



Centers for Very Large Business Applications
Otto-von-Guericke Universität Magdeburg and Technische Universität München

Annual Report 2009

Bridging the gap between ERP Research and ERP Development
Benefits from a Public-Private-Partnership focusing on research and development topics
in enterprise software

“If we want to maintain the level we enjoy today we have to accelerate the speed of innovations (...) as long as we can stay on top, we might be a serious member of this global economy, and a prerequisite for this is education.”

*Hasso Plattner
Co-Founder and Chairman of the Supervisory Board, SAP AG*

1. Introduction

In 2009, the Centers for Very Large Business Applications (CVLBA) in Magdeburg and Munich were able to continue and increase their successful activities. With regard to research, the centers were able to expand their leading position in the field of integrating business transactions into increasingly large business applications.

Very Large Business Applications (VLBA) have been a major focus at the Otto-von-Guericke-Universität Magdeburg and Technische Universität München not only since 2006, when they founded the two Centers for Very Large Business Applications. The centers bring together faculties from a broad variety of disciplines including computer science, business administration, economics, psychology, library sciences, and law.

The centers' objectives are the integrated study of very large business applications and their underlying technologies – their design, their implementation, their management but also their impact on the economy and on society as a whole. An interdisciplinary approach is essential in this context, to improve the efficiency and quality of business information systems development and the business processes they support. Expected benefits of the CVLBAs' research output comprise improvements in the management of the deployment process, increased user satisfaction and the delivery of greater functionality to the market concerning software and related products.

In the context of this broad range of research areas, the centers put the following in the focus of their research efforts:

- **Stakeholder Relationship:**
Managing stakeholder relationship deals with internal and external contacts of an organization. The stakeholders' requirements and perception of information and communication systems determine the development and operation of these systems. In terms of process orientation the material and immaterial relationships between an organization and its stakeholders can be differentiated into input (e. g. retrieval of knowledge and information for added value) and output (e. g. reporting to stakeholders).
- **Life cycle of Information and Communication Systems:**
Like physical products, information and communication systems have a specific life cycle. It comprises not only the development and operation of these systems but also the disposal (or replacement) of them is a part of this life cycle.
- **Continuous Improvement:**
The aspect of information and communication systems' life cycle management is often misinterpreted in literature. Continuous improvement is not the development of systems with an endless life time. It is the improvement of the process to manage information and communication systems and services continuously.

- **Sustainability of Information and Communication Systems:**

The sustainability of information and communication systems and services becomes increasingly important. The sustainable development of these systems can have positive effects (e. g. improved understanding and efficiency in working with these systems).

- **Performance:**

Beside the pure existence of information and communication systems, the continuous improvement of their processes during their life cycle there is also the question how the performance of Very Large Business Application systems can be modeled and evaluated.

The following articles represent the current scientific activities in the research field of Very Large Business Applications and can be associated with the topics mentioned above.

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Prof. Dr. Hans-Knud Arndt
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2. Research Topics

Methodological Aspects

A Quality Report as a Tool for the Quality Management of Web Services

Introduction

The differentiation from competitors is crucial for the economic success of a product. This differentiation can be achieved in addition to price and the date of the market entry through the product quality. To differentiate the quality of products, it is necessary to distinguish between several relevant product characteristics, to determine their values, to evaluate these values and to relate this evaluation to the evaluation of other products. Procedures for the determination of the quality of a product are used in many areas of the quality management, e. g. in the quality assessment. Since general definitions of the software quality are not adequate for the practical determination, quality models are used for their description.

Web services are software systems supporting a machine-machine interaction over a network. They are often used as modules in different software architectures, especially in service-oriented architectures. Web services have a life cycle.

In the course of the quality management of a web service applied in a software consequently needs appropriate procedures and quality models as means to determine the quality. As there is a lack, research is needed in this field.

Approach

In order to eliminate the described deficit, a procedure has to be developed that helps to determine the quality of a web service. A report is conceivable which integrates all relevant views, all influences on the quality and all phases of the life cycle of a web services.

