ReGIS – A Web Application Platform-based University Research Group Information System

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ABSTRACT

A new class of integrated information systems that specifically addresses the needs of universities has emerged under the name of campus management systems. Campus management systems follow the same concept as integrated enterprise systems in companies and focus on a set of well-defined, structured processes that are standardized and streamlined for the entire university. Besides these university-wide processes, we have identified the need to support and optimize processes on the level of the individual university research group. In this paper we describe the Web application platform based research group information system, ReGIS. It complements university-wide campus management systems with a flexible approach to support and optimize research group-level processes. We provide a detailed description of our approach, including the results of our process analysis as well as the underlying conceptual framework, the current implementation status and first application results of the ReGIS system.

Keywords

Information Systems Application, Standardization, Enterprise Systems, Customer Relationship Management

1. INTRODUCTION

Universities are faced with increased national and international competition due to the establishment of teaching and research standards and the governmental expectation to acquire third party funding. The need for an increase in professionalism at universities is driven by various factors: First, the international alignment of bachelor and master studies implemented by the Bologna reformation has resulted in an increase in complexity regarding the offered courses of study. Second, universities are faced with more competition between each other. This is enforced with international standards such as conference and journal rankings. Finally, universities need to be attractive for students, researchers and industry to establish cooperation and attract 3rd party funding.

10th International Conference on Wirtschaftsinformatik,
16th - 18th February 2011, Zurich, Switzerland

Given this situation, universities as service businesses need to think of ways to increase productivity [6]. Service businesses are among the main beneficiaries of increased investment in information & communication technologies, leading to faster growth in labor productivity and in many cases more total factor productivity growth [24]. To enable standardization and drive for process excellence, integrated information systems have been introduced in the form of campus management systems at universities [1]. The underlying concepts of campus management systems are similar to integrated enterprise systems, such as ERP, in companies: a shared database is established and end-to-end processes involving all relevant stakeholders are defined and standardized. Campus management systems typically focus on core processes of a university, e.g., managing student accounts, managing degree programs, coordinating exams, lesson planning and cross-sectional functionalities such as reporting. In addition to these core processes, more advanced scenarios such as alumni management are supported. Campus management systems typically focus on a set of well-defined, structured processes that are standardized for the entire university. Primary focus is set on student lifecycle and relationship management, often following customer lifecycle concepts derived from marketing research.

Besides these university-wide processes, we have recognized the need to support and optimize edge processes on the local level of a university research group. Examples are research group-specific approval processes (e.g., for books procurement) and operational teaching activity support (e.g., thesis management). This kind of extension requirements are similar to the challenges enterprises are faced with when introducing and standardizing on a central integrated enterprise systems. Typically, such requirements are solved by pragmatic, localized solutions such as spreadsheets or small databases on the departmental level. The key advantage of these approaches is that they are very fast and easy to implement. Major problems of such solutions are that they can result in a chain of events leading to data duplication, data inconsistencies and disjoint applications with a lack of integration. Such shortcomings lead to company-wide inefficiency resulting in increased costs for operations and overall opacity. More sustainable approaches to address these flexibility requirements are provided by so-called composition or application platforms. These platforms enable the creation of composite edge applications on top of or in extension to company-wide standardized enterprise systems. Typically, such platforms include capabilities such as business object and data management, connectivity and integration, business process management tools, development tools and user-interface generators. They can be installed within the company or consumed as Web platforms.

Examples of locally installed, on–premise application platforms addressing departmental needs are Lotus Notes/Domino [12] and Microsoft Office Server including Sharepoint [18] in combination with Microsoft Dynamics as the core application platform. Various web-based on-demand platforms have appeared recently, one prominent example is Force.com [2] by Salesforce.com.

In this paper we describe ReGIS, an information system that provides flexible edge process support for a university research group. It relies on a Web application platform and extends university-wide campus management systems. The paper is structured as follows: Section 2 gives an overview on related work and describes the identified research gap. Section 3 provides an overview on the research approach that has been pursued and specifically articulates four key research questions. Section 4 introduces the entire set of processes we have defined for our research group. Section 5 describes the underlying conceptual framework of ReGIS and section 6 presents the implemented solution and its key capabilities. Section 7 provides the first results of the real-world application of ReGIS based on usage data and a time/cost study comparing process execution before and after introduction. Finally, we summarize the paper in Section 8 and give an outlook on future work.

2. RELATED WORK

Campus management systems follow a similar concept as integrated enterprise systems in companies. Alt and Auth provide a detailed overview of the current state in research and practice [1]. A wide range of campus management systems has been developed over the last years; commercial products are available on the German and international market. Examples from the national German market include SAP's Campus Management, CAS Campus, the offerings by HIS GmbH and Datenlotsen. The international market is specifically driven by the US, including offerings by Talisma, the Campus Management Corporation and Eduswift. The primary scope of the campus management systems is set on university-wide processes, specifically student lifecycle management and course planning. With the increasing popularity of internet portals, modern campus management systems also offer self-service functionalities to students and staff members

Campus management systems typically follow an ERP II approach [4]. ERP II refers to an alternate class of information systems in which flexible and customized federations of smaller business components interact, even beyond enterprise boundaries, by means of a platform-neutral communication bus [9]. ERP II is an evolution of the well-known concept of ERP. In contrast to standard ERP systems, which lack to integrate the three major stakeholders (the company, the supplier, and the customer), due to conceptual as well as technical issues, ERP II extends business processes, opens application architectures, provides vertical-specific functionality and is capable of supporting global enterprise-processing requirements. This is accomplished by componentization and integration of front-office tools and different kinds of collaboration and coordination platforms with back-office functionalities represented by a core ERP system [19] [16]. In addition, ERP II also comprises of a business strategy and a set of industry domain specific applications that drive customer and shareholder value by enabling and optimizing enterprise and inter-enterprise, collaborative operational and financial processes [4]. While ERP II was initially discussed in the context of Supply Chain Management systems, fundamental findings can be applied to supply chains of services and eventually on services in general [14].

