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**Brief Contents**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invited Speakers</td>
<td>IV</td>
</tr>
<tr>
<td>Organizing and Steering Committees</td>
<td>V</td>
</tr>
<tr>
<td>Senior Program Committee</td>
<td>VI</td>
</tr>
<tr>
<td>Program Committee</td>
<td>VII</td>
</tr>
<tr>
<td>Auxiliary Reviewers</td>
<td>XII</td>
</tr>
<tr>
<td>Foreword</td>
<td>XIII</td>
</tr>
<tr>
<td>Contents</td>
<td>XV</td>
</tr>
</tbody>
</table>
INVITED SPEAKERS

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FOREWORD

This volume contains the proceedings of the eleventh International Conference on Enterprise Information Systems (ICEIS 2009), 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 the Association for Computation Machinery (ACM), technically co-sponsored by the Institute of Electronics Information and Communication Engineers (IEICE), and by the Workflow Management Coalition (WFMC).

This year ICEIS was held in Milan, Italy. This conference has grown to become a major point of contact between research scientists, engineers and practitioners in the area of business applications of information systems. ICEIS 2009 had five simultaneous tracks, 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”. Papers published in each and every track describe state-of-art 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 2009 also had a number of satellite workshops, related to the field of the conference, including the following nine international workshops: 9th Int’l Workshop on Pattern Recognition in Information Systems; 7th Int’l Workshop on Modelling, Simulation, Verification and Validation of Enterprise Information Systems; 7th Int’l Workshop on Security In Information Systems; 6th Int’l Workshop on Natural Language Processing and Cognitive Science; 3rd Int’l Workshop on RFID Technology - Concepts, Applications, Challenges, 3rd Int’l Workshop on Human Resource Information Systems, 1st Int’l Workshop on Future Trend of Model-Driven Development, 1st Int’l Workshop on Ontology for e-Technologies and the 1st Joint Workshop on Advanced Technologies and Techniques for Enterprise Information Systems.

ICEIS 2009 received 644 paper submissions from 70 countries on all continents. 81 papers were published and presented as full papers, i.e. completed work (8 pages/30’ oral presentation) and 171 papers, reflecting work-in-progress, were accepted and orally presented as short papers (6 pages/20’ oral presentation). Furthermore, 87 contributions were accepted and presented as posters.

These numbers, leading to a “full-paper” acceptance ratio of 12%, and a total oral acceptance ratio below 40%, 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.
This year, the book of Selected Papers, usually published after the conference by Springer-Verlag in the “Lecture Notes in Business Information Processing” series, has been anticipated and made available at the conference, including all full papers. For this reason the ICEIS full papers are not included in the proceedings.

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 a valuable help with their expert reviewing of all submitted papers. 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 whose collaboration with ICEIS was much appreciated. Finally, special thanks to all the members of the INSTICC organizing committee, especially Vitor Pedrosa, whose diligence and dedication was fundamental for the success of this conference.

Two awards will be given to the best papers presented at the conference: one for the best paper award and one for the best student paper award, mainly based on the classifications provided by the Program Committee members and the oral presentation quality.

We wish you all an exciting conference and an unforgettable stay in Milan. We hope to meet you again next year for the 12th ICEIS, details of which will be readily available at http://www.iceis.org.

Conference Chair
Joaquim Filipe, Polytechnic Institute of Setúbal / INSTICC, Portugal

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CONTENTS

INVITED SPEAKERS

KEYNOTE SPEAKERS

HUMAN BEHAVIOR AND INTERACTIONS IN WEB ENVIRONMENTS
Peter Géczy IS-5

SERVICE COMPUTING EIS, WORLD PANIC AND OUR ROLE CHANGE
Masao Johannes Matsumoto IS-7