During the research a lot of similarities between life cycle assessments and Sustainability reporting of environmental management and the quality management have been identified. These similarities include e. g. principles, procedures and the terminology. Since the life cycle assessments and Sustainability reporting relate on the product life cycle, on the stakeholders and on all relevant product characteristics, an adaptation of the method to the quality management of software seems to be promising.

The following two research questions have to be answered:

- Is it possible to adapt the principles and procedures of Life cycle assessment and Sustainability reporting to the quality management of web services?
- Is a quality report based on these findings an appropriate tool for quality management?

The results of the research are derived from literature analysis. Thereby, argumentative deduction, reference modeling and expert interviews are used.

Conclusion

The outcomes of this research project shall be a procedure and a quality model which can be used in order to improve the quality management of web services. They should close an existing gap and show new ways to deal with the quality of web services. Furthermore, they ought to enable an individual view on the quality for each stakeholder.

The current results are:

- Development of an extended software life cycle
- Analysis of existing quality models
- Identification of relevant stakeholders
- Identification of possible quality characteristics
- Construction of a structure for quality models
- State-of-the-art of the subject of consideration

Development Process for Domain-Specific Languages

Introduction

Today software development engages multiple challenges. Different domains, technologies, and languages must be woven together to fulfill demanding requirements and features in short time frames. Mastering this complexity in order to yield high-quality software while increasing reusing and automatization is the goal of development approaches. By leveraging domain-specific languages (DSL), application developers can close the gap between the domain they are working on and the implementation. Using a sophisticated development process utilizing multiple DSL based on one host-language can enhance productivity significantly.

Although research into DSL is quite sophisticated, yet no coherent development process which combines language engineering and application engineering has been elaborated. The complex process begins with domain analysis, continues with syntax design, the choosing of appropriate design patterns, and language implementation. Another constraint is language interaction, e.g. to have the understanding at which places in the languages or program execution other languages must be called.

Approach

The dissertation provides a theoretical elaboration and empiric evaluation of two processes: (1) Language Engineering for internal domain-specific languages and (2) multi-DSL development.

The first part is a literature review to form the theoretical foundation of language design, implementation and testing. This knowledge is enhanced with empirical language engineering ex-

periments. Combining both works gives prototypical processes, which are then evaluated and refined with two medium-sized web applications.

Conclusion

A coherent approach to language design and software development increases productivity. Developers stay on one abstraction level and can combine expressions from different domains concisely. This boosts reusability of source code and testability of the implementation.

Initial processes have been designed and two internal DSL, one for product line configuration and the other for feature-oriented programming, have been implemented. Currently, patterns for language engineering are researched and the validation with two medium-sized software projects prepared.

Information Visibility in Supplier Networks

Introduction

Traditional hierarchical supply chains are increasingly evolving to supplier networks for the purpose of appropriating more value and strategic benefits from such networks. While organizations create or join such networks, they are often faced with the issues of efficiently managing and appropriating value from such networks. However, managing such a network of relationships and coordinating activities within the network is significantly more complex and challenging. Timely access to relevant information within the network can not only help in effectively managing the network and coordinating activities among members of the networks, but also result in more efficient supplier networks and improved performance across the network.

Therefore, this project aims to outline the means of achieving information visibility in such supplier networks and the various performance implications of achieving information visibility. More specifically it aims to identify the inter-organizational governance issues associated with the sharing of timely and relevant information in supplier networks; issues related to product characteristics, industry characteristics, individual organizational characteristics that determine the need for information; and the information technology and infrastructural capabilities that make sharing information in the supplier network a possibility.

Approach

In order to address the identified research objectives, the project will draw from existing literature and theories in the domain of strategic management and inter-organizational governance to identify factors that are likely to determine the governance dynamics within supplier networks, different network configurations that result in different information sharing needs and capabilities and tangible performance metrics that can be used to assess the implications of information visibility.

