

NEW UNIVERSITY ERP FOR STUDYING, TEACHING AND ADMINISTRATION - PAST, PRESENT AND FUTURE OF THE PEPPI

1st Tuomas Orama, 2nd Jaakko Rannila, 3rd Mika Lavikainen, 4th Lauri Stigell

1st, Development manager, Helsinki Metropolia University of Applied Sciences, Bulevardi 31 PL 4000, tuomas.orama(at)metropolia.fi

2nd, Project manager, Helsinki Metropolia University of Applied Sciences, Bulevardi 31 PL 4000, jaakko.rannila(at)metropolia.fi

3rd, Project manager, Helsinki Metropolia University of Applied Sciences, Bulevardi 31 PL 4000, mika.lavikainen(at)metropolia.fi

4th, Lauri Stigell, CEO, Edumate Consulting Ltd, lauri.stigell(at)edumate.fi

Keywords

Student Information System (SIS), Enterprise Resource Planning (ERP), Service oriented architecture (SOA), Enterprise Architecture, Enterprise Service Bus (ESB), Administrative Model, Consortium

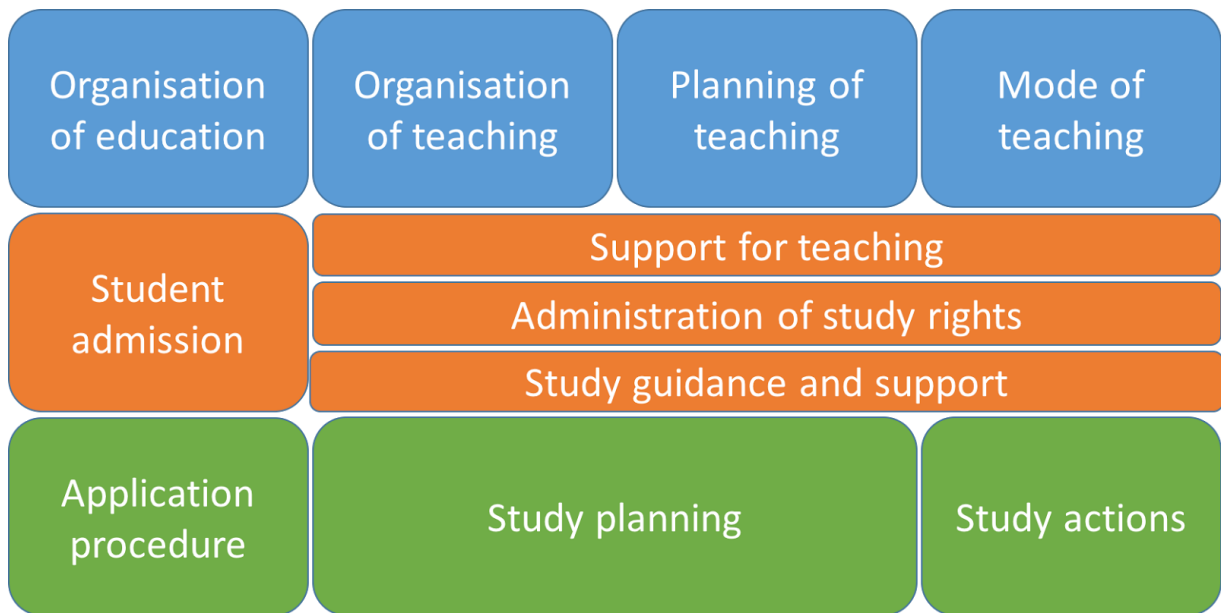
1. INTRODUCTION

It has been over a decade in Finland since the latest new Higher Education Institution (HEI) student information system (SIS) was released. At the moment, there is more or less only two prevailing ecosystems in Finland. Those two are Oodi in universities and Winha in universities of applied sciences (MINEDU 2016). Both of them are made in the late 90's.

HEI's woke up into the situation of renewing ecosystems in 2005 when ProAMK (PROAMK 2007) project was started. Its goal was set high - to create one ecosystem for every university of applied sciences in the areas of education and research. In 2007, the project was closed down because of lack of belief and courage. In 2009 new project started by the ministry of education. It was called RAKETTI and one of its goals was to create or acquire a new student information system for the whole sector. In 2010 the project excluded that goal from the project - because of lack of belief and courage. Instead, the project refocused on the architectural specifications, definitions of definite national services and some reference projects (RAKETTI 2014).