From a conceptual point of view, the idea of student relationship management derived from CRM has been introduced in [11]. The major goal is the strategic orientation of the entire academy aiming at the increase of student satisfaction and the creation of additional value for the students as well as for the academy. The authors describe potential uses within the context of higher education management, but do not further discuss what an actual implementation could look like. Seeman and O'Hara have explored customer relationship management in a particular higher education setting. They investigated the development and implementation, as well as the benefits of a CRM project in a state community college. The project resulted in the expected increased student loyalty, retention and satisfaction with the college's programs and services [21]. A case-study by Tapp et. al [22] reveals the potential of direct marketing and customer relationship management for higher education using the example of the University of the West of England. While the study majorly focuses on the strategic marketing tools to attract more applicants, it also proves how important an underlying analytical CRM is to decide upon the right strategy in higher education.

Existing work and commercially available implementations in the context of campus management systems focus on supporting a set of pre-defined, university-wide processes. Besides streamlining standardized university-wide processes, there is an additional need for support edge processes. The need for edge process support is not specific for universities; this need also has been identified when using ERP in businesses in general [13]. Edge process requirements usually have been addressed by pragmatic and localized approaches in the past, relying on spreadsheets or departmental databases. So-called composition platforms have been established by major enterprise software vendors during the last five years (e.g., SAP NetWeaver Composition Environment). They typically include basic functionalities such as business process modeling and execution, services connectivity, basic data management and UI generators. Recently, Web application platforms have been established as a result of an on-going general trend towards on-demand services [8]. The reasons to rely on internet-based software services are of a complex nature. Important drivers are the total cost of ownership and the available technical know-how [3]. The market of Web application platforms is very wide and heterogeneous. It ranges from easy to learn platforms which offer only limited modeling capabilities and force the user to develop applications along predefined templates, to fully fledged development and runtime environments such as the Google App Engine and Microsoft Azure which allow the development of comprehensive applications from scratch [15]. According to this classification the Force.com platform, one of the oldest and most advanced Web platform on the market, ranges somewhere in the middle. It provides basic but easy to learn customization features which allow quick adjustments to a changing environment. In addition, it offers a sophisticated programming environment based on the APEX programming language to the tech-savvy user.

Web platforms provide an interesting opportunity specifically for the university application domain. They do not require a lot of infrastructure investments, are simple to learn and allow for the easy creation of edge processes extending the centrally established campus management systems. In this paper we will analyze and describe the potential opportunities of combining existing

integrated campus management systems with Web platforms to enable the implementation of edge processes on the research group level.

3. RESEARCH APPROACH

The reasons for starting the research described in this paper are manifold: First, we recognized the need for enhanced process support in our daily work on the research group level which was not provided centrally on the university level. Second, as a research group for enterprise information systems we wanted to "practice what we preach" within our own environment. Third, as discussed in the related work section the combination of integrated enterprise systems with Web platforms enabling edge processes is not well researched in general. Based on our literature study and the above mentioned real-world challenges, we have identified the following research questions:

1. What are typical edge process candidates on the research group level?
   o
2. How to design a research-group level information system that is extending and complementing centrally available campus management systems? Do existing Web application platforms provide the required key capabilities?

3. What is the adoption behavior and what are the potential advantages (with regards to time/cost) of such a research group information system compared to manual execution of the edge processes?

We applied the principles of action research [7] to our work and followed the general design cycle as described in [23]. Our fundamental thinking in this work is that processes of change are especially well suited to gain a deep understanding of systems. We are carrying out a spiral of steps, each of which is composed of a circle of planning, action, and fact-finding around the result of the action. The individual activities and their results are documented in the subsequent sections.

4. PROCESS ANALYSIS & DESCRIPTION

Process analysis and description techniques have been a part of manufacturing for decades. The techniques started in closed system manufacturing (e.g., chemical processing industry & food processing industry), where a total process perspective was necessary, and then progressed to discrete manufacturing (e.g., automotive industry). More recently, the service sector has discovered the value of these techniques. Process improvement in the service industry has an advantage - labor costs are higher, so making their core process more efficient can have a substantial impact. The service industry differs from manufacturing in several ways: 1) Production and consumption of services is simultaneous. 2) Services can't be saved or inventoried, 3) The solutions are driven by performance, ideas, concepts, etc.

In general, a research group is an organization unit that provides education services and creates research output in different forms. Managing a research group shares many similarities with managing small and medium sized companies or a department being part of a larger enterprise. The chairperson has end-to-end responsibility for all processes. A budget needs to be managed and the fulfillment, quality and compliance of services provided need to be ensured. Our research group "ERIS" is, from an organizational point of view, a chair within the business school of our university. The research group was established from scratch and joined the faculty in September of 2009. At the beginning, we engaged in various entities within the university, specifically other research groups, the faculty and the university administration at different organizational levels to better understand the major processes, roles and responsibilities. We defined a rough framework for all processes at our research group: we distinguished between core and support processes as visualized in Figure 1.