While governance mechanisms can determine the willingness to share information, and network configurations determine the re-

quirement for information visibility, organizations should possess the capability to share information. This capability is often determined by the existing business process and IT infrastructural capabilities that organizations within the network possess. Therefore, multiple case studies of real life supplier networks will be carried out in order to identify the IT capabilities and the extent of use of inter-organizational information systems in such networks. The findings from existing literature and the case studies will be triangulated with expert interviews and surveys of organizational decision-makers.

Conclusion

The findings of this research will be synthesized to come up with a characterization of information visibility, and a theoretical model identifying its antecedents and its consequences. This research has significant practical implications for organizations participating in such supplier networks as it will provide them with guidelines on the pre-requisites of setting up supplier networks, and on how to effectively manage and appropriate value from such networks. For software vendors and solution providers, this research will identify the desired information systems capabilities and characteristics from large inter-organizational business applications targeted towards such supplier networks.

Seamless Health Care - Service Oriented Device Architecture

Introduction

Nowadays information technology (IT) is one of the most important aspects in the health care domain. IT can act as an enabler for new or improved medical processes. Many projects exist that try to utilize the benefits of IT in health care. One famous example is the introduction of the new electronic health card in Germany.

Missing integration concepts causing deficits in information logistics are common to health care systems. Some possible reasons for these deficits are heterogeneous distributed computer systems and media disruption which causes difficulties in integrating information, especially across several health care institutions. "Seamless Health Care" as a vision intends to enable both vertical (institutional) and horizontal (over time) information exchanges for every patient.

Approach

The objective of the project is the exploration of possibilities for realizing the idea of "Seamless Health Care". This implicates the solving of real existing problems in health institutions by considering technical and economical aspects. At the moment, the concept of Service Oriented Device Architecture (SODA) is explored in the context of medical devices in hospitals.

At first specific problem areas are identified and appropriate solutions are developed as well as subsequently tested in the field. In a second step, the solutions to be developed will be evaluated and optimized using the experiences gained from the analysis of the field test results.

Conclusion

Through the development of solutions for the purpose of achieving seamless health care, several benefits are expected:

- Cost reductions by raising the efficiency of the care provider side
- Raising the quality of care by optimizing computerized supported clinical pathways
- Increasing the usability of health care systems by intelligent behavior of the applications
- Improving the consistency of the application landscape in hospital settings

It was shown that interoperability is an almost non-existent feature of medical devices. Thus the concept of service oriented device integration seems to be a promising idea for providing benefits on various levels. In further research this presumption will be proofed and a solution design will be developed and evaluated. As a first step, the specifics of device services in comparison to software services were analyzed and SODA specific design problems were derived. Afterwards, solutions for these problems were expressed in the form of design patterns. In a next step, these patterns will be implemented and evaluated on a concrete scenario.

Modeling and Management of IS-Risks in Complex Value Networks

Introduction

In recent times, compliance has been a buzz word for many companies, focusing on the assurance of their economic actions to moral and legal aspects, e. g. laws and regulations. The usage of transparent IT-Compliance systems on the one hand reduces risks and improves efficiency and effectiveness. On the other hand, disciplinary sanctions are obviated and image and trustworthiness of the company improve. IT-Compliance needs to be seen in a broader context, bearing in mind the connections with governance and risk management. As part of the GRC-triad, consisting of governance, risk management and compliance, IT-Compliance helps risk prevention and damage mitigation.

Especially in complex value networks, it is important to have mutual risk understanding and mechanisms to control risks among all value adding partners. How can global sourcing projects along automotive supply chains manage and distribute risks among each member? How are risks and their spreading treated within trade cooperation, e. g. how do retailers deal with erroneous labeled EANs or misleading information on goods, provided by wholesaler or manufacturer? Compliance, risk and governance are important factors in the health sector. Time-critical processes in unstructured, complex hospital information systems need to be managed with careful regards to legal regulations and security related limitations.