LET’S SEMANTICISE THE WORLD!! ... OR NOT??
Michele Missikoff IS-17

DESIGN OF ADAPTIVE WEB SERVICES
Barbara Pernici IS-25

MACHINE LEARNING IN ONLINE ADVERTISING
Jianchang Mao IS-27

RISK-AWARE COLLABORATIVE PROCESSES
Ernesto Damiani IS-29

FORESIGHT & RESEARCH PRIORITIES FOR SERVICE ORIENTED COMPUTING
Michael Papazoglou IS-31

INFORMATION SYSTEMS ANALYSIS AND SPECIFICATION

SHORT PAPERS

A PETRI NET MODEL OF PROCESS PLATFORM-BASED PRODUCTION CONFIGURATION
Linda L. Zhang and Brian Rodrigues 5

A SIMULATION MODEL FOR MANAGING ENGINEERING CHANGES ALONG WITH NEW PRODUCT DEVELOPMENT
Weilin Li and Young B. Moon 13

SECURITY ANALYSIS OF THE GERMAN ELECTRONIC HEALTH CARD’S PERIPHERAL PARTS
Ali Sunyaev, Alexander Kaletsch, Christian Mauro and Helmut Krcmar 19

AN APPROACH TO MODEL-DRIVEN DEVELOPMENT PROCESS SPECIFICATION
Rita Suzana Pitanguereira Maciel, Bruno Carreiro da Silva, Ana Patrícia Fontes Magalhães and Nelson Souto Rosa 27

ONTOLOGY MAPPING BASED ON ASSOCIATION RULE MINING
C. Tatsiopoulos and B. Boutsinas 33

EVALUATION OF CASE TOOL METHODS AND PROCESSES - An Analysis of Eight Open-source CASE Tools
Stefan Biffl, Christoph Fersl, Christian Höllwieser and Thomas Moser 41

SECURITY AND DEPENDABILITY IN AMBIENT INTELLIGENCE SCENARIOS - The Communication Prototype
Alvaro Armenteros, Antonio Muñoz, Antonio Maña and Daniel Serrano 49

XV
A METHOD FOR REWRITING LEGACY SYSTEMS USING BUSINESS PROCESS MANAGEMENT TECHNOLOGY
Gleison Samuel do Nascimento, Cirano Iochpe, Lucinia Heloisa Thom and Manfred Reichert

A COMPREHENSIVE APPROACH FOR SOLVING POLICY HETEROGENEITY
Rodolfo Ferrini and Elisa Bertino

CORRELATION OF CONTEXT INFORMATION FOR MOBILE SERVICES
Stephan Haslinger, Miguel Jiménez and Schahram Dustdar

BUSINESS PROCESS RE-ENGINEERING IN SUPPLY CHAINS EXAMINING THE CASE OF THE EXPANDING HALAL INDUSTRY
Mohammed Belkhatir, Shalini Bala and Noureddine Belkhair

DISCOVERY AND ANALYSIS OF ACTIVITY PATTERN CO-OCCURRENCES IN BUSINESS PROCESS MODELS
Jean Michel Lau, Cirano Iochpe, Lucinéia Heloisa Thom and Manfred Reichert

MODELLING, ANALYSIS AND IMPROVEMENT OF MOBILE BUSINESS PROCESSES WITH THE MPL METHOD
Volker Gruhn and André Köhler

RFID IN THE SUPPLY CHAIN: HOW TO OBTAIN A POSITIVE ROI - The Case of Gerry Weber
Christoph Goebel, Christoph Tribowski, Oliver Günther, Ralph Tröger and Roland Nickerl

UNCERTAINTIES MANAGEMENT FRAMEWORK - Foundational Principles
Deniss Kumlander

A RULE-BASED APPROACH AND FRAMEWORK FOR MANAGING BEST PRACTICES - An XML-based Management using Pure Database System Utilities
Essam Mansour and Hagen Höpfner

ENTERPRISE SYSTEM DEVELOPMENT WITH INVARIANT PRESERVING - A Mathematical Approach by the Homotopy Lifting and Extension Properties
Kenji Ohmori and Toshiyasu L. Kunii

