

Degree Programme in Business Information Technology yearbook 2013–2014



Hämeenlinna, FINLAND

Lasse Seppänen (ed.)

printed

ISBN 978-951-784-688-2

ISSN 1795-4231

HAMKin julkaisuja 14/2014

e-publication

ISBN 978-951-784-690-5 (PDF)

ISSN 1795-424X

HAMKin e-julkaisuja 32/2014

**Degree Programme in
Business Information Technology
yearbook 2013 – 2014
Hämeenlinna, FINLAND**

Lasse Seppänen (ed.)

Degree Programme in Business Information Technology yearbook 2013–2014
– Hämeenlinna, FINLAND

Lasse Seppänen (ed.)

printed

ISBN 978-951-784-688-2

ISSN 1795-4231

HAMKin julkaisuja 14/2014

e-publication

ISBN 978-951-784-690-5 (PDF)

ISSN 1795-424X

HAMKin e-julkaisuja 32/2014

© HAMK University of Applied Sciences and the authors

PUBLISHER

HAMK University of Applied Sciences

PO BOX 230

FI-13101 Hämeenlinna, FINLAND

tel. (03) 6461

julkaisut@hamk.fi

www.hamk.fi/julkaisut

Cover Photo: From left student Markus Pykkänen, student Taina Ruokolainen,
student Anssi Päivinen, student Ari Tölö and Kari Kinnunen, Paccor Oy
Photo: Lasse Seppänen

Layout: HAMK Publications

Printed in: Tammerprint Oy, Tampere

Hämeenlinna, December 2014



Foreword for exchange students

The Degree Programme in Business Information Technology, BIT, welcomes exchange students!

The studies described in this book are suitable to both IT and business related students coming from degree programmes like Business Information Technology/Systems, Information Technology, Business Administration or Business Economics. The studies are best for the third year students.

ICT Projects 15+3 ECTS credits

ICT Project is a project based course of the Degree Programme in Business Information Technology of HAMK University of Applied Sciences. This course of 15 ECTS credits is held on the third year to make students learn in real projects from local companies. Though the name relates largely to ICT there is a lot of room for business related students in the projects.

The projects start in September. The students meet the client and they write a project plan to and familiarize the project and its environment. Several project management methods may be used in the project. In the project meetings agile SCRUM kind of method is used in order to have an opportunity for every student to express themselves. The projects end normally in February but can be scaled to exchange students for a shorter period of time. The outcome of the project is delivered to the client and a project report is written in a form of an article to this yearbook. In a common seminar day every project group demonstrates their results also in English.

The management language of the projects is English. The course is integrated to Professional English, 3 ECTS credits. The English teacher takes part in some of the project meetings. This way the students are prepared to future international projects. Students have given good feedback of this arrangement.

These projects have started 2000. During the year 2013-2014 25 students took part in the seven ICT Projects. Five of them were for local companies, two to the university IT Management. You can see some of their reports later in the book.

Digital Enterprise studies 5 – 20 ECTS credits

In our Digital Enterprise minor studies in cooperation with the Degree Programme in Business Administration we have courses like Customer Relationship Management, Financial and Human Resource Management, eCommerce and Production Management. These courses are performed in a practice enterprise PE Amientia Design Ltd with Microsoft Dynamics AX ERP system, not with traditional courses.

Welcome to us for half a year and 30 credits!

principal lecturer Lasse Seppänen

Contents

Foreword for exchange students	3
Minor subject studies in a practice enterprise and factories	7

ICT PROJECTS

ICT Project is for real clients	13
ICT Project: Paccor and Microsoft AX 2012	17
ICT Project: Security.....	25
ICT Project: Sharepoint.....	33
ICT Project: Sorviin.info.....	41
ICT Project: Ambientia.....	47

Minor subject studies in a practice enterprise and factories

Principal Lecturer Lasse Seppänen

The Digital Enterprise studies are in two minor subjects: Enterprise Resource Planning (ERP) Systems and e- and mBusiness each 15 ECTS credits.

ERP Systems consist of Customer Relationship Management (CRM), Financial and Human Resource Management, and Production Management each 5 ECTS credits. These courses are available to exchange students along with the ICT Projects.

e- and mBusiness has also three courses Digital Marketing, eCommerce and Digital Service Development each 5 ECTS credits. Of these courses eCommerce dealing web shops is available to exchange students.

CRM and Financial and Human Resource Management deal with international sales. We have international partners in Austria (IMC University of Applied Sciences, Krems), the Netherlands (Avans University of Applied Sciences, 's-Hertogenbosch) and Norway (Molde University of Applied Sciences). Our students sell them virtual mobile phones with order-to-delivery process. From the practice enterprises of our partners we buy their products. The students use webex, skype and email in the business negotiations.





In business negotiation Mikko Kero and Jonna Ritari



CEO Toni Perosvuo is happy

These studies are developed in cooperation by degree programmes Business Administration and Business Information Technology. A team of teachers lecturer Merja Helin, lecturer Kyllikki Valkealahti, lecturer Tommi Saksa and principal lecturer Lasse Seppänen lead students while they work in PE Amentia Design Ltd performing various tasks related to their roles. In these studies we use Microsoft Dynamics AX 2012 ERP and Microsoft Dynamics CRM systems on virtual servers. We are part of the Microsoft Dynamics Academic Alliance.



Action in Amentia Design

We went to an excursion on the StoraEnso fluting mill in Heinola. This factory produces semi-chemical fluting which is used as a raw material in the corrugated board industry. Our primary interest was to see how the ERP system run the factory. We saw how production orders sent from the used ERP system Microsoft Dynamics AX 4 were directed to resources (work force, machines) and products were cut and packaged. After a presentation of the factory and the ERP system we took a tour through the factories. We saw how the packages for various products were made in front of our eyes. Basically all production was automated. Workers were needed in starting the batches. In this process they checked that all colors were exactly aligned. Automated trucks travelled through the factory. This was also seen from screens located on all work stations.

This excursion was a joint group of the Paccor ICT Project and Amientia.



The hosts Ari Lehmuskela and Heidi Haavisto





ICT PROJECTS

ICT Project is for real clients

Principal Lecturer Lasse Seppänen

During their third year the students of the degree programme in Business IT develop their international project skills in ICT Projects. The clients of these projects are local companies or HAMK.

The students learn on their first year the basics of project management. For two years they are doing small projects in given subjects. The project studies end with the ICT Project. In the beginning the teachers tell about the management of the project. There can be one or several clients in a project like a client and a software house or a client and a service provider on whose servers the system will run. In these cases students need to be able to discuss with all parties.

