

FIRST STEPS IN CREATING ENTERPRISE ARCHITECTURE – A CASE STUDY

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Abstract

Enterprise architecture (EA) examines the key business, information, application, and technology strategies and their impact on business functions. Enterprise architecture has four parts: system, technology, information and process. Enterprise architecture enables the organization to achieve the current and future business objectives. In Turku University of Applied Sciences the process to build enterprise architecture has begun. The system architecture showed the complexity of systems in use and their state of art in relation to the core operations. The analysis showed that we have critical systems that need updates and corrections. The research showed the importance of enterprise architecture work too.

Introduction

Many Higher Education Institutes (HEI) have introduced several information systems to support their processes. Too often these systems are introduced and implemented without considering carefully the wholeness of HEIs' information management, systems and operations. As the amount information continues to increase all the time and ICT technologies to develop, HEIs have to tackle the issue of enterprise architecture too. With proper enterprise architecture the complexity of core processes and ICT can be decreased and cost efficiency improved. Enterprise architecture is a tool for strategic management and it harmonises the development activities. Enterprise architecture improves an organization's ability to reach for desired futures.

Turku University of Applied Sciences (TUAS) is a good example of an HEI that has introduced several information systems without real enterprise architecture. As a result the information systems are not communicating with each other, the integration is poor, many different technologies are used, and information is repeated, to name just a few challenges. In this paper we will analyze the system architecture of TUAS and discuss the future steps in creating a system architecture that serves the enterprise architecture. Furthermore, we try to build an understanding of what enterprise architecture is and why it is important in HEIs.

Enterprise Architecture

Enterprise architecture (EA) examines the key business, information, application, and technology strategies and their impact on business functions. Enterprise architecture describes how different parts of an organization (organization units, people, processes and information systems) connect and function together (Ministry of Finance, 2007; Morganwalp & Sage, 2004; University of Helsinki, 2009). Enterprise architecture enables proactive ICT

development and connects it with the development of core operations. Actually, one could say that enterprise architecture is a framework for the organization to achieve the current and future business objectives. Enterprise architecture is a systematic and structured tool to support the development of the ICT landscape and provide a holistic view at the organization (Zachman, 1987). There are common frameworks and tools for creating enterprise architectures such as the Zachman Framework for Enterprise Architectures (www.zachman.com) and the Open Group Architectural Framework (<http://www.opengroup.org>).

Enterprise architecture has four parts (Figure 1): system, technology, information and process (Iyer & Gottlieb, 2004; Ministry of Finance, 2007; University of Helsinki, 2009). The enterprise architecture helps to organize descriptions and interrelations of the structural components, information and information systems as well as link technical platforms together (Ministry of Finance, 2007).

System architecture connects the other architectures and describes the information systems, their connections, responsibilities and purposes. Process architecture guides the creation of enterprise architecture. It describes core operations, their goals, processes and services. Information architecture describes databases, data warehouses and data flows. Finally, technology architecture describes business relevant technology guidelines, standards and tools (University of Helsinki, 2009).

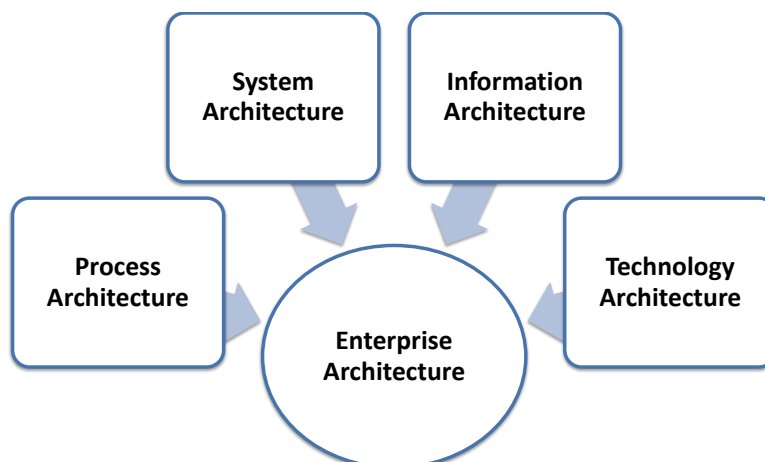


Figure 1. Parts of enterprise architecture.