In times of opaque financial products, company losses exceeding the experiences of the last decades and the transmission of dam-

age not only within the affected domain, but also overlapping on all other disciplines of modern society, it is most important to conduct research on how such error propagation can be prevented in future.

Approach

The goals of this research include an understanding and scope of the risks in Information Systems and their specific characteristics, useful requirements of successful risk management strategies and the suggestion of a risk modeling technique as a basis for successful risk controlling. Finally implications for risk mitigation will be derived.

This research is approached from two perspectives. On the one hand, the implications of the usage of risk assessment in practice are analyzed. On the other hand, theoretical concepts for risk management strategies will be evaluated and further developed. The practical requirements of risk management will be evaluated through several case studies. This research will focus on how the probability of risk is predicted and how ERP data is used to support these predictions. The usage of corporate governance modules in ERP systems will be analyzed in respect to domain-specific and domain-overlapping aspects. On the other side, theoretical concepts for risk management will be discussed.

Conclusion

This research aims to develop a valid understanding on risks in Information Systems and their management in complex value chains. The derived characteristics of IS risks in complex value networks can be used for further risk management strategies in the context of IS.

The developed risk modeling technique will contribute to risk managers by visualizing expected risks and leading to better risk mitigation in companies. This research acts on the suggestions e.g. by Alter and Sherer, demanding more efforts on risk mitigation rather than focusing on risk identification and risk assessment.

More precisely, the usage of IS to support the risk management process will be analyzed and possible patterns for using GRC-modules and risk mitigation will be derived. Case studies will not only focus on specific risk management projects, but also on examining risk management in typical IS projects, e. g. system installation. Patterns identified in the preceding case studies will be theoretically founded and existing strategies will be evaluated for helpful solutions.

Model-Driven Configuration Management

Introduction

While the capabilities of Model-Driven Engineering (MDE) have been realized in many parts of software development, MDE support for IT system landscapes and IT infrastructures is barely adequate.

Although common frameworks for Enterprise Architecture Management (EAM) propose predefined artifacts and methods for this purpose, the transition between the design stage and the operating stage of software takes place manually. Time-consuming discovery procedures capture the current software configuration after the transition, store it in configuration databases and allow further analysis on the basis of reconstructed models.

Approach

The identified gap between EAM and IT operations shall be closed by model-driven configuration management so that (1) the deployment of software in an IT system landscape and (2) the configuration of the underlying IT infrastructure can be accomplished automatically and traceably during both the initial transition and later migration.

First, frameworks for systems development will be analyzed and requirements for configuration management derived. In particular, it will be investigated which artifacts are needed to build and operate IT system landscapes and IT infrastructures. The artifacts will be collected by content analysis of literature. Subsequently, the capabilities of model-driven engineering for the development of IT system landscapes and IT infrastructures will be captured. Next, it will be shown how EAM artifacts can be transformed into artifacts of IT operations by model-driven engineering. Model-Driven Configuration Management (MDCM), finally, means using MDE techniques to implement the requirements concerning the configuration of IT system landscape and IT infrastructures.

Conclusion

MDCM, which will be the outcome of my thesis, contributes to model-driven engineering, configuration management and data center automation as well as IT service management. In particular, my research will deliver the following results: (1) a collection of formal artifacts for the configuration of IT system landscapes and IT infrastructures, (2) a MDE-based process model for the automated configuration of IT system landscapes and IT infrastructures, (3) a validated MDCM reference architecture for EAM and IT operations to automatically generate specific artifacts for IT service management, based on a set of defined EAM artifacts.

At this time, the project results comprise: An evaluation to capture the capabilities of model driven engineering, case studies for IT infrastructure modeling with SAP SCM and a content management system, a first concept for the MDCM reference architecture. The results will be further refined by evaluation and collection of further artifacts.