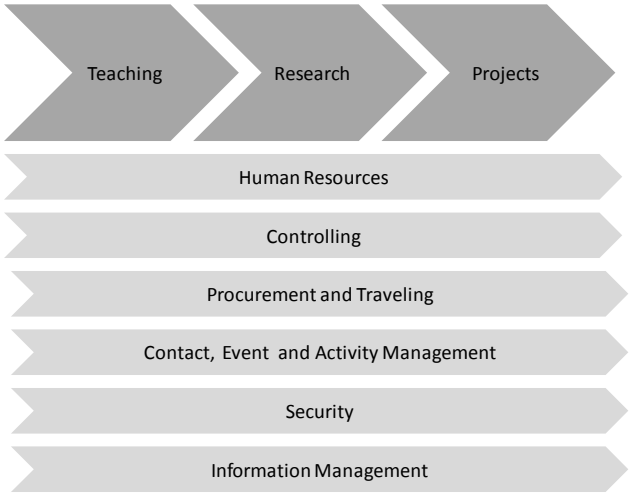

Figure 1: Research Group Processes

Core processes comprise of teaching, research and projects. The area of teaching covers all activities in the context of education. This includes the planning and execution of our teaching program (lectures, seminars, etc.), the management of thesis projects and certificate creation. Research covers for example the dissertation and habilitation sub-process as well as the definition of all involved activities for submitting publications. In the third core area of projects, we have defined all activities required to execute internal as well as externally funded industry projects by public organizations and industry. The two areas of research and projects do overlap: the reason to introduce two explicit categories was to emphasize the importance of project-centric work in research at our research group.

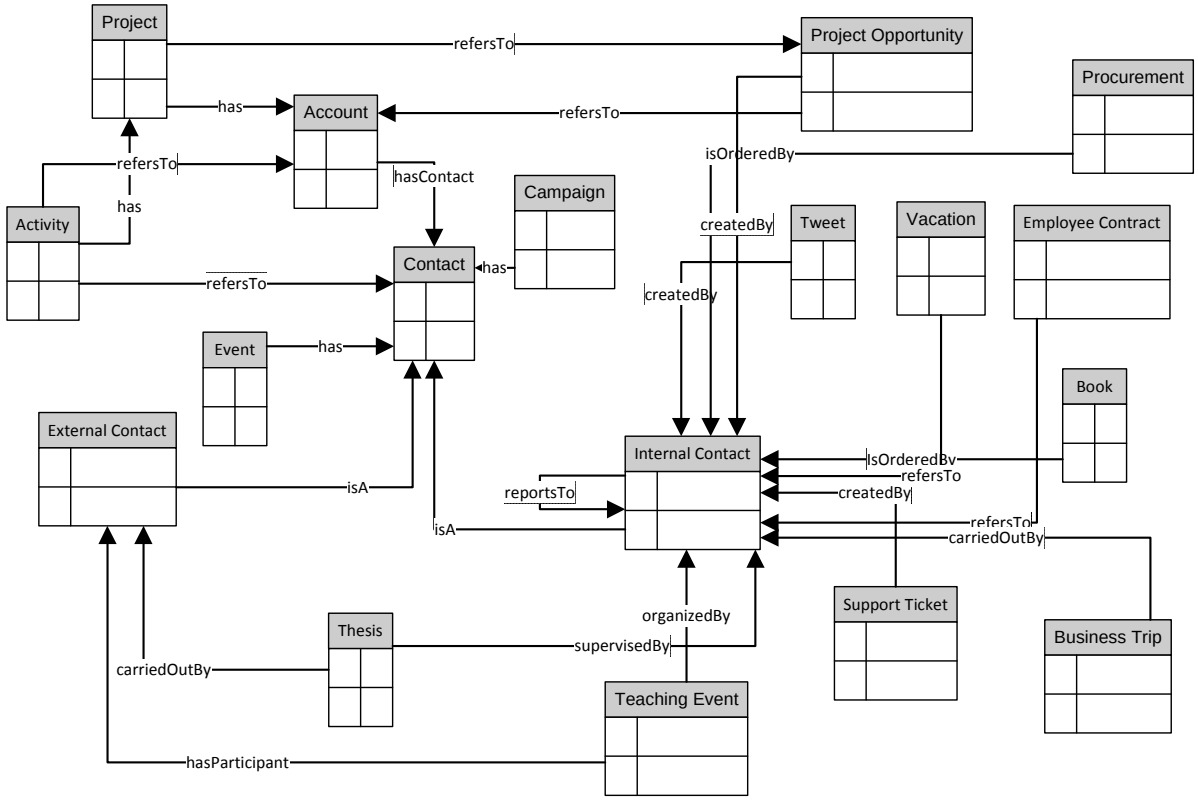

Figure 2: Excerpt from Conceptual Model

Support processes include human resources, finance and controlling, procurement, traveling, external and internal communications, activity management and facility management including security and information management. In the area of human resources we look specifically on employee and student assistant management from an onboarding and off-boarding perspective. Finance and controlling specifies budget planning and monitoring activities for the entire research group. Procurement deals with all activities involved when acquiring goods for the chair (e.g. books, office equipment, etc.). Traveling defines all necessary steps to carry out a business trip. Communications and activity management describes the way interaction should be structured, organized and documented. Facility management and security defines the rules for securing our office and associated data. Finally, information management deals with all IT provisioning processes.

The individual processes are further refined into more detailed sub-processes and, finally, broken down into detailed activities. For each process a process owner from the team (professor, office assistant or research assistant) was defined. The goal of the process owner was to initially define and document the process, align it with the team and keep track of changes.