It is important to understand that correct and robust picture is not achieved by focusing only on one of the parts. Best understanding is achieved when all four parts are looked at the same time. It is also important to understand that process architecture should guide the development of other fields. Too often the development activities are based on technologies rather than needs of the processes (University of Helsinki, 2009). Cheong and Habling (2001) emphasized the four dimensions too: strategic content, business content, business processes and enterprise software architecture. All the above emphasize the understanding of the organization and the business.

It is important to understand that process content or architecture should guide development of other parts of the architecture (University of Helsinki, 2009). The system architecture or the enterprise software architecture describes how to integrate technical components and applications to meet business needs. The description of system architecture is possible to do using four fields showing the state of the systems. Other dimensions are the significance of the system to core processes and an evaluation of the performance of the system. The evaluation of information systems can be done with the DeLone and McLean model too (DeLone & McLean, 1992, 2003). This has similar dimensions as the enterprise architecture – information, system and service.

The Research

This research examines the enterprise architecture from the viewpoint of systems. We used quantitative methods and a descriptive case study. The study describes an analysis of the system architecture especially the state of the art of the systems in the Turku University of Applied Sciences. In general, a case study aims for in-depth understanding of the context of the phenomenon (Cavaye, 1996). Furthermore, a descriptive case study presents a complete description of a phenomenon within its context (Yin, 2002). A case study is well suited to capturing the knowledge of practitioners and to document the experiences of practice (Benbasat, Goldstein, & Mead, 1987). The main research question is, “What is the current state of the art of the information systems in the case organization?”

Data was collected with a web survey focusing on four questions:

- How significant is the information system?
- How substantial is the information system’s need for change?
- How well does the information system support education related activities?
- How well does the information system support management and quality assurance?

Each question had a Likert type of scale to answer that provided ordinal data; the ordering of responses is possible but no measure of distance is possible.

The survey was sent to the 11 members of the university’s IT steering group who represent different faculties of university and management operations. Of them, 8 answered the survey. From the Zachman Framework perspective this research setting views the architecture from the executive perspective. Also, survey questions correspond partly to the DeLone and McLean (2003) model.

The Turku University of Applied Sciences is one of the largest of its kind in Finland with almost 9,500 students and 37 degree programs. Administered by the City of Turku, the university has to use some of the information systems the city provides. Our main goal is to work in close co-operation with our region and to answer the requirements of the working life. Our education and our research and development initiatives focus on applying knowledge in state-of-art problems not forgetting creation and testing of new applications and technologies. The university has a matrix organization of six faculties and three supporting service units (Figure 2). Information technology related

topics belong to Innovation Services. The research focused on analysing the information systems listed in Table 1.

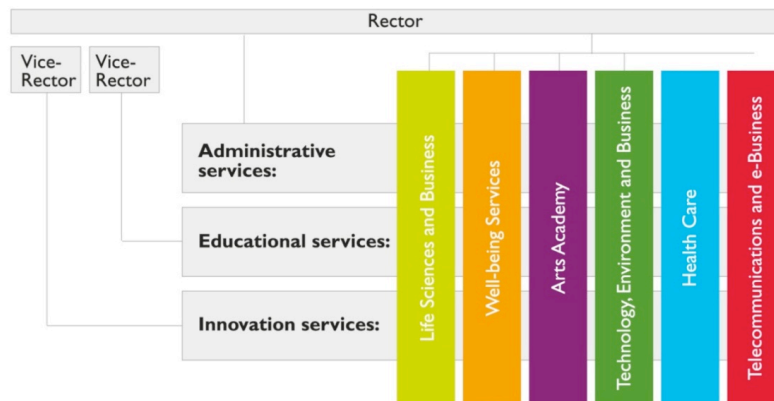


Figure 2. The organization of Turku University of Applied Sciences.