Management Aspects

Co-Evolution of Innovation in the Global Software Markets

Introduction

Research on strategic (long-term) alliances is not a new endeavor. Economists have traditionally been interested in the potential and real anti-competitive implications of joint ventures, and other forms of cooperation between and among firms.

Especially in a globalised economy, where technological innovation and industry dynamics are becoming faster, strategic alliances of a firm are expected to change in number and nature not only in relation to the strategic intent of the firm but also as an outcome of the co-evolution of the environment in which it operates. The odds of success increase when the symmetry in the strategic exploitation/exploration intent of the partners is present at the start and is re-calibrated and maintained over time. Long-term success will be more likely when symmetry of strategic intents is present during formation and is maintained as an outcome of continuous mutual adaptation, recalibration and reaffirmation of strategic intents of the alliance partners.

Vendors as well as customers are influenced by the market and its functions (one environment). So, a non-conform development could lead to inefficiency and great losses on both sides. Especially no demand for new developed products could lead to high losses. The aim of every producing or service-providing company is to offer products for a market with a demand for them. But not only new products are affected by the market mechanisms.

Whereas a co-evolutionary development of both can impact a faster adaption or acceptance of new solutions (like on-demand ERP) on the customer's side and a higher return-on-investment (ROI) rate according to the vendors. Although there is a dependency between both market participants, the lack between the demand and the offer of the software rental model (SaaS) is still existing and partially becoming bigger.

The objectives of this work are the analysis of technical, organizational and economic factors, influencing companies and their decisions and the composition of a co-evolutionary approach reducing divergences between software vendors and customers (using the example of on-demand ERP).

Approach

Especially in literature, there are common theories, helping to identify and explain the reasons for an inhomogeneous development of both parties. The aim of this work is, to identify the reasons and give the basis for the following research question. It is also the groundwork of this dissertation and shall give the reader a clear explanation of the relevance of this work.

With the help of questionnaires and interviews with numbers of CIOs, the factors, influencing the diffusion of new technologies or concepts like ERP on-demand, should be identified and described clearly. These factors are divided in three categories:

- Technical factors like network connection, hardware etc.
- Organizational factors like business processes, organizational restrictions (e. g. regulations and laws) etc.
- Economic factors like investments, sunk costs, transaction costs etc.

The solution shall be based on a co-evolutionary approach helping to align organizations in their development and give the opportunity for a long-term relationship likely when symmetry of strategic intents is present during formation and is maintained as an outcome of continuous mutual adaptation, recalibration and reaffirmation of strategic intents of the alliance partners. It should help to display a method for a more effective way of cooperation and diffusion of new concepts and technologies.

Conclusion

Having a framework of influencing factors will help customers and vendors (in co-evolution) to develop on-demand software, aligned with the market. This co-evolution should help especially software vendors to develop on-demand software, considering the demands of the customers and the market.

Analyzing existing on-demand software has shown major gaps between the expectation and the offered functionalities. Also the employed business models frequently raise many questions.

“Conditions of Life” in VLBA

Introduction

The idea of individualization and opportunities for its realization are increasingly discussed. Being originally a topic of social sciences, individualization now catches on in business informatics and in interdisciplinary projects dealing with cognitive technical systems. The need for individualization appears in different forms and is illustrated by the following use case, which is part of authorization management: A user has to access specific IT resources in order to accomplish a task in a business process, but the required privileges are not assigned to the role the user takes on. In general, a role is either a formal (business role) or an informal (functional (extra) role) organizational item that represents the user's tasks or a formal technical item (technical role) that corresponds to a user's access privileges.

Two problem areas can be identified within authorization management. On the one hand, there is no end-to-end process for accessing heterogeneous IT resources that is user-driven and technically supported, despite existing automatic provisioning of IT resources, e. g., with GRC (Governance, Risk & Compliance) techniques. On the other hand, it is almost impossible to spontaneously meet a user's needs for IT resources when he or she steps out of "his or her role". The idea of individualization is an enhancement of existing formal role concepts by subjective information demand that results from a particular condition of life (or life situation) of a user. Hence, the research question to be answered is: How can functional extra-role-behaviors be supported automatically?

