



ICEIS 2008

***TENTH INTERNATIONAL CONFERENCE ON
ENTERPRISE INFORMATION SYSTEMS***

Proceedings

Databases and Information Systems Integration

BARCELONA, SPAIN – June 12-16, 2008

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ICEIS 2008

Proceedings of the
Tenth International Conference on
Enterprise Information Systems

Volume DISI

Barcelona, Spain

June 12 – 16, 2008

Organized by
**INSTICC – Institute for Systems and Technologies of Information, Control
and Communication**

Co-sponsored by
WfMC – Workflow Management Coalition

In Cooperation with
AAAI – Association for the Advancement of Artificial Intelligence

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Edited by José Cordeiro and Joaquim Filipe

Printed in Portugal

ISBN: 978-989-8111-36-4

Depósito Legal: 275673/08

<http://www.iceis.org>

secretariat@iceis.org

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A number of selected papers presented at ICEIS 2008 will be published by Springer-Verlag in a LNBIP Series book. This selection will be done by the Conference Chair and Program Chair, among the papers actually presented at the conference, based on a rigorous review by the ICEIS 2008 program committee members.

FOREWORD

This volume contains the proceedings of the Tenth International Conference on Enterprise Information Systems (ICEIS 2008), organized by the Institute for Systems and Technologies of Information Control and Communication (INSTICC) in cooperation with the Association for Advancement of Artificial Intelligence (AAAI) and co-sponsored by the Workflow Management Coalition (WfMC).

ICEIS 2008, held in Barcelona, Spain, culminates a series of ten successful ICEIS editions, clearly showing that this is a world class event which has become a major point of contact between research scientists, engineers and practitioners in the area of business applications of information systems. This year, five simultaneous tracks were held, covering different aspects related to enterprise computing, including: “Databases and Information Systems Integration”, “Artificial Intelligence and Decision Support Systems”, “Information Systems Analysis and Specification”, “Software Agents and Internet Computing” and “Human-Computer Interaction”. All tracks describe research work that is often oriented towards real world applications and highlight the benefits of Information Systems and Technology for industry and services, thus making a bridge between the Academia and the Enterprise worlds.

Following the trend of previous editions, ICEIS 2008 also had a number of satellite workshops, related to the field of the conference. This year we collaborated in the organization of the following ten international workshops: 8th International Workshop on Pattern Recognition in Information Systems; 6th International Workshop on Modelling, Simulation, Verification and Validation of Enterprise Information Systems; 6th International Workshop on Security In Information Systems; 5th International Workshop on Natural Language Processing and Cognitive Science; 2nd International Workshop on RFID Technology - Concepts, Applications, Challenges; 2nd International Workshop on Human Resource Information Systems; and .the joint workshops: 5th International Workshop on Ubiquitous Computing; 4th International Workshop on Model-Driven Enterprise Information Systems; and 3rd International Workshop on Technologies for Context-Aware Business Process Management.

ICEIS 2008 received 665 paper submissions from more than 40 countries in all continents. 62 papers were published and presented as full papers, i.e. completed work (8 pages/30’ oral presentation), 183 papers reflecting work-in-progress or position papers were accepted for short presentation, and another 161 contributions were scheduled for poster presentation.

These numbers, leading to a “full-paper” acceptance ratio below 10%, and a total acceptance ratio below 61%, show the intention of preserving a high quality forum for the next editions of this conference. Additionally, as usual in the ICEIS conference series, a number of invited talks, presented by internationally recognized specialists in different areas, have positively contributed to reinforce the overall quality of the Conference and to provide a deeper understanding of the Enterprise Information Systems field.

A book of Selected Papers will be published, following the conference, by Springer-Verlag in the newly created series "Lecture Notes in Business Information Processing" (LNBIP). This series brings the successful LNCS approach to areas such as business information systems, e-business, B2B integration, Enterprise applications and industrial software development.