Table 1
Analysed Information Systems in TUAS

Information system	Short description
4T	Management information system
Connect Pro	Online meeting system
CRM	Customer relationship management system
ePopulus	Travel management system
Esmikko	Access control and working hours control systems
ESS	Human resource administration system
Helpdesk	IT support management system
JoutseNet	Document management system
Kalupakki	Chattel accounting system
Loki	e-service for TUAS publications
Lync	Instant messaging and video conference system
Messi	TUAS Intranet
Mimosa	Scheduling software for time tables
Mobility-online	Student mobility management system
Nelli	Library portal
Netku	City of Turku's intranet
Optima	e-learning system
Projektori	TUAS project management system
Publikaattori	TUAS publishing database
QlikView	Quick reporting tool for management
QPR	Process management tool
Rondo R8	Invoicing system
SAP	Financials system
Soft Tutor	e-exam system
SoleOPS	Teaching process planning and management system
MS Exchange	email system
Tilipussi	Teachers workload management system
Webropol	Online survey and feedback system
WinhaPro	Study register

Results

The significance of the information system is shown in Figure 3. The results show clearly the key information systems. All respondents evaluated four of the systems as critical: study register, email system, financials system and invoicing system. Only a few systems had low significance evaluations from the respondents and even those systems had some critical and high significance evaluations too.

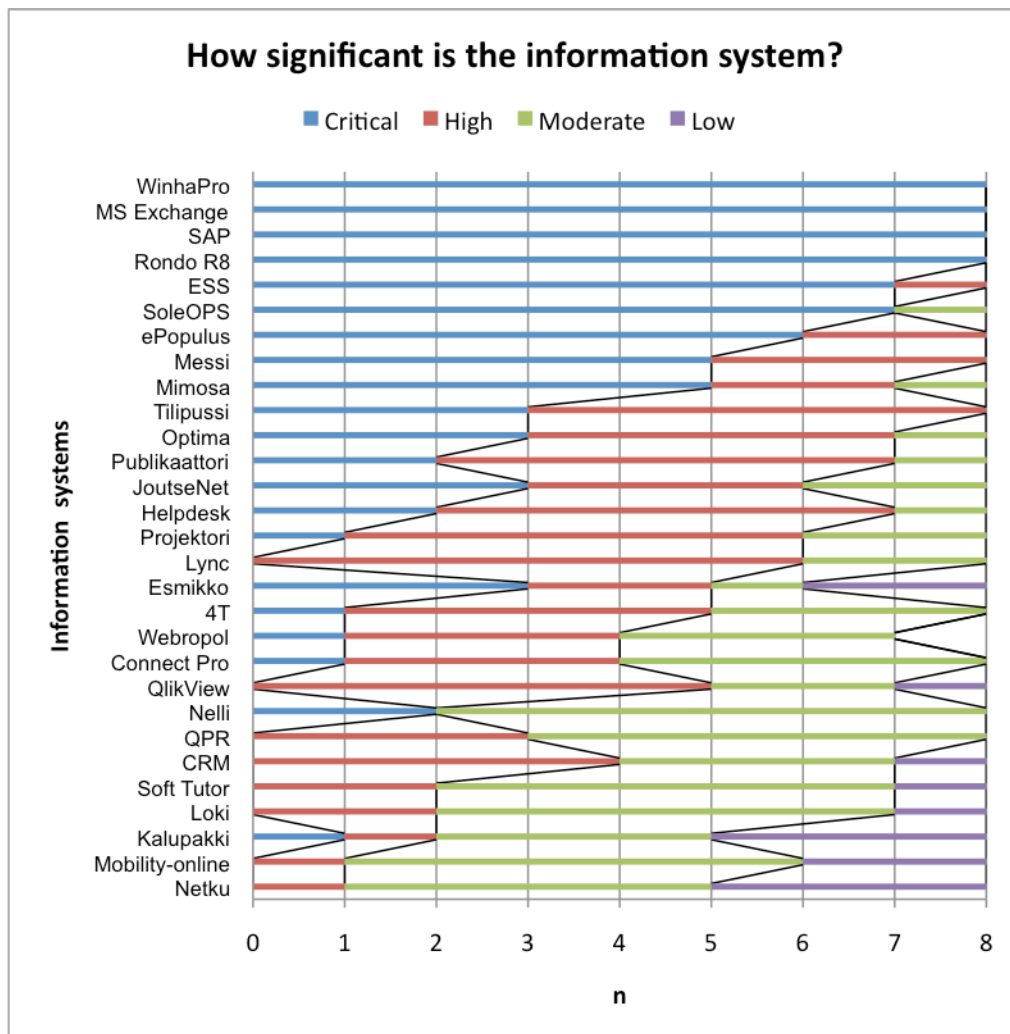


Figure 3. Significance of the information systems.