Approach

Objective of this dissertation is to develop a concept for an individual and automated synchronization of organizational and technical roles. Two subordinate objectives exist:

- Opportunities to automate the application for and the provisioning of IT resources, based on the idea of personalization (via conventional roles).
- The opportunity to additionally allow extra role behavior (via functional roles) for achieving individualization with context-awareness.

The starting point for both subordinate objectives is a literature review and argumentative deduction. For answering the first subordinate objective reference modeling and a case study for verifying the developed model are applied. Further investigations with respect to extra role behavior include expert interviews and document analyses in the context of so-called pilot projects.

Conclusion

The foundation for either subordinate objective is the definition of user context and the design of an appropriate UML model. The model represents the context of a user, e. g. the information demand of a user (more precisely, the demand for IT resources) and is complemented by a variety of authorization concepts. By showing the compliance between organizational and technical roles it is validated that individualization on IT level can be achieved by applying the definition of "user context".

According to the first subordinate objective, more authorization concepts are investigated on the basis of a sample system landscape that consists of the operating system, an ERP system, a content management system, a document management system, a wiki etc. Finally, the application of domain-specific languages (DSL) for accessing IT resources (possibly) automatically is elaborated, in particular in the context of configuring existing IT systems. Regarding the SAP field, the Blue-Ruby project (SAP Research, Palo Alto) might be a starting point for designing a DSL in order to dynamically access technical roles or create new ones.

The results of the second subordinate objective shall give information about how many roles and authorization concepts have to be synchronized with, to what degree extra role behavior occurs, and how this is dealt with. The additional introduction of the user context approach shall reveal opportunities for its realization and its potential deltas. Finally, the approach is evaluated.

Operational Aspects

IT-Infrastructure Modeling Language

Introduction

In the software development process, different graphical modeling languages are used to describe software systems. Examples for such modeling languages are event driven process chains in the area of process modeling and the Unified Modeling Language (UML) in the field of software engineering.

One problem area in software development is not yet supported by a standardized graphical modeling language: The modeling of IT infrastructures.

In this research topic, an IT-infrastructure is defined as the sum of all hardware and software entities, which are needed for the implementation and operation of a software artifact. The modeling of IT-infrastructures will help to improve the communication of software developers and IT operations. Moreover the diagrams can be used to automatically configure IT systems and Configuration Management Systems.

Approach

This project aims at developing a graphical modeling language for IT infrastructures. It should be possible to model all components of an IT infrastructure and their relations. The modeling language should meet all organizational requirements and thereby close the gap between software architects and IT operations.

In a first step, existing modeling languages (e. g. UML, ITML, ArchiMate) have been analyzed, to determine the elements and diagrams that can be used for IT-infrastructure modeling. After that, (ITIL-based) configuration management system requirements have been studied to determine the necessary data for configuration systems. In a third step, IIML diagrams, the diagram elements, and the meta-model will be elaborated.

Conclusion

Software architects and IT operations will have a standardized modeling language, which enables them to clearly communicate their needs and requirements. In addition, a formal (graphical) modelling language can be used to transform the models into system configuration files and initial data sets in configuration management systems.

The result of this project will be a graphical modeling language with different diagram types (e. g. asset diagram, virtual network diagram, staging diagram, permission diagram). All diagrams of the language are embedded in one of four layers (Facility, Hardware, Virtual-, and Service-Layer), which structure the modeling language and gives modelers an orientation in the field of IT-infrastructure modeling.

Sustainable Infrastructures for VLBA

Introduction

Growing demands on flexibility of companies' fundamental IT fuels the need for implementing virtualized infrastructures for Very Large Business Applications. Published success stories and white papers give evidence that ERP and therefore VLBA systems can be successfully run in virtualized infrastructures. Consequently, the change of today's infrastructure towards virtualized environments appears to be implementable and is likely to become a major trend.