Typical projects are development of interactive web pages and services, and introductions and configurations of ict systems. For example in last year's projects an English translation and new features were done to the sorviin.info service that is used to inform students of practice and thesis jobs. In another project Microsoft Dynamics AX in a factory was evaluated, in another the use of SharePoint and in another security issues. Also the student took part in demanding programming projects. The IT Management of HAMK and the degree programme represented the university in the projects. In 2013 – 2014 20 students took part in the six ICT Projects. Three of them were to local companies, one to the ICT Management and two to the degree programme. (table 1)



Members of the AX Project: Markus Pylkkänen, Taina Ruokolainen, Anssi Päivinen and Ari Tölä

Table 1: ICT Projects and clients 2013–2014

Client	ICT Project
Ambientia oy	Android
Kehittämiskeskus Oy Häme	Sorviin.info UI v. 2
Paccor oy	Microsoft Dynamics AX
IT Management of HAMK	SharePoint
Degree programme in Business IT	Mobile technologies
Degree programme in Business IT	Security

In English

The projects are managed in English. Project meetings and often the client meetings are in English. This attracts the students as there is no traditional English course but the discussions and documentation are of the own project. The three credit course Professional English is integrated with the ICT Project. The English teacher often takes part of the project meetings. The English teacher Brian Joyce organized the Trade Fair event where the projects presented themselves. These arrangements have pleased the students.

Project documentation, oral presentation in the project meetings and the Trade Fair presentation are evaluation criteria. The student have told that their language skills have clearly improved during the project as the language has been used frequently in real matters. Also the teachers have noted this as speaking English is also good for them too. The Paccor project won the 4th prize in the Trade Fair.

At the end the students present their projects in an auditorium. Typically they have a slide series and they present their system naturally in English.

Project management in a key role

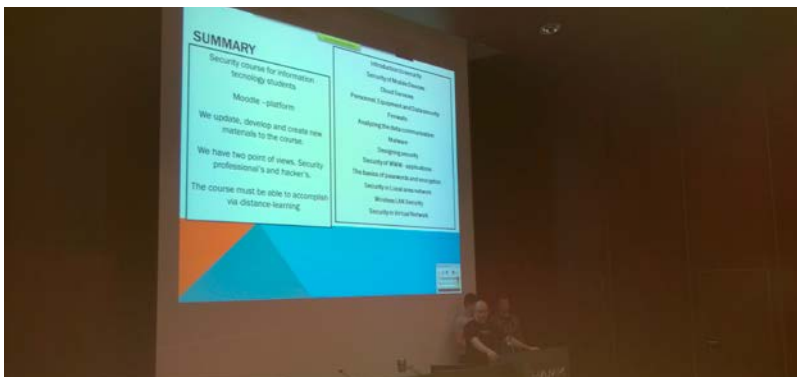
Project management has changed. In the early years we used the waterfall method starting from the planning phase which has proven to be too difficult. Now the students learn their environment and the client wish list and after that a plan is written. The students are free to pick their project management method as long as there is a project manager and suitable roles to all students. Typically such SCRUM meetings are held where every student can frequently tell about his/her thoughts and plans. During the project frequent meetings are also held with the client and the supervisor. At the end of the project a project report is written to this year book and the project results are delivered to the client. A final seminar day concludes the project in February.

Project manager is responsible for the client and supervisor interfaces. He/she organizes all the meetings including the steering group meetings (an other project group). This way they get a peer-to-peer evaluation. .

The students get experience in project work and client interface. They learn of the importance of the timetable and documentation in the course of the project. They realize the responsibility of the project manager as he/she must be aware of the project and the members of the project team.

Good feedback from companies

The client companies have mostly given very positive feedback. They get new knowledge, new technology and new features to their systems. In some projects even if starting from scratch almost a complete system could be delivered. A project can be extended to two years if it has been too large for one group. Companies have thanked the teams of cooperation, open mindness and constructive discussion.



Security project presentation for a focused audience



From left: student Markus Pylkkänen, student Taina Ruokolainen, student Anssi Päivinen, student Ari Tölä and Kari Kinnunen, Paccor Oy

ICT Project: Paccor and Microsoft AX 2012

Principal Lecturer Lasse Seppänen
Student Anssi Päivinen, Project Manager
Student Taina Ruokolainen
Student Markus Pylkkänen
Student Ari Tölä

Paccor is a company which offers consumer packaging and related services. Paccor's product range consists of different kinds of containers, lids and cups, mainly for food service sector. Paccor Group has 19 factories in 13 different European countries. Their factory located in Hämeenlinna, Moreeni, and was the client of our ICT project. Our contact person was Kari Kinnunen. Paccor is planning to change their current production management system and that is the reason why they took part in business information technology's ICT project to test and find out how well Microsoft Dynamics AX 2012 would fit to their production.

Microsoft Dynamics AX is an ERP system built by Microsoft and it is suitable for many different industries. Microsoft Dynamics AX fits the versatile needs of medium-sized and large companies. The system includes custom-

er relationship management, warehouse management, sales and purchases in addition to the modules for production planning, production control, human resources management, project and cost management.

The target of the ICT project was to focus mainly in production part while studying the use of Microsoft Dynamics AX. Along with production we had to introduce ourselves to product and warehouse management. It would be good for us to know also about sales management, so that we could buy materials to the warehouses.

We were a steering group to another ICT project group, formed by Henri Pulakka, Petri Honkola and Joose Kaaselainen. Their customer was Sorviin.info. ICT project was also finteegrated to an English course taught by Brian Joyce. Principal lecturer Lasse Seppänen was the supervisor of the project.

Start of the project

Our ICT projects started with mutual lessons, where the students were introduced to the subjects and cooperation companies. Our group of four was formed by the interests of the students and our project got the job Paccor Ltd was offering. None of our group members had previous experience of Microsoft Dynamics AX, but we took the challenge open minded. Some of us had previously worked in projects concerning different systems. The idea was to test and create Paccor's production line with Microsoft Dynamics AX. In the end we would report our experiences of the system's suitability to our contact person Kari Kinnunen.

In the very beginning of our project we divided areas of responsibilities and titles to the group members in terms to ease the progress of the project. Despite the areas of responsibilities all the group members were equals and responsible for the project success in the same way.

Anssi Päivinen, project manager
Taina Ruokolainen, secretary
Markus Pylkkänen, project member
Ari Tölö, project member

The duties of the project manager were to be up to date with the project's big picture and progress. In addition he was the contact person between the supervising teacher and the client. The secretary's main responsibility was producing and controlling the documentation. The project members' responsibility was to perceive the progress and working in Microsoft Dynamics AX. Despite of all these tasks, all of us worked among the same things throughout the whole project.

The actual start of the project delayed due to reasons that had nothing to do with the project group, but because we didn't have access to the Microsoft Dy-

namics AX. After we got access to the system, we faced another problem because of insufficient user rights. Finally, after a fair month's delay, we were able to start. For the very beginning we held a few meetings with our contact person from Paccor, where we got information about Paccor and its production. We also got a change to visit Paccor's factory in Moreeni, Hämeenlinna. Our project started with the introduction to the system and receiving the tasks from our client. Working with the Microsoft Dynamics AX started as soon as we got permissions.