The program for this conference required the dedicated effort of many people. Firstly, we must thank the authors, whose research and development efforts are recorded here. Secondly, we thank the members of the program committee and the additional reviewers for their diligence and expert reviewing. Thirdly, we thank the invited speakers for their invaluable contribution and for taking the time to synthesise and prepare their talks. Fourthly, we thank the workshop chairs and the special session chairs whose collaboration with ICEIS was much appreciated. Finally, special thanks to all the members of the local organising committee, especially Jorge Cardoso, whose collaboration was fundamental for the success of this conference.

This year, the organization will distribute two awards to papers presented at the conference: the best paper award and the best student paper award, mainly based on the classifications provided by the Program Committee members.

We wish you all an exciting conference and an unforgettable stay in Barcelona. We hope to meet you again next year for the 11th ICEIS, to be held in Milan - Italy, details of which are available at <http://www.iceis.org>.

Joaquim Filipe

I.P.Setúbal/ INSTICC, Portugal

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DEVELOPING THE SKILLS NEEDED FOR REQUIREMENT ELICITATION IN GLOBAL SOFTWARE DEVELOPMENT

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Keywords: Global Software Development, Requirement Elicitation, Training, Education.

Abstract: The requirement elicitation stage is that which is most critical in the development of a software product. However, this stage is not covered on teaching courses with the required depth, nor is invested the necessary time in training students and practitioners in these tasks. There is currently a trend towards global software development (GSD) which complicates the process of elicitation requirements since, for instance, communication is more difficult because stakeholders are geographically distributed. Moreover, the elicitation in GSD involves a variety of characteristics that are not often taught in software engineering courses. This paper presents some of the most important factors which may affect elicitation in GSD. Furthermore, we propose techniques with which to help students and software engineers to develop some of the skills needed to carry out the elicitation process in GSD.

1 INTRODUCTION

Independently of the methodological approach used, the requirement elicitation phase is the first step in the process of developing a software product. In such stage requirements are discovered and documented fulfilled which must satisfied by the software in order to satisfy expectations and needs for clients and users. The aforementioned stage is the most critical phase in software development, because the mistakes made at this stage are more expensive and difficult to resolve owing to their impact upon the other stages. In fact, the 85% of the defects in software systems come from the requirement elicitation stage: 49% from incorrect assumptions, 29% from omitted requirements, 13% from requirement inconsistency and 5% from ambiguous requirements (Young, 2002).

Given the importance of this stage is fundamental to have professionals trained in this process, who are capable of accomplishing top-quality requirements elicitation. However, professionals who have recently graduated from universities lack the skills and abilities necessary to carry out this stage properly because during their degree little time is usually spent

on training in this phase of software engineering and they often do not perform professional practices. In fact, according to a survey dealing with university curriculums carried out amongst 214 software engineers, the requirements elicitation process is ranked second among the topics that should be improved in its teaching at universities and third among the topics that may have the greatest need for training (Lethbridge, 2000). This is a problem for companies since they have difficulties in recruiting qualified personnel, and it is also a problem for new graduates who may be discriminated against because of their lack of experience. Because students do not graduate with the skills necessary for requirement elicitation, they must acquire these skills during their company training, and it is therefore companies which take the responsibility for and assume the costs of such training.

With the arrival of new trends in software development, the gap between what is taught in universities in the field of requirements engineering and what takes place in practice is widening. One of these trends is Global Software Development (GSD) (Herbsleb, 2007). GSD has grown considerably in recent years due to the culture of globalization and other factors

such as offshoring, and it will continue to do so (Aspray et al., 2006). However, this practice is causing some challenges (Herbsleb and Moitra, 2001): problems caused by inadequate communication, problems caused by the cultural diversity, problems in knowledge management, and problems caused by time differences.

The objective of our work is to study what factors influence the global requirement elicitation process and to propose a set of techniques through which to develop some of the skills needed for this process in students and practitioners.