Based on the majority of the respondents there are only two information systems that require major changes (Figure 4): TUAS project management system and document management system. In addition, many other information systems were identified as needing major changes by some of the respondents. On the other hand, there were many systems that needed only minor or moderate changes.

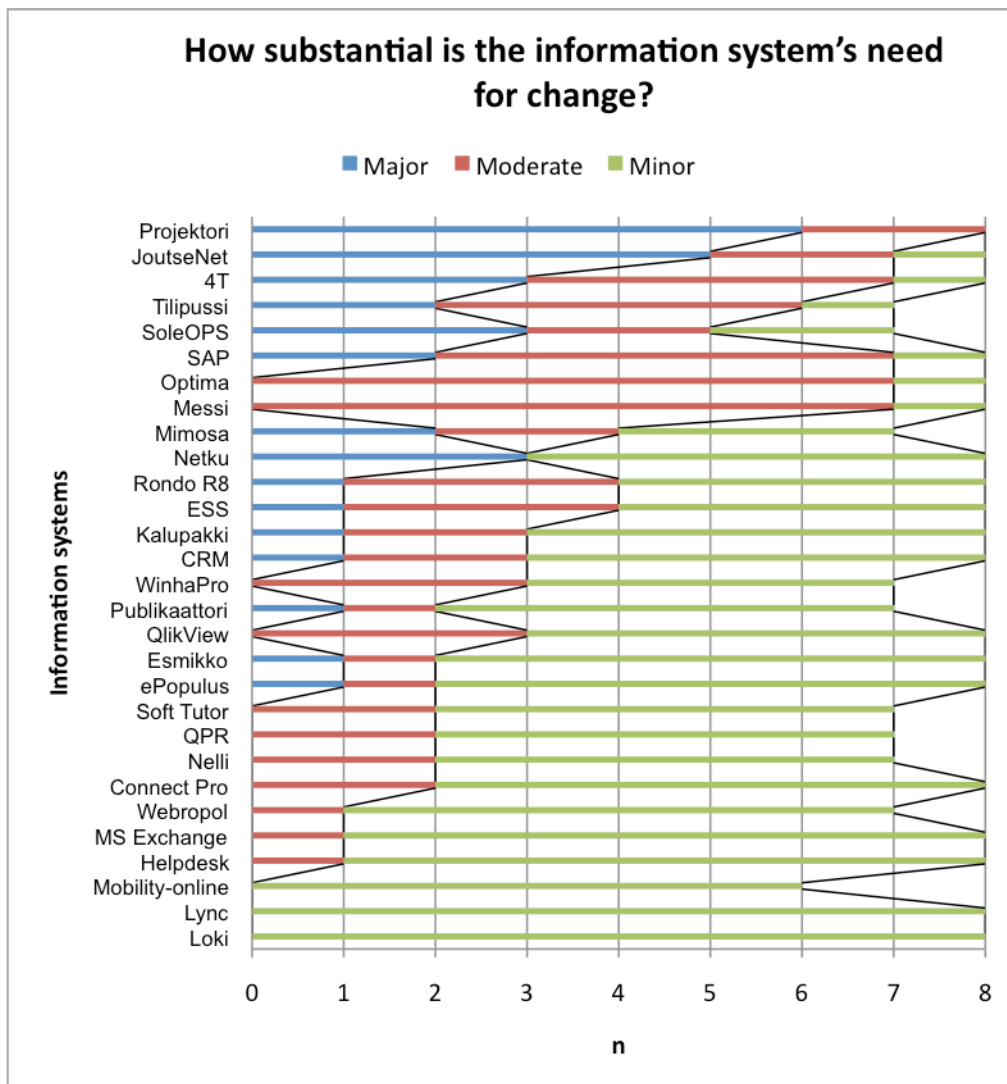


Figure 4. Need for changes in the information systems.