Project phases and challenges

Our project divided clearly into few different steps. First was the beginning of the whole project, when we introduced ourselves to the use of Microsoft Dynamics AX, our client and the customs of the ICT project. So our start was very theoretical. We also created a project plan to support our progress. The progress of our project was planned to divide into cycles that last couple of weeks, because our purpose was to have meetings with our client every other week. In these meetings we would talk about the progress of the project, current and future stages and also appeared problems. Sometimes the time between the meetings might have been longer than two weeks because of various reasons, either the problems in fitting timetables together or nothing new to report hadn't appeared which would need the meeting.

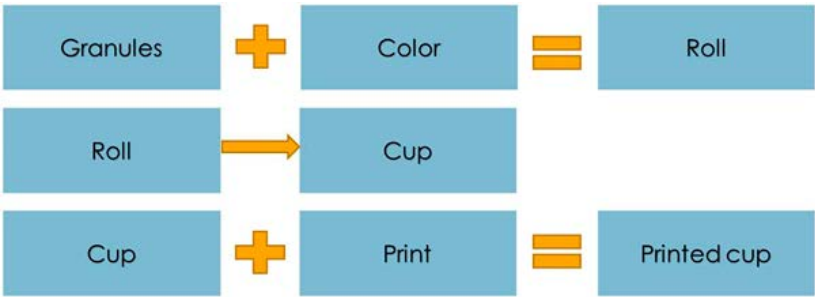
Receiving the task list from the client and getting access to the system started the actual phase of working on the project. In the beginning the problem seemed to be the user permissions in Microsoft Dynamics AX. At first we didn't have the required permissions to the system, so we were only able to examine the system theoretically. Finally we got our hands on Microsoft Dynamics AX, but everything didn't seem to be working correctly. At first we thought that we just can't use the system properly. Very quickly this thought disappeared and we noticed we didn't have necessary access rights to use the system. Quickly we got admin rights of Microsoft Dynamics AX to few of our group members and after a little investigation we managed to matching rights to the rest of the group. Now we were able to really start working on Microsoft Dynamics AX. First we started to proceed by defining basic parameters to the system. After the parameters we had to define proper working environment, which would match Paccor's production that was introduced to us. The environment consists of personnel, warehouses, products etc. After we defined the working environment we got to build Paccor's production line and environment.

In our testing of Microsoft Dynamics AX, Paccor's production environment consists of purchases, warehouses, products and production. By December we had managed to set the basic parameters to the system, also partly personnel and products.

By using the Microsoft Dynamics AX we learnt more about the operability of the system, so our working was mainly testing and checking. We intended to add all the parameters to the system at once, even those we didn't need. In reality it went so, that we edited the parameters throughout the whole project, because we didn't know which parameters have impact on each others in the first place.

Adding personnel went without any problems and that immediately created a positive atmosphere, using the Microsoft Dynamics AX wouldn't be that hard after all. We filled a lot of things during the adding of personnel, for example adding an office to the factory, just that we would learn the system.

While creating the products we started to understand the variety and by that the complexity of the system. This was the first touch to the world of incorrect parameters and missing data. We managed to create our first product successfully during a couple of days with the help of certain instructions. Finally we started to find out how we could make the products BOM (Bills of Materials) that we would need in the production. While we made the BOM, we noticed how vast area we have to cover with definitions in Microsoft Dynamics AX that everything would work correctly. The minimum requirements for BOM's successful creation were among the system's parameters and product management settings also correct definition of the purchase, warehouse, production and accounting settings. We got free hands when it came to the definition of the more specific information and structure of the product.



Picture 1. Simple structure list of a cup

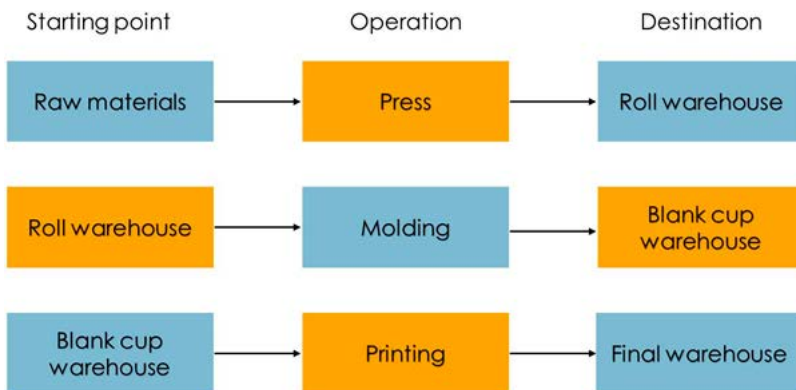
After the new year we continued working with the products. We refined the product's BOM so that it fitted our needs in every part in the production.

Next we would define the warehouses and purchase of a product to a warehouse. Defining the warehouses everything went relatively painless or so we thought. We defined four different warehouses, one for each step we designed. When we started purchasing products in the system, we realized it did not go as we planned. Everything wasn't as they should be in the warehouse, purchasing and accounting parameters. We used a lot of time to figure this out

and we managed to fix many of the error messages, but we never managed to fix this properly before the end of the project.

During the definition of the warehouses someone had made some changes to the Microsoft Dynamics AX database and because of that we lost our login permissions temporarily. After the problem was solved we only had couple of weeks left to finish the project before we would run out of time. In a hurry we started to investigate warehouse definitions and build up the production. Surprisingly everything didn't go as planned in a little rush. We accidentally worked a moment in a wrong company, creating own warehouses and warehouse definitions there, because in the school's Microsoft Dynamics AX there are several dozen of fictional companies reserved for test use and we all have admin permissions to the system.

After we noticed our error we went back to work in our own environment in AX and started creating the production and continued to define the warehouses. We got a lot of definitions done in the production and warehouses, but we started to run out of time so we had to leave them as they were. We managed to create among other things the production line, routing and work stages. These don't work perfectly yet, because we didn't have time to fix away all the error messages.



Picture 2. Plan for the connections of warehouses and production lines

Project closure

Ending the project had many steps. An ICT seminar, where all the groups held a 20 minute presentations showing their projects, was held at school on 19th of February 2014. We repaired a PowerPoint show where we covered who we are, what is Paccor, what was our project, what did we do and what was the result we reached. The official ending of the project happened at the factory of Paccor, where we held our final meeting on Friday the 21st of February 2014 and where we reported our project to our contact person Kari

Kinnunen. In the report we covered the whole project, in specific detail what we did and what was the conclusion we made about Microsoft Dynamics AX and its suitability to Paccor. At the end of the ICT project we made the teachers a CD which includes all the relevant documents created during the project.

New things learned

This project taught our group members to work in a real company related project. We saw and experienced the steps and progress of a vast project. We experienced both challenges as well as the moments of success when we overcame the problems we had to face. The project increased our understanding to the subjects, problems and demands that may affect company's systems. We also got familiar with the dynamics and delegation of a project group. It was important that everyone knew what needed to be done, so all of us would not work on the exact same thing which would cause the project not to go forward. The scheduling of a big project also came out. One needs to consider the present but also the future and the past. During the project we got to experience the effect a big steering group has to the communication and scheduling.