The following section describes the most important factors that influence the success or failure of an elicitation requirements in GSD. Various skills which would be desirable in order to carry out this process are outlined in Section Three. Our proposal is explained in Section Four, and finally in Section Five some conclusions and future work are presented.

2 FACTORS INVOLVED IN THE REQUIREMENT ELICITATION IN GSD

Multiple factors determine the success or failure of a GSD project. Herbsleb and Moitra (2001) present the problem of GSD and raise the issue of the dimensions that characterize it. These are: strategic issues, cultural issues, inadequate communication, knowledge management, project and process management issues, technical issues.

These dimensions were studied by Damian and Zowghi (2002) in order to identify how these problems affect each phase of engineering requirements. The challenges identified for the elicitation stage are shown below: differences in customer culture and business (Cultural diversity), achieving appropriate participation of system users and field personnel (Inadequate communication, Time difference), and manage conflict and have open discussion of interests (Inadequate communication, Knowledge management, Time difference).

Rafo and Setamanit (2005) present a list of important factors in GSD which is grouped into three categories:

- *The fundamental factors:* Communication problems, Coordination and control problems, Cultural differences, Language difference, Time-Zone differences.
- *The strategic factors:* Development site, Product architecture, Development strategy, Distribution overhead, Distribution effort loss.

- *Organizational factors:* Team formulation, Team dynamics.

Bhat et al. (2006) identify the success factors in offshoring outsourcing projects based on root-cause analysis. The factors which were identified are: Shared goal, Shared culture, Shared process, Shared responsibility, Trust.

In summary, the factors that have a major impact in the requirements elicitation in GSD. The factors are the following ones: cultural differences, communication, time difference, knowledge management, language difference, trust, team formulation and team dynamics.

These relevant factors are considered in the definition of the basic skills for the requirements elicitation in GSD presented in the following section.

3 BASIC SKILLS FOR REQUIREMENTS ELICITATION IN GSD

A list of 31 skills which are necessary for analyst requirements is presented in Young (2006). Some of the skills presented are the following: criteria for a good requirement, customer/user involvement with requirements (joint team), identifying real requirements (from the stated requirements), anticipating and controlling requirement changes, and so on.

This list of abilities is a good starting point, but it does not consider particulars aspects of elicitation in GSD.

Different skills for GSD are discussed in the literature. By example, the next list of skill is presented in Damian et al.(2006): international Teamwork, computer mediate communication, iterative development in remote client-developer relationships, living with ambiguity/uncertainty in remote teams, and distributed project management.

Taking into account those skill and the factors mentioned in the previous section, we identified the following basic skills that a global requirement engineer should have:

Knowledge of culture. A knowledge of the norms, beliefs, business ethos, and skill in the native language of the potential client is highly important (Nguyen et al., 2006; Huang and Trauth, 2007). Therefore software engineers should get used to dealing with people who have different customs, culture and even ways of interacting.

International Teamwork. Work in distributed teams to solve large problems and collaborative development of shared understanding of project goal and

constraints (Damian et al., 2006), in addition the skills to elicit requirements in distributed environment.

Communication skills. As was mentioned in the previous section, one of the biggest problems in GSD is communication because stakeholders are geographically distributed. To face this problem the engineers need the following skills:

- Conversational skills in English language, because it is the most common business language (Adya, 2006; Huang and Trauth, 2007; Richardson et al., 2007).
- Knowledge of Communication protocols and strategies, in order to avoid potential miscommunications and misinterpretations (Huang and Trauth, 2007; Richardson et al., 2007).
- Using groupware tools such as: e-mail, video conference, wiki, instant message, and so on to communicate. Therefore, one of the skills that a software engineer should have is knowing how to use this kind of tools in order to obtain the maximum benefit from them (Damian et al., 2006; Richardson et al., 2007).

4 TECHNIQUES TO DEVELOP SKILLS

In order to develop these skills in software engineers or even in students we propose using techniques of simulation and artificial agents.