We used the Business Process Modeling Notation (BPMN) [25] to initially model the processes. Besides BPMN, we also made use of the RACI methodology [5] to explicitly document responsibilities on a detailed level. We established process description templates as a basis for explanation of the individual process steps and document responsibilities. Because processes are always living, we decide to use a Wiki to publish the process descriptions and allow for easy track keeping of changes.

It is important to emphasize that there is no strict separation between university level, faculty level and research group level processes. Many activities of the identified research group level processes have direct relationships with university or faculty level processes, and there is already central information system support for some of them. Typically, university or faculty level processes are complemented by research group level processes. For example, the research sub-process thesis management is from a high-level perspective driven by the university level: this mainly includes ReGIStration of the thesis and finally delivery of the certification including the grade. Beside these two major general steps, more detailed activities are performed on the research group level. For example the Web pages of the chair need to be updated and dates or intermediate & final presentation dates of the thesis need to be scheduled.

The major goal of the process analysis and description was to get a comprehensive and detailed view on all relevant processes, associated sub-processes and activities from a research group perspective. The process analysis and description provided the basis for creating the conceptual framework for ReGIS and defining the actual scope for the ReGIS implementation project.

5. CONCEPTUAL FRAMEWORK

In this section, we provide an overview of the conceptual framework of our approach. We start by introducing the underlying conceptual model. Besides the conceptual model, we

also explain how our approach may be embedded into a university IT landscape by providing a conceptual architecture.

5.1 Conceptual Model

Our conceptual model follows an "anything relationship management" oriented approach (xRM). This approach has been derived from customer relationship management (CRM) and can be considered as a strategy for systematic management of all kinds of relationships-not just those with customers. An excerpt of our conceptual model is visualized in Figure 2. Following the customer relationship management approach, we center all business objects on the central object "contact". A contact can be either an internal contact or an external contact. Internal contacts are members of the research group: professor, guest lecturers, office assistants, research assistants and student assistants. External contacts are always assigned to an account, which represents an organization; either a company or a public organization. Besides the central "contact" object, we have defined a set of associated business objects capturing data required in core and support processes, e.g., projects and project opportunities, teaching events, research events, etc. The different objects are explicitly networked between each other, e.g., the thesis object is related with contacts and accounts, meaning that a research assistant (in the instance of an internal contact) may offer and supervise a thesis project for a specific student in cooperation with a company.

A major reason for modeling and exposing explicit relationships between the various business objects is to enable usage scenarios beyond pure transaction-oriented execution of business processes. This is of specific importance for knowledge-intensive research group processes, where only small subsets of activities are of transactional nature. Our model also includes objects capturing data that is stored in central university-wide management systems. For example, students are also centrally registered in the campus management system.

5.2 Conceptual Architecture

Existing components are the centrally provided university campus management systems as well as the universities, the faculty and finally our research group web sites. We complement the existing components by introducing a dedicated research group information system that is accessible via a web interface and from desktop tools, specifically personal productivity tools such as an email client.

As mentioned earlier, we propose to run the research group information system on the basis of a web application platform provided in the form of a Platform-as-a-Service (PaaS). By doing so, we minimize efforts for operations and maintenance.

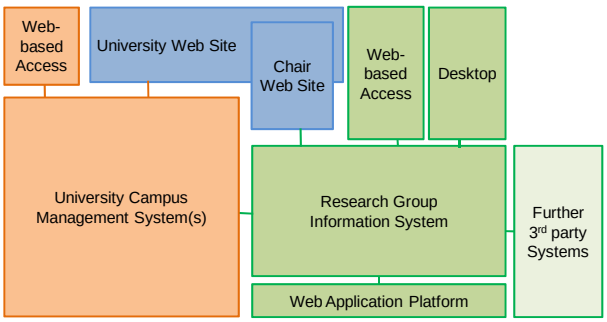

Figure 2: Conceptual Architecture

The research group's information system exposes data to the research group web sites via web services and interacts with the university campus management system for data exchange. The data exchange between the university system and the research group system is challenging, e.g., one is faced with data consistency and redundancy issues. We will further elaborate in section 6 on the challenges we have been faced with.

Furthermore, we enable enhancement of the core research group information system by further 3rd party systems providing specific functionality. For example, in our concrete case, we use the campaign management system Mailchimp [17] and Microsoft Windows Sharepoint Services [18] enabling document management and collaboration.

6. IMPLEMENTATION

In this section we describe the implementation of ReGIS in detail. First, we briefly illustrate how the underlying web application platform has been selected. Second, we provide an insight into the implementation approach we have pursued. Third, we will sketch the actual functionality that has been implemented so far. Finally, we describe challenges we have been faced with during selection, implementation and introduction of ReGIS.

6.1 Web Application Platform Selection

We defined several boundary conditions as an initial step in the selection process: First, we did not want to implement a new custom solution from scratch, so we followed our fundamental relationship management approach (ideally basic CRM functionality should be already available). Second, the platform should be easily extensible on a configuration and code implementation basis. In contrast to basic web development platforms such as the Google App Engine [10], web application platforms typically include a set of capabilities enabling efficient creation and maintenance of business objects, business logic and associated user interfaces. Third, the platform should be 100% web-based and be hosted and operated by a professional third party provider ensuring stable operations and security independent of resources from our research group. We performed a market research on available web application platforms fulfilling the above mentioned boundary conditions. Several startups have launched web application platform offerings recently. Many of them offer comprehensive configuration and development capabilities for business applications, but they mainly lack any pre-defined business objects or pre-packaged solutions such as CRM.