Risks

The risks connected to our project were both student and system related. Student related risks were that one or more of us would get sick, drop out of the course or we would have problems in the group chemistry. Losing one or more students from the group, temporarily or permanently, would have increased the work load on other students. Fortunately any of the student related risks did not happen during this project.

System relating risks involved both Microsoft Dynamics AX and HAMK's virtual machines. The risk was that the machinery and systems would break down or they would have some kind of errors. One of the risks was also that we would not get necessary permissions or access to the system. We ran into these problems from the very beginning when our project got delayed because of incomplete access to Microsoft Dynamics AX. There were also times when the whole system was down or contained database problems. Fortunately these situations did not last more than one week at the time.

Student opinions of the project and quality

Our group is very pleased to the project we did. Despite the problems, we managed to do a lot. ICT project is a very educational experience. Especially we are very pleased how the information travelled between the project group, supervising teacher and the client. Our project contained a lot of remote work and because of that communication between the group members is very vital. Our communication inside the project group happened in a Facebook group

conversation. Other communication between the teacher and the client happened via active emailing. We took good care of that everyone would be up to date with everything. The only negative thing we could point out was the delay in the beginning of the project, because we were not able to do anything to fix it by ourselves. The phase to give the correct permissions to the system could have been a bit faster, so we could have been able to start the project much more efficiently and we would have been able to go as far as we wanted with the project.

Client and supervisor feedback

The supervisor thinks that the group got a big challenge. First the start was delayed due to installation delays. Second it turned out during the project that AX is a really big system with a lot of parameters. During the project the supervisor also installed an own company to AX, just adding the basic parameters took some days.

The group was well motivated and worked hard despite of the continuous difficulty of the project. Even though the project did not reach the full completion of the target, the final result was clearly seen ahead.

Future development ideas

As a future development idea our project group would recommend better preparation for the project from teachers' and clients' side. It is very important that the project groups could start their projects right away without bigger problems. Because it is really important to reach also the demanded working hours and certain skills, delays from other than the students' side cause extra stress. Next class year could continue to test Paccor's information with Microsoft Dynamics AX. Our project showed that AX is a potential ERP system to control Paccor's production.



From left: lecturer Erkki Laine, student Joni Heinonen, student Iiro-Petteri Kaukonen and student Toni Järvinen

ICT Project: Security

Lecturer Erkki Laine
Student Joni Heinonen
Student Toni Järvinen
Student Iiro-Petteri Kaukonen

HAMK

HAMK University of Applied Sciences operates in multiple different districts. Activities are in Hämeenlinna, Riihimäki, Valkeakoski, Forssa, Evo, Mustiala and Lepaa. There are six different fields of study and 23 different degree programmes and four of them are carried out in English. There are about 800 employees and over 100 co-operating universities. There are about 7000 students and 650 of them are foreign students.

The project work was made for the Business Information Technology degree programme in Hämeenlinna campus. Business Information Technology can be studied both full time and part time. Part time studies are implemented in distance education and it is also strongly present in full time studies.

Project members

The project group members Joni Heinonen, Iiro-Petteri Kaukonen and Toni Järvinen developed information security courses materials to meet today's standards. Course is aimed mainly for the students of the degree programme. The project began in September 2013 and ended at the end of February 2014. Clients were teachers Tapio Kilpeläinen and Erkki Laine. Erkki was also the supervisor teacher of the project.

The steering group of the project was the SharePoint group. Correspondingly the information security group was the steering group of SharePoint group. The members of the steering group were Eero Mäkelä, Jere Kallioniemi and Anssi Hatakka. The English teacher and the arranger of trade fair was Brian Joyce. In trade fair all the projects were presented. The role of the project manager was changed every few months so every member had a chance to be in the role.

The beginning of the project

The project manager immediately contacted the clients and arranged a meeting. In the meeting the subject of the project was talked through and the client told us requirements on what must be included in the course. There were lots of things going on in the meeting and the next meeting was arranged for the next week so the project group could make themselves familiar with the things introduced and get a better picture about the subject and nature of the project.

Another meeting was a lot more proficient. The project group brought forward things that should be paid attention to and should be included in the information security course. Also adjustments were provided to the requirements introduced in the previous meeting. After this meeting it was clear for the project group that what must be done.

The materials of Information security course will be reviewed, some of the materials will be updated, some will be completely renewed and new subjects and materials will be brought to the course. After the second meeting it was ensured that both the project group and client had similar view about the nature of the project and the desired outcome.

About the structure of the security course and project

In the nearby future of information technology a major changes is anticipated to happen. Nowadays the students are accomplishing courses of different topics in the degree programme. In the future the course-orientated way will be left behind and students will study project-orientated. The courses will be-

come modules and different topics will be taken from them to each projects when needed. At this time studying will be done by the subject of the project.

In our ICT project the goal was to make long term solutions so the project-orientated studying was observed in the structure of the course. The materials of new information security course was brought into use on January which was two months before the project is meant to be finished. The course that began on January was executed on the current course structure instead of the new project oriented studying. This created challenges to the planning of the project.

The project group found an excellent solution on executing this. Instead of the regular “waterfall” -model the project was carried out using Scrum-model. There are different topics in the information security course and these topics are examined in three different points of view. The three points of views were divided into different layers. The layers were attached into the cycles of Scrum-model.

In the Scrum model a list of required things is being made and after that they are prioritized to the order of importance and then divided to the scrum cycles. In each of the scrum cycles only the required things are being made. This way the most critical tasks are surely being made and will be developed in later Scrum cycles.

The basics of information security were carried out in the first scrum cycle. Information security was made familiar in each of its areas and simple exercises was brought to the contents to enhance the learning process.

In the second Scrum cycle information technology is meant to be observed through eyes of a hacker. The goal was to bring forward the different methods and tools that information security testers use.

In the third cycle of scrum it was originally planned to bring the two previous layers together and deepen the knowledge about the subject. However we didn't implement this idea in the plan. The project would have become too vast according to the schedule and our knowledge. In the third Scrum-cycle we concentrated on developing the previous materials on the basis of the feedback we received.

About working in Project

After the first meetings we began researching the information technology in general. First we studied the previous information security courses and the information security sections on other courses. Based on these we made the initial frame. We researched what else should be included in the course. New topics on the header level was found plenty: WWW- security, cloud servic-

es, mobile devices and malwares. These was integrated into the course frame and frame was sent to the client for approval.

The mere understanding of information security was not enough but we also had to understand the purpose of the course itself. The aim was to find main points of information security and create simple but comprehensive materials for people to understand information security.

Information was gathered from all kind of older courses not only the security courses. Information security can also be understand as a perspective on everything we do. For this reason we took materials and exercises related to information security also from other courses.

When the courses frame had been approved we began a deeper study of the subjects. Different topics were divided among the members of the project team and each group member focused on their own subjects. During this research the subtitles were made for the topics.

When all the required titles and subtitles were ready the working was easy. Each group member studied the basics of their topics from many different sources and based on these, created the materials and exercises. Information was gathered from various links, books, thesis' etc. From these materials we found links to the next materials.