Picture 1 (SYNERGIA 2015) illustrates the agreed education process areas within Finnish HEI's. Gradually the understanding was reached which process areas would be covered by national solutions (student admission, application procedure) and which by the HEI's themselves.

Picture 1: Process areas in the Finnish Higher Education



Before the understanding, the situation in the early 2010s was expectant. Everybody was hoping that the national projects would create new systems covering all process areas to replace the old systems. When they didn't, two Universities of Applied sciences started their own project using their own money at their own risk. The goal was to create a whole new ecosystem with totally different system architecture for the usage of whole education sector. The goal was set even higher than before with fewer resources.

2. THE GOALS OF THE PROJECT

Helsinki Metropolia University of Applied sciences with Tampere University of Applied sciences started the developing programme "Renewing student administration systems" with a project called Peppi in 2010 (PEPPI 2010). It was followed by student dashboard (PAKKI 2014) and student information system (PERUSREKISTERI 2014) projects (2014 - 2016). The goal in every project was to create an ecosystem of services created in Service oriented architecture (SOA) fashion. One of the goals was - as expected - to replace old systems with new services. But far more ambitious goal was to renew the Enterprise Architecture (EA) on it's all levels:

- Business
- Information
- System
- Technology

One remarkable aim was also to create an ecosystem of services so that other HEI's could start using this ecosystem in their organisations. The big picture was that there would nationally be at least one product family that could respond to most of the needs that HEI's have in order to cope with the ever changing business environment. In addition, it was crucial that the product family would be affordable and still be constantly developed accordingly to the HEI specific requirements.

It was also clear that user interfaces should be modernized to modern standards. Both student and staff users are digital natives in today's world. Users demand high standard usability from HEI's systems and this was a high-priority requirement from the day one.

3. The environment

Finnish HEI environment

As mentioned above, Finnish HEI environment consists of universities and universities of applied sciences. The number of institutions is relatively high although there have been several mergers during the last decade. At the moment there are 14 universities and 24 universities of applied sciences but it is expected that there will be more mergers in coming years. More interestingly, there is also deepening cooperation between the two higher education sectors, and some commentators have even suggested that it could fade out the lines between the sectors. However, the official dogma is still the current separate model.

The other trend within the HEI environment is decreasing funding. The HEI's are almost entirely government funded, and due to ongoing weak economic growth, the cuts have been considerable, even 15 % in the area of information management, in recent years. That has already led to dismissals in many institutions. This has great impacts to HEI's resources and the capability to make investments for the future. However, cutbacks haven't been all that bad. The flip side and the positive effects of the cutbacks are that HEI's had to think things differently. They had to simplify many decisions and they also had to cooperate with each other. This has had very positive effects for the whole sector. Due to these positive effects many think that acquiring ecosystem IPR's and distributing the ecosystem owned by HEI's consortium which governance is very lightweight makes sense. In addition, self-owned ecosystem cuts yearly licence fees dramatically.

Establishment of the project

In late 2000s, Finnish HEI sector had various projects, discussions, and investigations about current student information systems and their current state (PROAMK 2007, HAUTAKANGAS & al. 2007, STIGELL & al. 2008). There were also inquiries about emerging of new SIS's on the market. Various interpretations were made about which out-of-the-box system would be the silver bullet for the whole Finnish institutions. Despite all the fuss, none of these actions didn't lead to concrete results; steps towards national student information system were never taken.

In order to succeed with the goals in our projects, we utilized the experience and results gathered from previous national projects. In those projects, we encountered some challenges with multi-organizational requirement specifications. It was challenging to match all requirements specified in a variety of working groups. Partly this was due to the methods that working groups used - members were not participating full-time and some specifications overlapped between working groups. Later it was hard to refurbish these requirements and agree on how to proceed. In addition, this method (although it was democratic) was too time consuming considering our schedule.

On the other hand these projects generated personal and organisational networks that have been highly beneficial in later projects. Also, many of the results in earlier national projects have been utilized in our projects during years.

We concluded that the most efficient way to implement our project was to proceed with two steps:

1. Develop the system for limited amount of organisations (in our case 2 biggest Universities of applied sciences in Finland)
2. Publish the system as is for other HEI's and continue development through consortium

We used this model in our first big SOA project (Peppi) which succeeded over expectations. That is why we have continued to use this method also in later projects that have extended the Peppi ecosystem.