While there is proof that VLBA and ERP systems can be run in virtualized infrastructures there are only few published results about the change of the expected performance from an application point of view. Providers of VLBA as well as providers of virtualization products often hesitate to publish their knowledge about performance impacts. This is why the customer often needs to estimate the impact of virtualization on his own.

Approach

The objectives are to develop a methodology and provide results for the estimation of performance values of VLBA to assist planning, sizing and running existing and new VLBA on the provider's and as well on the customer's side.

To gain reliable data for the comparison of virtualized and natively run VLBA, an appropriate performance measurement tool needs to be implemented. The tool for automated load generation will simulate different use case scenarios of VLBA and by this means it will make it possible to collect realistic performance data. The comparison of the obtained test results will shed light on the actual difference between natively run and virtualized infrastructures' performance.

Conclusion

A methodology and toolset to estimate systems performance can improve the usage of systems in various ways. Developers and customers of VLBA are supported in collecting information to verify the expected system behavior, ensure the ability to meet the quality of promised service levels or to collect initial data for the projection of a system's reactions to changes. In case of unexpected reactions, it can help to identify bottlenecks or defective components.

At this time, the project results comprise: a load generator for an Enterprise Portal (EP) Systems, performance metrics for EP-Systems and comparable performance data of native EP-Systems and VMware-based virtualization. The results will be further refined by conducting additional experiments and thereby evolving the methodology.

Community Aspects

SAPiEms – Idea Community

Introduction

“Crowd sourcing” is currently one of the most discussed key words among IS and innovation researchers. The major question for both research and business is how to find and leverage the enormous potential of the “collective brain” to broaden the scope of “open R&D”. The integration of customers and stakeholders into a company’s innovation management has received a boost from the open innovation paradigm. Crowds are said to be able to produce more and better results compared to experts dealing with the same subject.

In terms of improving this wisdom of crowds, internet based idea communities represent a suitable approach for integrating stakeholders into a company’s innovation process. Although these communities sound like a familiar way of gaining access to the customer’s innovative strength, there is only limited research dealing with this integration practice in detail. Especially the limited literature on idea communities lacks studies focusing on how to implement an idea community from a technical and organizational point of view.

Approach

The main objective is to identify, how an idea community has to be implemented in order to access the innovative strength of SAP stakeholders in a systematic way and to connect to the innovation management process at SAP. SAP can approach innovative community members for recruiting purposes. The employed software represents a methodically and technically engineered tool which improves the implementation of future idea communities in line with the action research paradigm.

The idea community is implemented as an internet-based platform, offering various, theory and best practice based functionalities in order to support participants in elaborating and contributing ideas in a collaborative manner. The platform and organizational parameters are evaluated in regular intervals.

Conclusion

The results of the idea community and its evaluation are returned to the participating software company and to the scientific community, respectively. For practitioners, the research results provides the “Do’s” and “Don’ts” of idea communities, suggestions for the organizational link to and opening of innovation management, and a target group specific communication.

In 2009, 152 people participated in the community, contributing 143 ideas. The ideas were evaluated by a jury of SAP experts and academic professionals. Together with the user profiles of the community members, the ideas were provided to SAP. Besides a significant number of scientific publications out of the SAPiEms project, a first dissertation has been finished in the course of the project in 2007 (Ebner, W.).

Document Recommender Systems: Identifying Related Documents

Introduction

The situation is the same for everyone: Managers, patent attorneys, product developers, scientists and entire R&D departments are drowning in documents but starving for relevant ones. Although distinguishing relevant information from irrelevant information is a task everyone has to deal with on a daily basis, only little help is given by recommender systems.

The quality of the results delivered by document recommender systems depends largely on its ability to automatically determine the similarity of one document to other documents. Various approaches exist to determine the degree of similarity of documents in order to identify related work. However, existing systems struggle with this task as synonyms, ambiguous nomenclature, etc. impede the identification process.