Although the security tester's point of view wasn't made as intended, also this subject was studied to some extent. From this perspective we made WWW-security materials and exercises.

From the studied materials the most important subjects were chosen and included to the course.

In the final phase we focused to fine-tune the course materials on the basis of the feedback we received and also created the required project documents.

Working methods

Studying in business and information technology bachelor's degree program can also be done with distance learning methods. That's why all the tasks in the course must be able to be performed from home. Because all the materials and tasks are going in cloud services, the project was also able to carry out anywhere with a computer and an internet connection.

The raw material were gathered in Google Drive. Communication between the project members was mainly done with email and social media services. The project client and the supervisor were able to review the results from the Moodle any time. General issues and problem were informed with email.

Meetings were held between the Scrum-cycles. This arrangement was fine with everyone.

Project challenges

Biggest challenge was to identify the security topics to correspond the modern day needs.

Information security is rapidly developing industry and this is shown in the amount of material.

Material in English were found as much as you wanted to search, but narrowing down the important topics were hard.

Distance learning option in all materials and practical tasks were a big challenge. For example the LAN practical tasks were hard to implement without physical devices. For this purpose we used a program called Packet Tracer, which we noticed to be licensed program at the end of our project. The license forbids to use the program if you don't have a connection to Cisco. This why all the practical tasks concerning LAN was not published.

In the project agreement we defined different phases of project, the approvals of results and continuation to the next phase. In certain point, we didn't find suitable time for meeting with the client and supervisor and few tasks weren't ready yet so we extended the first Scrum-cycle by two weeks. This was considered in the risk-analysis so it wasn't an issue.

Later we had to give up on the second Scrum-cycle, because we couldn't finish the necessary materials by the start of January when the new information security course were started for a new class. Project plans minimum requirements were completed despite Scrum-cycle out.

In return, we completed new material for the basic tasks, which can be transferred in to the third cycle at the possible new project.

About the testing

Every project member had their own topics. This why testing the materials and tasks were tested with an another person. We received feedback right away after the testing, and the corrections were made using that.

The client was responsible to go through all the materials and to approve them, or to give suggestions for improvement. After that we could move to the next Scrum-cycle.

The final testing were done by new students in information security course.

About the work, and the result

Research were done multiple times more comparing to the material we implemented for the project. Project members learned a lot more than the visible results gives the impression.

Project group is satisfied with the result. Research were done a lot, and narrowing down the most important things were a hard task. Even though the main goal were to improve the content of information security course it also gave a lot of experience of security for the project members. These skills can be utilized in every other area of information technology.

Client and instructor feedback

The group made plenty of project reports and memos of good quality during the project. The grammar and appearance were good in general. The final report, guidelines and the other documents were clear and proper. Meetings with the supervisor and the client were kept suitably. The meetings were very well organized. Working hours, tasks and responsible persons had marked clearly in the documents. Aims and tasks were clearly marked in the project plan. Communication with the supervisor and the client worked very well. Communication inside the group was good. The group steered "SharePoint" project within different phases. Steering was active and proper.

The project group made aims, tasks and limits to the project independently with the client. The workload was quite well balanced during the project. Working between the group members progressed well. The project manager was super active, managed well and took big responsibility for the project. The risk analysis was done and the group reacted against the risks when they became apparent. The project management was under group's control during the whole course and the project end results were excellent.

Project team enlarged their knowledge about security systems and built the "Security" Moodle platform. They produced new learning material and a variety of learning tasks. The course structure was the group's handiwork.

The project was carried out using Scrum-model. The topic was technically challenging and wide, but defining the subject managed well and results achieved brilliantly. The project was completed well. The project group achieved their targets very well and the end results are very useful to the client.

Things we learned

During the project we encountered a lot of technical things and understanding how networks are working (OSI-model). About technical things we could

mention different breaching methods in Web-pages, vulnerabilities of WLAN, how important is to keep programs updated. Our view in security has expanded a lot.

Testing security brought a lot of new thoughts about information security. Even if your work isn't related to it, information security must be taken in to account in everyday working.

Security mostly a way of thinking. For example when you are a programmer you should pay attention to security all the time, just to make sure the program works in the it is supposed to. In the plan this kind of things aren't necessarily taken into account and it might not even be possible. Every designer, programmer and employee is responsible to work securely.

After this project we could say that we are capable of creating a program with security taken into account.

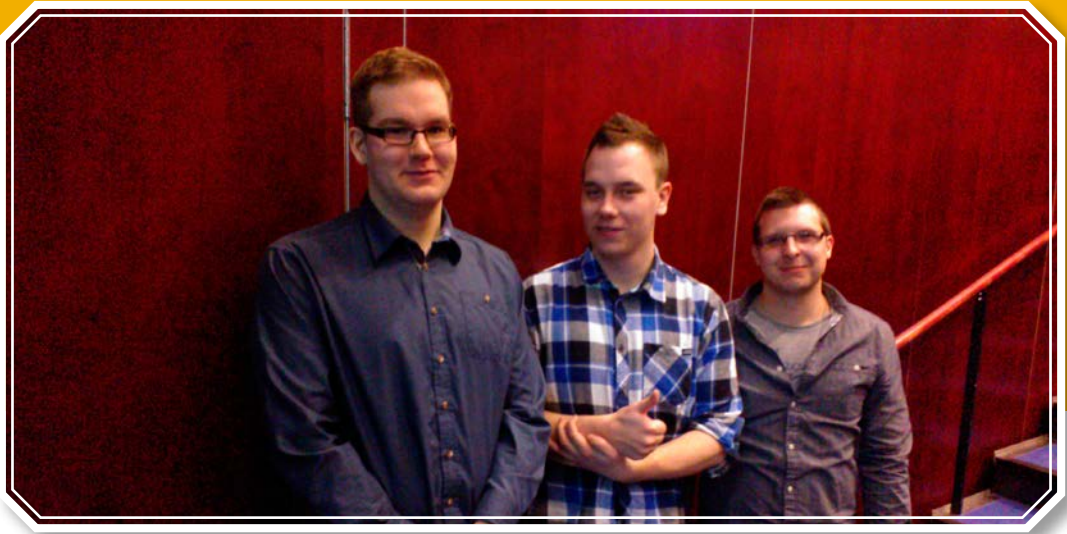
Further development ideas

New materials and tasks could be made for topics concerning Companies local area networks. This way the network managed in last tasks could be realistic size. For this purpose is needed a program which could emulate it like Packet Tracer. Or get a licence for Packet Tracer.

Some basic topics could be taken little deeper. For example security planning, personnel security ect. We mainly focused on technical issues, but things like social hacking it would be good to understand its principle and that should be noticed on personnel security.

Courses second and third levels are extremely good targets for further development. At second level you could go through security issues from security testers point of view. This motivates to implement security carefully, and it also gives tools to test all the implemented security things. Third level could be a summary of the 2 previous levels.

New topics could also be brought it. For example so called "Internet of Things", security of virtualization and server softwares. Topics are simple but also very important.



