher education programme; ii) qualification giving access to higher education: any diploma or other certificate issued by a competent authority attesting the successful completion of an education programme and giving the holder of the qualification the right to be considered for admission to higher education (see HIGHER EDUCATION, HIGHER EDUCATION INSTITUTION and PROGRAMME OF STUDY). Also termed as any higher education award given for the successful completion of a programme of learning; a generic term that refers to the wide variety of higher education qualifications at different levels and across different countries.

QUALITY ASSURANCE refers to the internal and external processes by which the quality of academic provision is maintained.

RECOGNITION a formal acknowledgement by a competent authority of the value of a foreign educational qualification with a view to access to educational and/or employment activities. An assessment of individual qualifications. Such assessment may be any kind of statement on the value of (in this case) a foreign qualification. Recognition refers to a formal statement by a competent recognition authority acknowledging the value of the qualification in question and indicating the consequences of this recognition for the holder of the qualification. For example a qualification may be recognised for the purposes of further study at a given level (academic recognition), or for the use of a title, or for the exercise of employment purposes (professional recognition) (see COMPETENT RECOGNITION AUTHORITY, QUALIFICATION, ACADEMIC RECOGNITION and PROFESSIONAL RECOGNITION). Recognition can also refer to the accreditation of a higher education institution by another authority (see ACCREDITATION).

REGULATED PROFESSION refers to professions whose practice is regulated in some way by law or administrative rules. A given profession may be regulated in one country and not in another (see DE JURE RECOGNITION).

TRANSCRIPT an official record or breakdown of a student’s progress and achievements. Many credit-based education systems employ detailed transcripts that show the credits and grades for units undertaken (e.g. ECTS Transcript of Records).

VALIDATION the process by which a recognised awarding institution judges that a programme of study leading to a qualification is of appropriate quality and standard. This can be a programme of its own or that of a subordinate institution (see FRANCHISE).
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