We made the decision to use Force.com [2] which is provided by Salesforce.com. Our main reasons for selecting Salesforce.com were the comprehensive out-of-the-box CRM functionality, the size of the vendor with the proven success in the market and the availability of the comprehensive web application development platform Force.com. Furthermore, subscription costs for public and non-profit organizations are the following: the first 10 subscriptions are for free, further subscriptions can be acquired with an 80% discount.

6.2 Implementation Process

We followed an agile implementation approach. The entire implementation was structured in multiple waves. In the first wave, the overall set of requirements was collected and the first set of capabilities was realized. The requirements were based on the defined processes and the conceptual model. For each wave,

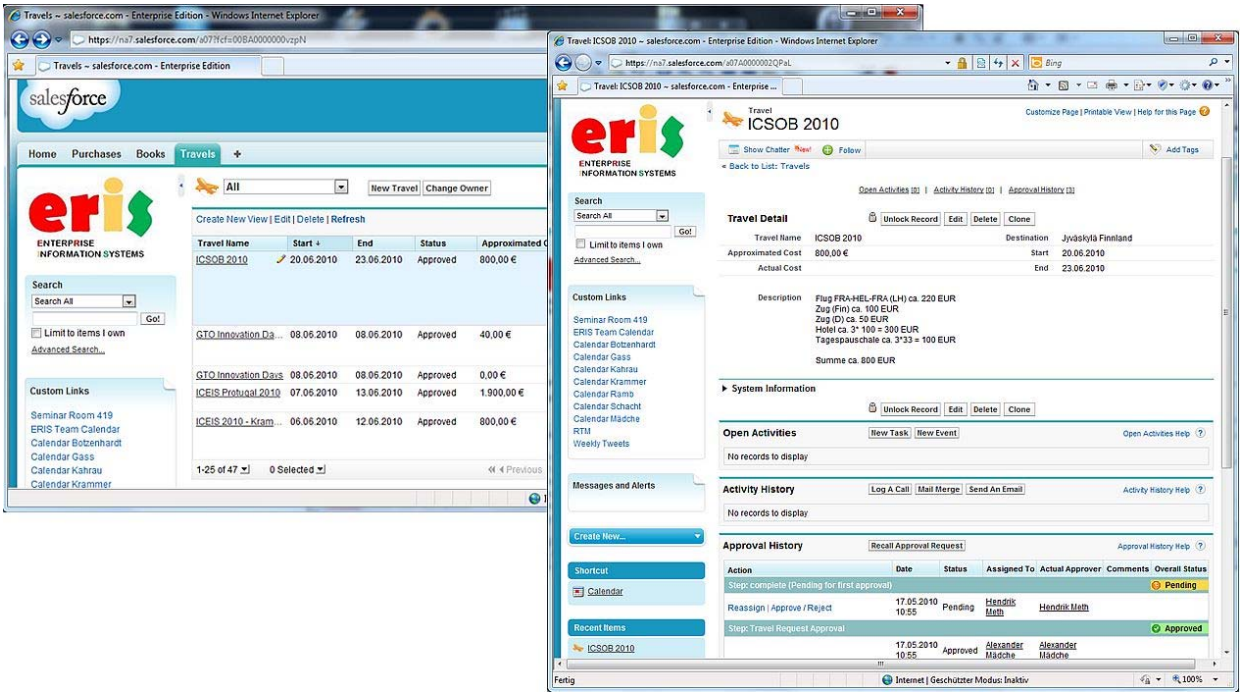

Figure 3: Screenshot showing the travel planning support by ReGIS

requirements were classified into the specific process categories and prioritized. The prototype of the first implementation wave focused on basic capabilities such as user management, security and the existing core CRM functionalities such as contact and account management, event and activity management and project opportunity management. The existing functionalities were adopted according to the defined requirements, e.g., the concept of an internal vs. external contact was realized as a new function. After testing and sign-off, the functionality implemented in the corresponding wave was made available for usage.

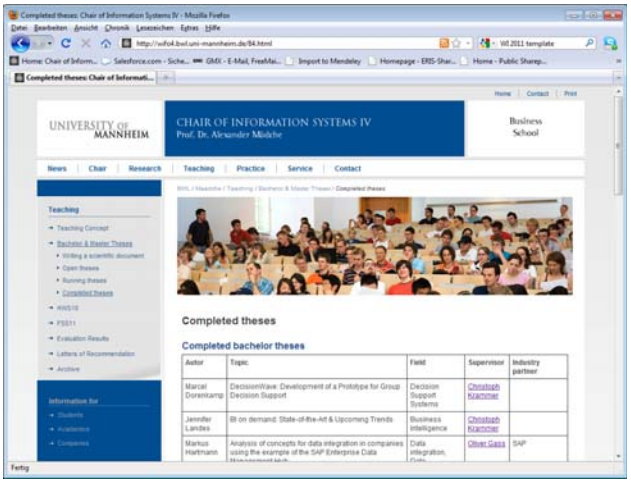

Figure 4: ReGIS web site integration

Each wave was associated with a major theme. The focus of wave two was set on supporting administrative processes such as procurement, business trips, vacation, etc. Wave three focused on teaching processes and included capabilities for thesis management, teaching event organization, etc. Wave four looked at research specific aspects such as research events and paper submission planning. The entire implementation process of ReGIS is not yet finalized. We are currently in wave five which is focusing on budgeting and controlling aspects.