From left: student Anssi Hatakka, student Eero Mäkelä and student Jere Kallioniemi

ICT Project: Sharepoint

Lecturer Tapio Kilpelainen

Lecturer Erkki Laine

Student Jere Kallioniemi

Student Anssi Hatakka

Student Eero Mäkelä

ICT Project SharePoint system development for HAMK – University of applied sciences

The main topic of our project was to develop previously installed SharePoint system for our client HAMK. The idea was to use the virtual environment in LabManager and SharePoint Moodle -course made by the previous year's students in their ICT project.

The most relevant part of our project was to update the current version of SharePoint 2010 into the newest version 2013 and make sure the environment works properly.

HAMK is planning to start using SharePoint for their own use in the future so that is why the system has been developed by two project groups so far. It is purpose that the next year's ICT project group will continue our work.

The Moodle -course used in our project is meant to work as a studying platform for future students. So far it seems that the course will be a part of a bigger studying collection. Studies will be put into modules in the future and the Moodle -course would be part of the module called Network Services Supporting, which is fifteen studying points of length.

As we moved on in our project we had to create a whole new virtual environment in LabManager and updated SharePoint system into newest version 2013. At the end of our project we installed all the necessary servers, made the correct updates and configurations and made sure they are working as intended.

The project took place in September 2013 to February 2014 and we worked almost daily. Working was done mainly in our work place at HAMK but also casually working remotely. Despite all the problems with schedule, we were finally able to finish the project in time.

Our project had three group members, all of which were information technology students studying at third year: Anssi Hatakka, Jere Kallioniemi and Eero Mäkelä. We changed our project manager during the project, because we all wanted to learn take responsibility. Our project instructor was Erkki Laine and our client person was Tapio Kilpeläinen. Both of them are lecturer at HAMK – University of applied sciences.

Our group also acted as a steering group for another ICT project group, which was Information security. Information security group also acted as a steering group for us.

In practice this meant that at the end of the projects, we kept a meeting with our steering group when we presented our current project state to them. We then made corrections based on their feedback and vice versa. Project groups were also a support group for each –others during the whole project, but it didn't have much of an impact into actual working.

ICT project course was a part of an English course called Professional English, which is three study points in length. At the beginning of the project we presented our project at English speaking Trade Fair, which was arranged at HAMK. A week before the final presentation we also presented our project at the English lessons. During that we had the opportunity to practice our presentation and make final corrections before the final presentation at auditorium.

Starting the project

We began our project at the beginning of September as we returned from summer holidays. We gathered at school according to schedule. ICT project responsible lecturer and our class were attending. Our project instructor Erkki Laine and our client Tapio Kilpeläinen were also present. Lecturers presented the available projects and then we formed project groups, at that time projects also selected their project managers.

After the class we kept a short meeting between our project group and discussed the main things of the project and project member's responsibilities.

After the short meeting we started to arrange our working room. Our team's working group took place at HAMK class 301. At the beginning there were no computers in the class, so we had to contact a teacher. After that HAMK's IT-support Tero Keso brought computers into space. After that it was in our responsible to make our own work stations. We installed three computers into space so we had one personal work computer for each.

We kept our first client meeting at second week. Present that the first meeting was our group, project instructor Erkki Laine and our client person Tapio Kilpeläinen. During that meeting we went through our project goals, scheduling and mainly what needs to be done during the project. Tapio then gave us materials to study through the program and we also started to plan our first task.

At first we had some difficulties to start. Before the actual work with Share-Point, it was necessary to have a good view of the program. Getting to know the program took us the first two months, so we haven't actually had anything done in practice by that. After we had used the first months for learning the program we got to actually working with it. Then we had to arrange another meeting with our client, since we weren't sure where it would be wise to start from.

Project phases and challenges

Project was quite challenging during the whole project. Neither of us had any previous experience of the program so that made it even more challenging. SharePoint also has a vast number of functions so we had to learn all of those, which made it very time consuming. Our project had just three members so we had to try and keep our working as efficient as possible. We enhanced our working by working remotely when it wasn't necessary for everyone to be present. During remote work we stayed in contact by phone and Facebook.

We kept meetings weekly with our client. During those meeting we always went through what we had done the past week and what is our project status

in general. Then our client usually give us a task, which we were then working for the next week and during the next meeting when then again reviewed our working. If we had succeeded completing a task, our client then gave us another one.

It was pleasant for us that our client was able to attend into weekly meetings during the whole project and was also very active. This made our working easier.

At meetings our policy was as follow: project manager arranged meetings with our client. This was mostly done by email or right after a previous meeting. Usually the meetings went the way that project manager made most of the talking while other two members acted as secretaries. Secretaries then made correcting questions when needed and assisted project manager. Meetings were first kept in video negotiation room but later on we kept them in our working room, because at that point it was very important for our client to see in practice what we had completed. Atmosphere in meetings was pretty laid-back.

At the beginning every project member went through the materials our client gave us in first meeting and also from internet. This was mainly done at home as a self-study. In between we gathered at school and had small meetings where we worked the project plan and other necessary documents.

When we had studied the system, we then started to work with the virtual machine in LabManager. We worked most of the course with environment made by the previous ICT project to get familiar with SharePoint in practice. This working was mainly done separate so every member was studying the same things. We think it was important that everyone studies every feature, because it was very important to have a good view of the system and therefore members could better help each-others during a problem.

HAMK – University of applied sciences held Trade Fair at 14 November. Students from every degree were invited there to present their out-going projects, so our class were also there presenting our ICT projects. For this event we made a PowerPoint-presentation about our project and used a laptop and an external display to view our presentation to audience. We also handed out brochures of SharePoint to audience. Trade Fair was fully in English and was a part of an English course Professional English. The Trade Fair was a nice addition, because we were able to practice our presentation before the final presentation in auditorium even though it wasn't exactly the same as our final presentation was.

Near the end of the project we had installation DVD from our client, so we were finally able to update SharePoint into newest version. We created a whole new platform into LabManager and created all necessary virtual computers. First we had to install operating systems and then install servers, install updates and make necessary configurations. We followed the guide created by

previous ICT project group since they used a similar environment. We made the installations as a group, because we all wanted to be part of it. After installations we were then able to start working with the new system version.

We accomplished our project plan during November. Check-report was completed in middle of December. We were working with documents pretty much during the whole project as we were working with the system. We put working hours into our report after every work day.

During January and February we had to work longer hours than previously, since the end was near and we still had some work to do. First the last weeks we also kept close contact with our client and kept a meeting before our final meeting so we were able to make some final corrections in time. The last two weeks we used to finish our documents and make some final corrections.

We had two main goals for our project: Moodle-course and updating system into newest version. We completed the updating process during the last week, because we were able to start it from January when we had the installation DVD from our client.

We had some pressure that we wouldn't stay in schedule in our project because there was so much work to do, and it was really hard to estimate how long each step would actually take time. At the end we still completed the project in time.