AUTOMATIC GENERATION OF TEST CASES IN SOFTWARE PRODUCT LINES
Pedro Reales Mateo, Macario Polo and Beatriz Pérez Lamancha

REASONING ABOUT CUSTOMER NEEDS IN MULTI-SUPPLIER ICT SERVICE BUNDLES USING DECISION MODELS
Sybren de Kinderen, Jaap Gordijn and Hans Akkermans

AN EVENT STRUCTURE BASED COORDINATION MODEL FOR COLLABORATIVE SESSIONS
Kamel Barkaoui, Chafia Bouanaka and José Martín Molina Espinosa

MINING AND MODELING DECISION WORKFLOWS FROM DSS USER ACTIVITY LOGS
Petrusel Razvan

INFORMATION ARCHITECTURE OF FRACTAL INFORMATION SYSTEMS
Jānis Grabis, Mārīte Kirikova and Jānis Vanags

A PROCESS FOR MULTI-AGENT DOMAIN AND APPLICATION ENGINEERING - The Domain Analysis and Application Requirements Engineering Phases
Adriana Leite and Rosario Girardi
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A REVISED MODELLING QUALITY FRAMEWORK</td>
<td>162</td>
</tr>
<tr>
<td>Pieter Joubert, Stefanie Louw, Carina De Villiers and Jan Kroeze</td>
<td></td>
</tr>
<tr>
<td>LAYERED PROCESS MODELS - Analysis and Implementation (using MDA Principles)</td>
<td>168</td>
</tr>
<tr>
<td>Samia Oussena and Balbir S. Barn</td>
<td></td>
</tr>
<tr>
<td>EFFICIENT DATA STRUCTURES FOR LOCAL INCONSISTENCY DETECTION IN FIREWALL ACL UPDATES</td>
<td>176</td>
</tr>
<tr>
<td>S. Pozo, R. M. Gasca and F. de la Rosa T.</td>
<td></td>
</tr>
<tr>
<td>DERIVING CANONICAL BUSINESS OBJECT OPERATION NETS FROM PROCESS MODELS</td>
<td>182</td>
</tr>
<tr>
<td>Wang Zhaoxia, Wang Jianmin, Wen Lijie and Liu Yingbo</td>
<td></td>
</tr>
<tr>
<td>A VISION FOR AGILE MODEL-DRIVEN ENTERPRISE INFORMATION SYSTEMS</td>
<td>188</td>
</tr>
<tr>
<td>N. R. T. P. van Beest, N. B. Szirbik and J. C. Wortmann</td>
<td></td>
</tr>
<tr>
<td>SPECIFYING AND COMPILING HIGH LEVEL FINANCIAL FRAUD POLICIES INTO STREAMSQL</td>
<td>194</td>
</tr>
<tr>
<td>Michael Edward Edge, Pedro R. Falcone Sampaio, Oliver Philpott and Mohammad Choudhary</td>
<td></td>
</tr>
<tr>
<td>ROBUST APPROACH TOWARDS CONTEXT DEPENDANT INFORMATION SHARING IN DISTRIBUTED ENVIRONMENTS</td>
<td>200</td>
</tr>
<tr>
<td>Jenny Lundberg and Rune Gustavsson</td>
<td></td>
</tr>
<tr>
<td>USING BPMN AND TRACING FOR RAPID BUSINESS PROCESS PROTOTYPING ENVIRONMENTS</td>
<td>206</td>
</tr>
<tr>
<td>Alessandro Ciaramella, Mario G. C. A. Cimino, Beatrice Lazzerini and Francesco Marcelloni</td>
<td></td>
</tr>
<tr>
<td>INFORMATION SYSTEMS SECURITY BASED ON BUSINESS PROCESS MODELING</td>
<td>213</td>
</tr>
<tr>
<td>Joseph Barjis</td>
<td></td>
</tr>
<tr>
<td>A SERVICE ORIENTED ENGINEERING APPROACH TO ENHANCE THE DEVELOPMENT OF AUTOMATION AND CONTROL SYSTEMS</td>
<td>219</td>
</tr>
<tr>
<td>David Hästbacka and Seppo Kaikka</td>
<td></td>
</tr>
<tr>
<td>APPLYING AN EVENT-BASED APPROACH FOR DETECTING REQUIREMENTS INTERACTION</td>
<td>225</td>
</tr>
<tr>
<td>Edgar Sarmiento, Marcos R. S. Borges and Maria Luiza M. Campos</td>
<td></td>
</tr>
<tr>
<td>AN EVOLUTIONARY APPROACH FOR QUALITY MODELS INTEGRATION</td>
<td>231</td>
</tr>
<tr>
<td>Rodrigo Santos de Espindola and Jorge Luis Nicolas Audy</td>
<td></td>
</tr>
<tr>
<td>A SOCIO-SEMANTIC APPROACH TO THE CONCEPTUALISATION OF DOMAINS, PROCESSES AND TASKS IN LARGE PROJECTS</td>
<td>237</td>
</tr>
<tr>
<td>Carla Pereira, Cristóvão Sousa and António Lucas Soares</td>
<td></td>
</tr>
<tr>
<td>ENTERPRISE ONTOLOGY MANAGEMENT - An Approach based on Information Architecture</td>
<td>243</td>
</tr>
<tr>
<td>Leonardo Azevedo, Sean Siqueira, Fernanda Araujo Baião, Jairo Souza, Mauro Lopes, Claudia Cappelli and Flavia Maria Santoro</td>
<td></td>
</tr>
<tr>
<td>FINDING REUSABLE BUSINESS PROCESS MODELS BASED ON STRUCTURAL MATCHING</td>
<td>249</td>
</tr>
<tr>
<td>Han G. Woo</td>
<td></td>
</tr>
<tr>
<td>METHOD MANUAL BASED PROCESS GENERATION AND VALIDATION</td>
<td>256</td>
</tr>
<tr>
<td>Peter Killisperger, Georg Peters, Markus Stumptner and Thomas Stückl</td>
<td></td>
</tr>
</tbody>
</table>
REVERSE ENGINEERING A DOMAIN ONTOLOGY TO UNCOVER FUNDAMENTAL ONTOLOGICAL DISTINCTIONS - An Industrial Case Study in the Domain of Oil and Gas Production and Exploration