The education related activities are supported well with the many information systems (Figure 5). On the other hand, there are number of information systems that support education related activities only little. Interestingly, there are clearly information systems that cause mixed feelings. Some see that these information systems are strongly supporting education related activities while others only see minor influence. For example, the travel management system had this kind of distribution of responses.

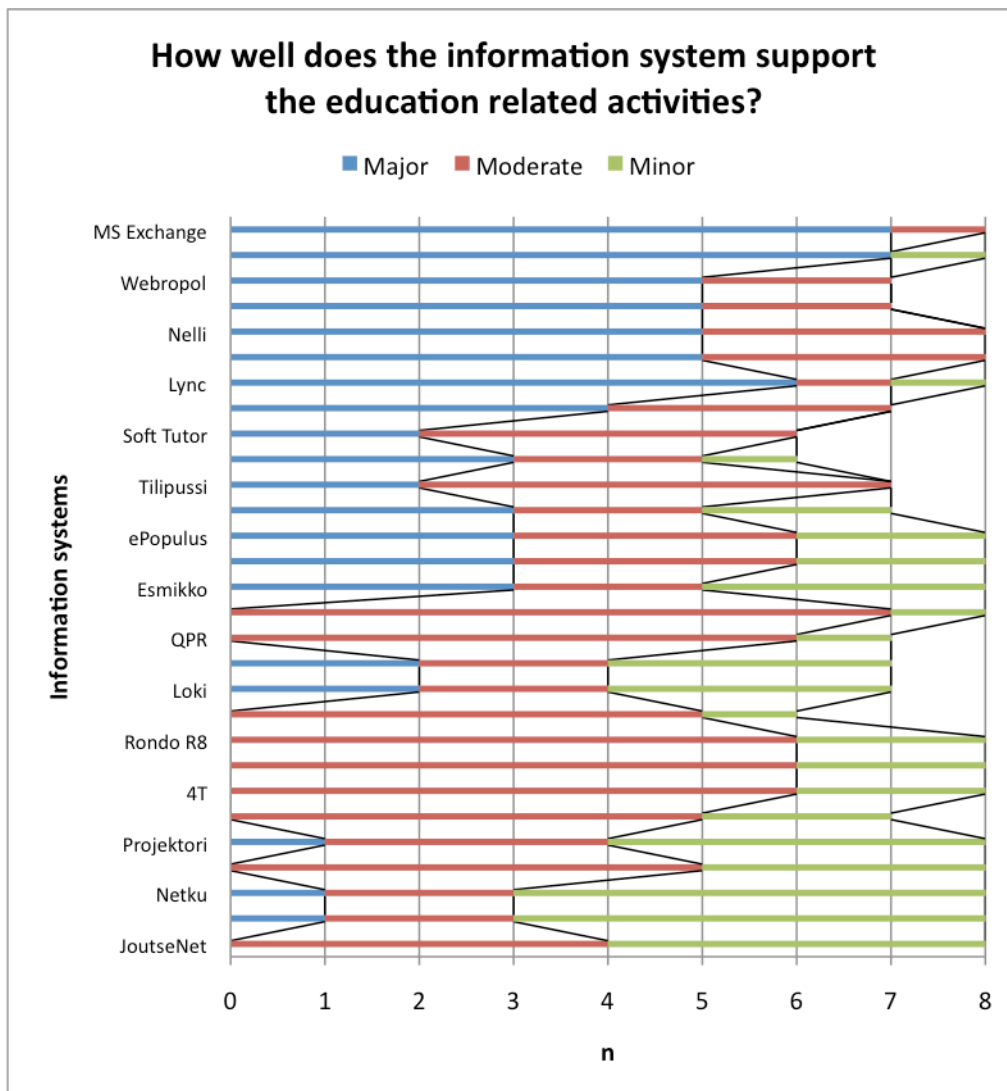


Figure 5. Information system support for education related activities.