Simulation is a technique which has been used in teaching for many years. It is successfully used, for example, in medicine and aviation. The main advantage is that it allows students to train themselves without the risk of a real environment and at a lower cost.

Educational Virtual Environments (EVEs) are frequently used for simulation. These environments use Virtual Reality (VR) to create virtual worlds in which students (Ieronutti and Chittaro, 2007):

- Directly experience certain physical properties (e.g. shape, size and time duration) of objects and events.
- Change their point of view in order to access new and/or unusual perspectives.
- Interact with objects either to discover and study their hidden elements or to evaluate the effects of their manipulation.

In training EVEs can, moreover (Ieronutti and Chittaro, 2007):

- Provide a low-cost alternative to creating full-scale physical training scenarios.

- Offer the opportunity to create a wide variety of scenarios including those rarely (or never previously) encountered in the real world.
- Simulate training scenarios that can be run repeatedly.
- Include a monitoring of progress during training sessions to evaluate learners' skills.

In Sims (2007) an EVE is presented which uses a Virtual Human with the goal of training students in the Arabic language and in Arabic cultural familiarization. Some of the cultural aspects that are discussed in this EVE are:

- Appropriate and inappropriate use of honorific and family names.
- Colloquial terms for policemen, soldiers, and strangers.
- Iraqi gestures that may be misinterpreted by Americans, and American gestures that may be misinterpreted by Iraqis.
- Methods to calm tense situations.
- Proper and improper ways in which to interact with Iraqi women.
- Showing respect for family relationships.

Other EVE is Lok (2006) where the virtual Human are use for simulating the patients who are interviewed by the students of medicine. The interaction between virtual patient and students are talk in a natural manner.

In the context of global requirement elicitation, a simulation environment that uses virtual reality will be useful in teaching students and practitioners how they should perform interviews or maintain a conversation with different types of stakeholders.

The artificial agents paradigm constitutes a natural metaphor for systems with purposeful interacting agents, and this abstraction is close to the human way of thinking about their own activities (Wooldridge and Ciancarini, 2000). This foundation has led to an increasing interest in social aspects such as motivation, leadership, culture or trust (Fuentes et al., 2004).

We propose the use of artificial agents to model the EVE because:

- Agents operate without the direct intervention of humans or others, and have some kind of control over their actions and internal states (Autonomy).
- Agents interact with other agents (and possibly humans) via some kind of agent communication language. This feature will be highly important in the simulation of human interactions in distributed teams (Social Ability).

- Agents perceive their environment and respond in a timely fashion (reactivity).
- Agents can take the initiative and achieve their own goals (Pro-activeness).

It is therefore possible to implement an EVE with different agents which have different types of behavior and simulate people of different cultures, characters or language, thus assisting software engineering and students to develop the desirable skills work in elicitation groups in GSD.

5 CONCLUSIONS

GSD is a current trend. However, although this paradigm has several advantages it also brings certain disadvantages which have been summarized in this paper. In order to decrease the effect of some of these problems we propose using different techniques to train students and practitioners in working with people who are geographically distributed and who may have different cultures, languages and time zones.

As future work we are going to develop of a simulator based on virtual agents which will allow students to be trained in the process of elicitation requirements in the area of global development. The agents will permit the simulation of stakeholders' behaviour by considering cultural, cognitive and geographic aspects, and also time differences.

ACKNOWLEDGEMENTS

This work is partially supported by the MELISA project (PAC08-0142-3315), Junta de Comunidades de Castilla-La Mancha, Consejería de Educación y Ciencia, in Spain; ESFINGE project (TIN2006-15175-C05-05) Ministerio de Educación y Ciencia (Dirección General de Investigación)/Fondos Europeos de Desarrollo Regional (FEDER) in Spain; the CompetiSoft project (506AC0287, CYTED program).

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Proceedings of the
10th International Conference on Enterprise Information Systems – ICEIS 2008
ISBN: 978-989-8111-36-4
<http://www.iceis.org/>