Mauro Lopes, Giancarlo Guizzardi, Fernanda Araujo Baião and Ricardo Falbo

A BPMN BASED SECURE WORKFLOW MODEL

Li Peng

SEMIOTICS - An Asset for Understanding Information Systems Communication

Pedro Azevedo Rocha and Ângela Lacerda Nobre

ENHANCING HIGH PRECISION BY COMBINING OKAPI BM25 WITH STRUCTURAL SIMILARITY IN AN INFORMATION RETRIEVAL SYSTEM

Yaël Champclaux, Taoufiq Dkaki and Josiane Mothe

TOWARDS INTEGRATING PERSPECTIVES AND ABSTRACTION LEVELS IN BUSINESS PROCESS MODELING

Ivan Markovic and Florian Hasibether

KEEPING THE RATIONALE OF IS REQUIREMENTS USING ORGANIZATIONAL BUSINESS MODELS

Juliana Jansen Ferreira, Victor Manaia Chaves, Renata Mendes de Araujo and Fernanda Araujo Baião

AN EFFECTIVE PROCESS MODELLING TECHNIQUE

Nadja Damij

POSTERS

A KIND OF INFORMATION CONTENT APPLIED FOR THE HANDICAPPED AND DEMENTIA SITUATION CONSIDERING PHILOSOPHICAL ELEMENTS

Masahiro Aruga, Shinwu Liu and Shuichi Kato

EVALUATION OF UML IN PRACTICE - Experiences in a Traffic Management Systems Company