When looking at the information system support to management and quality assurance, the list has slightly different order (Figure 6). Again the top is taken by our email system, but that is followed by quick reporting tool for management. Understandably the bottom of the graph is taken by information systems that do not focus on management and quality assurance such as City of Turku’s intranet, chattel accounting system and student mobility management system.

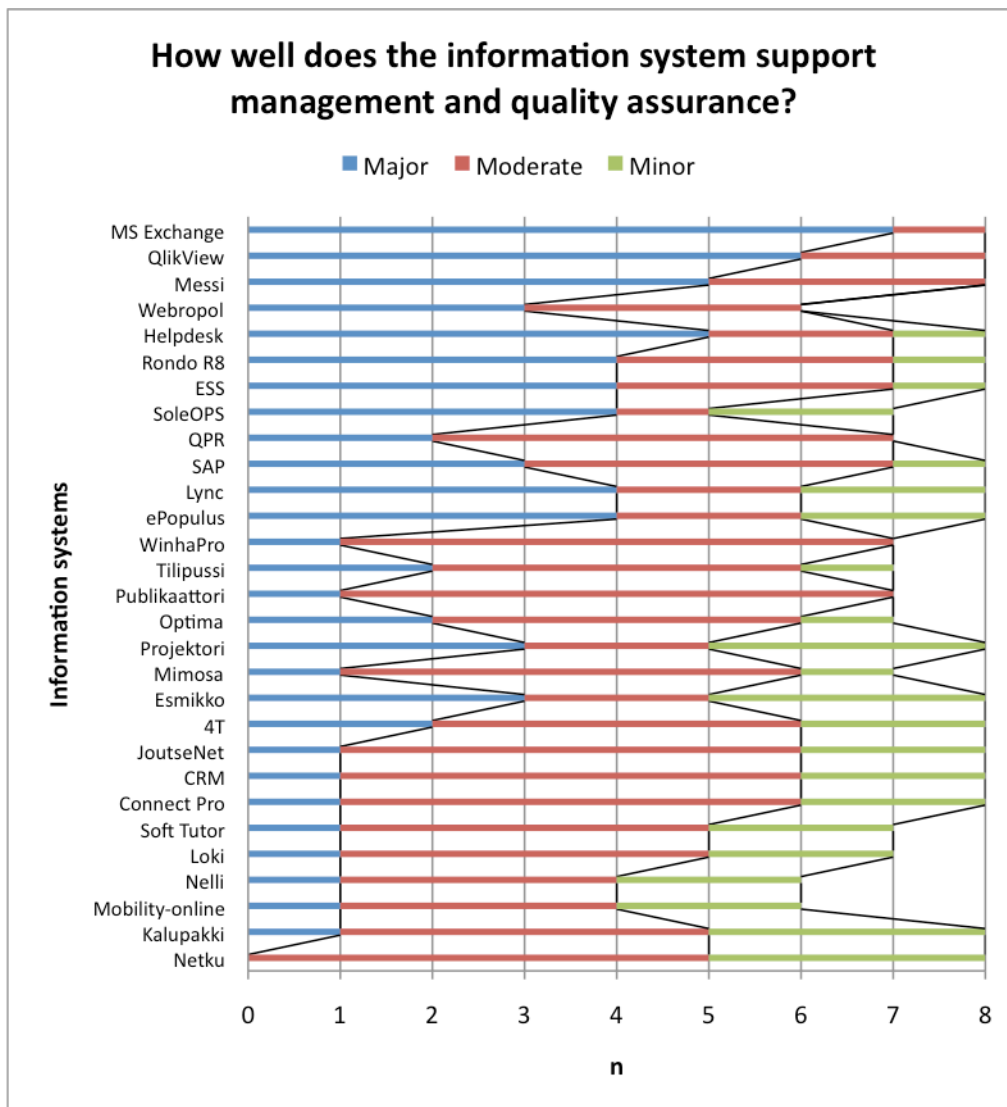


Figure 6. Information system support for management and quality assurance.

Discussion

This study focused on the system part of the enterprise architecture. The study analysed the state of the art of the current information systems and provided necessary information for creating more detailed system architecture description.