Approach

The objective is to develop powerful approaches to identify related documents and to implement them in a document recommender system prototype, which has the potential to expand the functionality of SAP products such as Enterprise Search (TRES).

Some of these newly researched approaches are sophisticated citation analysis approaches, collaborative document evaluation and document usage mining. Although some of these approaches have been known for decades, they have not been applied in this particular context of recommender systems. Other approaches such as the “citation proximity analysis”, “citation order analysis” or “in-text impact factor” were developed exclusively.

Conclusion

The project addresses the fundamental problem of finding relevant documents. The aim is to improve effectiveness and efficiency as well as to ease collaboration through organization borders by promoting information flow among participants, especially in R&D.

Since the start of 2008, the theoretical foundation for the project has been elaborated on and is now published. New approaches for automatically classifying documents have also been developed and are currently implemented.

Collaborative Document Evaluation

Introduction

Enterprises face the challenge of an increasing amount of documents being produced. Announcements, offers, bills, handbooks and patents are only some document types that need to be managed. This is also true for research departments, respectively researchers. They have not only to deal with their own research results and articles but with articles that were published by other researchers. In addition, large enterprises face the challenge to manage the skills of their employees and, for instance, to find the right employee for a certain project.

Classic keyword search has to cope with various problems such as unclear nomenclature and synonyms. Additionally, researchers need to estimate a document's quality, for instance, by inspecting its citation counts and/or the issuing journal's reputation. Both evaluation approaches face various difficulties due to biased peer reviewers, incomplete citation count databases, negative citations and cronyism. Expert search systems also face various problems. For instance, skill databases often are not up to date and determining employee skills automatically is difficult.

Approach

The objective of the PhD project is to develop a concept and prototype for collaborative document evaluation. Collaborative document evaluation means to classify and evaluate documents and employees based on user generated data. This data can be, among others, bookmarks and annotations in PDF documents, tags, or mind maps.

To achieve the objective, a software tool will be developed to collect collaboratively created data from employees. The focus will be on mind maps. Then, concepts and algorithms will be developed to classify both the author of a mind map and the documents that are linked within the mind map. In the next step, the new algorithms need to be combined with existing algorithms in order to improve document search engines and expert search systems.

Conclusion

User generated data such as mind maps will help to enhance document search engines and expert search systems. Enterprises and their employees will be able to find relevant documents and employees with certain skills more effectively. The algorithms and methods that are developed as part of the PhD can directly be used to improve SAP products.

So far, a software tool to create mind maps has been developed. The tool is used by several hundreds of users and the created mind maps will be analyzed in future research. In addition, new algorithms have been developed, in cooperation with Bela Gipp, to calculate document similarity. Furthermore, several papers have been published about the conducted research, among others, on search engines, information retrieval and mind mapping.

3. Facts and Figures

Key Indicators (1.1.2009 - 31.12.2009)

| | |
|---|----|
| Employees (on average) | 12 |
| Publications and Conference Contributions | 65 |
| Supervised Bachelor Theses | 9 |
| Supervised Diploma and Master Theses | 11 |
| Completed Dissertations | 1 |

VLBA Research Fields

| | Employee |
|---|--------------------------------------|
| A Quality Report as a Tool for the Quality Management of Web Services | Bastian Grabski |
| Co-Evolution of Innovation in the Global Software Markets | Harald Kienegger |
| Collaborative Document Evaluation | Jöran Beel |
| “Conditions of Life” in VLBA | Lars Krüger |
| Development Process for Domain-Specific Languages | Sebastian Günther |
| Document Recommender Systems | Béla Gipp |
| Information Visibility in Supplier Networks | Suparna Goswami |
| IT-Infrastructure Modeling Language | André Zwanziger |
| Model-Driven Configuration Management | Sebastian Herden |
| Modeling and Management of IS-Risks in Complex Value Networks | Manuel Wiesche |
| SAPiE - Idea Community | Michael Huber / Ulrich Bretschneider |
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