Michel dos Santos Soares and Jos Vrancken

A COMPARISON OF SECURITY SAFEGUARD SELECTION METHODS

Thomas Neubauer

PRIVACY FOR RFID-ENABLED DISTRIBUTED APPLICATIONS - Design Notes

Mikaël Ates, Jacques Fayolle, Christophe Gravier, Jeremy Lardon and Rahul Garg

BRAIN PHYSIOLOGICAL CHARACTERISTIC ANALYSIS FOR SOFTWARE ANALYSIS SUPPORT ENVIRONMENTS

Mikio Ohki and Haruki Murase

MODULAR BEHAVIOUR MODELLING OF SERVICE PROVIDING BUSINESS PROCESSES

Ella Roubtsova, Lex Wedemeijer, Karel Lemmen and Ashley McNeile

THE PATTERNS FOR INFORMATION SYSTEM SECURITY

Diego Abbo and Lily Sun

ALIGNING GOAL-ORIENTED REQUIREMENTS ENGINEERING AND MODEL-DRIVEN DEVELOPMENT

Fernanda Alencar, Oscar Pastor, Beatriz Marín, Giovanni Giachetti and Jaelson Castro

VAODA - A Viewpoint and Aspect-Oriented Domain Analysis Approach

António Rodrigues and João Araújo
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOWARDS A UNIFIED DOMAIN FOR FUZZY TEMPORAL DATABASES</td>
<td>355</td>
</tr>
<tr>
<td>M. C. Garrido, N. Marín and O. Pons</td>
<td></td>
</tr>
<tr>
<td>PROCESS INSTITUTIONALIZATION USING SOFTWARE PROCESS LINES</td>
<td>359</td>
</tr>
<tr>
<td>Tomás Martínez-Ruiz, Félix García and Mario Piattini</td>
<td></td>
</tr>
<tr>
<td>A SYSTEMATIC LITERATURE REVIEW OF REQUIREMENTS ENGINEERING IN</td>
<td>363</td>
</tr>
<tr>
<td>DISTRIBUTED SOFTWARE DEVELOPMENT ENVIRONMENTS</td>
<td></td>
</tr>
<tr>
<td>Thaís Ebling, Jorge Luis Nicolas Audy and Rafael Prikladnicki</td>
<td></td>
</tr>
<tr>
<td>APPLICABILITY OF ISO/IEC 9126 FOR THE SELECTION OF FLOSS TOOLS</td>
<td>367</td>
</tr>
<tr>
<td>María Pérez, Kenyer Domínguez, Edumilis Méndez and Luis E. Mendoza</td>
<td></td>
</tr>
<tr>
<td>A WORKFLOW LANGUAGE FOR THE EXPERIMENTAL SCIENCES</td>
<td>372</td>
</tr>
<tr>
<td>Yuan Lin, Thérèse Libourel and Isabelle Mougenot</td>
<td></td>
</tr>
<tr>
<td>USING ONTOLOGIES WITH HIPPOCRATIC DATABASES - A Model for Protecting</td>
<td>376</td>
</tr>
<tr>
<td>Personal Information Privacy</td>
<td></td>
</tr>
<tr>
<td>Esraa Omran, Albert Bokma and Shereef Abu Al-Maati</td>
<td></td>
</tr>
<tr>
<td>LINKING IT AND BUSINESS PROCESSES FOR ALIGNMENT - A Meta Model based</td>
<td>383</td>
</tr>
<tr>
<td>Approach</td>
<td></td>
</tr>
<tr>
<td>Matthias Goeken, Jan C. Pfeiffer and Wolfgang Johannsen</td>
<td></td>
</tr>
<tr>
<td>MODELING WITH BPMN AND CHORDA: A TOP-DOWN, DATA-DRIVEN METHODOLOGY</td>
<td>389</td>
</tr>
<tr>
<td>AND TOOL</td>
<td></td>
</tr>
<tr>
<td>Andrea Catalano, Matteo Magnani and Danilo Montesi</td>
<td></td>
</tr>
<tr>
<td>PROACTIVE INSIDER-THREAT DETECTION - Against Confidentiality in</td>
<td>393</td>
</tr>
<tr>
<td>Sensitive Pervasive Applications</td>
<td></td>
</tr>
<tr>
<td>Joon S. Park, Jaeho Yim and Jason Hallahan</td>
<td></td>
</tr>
<tr>