When we combine the significance of the information system and the current performance of the system, i.e., the need for change analysis, we get Figure 7. It shows that the system architecture is in quite good condition. Most of the information systems are closer to the critical classification in significance than in low classification. Based on this analysis all information systems are necessary although the level of significance varies. At the same time, most information systems need mainly minor changes. In the lower right corner of Figure 7 we see a number of information systems that are quite significant but at the same time require revisions. The university should recognize this when continuing the creation of enterprise architecture. The content of the higher left corner is mainly single purpose information systems. A surprise is that the CRM system is located there too.

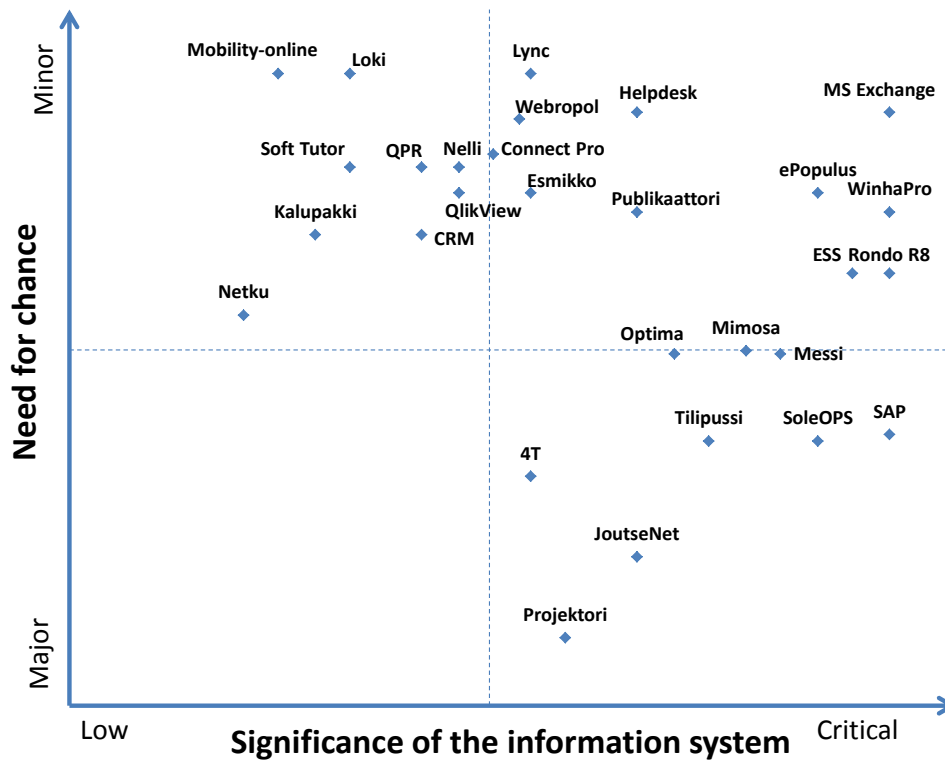


Figure 7. State of the art of information systems in TUAS.

When analyzing how different information systems support university operations, we noted that there are certain common information systems or tools that highly support both education related activities and management related activities. Such information systems are, for example, the email system, online survey and feedback system, IT support management system, and our intranet. On the other hand, there are information systems that do not highly support either of the fields. They support poorly both education and management related activities. Such information systems are, for example, the City of Turku’s intranet, document management system and chattel accounting system.

The enterprise architecture work is now started in TUAS with the description of the state of the information systems. This system architecture work is far from ready, but this small exercise already showed the possibilities and need of detailed analysis of the ICT environment.

Conclusions

The research showed the first step of the creation of enterprise architecture in Turku University of Applied Sciences. Based on the results, we can conclude that future development activities should focus on the information systems identified as needing change. Actually, the development activities should focus on larger process based unities such as R&D, teaching, business intelligence and financial and HR administration (Table 2). Based on this research, it seems that it pays off to follow the enterprise architecture principles in the future development activities too.

Table 2

Future Development Fields

Focus area	Information systems to improve
R&D	TUAS Project management system
Teaching	Teaching process planning and management system Scheduling software for time tables
Financial and HR administration	Financials system Invoicing system Human resource administration system Teachers workload management system
Business Intelligence	Management information system Document management system

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