Financial constraints

Our development programme had its financial resources exclusively from the owner institutions. That leads to two things. Firstly, there was no confusion of who is making the decisions: we had the money, we made the decisions without a need to negotiate in a democratic - yet usually a necessary - process. Secondly, and more importantly, the amount of money did not allow us to waste time: the

high quality results were urgently needed in a limited time. Table 1 describes the key figures of the development programme between 2010 and 2016.

Table 1: Development programme in numbers

Programme members	Budget (2010 - 2016)	Documentation so far (in pages)	Estimation of man-days used in the project	Estimation of code lines created in the project
over 100	5-6 million €	1000-1200	10000-15000	450 000 - 650 000

Technical environment

The Finnish public sector's system architecture has been focusing on these principles during the last decade:

- Interoperability - service interfaces
- Enterprise Architecture
- National Enterprise Service Bus
- Mobile services
- Open data
- Open source software

As we started our own project we wanted to have an answer to every principle mentioned above. First of all Peppi ecosystem is made using an only open source software. It is made in SOA fashion which means that all the thing you can do in a user interface can be made through service interface (REST/JSON or SOAP/XML). All the services run in ServiceMix 5 which is ESB product. This pretty much answers all the interoperability issues. These solutions also answer the issues of integrating the services to national ESB because of the usage of standard interfaces. Peppi ecosystem is also designed by the principles of EA and all the aspects of it have been taken into account. All Peppi user interfaces are made with responsive web design. This covers the part that all services can be used with wide range of mobile devices. Also, native applications can be made because all the services can be accessed through back end application interfaces (REST/JSON). (PEPPI 2016a)

4. THE RESULTS

At the end of 2016 Peppi ecosystem covers all the needed functionalities in the areas of studying, teaching, and the student administration. As a result, the system architecture is better organized, master data management and integration management is controlled and well documented, large-scale reporting is enabled and the organizations have been able to get rid of the obsoleted systems. Most importantly the new services are user-friendly and the system itself has reduced the need for manual work.

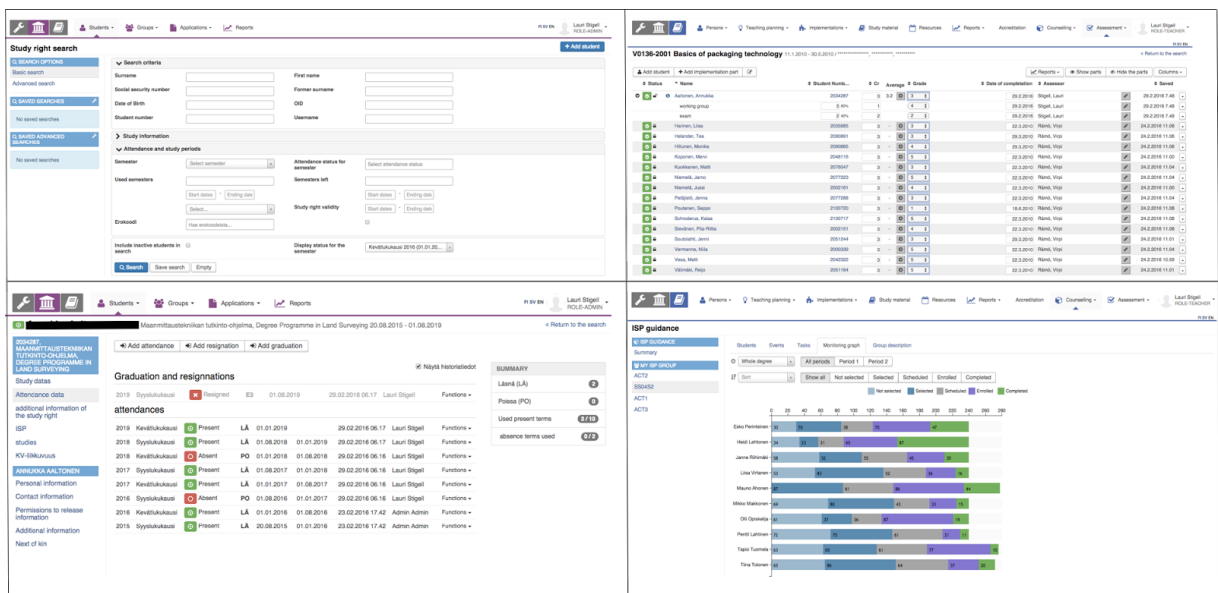
As mentioned, Peppi ecosystem has been developed in different projects. Here are explained projects and services within Peppi ecosystem in short