6.3 Functionality

ReGIS, in its current status, provides comprehensive functional coverage for key administrative processes, teaching processes, research processes and basic project process support. Figure 3 depicts two screenshots of our implemented system and the web-based access. On the left hand side, one can see the overview screen of the books procurement functionality. The screenshot on the left side shows a detailed screen for one specific business trip.

Figure 4 provides a screenshot example of the web site publication of ReGIS data for thesis projects and their actual status (open, running, completed). The basic idea of this approach is that we prevent manual re-editing of existing structured data on Web sites by automatically generating web pages from ReGIS (for example the list of all open thesis projects is provided by http://eris.force.com/theses?status=Open) and embedding these generated pages into our Web Content Management system (based on Typo3).

The table below lists an overview on the key capabilities that have been implemented in ReGIS.

Functionality	Area	Short description
Contacts	Admin	Document all basic data about contacts
Events	Admin	Plan and schedule events via shared team calendar
Activities	Admin	Define and delegate team tasks
Campaigns	Admin	Plan interaction with contacts
Vacation	Admin	Plan vacation and request for approval
Sick days	Admin	Document sick days
Contracts	Admin	Manage all employee contracts at the research group centrally
Teaching Event	Teaching	Plan teaching events (e.g., a lecture) and document outcomes (e.g., evaluation feedback, participants, …)
Thesis	Teaching	Manage thesis projects holistically from idea to final grading
Research Event Papers	Research	Collect relevant research events and plan submissions
Procurement	Admin	Manage procurement processes
Books	Admin	Manage book procurement, organization and ownership
Travel	Admin	Manage travel processes
Support Ticket	Admin	Capture ReGIS support requests and their status
Tweet	Admin	Enable weekly status documentation
Project Opportunity	Project	Document opportunities for 3rd party funded projects

Table 1: ReGIS Functionality

In addition to this core functionality, we have defined a set of reports based on the reporting capabilities provided by Force.com.

6.4 DISCUSSION

We have been faced with various challenges when implementing and introducing the new functionality.

One major challenge was the integration with central university processes and the associated campus management systems. We could not leverage the potential of full automation for several processes. Reasons for this was that either paper-based approaches were pursued or the existing campus management systems did not provide any kind of interfaces for automated data exchange. In the case of paper-based approaches, a straight forward work around could be established; the necessary forms were generated out of ReGIS, printed out, signed and sent via in-house mail to the corresponding administrative department. The lack of interfaces to central campus management systems, specifically the finance and controlling system but also basic student master data, is more challenging and is not yet solved. This is our pragmatic solution.

Another challenge, from a technological perspective, was the integration issues between the existing personal productivity tools, such as Microsoft Outlook, and the new event management functionality provided by ReGIS. The usage of multiple calendar tools resulted in synchronization issues and conflicts. This challenge could be solved by establishing ReGIS as the default calendar.

7. APPLICATION

As mentioned earlier, the system is introduced in a step-by-step process beginning in November of 2009. In the following we provide some application results describing the impact that has been generated by ReGIS so far. First, we present some basic usage statistics of our system. Second, we analyze two selected functionalities and perform a time/cost analysis by comparing the execution of these processes with and without the availability of our information system ReGIS.

7.1 Usage statistics

We currently have ten active users including the chairperson, the office, seven research assistants and one student assistant responsible for administration and development. We have calculated the overall number of logins from January to July of 2010; we range between 50 and 538 logins with an average of 286 logins per user. Assuming equal distribution of these logins over this time, we result in 40 logins per month per user. In the month of May of 2010, we counted 13.895 page views in our system.

We currently rely on six standard objects (Account, Contacts, Tasks, Events, Opportunity, and Campaign) and 20 custom objects (e.g., Book, Thesis, Travels, Vacation, etc.). We have 153 accounts and 396 contacts in our system. The objects with the largest number of instances are events (3.728 instances), tasks (929 instances), contacts, payments and accounts. The custom objects are used in 11 custom applications (such as thesis management, books procurement, etc.). From a reporting perspective, 90 custom reports have been created since November of 2009.

7.2 Time/cost analysis for two examples

Besides the pure usage statistics, we have also performed a preliminary time and cost analysis comparing process execution with and without our system. In the following, we will focus on two specific processes: i) The thesis management process dealing with the entire management of a bachelor, master or diploma thesis and ii) the book procurement process including all necessary activities to procure a book.

The table below describes a subset of purely administrative activities carried out as part of the entire thesis management process. The table does not include content-centric activities such as defining the scope of the teaching, reviewing it or writing the certificate including grading. The data was collected by asking all team members to provide a rough time estimate. The time in the table was calculated as the mean value of all time estimations (in case of research assistant tasks).

Activity	Estimated Time
Thesis management is triggered by the research assistants. The thesis gets a unique number and is documented in an Excel sheet as a new thesis project proposal.	5 min

Before publishing the thesis, approval of the chairperson needs to be given. This is done via email.	3 min
After approval, the Excel sheet is updated. New thesis projects are typically published on the chair web sites, an update of the corresponding page is done by the research assistant.	8 min
After allocation of the thesis project, the Excel sheet and the chair's web pages need to be updated again. The status is changed and the name of the student is added to the thesis project. On the web pages, the thesis project is associated with the name of the student and categorized under running thesis projects.	8 min
Finally, after finalizing the thesis project, the Excel sheet and the chair's web pages are updated.	8 min
∑	32 min

Table 2: Thesis Management Process without ReGIS

The administrative aspects of the thesis management process supported by ReGIS are as following:

Activity	Estimated Time
A new thesis object is created, status: new.	5 min
The approval process is triggered and carried out.	1 min
The status of the thesis object is changed: published; web page is updated automatically.	1 min
The status of the thesis object is changed: allocated; The student is associated with the object. The web page is updated automatically.	2 min
The status of the thesis object is changed: finalized; web page is updated automatically.	1 min
∑	10 min

Table 3: Thesis Management Process with ReGIS

Approximately 60 thesis projects are carried out per year under our chair. The administrative efforts for the thesis projects before using an integrated information system sums up to 1.320 minutes or 22 hours equal to 825 Euro[1] per year. By using ReGIS, the entire administrative effort is reduced to 600 minutes or 10 hours equal to 375 Euro per year.