Ending the project

At the end we used our last weeks to finish our final presentation and necessary documents. We also kept last meetings with our client. Project was ended at final seminar at 19 February, which took place in HAMK's auditorium. Our class was there presenting our projects. There were also two younger student classes, lecturers, project instructors, and clients. The presentation lasted for about twenty minutes and after that there was ten minutes for questions.

We presented our project as a PowerPoint – We talked about our system, our client and the meaning of our project. We demonstrated our system interface with pictures.

When the presentation was held, we saved all official documents into DVD, which we handed to school.

Risks during the project

At the beginning of the project we created a risk analysis.

One of the biggest risks we nominated hardware problems, for example if a server would go offline, the whole system would then fall and our working would be stopped. This could've had a huge impact on our project depending of the risk scale. We are happy the risk didn't take place during our project.

Our virtual environment LabManager also possessed some risks. Computers were repetitive slow, which made our work harder. On this risk we unfortunately couldn't affect for our self since it was managed by HAMK. To our luck LabManager worked well for most of the time.

A huge risk was our previous, non existant knowledge of SharePoint and overall below-average server skills inside our group. This had some impact to the final result. Without Tapio Kilpeläinen's courses during our ICT project, we would not have succeeded as we did.

The actual use of the SharePoint also had some risks. Sometimes there occurred a problem we didn't have a solution at this time. We then had to look help from internet and guides. These problems sometimes took a huge amount of time. Moodle course did have good guides for every field so it was quite easy to solve them as problems occurred. Official Microsoft web site also had good guides for SharePoint.

There was no sickness absence during our project even though we were prepared for those. However other school tasks during our project and personal matters took some time from our project.

Our opinions of the project and its quality

We all agree, that the project was quite challenging. We had to completely learn a new system and work with servers. We had a lot of responsibility during the project; because we had to make sure that we stay in schedule and that we completed the project in time and also keep in contact with our client regularly. We are overall happy on what we have achieved. We had some difficulties with scheduling but we overcame those. We hope that our SharePoint knowledge will help us at future work places.

We would like to thank our client person Tapio Kilpeläinen from co-operation. Working with him went well and was pleasant.

Client and instructor feedback

We kept our last meeting with our client and instructor on 17 February. In that meeting we went through what we had accomplished and how we reached our goals. We agreed that we successfully completed the main goals and it is now easy for the next project group to develop SharePoint further.

Client and instructor were generally happy on what we accomplished.

The group made plenty of project reports and memos of good quality during the project. The grammar and appearance were good in general. The final report, guidelines and the other documents were clear and proper. Meetings with the supervisor and the client were kept suitably. The meetings were very well organized. Working hours, tasks and responsible persons had marked clearly in the documents. Aims and tasks were clearly marked in the project plan. Communication with the supervisor and the client worked very well. Communication inside the group was good.

The project group made aims, tasks and limits to the project independently with the client. The workload was quite well balanced during the project. Working between the group members progressed well. Group members changed the role of project manager during the project and project managers managed well. The risk analysis was done and the group reacted against the risks when they became apparent. The project management was under group's control during the whole course and the project end results were good. The group steered "Security" project within different phases. Steering was active and proper.

Project team enlarged their knowledge about SharePoint system without earlier experience. They learned new management functions, made operative systems and server installations in virtualization environment. The group made configurations to computers and worked with Moodle platform. They updated learning material and learning tasks in Moodle-course.

The topic was technically challenging and wide, but the project managed well and results achieved brilliantly. The project was completed well. The project group achieved their targets very well and the end results are very useful to the client.

Future development ideas

At the last meeting we went through our future development ideas with our client.

In the future it is important to develop the following functions:

Fast Search searching function, Microsoft Exchange -email server and Office 365 cloud service integration into system, SharePoint sites with Designer and Web-application programming into SharePoint.

In addition, SharePoint should be integrated as a part of HAMK's intranet portal and use with studying and make investigations regarding account rights.



From left: lecturer Erkki Laine, student Henri Pulakka, student Petri Honkola and student Joose Kaasalainen

ICT Project: Sorviin.info

Lecturer Erkki Laine
Student Henri Pulakka
Student Joose Kaasalainen
Student Petri Honkola

Sorviin.info is a free web service that provides thesis and internship jobs for students and employers in Hämeenlinna and Hattula regions. Service has been developed by Häme Development Centre Ltd. and executed by Opiferum. Sorviin.info won the SEKES Annual Good Deed competition in 2012 and 3rd prize in the Finnish national competition of Municipal Marketing Recruitment series.

Häme Development Centre Ltd. wanted to expand their user base by translating the website to English. In this way foreign students could also be able to use this service. Translating the website included many different cases, like adding English announcements, possibility to modify the English page content in admin panel, categorizing language filters and adding flag icons to the job listing. Website also needed timed announcements feature

that would give employers possibility to schedule their announcements to be shown in a specific timespan. Website experienced few layout improvements as well. There was also an idea to make an introduction video to the front page of the website, but there wasn't enough time for us to create it.

ICT Project group was formed by HAMK University of Applied Sciences students who are studying in Business Information Technology degree program. ICT Project group started to develop the website in September 2013 and project was finished in February 2014. Group included Project Manager Henri Pulakka as well as Joose Kaasalainen and Petri Honkola. Our supervisor was lector Erkki Laine. Häme Development Centre Ltd. contact person was Project Manager Keijo Piilola. Sorviin.info was executed by software company Opiferum whose contact person was Project Manager Tommi Hellgren and web programmer Lisa Karvonen. Paccor ICT Project group operated as our steering group and vice versa. Paccor project included members Anssi Päivinen, Taina Ruokolainen, Ari Tölö and Markus Pylkkänen.

Starting of the Project

Project started with a meeting of ICT Project group, Häme Development Centre Ltd., Opiferum as well as Erkki Laine and Lasse Seppänen in 16th of September in Häme Development Centre Ltd. premises. Meeting addressed fundamental affairs concerning Sorviin.info web service and future tasks and goals were introduced. Meeting helped us to get explicit viewpoint of the project and showed what is required from us to complete it.

The next meeting was held with the project group and Opiferum in the premises of Opiferum. We went through the site's technical side in more detail, talked about the functionalities we were going to add to the site and we got some tips for making them. Opiferum gave us the username and password for the development server. Our first task was to get acquainted with the site and its software and then translate the site from Finnish to English.

Project phases and challenges

We met with Opiferum a couple times a month. Target of the meetings was to show that concrete progress had been made. Keijo Piilola participated on the behalf of the Häme Development Centre Ltd. as often as he could. At the meetings Opiferum gave us feedback on our work and we discussed possible future improvements.

We arranged one meeting with our steering group during the project. We had read each other's project plans and progress reports in advance. The meeting was attended by the project groups as well as groups' supervisors Erkki Laine and Lasse Seppänen. At the meeting both project groups reported the current situation of their project and evaluated other group's documents.

We met with our supervisor Erkki Laine a few times during the project. We discussed general matters related to the ICT project, project documents and the current state of the project. Erkki also arranged a room for us to work.