- Peppi project (2013)
 - Enterprise resource planning
 - Curricula
 - Course planning / management
 - Schedules / room reservations
 - Organisation management eg. teacher resourcing
- Student registry project (2016)
 - Student information system (SIS)
 - Student registry
 - Assessment / Accomplishment registry
 - Code management

- Reports (eg. printed certificates and statistical reports)
- Student dashboard project (2016)
 - Personal curriculum management
 - Personal assessments / accomplishments
 - Personal reports
 - Enrollments
 - Personal information management
- Intranet / integrated dashboards project (2016)
 - Intranet
 - Course workspaces
 - Dashboard integrations
- Numerous smaller projects ie. (2013 - 2016)
 - Study-plan service
 - Schedule machine
 - Application management service (eg. for different certificates)
 - e-Signature service
 - ...

The services are collected to the role-based dashboards (Picture 2). Currently, there are five different dashboards in production: student, teacher / counsellor, planner, student administration and administrator.

Picture 2. Role-based dashboards



5. THE STATE OF DEVELOPMENT

The Finnish HEI's have defined a nationally agreed process map of the education process phases (illustrated in chapter 1). The process map (Table 2) added with our projects describes the overall coverage of the current Peppi ecosystem.

Table 2. Process areas covered by different projects

Project	Education and Curricula Planning	Student Application and Admissions	Study Right Management	Teaching	Studying	Studying Support Services	Alumni
Enterprise resource Planning (Peppi)	■			■			
Student registry (Perusrekisteri)			■				
Student dashboard, PSP (Pakki)					■		
Integrated dashboard	■						

The table shows that the current ecosystem covers almost all of the defined process areas. Of course, there are some sub-processes within these main processes that are to be covered but the overall coverage is high. The gap in the second process phase (application and admission) is covered with separate national service so there is no need to cover that part in the Peppi ecosystem, although we have running integrations also with the mentioned national service. The last process phase is meant for post-study alumni and we currently don't have any plans to integrate it with Peppi ecosystem since there are several other products on the market to support that.

As a conclusion of current development, we could say that Peppi ecosystem now covers all the currently desired educational process steps. The consortium is now concentrating on the deployment of recent results in various HEI's as well as laying emphasis on further development of existing services.

6. THE FUTURE

The future looks bright for the consortium and the Peppi ecosystem. At the moment Consortium is implementing new services every year. At the moment, development ideas presented for the current roadmap include:

- Integrations to cloud services (Drive, O365, Moodle, Optima etc.)
- Integrations to national application system (studyinfo.fi)
- New planning and optimization tools for scheduling

Consortium and development

The results of the Peppi ecosystem projects have been rapidly taken into use in different universities. The distribution is managed through the Peppi Consortium which - at the end of February 2016 - covers about 50 % of the Finnish universities and universities of applied sciences (PEPPI 2016b).

- 13 universities of applied sciences
- 4 universities
- 1 vocational school
- 8 company members

All the members can influence and/or participate in the ecosystem development. The structure of the consortium is kept quite light consisting at the moment only 3 groups.

- Steering group
- Business and information group
- System and technical group

Business and information group is the main group when considering the ecosystem development. It makes the proposals for the ecosystem roadmap and for improved features. Steering group holds no content expertise so they don't intervene on the content development. Instead, they decide on the bigger guidelines how the consortium should extend and what are the fees. System and the technical group are responsible for the integrity of used technologies. They make requirements which technologies and techniques should be used in the ecosystem development.

Consortium commits the members into development by collecting yearly fees based on the number of full-time equivalent students in HEI. These annual fees are used for the ecosystem development.

The consortium members gather requirements and development ideas. They then present those ideas to other consortium members and suggest changes to the ecosystem roadmap. When a joint understanding is achieved the ideas will be developed in the version agreed jointly.

7. SUMMARY

Finnish universities of applied sciences, Metropolia, and TAMK, started renewing their student information systems using service orientated architecture in 2010 when the first project Peppi was launched. Peppi project brought large-scale services for university resource planning. The successful project was followed by several other projects expanding the Peppi ecosystem to cover all educational process areas except the application and admission phases which were decided to be nationally supported.