The table below describes the book procurement process before the introduction of our system:

Activity	Estimated Time
Book procurement request is entered in an Excel sheet.	5 min
Approval request is sent to chairperson via email, with CC to office.	3 min
Office sends bundled procurement request via email to library; library sends order confirmation. Library receives book and registers.	5 min
Book is received and documented at chair in Excel sheet by office. Book requester is informed via email.	10 min
Payment form for invoice is filled out by office, signed by chairperson and sent to university administration.	15 min
∑	38 min

Table 4: Books Procurement without ReGIS

The book procurement process has been streamlined using ReGIS. After the creation of book instance, all further interaction is centered on this object. An approval process is triggered, the library is automatically notified, the book requester is notified and the payment form for the invoice is generated based on the object.

Activity	Estimated Time
Book procurement object is created in ReGIS.	5 min
The approval process is triggered and carried out.	1 min
After approval, ReGIS sends request to library. Library sends order confirmation. Library receives book and registers.	0 min
Book is received, metadata data is added and status is changed. Book requester is informed automatically.	3 min
Payment form is generated out of ReGIS, signed by chairperson and sent to university administration.	2 min
∑	11 min

Table 5: Books Procurement with ReGIS

Approximately 150 books are acquired per year under our chair. This sums up to an overall time effort of 5.700 minutes or 95 hours without using ReGIS. From a costs perspective, specifically the office is affected; compared to the former 30 minutes, the streamlined process based on ReGIS is executed in only five minutes. In one year, the former process cost 1.171,50 Euro[2] from an office administrative viewpoint compared to 195,25 Euro of the streamlined, ReGIS-based edge process.

[1] Under the assumption that a research assistant (TV-L 13) costs approx. 60.000 € / year. With 200 working days per year, a day costs 300 Euro or an hour 37,50 Euro (40 hours /week).

[2] Under the assumption that an office assistant (TV-L 5) costs 25.000 € / year. With 200 working days per year, a day costs 125 Euro or an hour 15,62 Euro (40 hours / week).

The preliminary application results have demonstrated two important aspects: first, based on the usage data there is a clear indication that the system has been adopted by our organization. Second, by looking into the details of these two selected, simple examples we have explicitly demonstrated the huge potential with regards to time and cost savings of edge process support and optimization on the research group level.

8. SUMMARY AND FUTURE WORK

In this paper we have described the current status of ReGIS, a Web platform-based information system providing edge process support for a university research group. ReGIS focuses on supporting typical core and support processes of a research group.

We have identified the need for edge process support in all major areas of our research group, including administration, teaching, research and projects. We have to emphasize that parts of the identified edge processes could be also provided by a central university-wide campus management system. In our concrete case, the maturity level of the entire campus management system and associated process support was low, so we had to implement core functionality on the edge level. We do not consider this as a problem. Ideally edge processes that are shared and executed in a similar way on the local research group level should be moved to the university-wide level.

The implemented ReGIS system follows conceptually a relationship management oriented approach and puts the "contact" in the center. All business objects are related with internal or external contacts. ReGIS relies on a Web application platform that comes with several advantages: first, no internal know-how in the research group on installing, operating and maintaining the infrastructure is needed. Second, the core platform capabilities and, specifically, the configuration-oriented approach can be leveraged for fast realization of capabilities without the requirement of establishing comprehensive development skills. We have implemented and introduced ReGIS in a relatively short time frame mainly relying on student resources. ReGIS in its current status provides comprehensive functional coverage for key administrative, teaching and research processes and basic project process support. We have been faced with various integration challenges with the central university processes and the associated campus management systems. The reasons for these integration challenges are twofold: First, in many cases, paper-based approaches for processes or process steps are still in place. Second, existing campus management systems did not provide service interfaces for automated data exchange. Therefore, we could not leverage the full potential of end-to-end process automation from edge process to standardized university-wide processes. Both issues can be fixed with workarounds involving human-based manual activities.

Our preliminary application results have shown that the system has been adopted and creates tangible positive impact regarding cost and time reduction in the two selected processes we have analyzed. For the thesis management process we calculated savings of 450 Euro per year. For the books procurement process it resulted in 976,25 Euro per year. Already, these two examples demonstrate the huge potential of streamlining edge processes on the research group level.

In the future we plan to extend the system in various directions: first of all, we need to finish the implementation wave 5 with the required budgeting and controlling functionality. To prevent complicated import processes with manual data editing, we need to establish a better integration with central university finance systems. Finally, to round up the core functionality, we will kick-off a wave 6 that will focus on project process support. The core functionality may be extended in different directions: first, we want to better support and capture interactions with our students. For example, we plan to provide a recruiting functionality where students can apply for thesis projects on our web page. The application is processed by ReGIS by automatically creating a contact and interlinking it with the thesis proposal. Second, we are planning to explore ways to interlink the relatively structured world of ReGIS with a more unstructured environment typically supported by community and collaboration platforms. We envision a seamless transition from the structured objects defined in ReGIS towards rather unstructured activities such as document creation, brainstorming, etc. We already evaluated Chatter by Salesforce.com which enables micro-blogging in a freestyle and business object-centric environment. The principle ideas are good, but the level of integration with unstructured processes is not yet developed enough. Third, our system is currently taking mainly an operational perspective. With regards to an analytical perspective, we rely on basic reporting. This may be enhanced in the future by interlinking operational and analytical aspects to achieve a closed loop of planning, execution and monitoring.