Trade Fair was held in the premises of HAMK on 14th December 2013. We presented there how Sorviin.info web service works. Häme Development Centre Ltd. gave us some brochures and other advertisements to share. Fair went well; visitors liked the concept of Sorviin.info and the changes we made to the site.

We had translated most of the website before February. The client wished to have a translated and workable version of the site, so they could present it at Tekijä 2014 event. The event was held at Tavastila shopping mall on 4th February 2014. We checked that the translations of the beta version worked and that the site didn't have any errors. When that was done, Lisa Karvonen from Opiferum transferred the translated version to the actual site.

After the translation, we started to make filters and timed announcements for the site. Implementing them was quite straightforward. Besides that, we fixed some errors that occurred on the site.

End of the project

Final seminar took place on 19.02.2014 and it was held in English. In the seminar we presented the Sorviin.info website and the reformatations that had been made. We reported to Opiferum that we had finished the website on our part. We sended a list of modifications that we had made for the website to Häme Development Centre Ltd. and Opiferum. We also gave them a couple ideas for further development. At the end of the project we wrote our personal reports, a final report for the ICT yearbook and delivered a DVD to school which included all files related to the project.

What we learned

Team members learned the habits for project working and how to advance in a project when cooperating with a real client. Our contact acted professionally and they were a pleasure to work with. Regular communication in a larger project group is a necessity, which accomplished from the very beginning. We learned how to stick to a schedule and every deadline that was set; was executed in time.

Practical learning:

- URL redirection in Apache WWW server
- Knowledge about jobberBase platform and Smarty template engine

- Coding experience in PHP, HTML, CSS, MySQL, jQuery and JavaScript
- Experience on a MVC structured PHP system and database

Actualized risks during the project and their effects

At the beginning of the project our group didn't have our own workplace available so we were forced to use available class rooms instead. Getting of the workplace was delayed until the beginning of December. This caused minor problems with our schedule but we were able to work efficiently with the translation process. We didn't encounter any other risks during this project.

Students' opinions about the project

Although this particular project wasn't our member's first choice, it felt to be interesting and properly challenging. Web development interests all the project members and this project gave us a good change to improve our know-how in that field. All in all this project was a success.

Supervisor's and client's feedback

The group made plenty of project reports and memos of good quality during the project. The grammar and appearance were good in general. The final report, guidelines and the other documents were clear and proper. Meetings with the supervisor and the client were kept suitably. Spacing between the first and next meeting with supervisor was quite long, but meetings kept meanwhile with the client. The meetings were very well organized. Working hours, tasks and responsible persons had marked clearly in the documents. Aims and tasks were clearly marked in the project plan. Communication with the supervisor and the client worked very well. Communication inside the group was good.

The project group made aims, tasks and limits to the project independently with the client. The workload was quite well balanced during the project. Working between the group members progressed well. The project manager directed the project well and informed members, client and supervisor. Summary of delivery to the supervisor delayed a bit. The risk analysis was done and the group reacted against the risks when they became apparent. The project management was under group's control during the whole course and the project end results were good. The group steered "Paccor" project within different phases. Steering was active and proper.

Project team enlarged their knowledge about "Smarty library" and "jobber-Base" software systems without earlier experience. The group translated,

modified and added more content to the Sorviin.info website. They translated the website from Finnish to English and managed the database.

The topic was challenging and wide, but the project managed well and results achieved brilliantly. The project was completed well. The project group achieved their targets very well and the end results are very useful to the client. The new version of the “Sorviin.info” published and introduced during expo in “Kauppakeskus Tavastia”, Hämeenlinna.

Ideas for further development

The login form could recognize from the email whether the user is an applicant or an employer. Another alternative could be that the user selects first whether he or she is an applicant or an employer. In the current model users can easily forget to make this selection.

On the category page you can currently only choose one filter at the time. It would be better if you were able to choose multiple filters simultaneously.



ICT Project: Ambientia

Principal lecturer Tommi Lahti
Student Marko Ojala, project manager
Student Pekka Pentonen
Student Teemu Kivistö

ICT Project: Android application for Ambientia/Evira

Most ICT projects are made in cooperation with real companies. Our project group's cooperation partner was Ambientia, which has a small history of collaboration with HAMK from previous years. ICT Project is a great chance for students to get to know working life, gain experience in project management and apply previously learned skills in practice. Ambientia offered us an opportunity to work with a real client project.

The project's main objective was to implement a working software, an Android application for Evira, that meets the requirements that were agreed with the client.

Starting of the project

The first few weeks of the ICT project were spent studying the basics of Android programming such as how to start an activity, manage the activity life cycle and build a dynamic user interface. We also familiarized ourselves with the programming environment, Eclipse IDE.

We used the online project management application TeamworkPM in the background to keep track of upcoming milestones and meetings and to maintain all the documents and other project related data like working hours.

Project phases and challenges

This project could be divided in two main phases. The first phase was programming all of the application's features and the second phase was to create the user interface. Some changes were made to the user interface compared to Evira's web software to maintain the application's ease of use on an Android device.

Our methodology during this project was a combination of rapid application development and the waterfall model. We shared tasks that we could manage independently and most critical task were solved in high priority.

The project started slowly with the self-studying, but after that it got more intense within the next few weeks. After the self-studies, when we had more knowledge about Android programming, was time to write a project plan.

The actual coding was started in the middle of November and there was a lot of difficulties making it compatible with lower versions of Android programming interface. Next big problem was how to use the application's local database. When we solved the database problem, the next critical task was to implement search function. We got help from a client at integrating search field into user interface. This task was a little bit behind of schedule. We also discussed lot about other functionalities that could make the application usability better but we did not have enough time.

We had at least weekly meetings with the project group, where each member described what he had done after the previous meeting, what he will be doing before the next meeting and what were the obstacles of the work. In these meetings our steering group was also present since our workspaces were in the same room. The steering group gave us feedback and opinions on our project and vice versa.

We met with our client once or twice a month in Ambientia's facilities to review what we had done since last meeting. In these meetings we went through what obstacles we had met in the process. We also kept in touch with the client via Skype so there was always a channel for asking advices.

Client and supervisor feedback

This project managed to fulfill the set targets well. Although some features closer to the end of the project were not fully implemented the application is well functional and the missing functionalities can be added to the application later on. It was anyway acknowledged already at the beginning of the project that with some advanced features the implementation time table might be challenging.

The project group performed well as a group. From the supervisors perspective, at least, the group seem to be rather excited on the project. The project management practices seem to become more and more familiar to the group during the project.

Ending the project

As a final result we got a working software and the client was happy about the results. The user interface was not so successful, but all the functionality was implemented to the application as was planned.

Summary

In the end we learned how to use java libraries in Android developing. We learned what kind of problems could come up when developing web interface functions to a mobile application.

Version control system was a new thing to learn and it became really important in this project. To communicate with Bitbucket service we used Git client that is integrated into Eclipse tool.

TeamWorkPM service was a great tool for managing project and was very helpful to carry out the scheduled tasks in time. Client was also familiar with this tool.

It was fun to finally use all the knowledge that we had learned at school lessons about programming.