The educational sector in Finland has gone through major cutbacks in funding as well as structural changes. This change in the environment demands new ways to cope with the changes. We need more efficient and affordable systems, flexible system development and more cooperation between HEI's. In this paper, we have described one IT-solution bundle that responds to these demands.

Peppi system has been both efficiently implemented and rapidly taken into use in many institutions in Finland. Currently, about a half of the HEI's have joined Peppi Consortium thus having access to Peppi services. The consortium expects that a number of member organizations continues to grow in becoming years among the HEI's as well as upper secondary and vocational schools.

The intriguing challenge is how we can keep on developing current and possible new services while consortium is still in a strong expanding phase. Thus far we have been able to do that, but it is clear we will continue evaluating both development method and administrative practices regularly in order to answer the needs of growing community. If - and when - we can do that, the future looks successful for the Peppi ecosystem.

8. REFERENCES

HAUTAKANGAS, Sami; SAARINEN, VESA: Yliopistojen opintohallinnon tietojärjestelmäselvitys, Minedu 2007.

MINEDU 2016. The higher education in Finland is based on the two-pilar system consisting of traditional universities and universities of applied sciences (former polytechnics). University Education in Finland. Retrieved 29.2.2016, from <http://www.minedu.fi/OPM/Koulutus/yliopistokoulutus/?lang=en>

PAKKI 2014. Retrieved 29.2.2016, from <https://wiki.metropolia.fi/display/Pakkiprojekti/Pakkiprojekti>

PEPPI 2010. Retrieved 29.2.2016, from <https://wiki.metropolia.fi/display/peppi/Peppi++Vaihe+2>

PEPPI 2016a. Retrieved 29.2.2016, from <http://www.peppi-konsortio.fi/tekninen.html> and <https://wiki.metropolia.fi/display/peppi/2.+Arkkitehtuuri>

PEPPI 2016b. Retrieved 29.2.2016, from <http://www.peppi-konsortio.fi/konsortio.html>

PERUSREKISTERI 2014. Retrieved 29.2.2016, from <https://wiki.metropolia.fi/display/perusrekisteriprojekti/Perusrekisteriprojekti>

PROAMK 2007. Retrieved 29.2.2016, from <https://www.proamk.fi/>

RAKETTI 2014. Retrieved 29.2.2016, from https://confluence.csc.fi/download/attachments/40568204/OPI-loppuraportti_2014-03-25_Lopullinen.pdf

STIGELL, Lauri; SORMUNEN, Marko; AUVINEN, Jussi: Opintohallinnon tietojärjestelmäselvitys 2008, University of Kuopio, 2008.

SYNERGIA 2015. Retrieved 29.2.2016, from https://confluence.csc.fi/download/attachments/51895485/process%20areas_english.png

9. AUTHOR'S BIOGRAPHIES



Tuomas Orama works as development manager and is the head of the development unit in Metropolia University of Applied Sciences in Helsinki, Finland. He graduated as an industrial designer from Kuopio Academy of Design. He has studied also in Institute of Design and Fine Arts in Lahti university of applied sciences and in università per stranieri di Perugia. His work experience includes dozens of IT-projects for more than a decade. He has worked in several expert positions in national IT-projects in HE-level.



Jaakko Rannila works as project manager at Metropolia University of Applied Sciences in Helsinki, Finland. He has bachelor's degree in science (Industrial Engineering and Management, Helsinki Stadia polytechnic, 2006). His work experience includes several IT-projects varying from SOA-projects to fully tailored software projects as well as a large national project involving Education IT-management. In addition, he has experience in developing ERP systems and search engine systems in Higher Education, renewing qualification criteria to upper secondary education in degree programme of



Mika Lavikainen works as project manager at Metropolia University of Applied Sciences in Helsinki, Finland. He has master's degree in science (Industrial Engineering and Management, Lappeenranta University of Technology, 2005). His work experience includes several IT-projects varying from CRM-projects to fully tailored software as a service projects as well as large EU Framework six projects. In addition to IT-based projects he has experience in developing advanced collaborative working environments (including augmented reality prototyping), Collaborative Networked Organizations (CNO's) and virtual organizations.



Lauri Stigell is an entrepreneur and owner of Edumate Consulting Ltd. He has a master's degree in arts (General History, University of Turku 2003). His work experience includes educational politics, learning and studying development and several national and university IT-projects.