After finalizing the above mentioned implementation activities, we plan to perform an elaborate evaluation study. Our plan is to introduce ReGIS to another research group and evaluate in detail the productivity impacts that have been created. This would also validate the applicability of our concept.

We have demonstrated ReGIS to several other research groups. We have constantly received feedback that a system like ReGIS is useful for any research group and have been asked if it would be possible to get access to this system. We are currently looking into opportunities to make ReGIS available to a broader community following an open source development and service-provisioning model. One possible vehicle to do so is the AppExchange platform by Salesforce.com. By using a marketplace concept such as AppExchange we could easily publish ReGIS as service and make it available to other research groups for either practical usage or for carrying out further research building on top of our work.

9. ACKNOWLEDGMENTS

We would like to thank Salesforce.com for the 10 free subscriptions of their service offering and the excellent support we have received during the implementation of the project. Furthermore, we would like to thank our student assistants Manuel Trenz and Christian Deckert for their engagement in the implementation project.

10. REFERENCES

[1] Alt, R. und Auth, G. 2010. Campus-Management-System. Wirtschaftsinformatik. 52, 3 (2010), 185–188.

[2] Application Development with the Force.com. http://www.salesforce.com/platform/. Accessed: 12-02-2010.

[3] Benlian, A. u. a. 2009. Drivers of SaaS-Adoption–An Empirical Study of Different Application Types. Business & Information Systems Engineering. 1, 5 (2009), 357–369.

[4] Bond, B. u. a. ERP is dead–Long live ERP II. Strategic Planning SPA-12-0420, GartnerGroup.

[5] Brennan, K. 2009. A Guide to the Business Analysis Body of Knowledge (BABOK Guide). International Institute of Business Analysis.

[6] Brown, J.R. und Dev, C.S. 2000. Improving Productivity in a Service Business. Journal of Service Research. 2, 4 (2000), 339.

[7] Davison, R. u. a. 2004. Principles of canonical action research. Information Systems Journal. 14, 1 (2004), 65–86.

[8] Dubey, A. und Wagle, D. 2007. Delivering software as a service. The McKinsey Quarterly. 6, (2007), 2007.

[9] Gillmann, M. u. a. 2010. Cooking the Web-ERP. On the Move to Meaningful Internet Systems 2002: CoopIS, DOA, and ODBASE. (2010), 602–617.

[10] Google App Engine. http://code.google.com/intl/de-DE/appengine/. Accessed: 12-02-2010.

[11] Hilbert, A. u. a. 2007. Student relationship management in Germany–foundations and opportunities. Management Revue. 18, 2 (2007), 204–219.

[12] IBM Lotus Notes 8. http://www-01.ibm.com/software/de/lotus/wdocs/notes-domino8 /notes.html. Accessed: 12-02-2010.

[13] Jacobs, F.R. und Bendoly, E. 2003. Enterprise resource planning: developments and directions for operations management research. European Journal of Operational Research. 146, 2 (2003), 233–240.

[14] Koh, S.C.L. u. a. 2008. ERP II: The involvement, benefits and impediments of collaborative information sharing. International Journal of Production Economics. 113, 1 (2008), 245–268.

[15] Lenk, A. u. a. 2009. What's inside the Cloud? An architectural map of the Cloud landscape. Software Engineering Challenges of Cloud Computing, 2009. CLOUD'09. ICSE Workshop on (2009), 23–31.

[16] Moller, C. 2005. ERP II: a conceptual framework for next-generation enterprise systems? Journal of Enterprise Information Management. 18, 4 (2005), 483–497.

[17] MailChimp. http://www.mailchimp.com/. Accessed: 12-02-2010.

[18] Microsoft Sharepoint 2010. http://sharepoint.microsoft.com/de-at/Seiten/default.aspx. Accessed: 12-02-2010.

[19] Mohamed, M. und Fadlalla, A. 2005. ERP II: harnessing ERP systems with knowledge management capabilities. Journal of Knowledge Management Practice. 6, (2005), 1–13.

[20] Schonenberg, H. u. a. 2008. Process flexibility: A survey of contemporary approaches. Advances in Enterprise Engineering I. (2008), 16–30.

[21] Seeman, E.D. und O'Hara, M. 2006. Customer relationship management in higher education: Using information systems to improve the student-school relationship. Campus-Wide Information Systems. 23, 1 (2006), 24–34.

[22] Tapp, A. u. a. 2004. Direct and database marketing and customer relationship management in recruiting students for higher education. International Journal of Nonprofit and Voluntary Sector Marketing. 9, 4 (2004), 335–345.

[23] Vaishnavi, V. und Kuechler, W. Design science research methods and patterns: innovating information and communication technology. Auerbach Pub (2007)

[24] Van Ark, B. u. a. 2003. ICT and productivity in Europe and the United States Where do the differences come from? CESifo Economic Studies. 49, 3 (2003), 295.

[25] White, S.A. und Miers, D. 2008. BPMN Modeling and Reference Guide: Understanding and Using BPMN. Future Strategies Inc.