<td>AN INTEGRATION-ORIENTED MODEL FOR APPLICATION LIFECYCLE MANAGEMENT</td>
<td>399</td>
</tr>
<tr>
<td>Guenter Pirklbauer, Rudolf Ramler and Rene Zeilinger</td>
<td></td>
</tr>
<tr>
<td>CHALLENGES AND PERSPECTIVES IN THE DEPLOYMENT OF DISTRIBUTED</td>
<td>403</td>
</tr>
<tr>
<td>COMPONENTS-BASED SOFTWARE</td>
<td></td>
</tr>
<tr>
<td>Mariam Dibo and Noureddine Belkhatir</td>
<td></td>
</tr>
<tr>
<td>DATABASE MARKETING PROCESS SUPPORTED BY ONTOLOGIES - System</td>
<td>407</td>
</tr>
<tr>
<td>Architecture Proposal</td>
<td></td>
</tr>
<tr>
<td>Filipe Mota Pinto, Alzira Marques and Manuel Filipe Santos</td>
<td></td>
</tr>
<tr>
<td>ON TECHNOLOGY INNOVATION - A Community Succession Model for Software</td>
<td>411</td>
</tr>
<tr>
<td>Enterprise</td>
<td></td>
</tr>
<tr>
<td>Qianhui Liang and Weihui Dai</td>
<td></td>
</tr>
<tr>
<td>MODELLING LOCATION-AWARE BEHAVIOUR IN WEB-GIS USING ASPECTS</td>
<td>416</td>
</tr>
<tr>
<td>Ana Oliveira, Matías Urbieto, João Araújo, Armanda Rodrigues, Ana</td>
<td></td>
</tr>
<tr>
<td>Moreira, Silvia Gordillo and Gustavo Rossi</td>
<td></td>
</tr>
<tr>
<td>INSTRUCTIONAL DESIGN FOR JAVA ENTERPRISE COMPONENT TECHNOLOGY</td>
<td>420</td>
</tr>
<tr>
<td>Marco Marcellis, Ella Roubtsova and Bert Hoogveld</td>
<td></td>
</tr>
<tr>
<td>INNOVATIVE HEALTH CARE CHANNELS - Towards Declarative Electronic</td>
<td>423</td>
</tr>
<tr>
<td>Decision Support Systems Focusing on Patient Security</td>
<td></td>
</tr>
<tr>
<td>Kerstin Ådahl, Jenny Lundberg and Rune Gustavsson</td>
<td></td>
</tr>
<tr>
<td>AUTHOR INDEX</td>
<td>427</td>
</tr>
</tbody>
</table>
APPLICABILITY OF ISO/IEC 9126 FOR THE SELECTION OF FLOSS TOOLS

María Pérez, Kenyer Domínguez, Edumilis Méndez and Luis E. Mendoza

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Abstract: The trend towards the use of Free/Libre Open Source Software (FLOSS) tools is impacting not only how we work and how productivity can be improved when it comes to developing software, but is also promoting new work schemes and business models, specifically small and medium-size enterprises. The purpose of this paper is to present the applicability of ISO/IEC 9126 for the selection of FLOSS Tools associated with three relevant software development disciplines, such as Analysis and Design, Business Models and Software Testing. The categories considered for the evaluation of these three types of tools are Functionality, Maintainability and Usability. From the results obtained from this research-in-progress, we have been able to determine that these three categories are the most relevant and suitable to evaluate FLOSS tools, thus pushing to the background all aspects associated with Portability, Efficiency and Reliability. Our long-term purpose is to refine quality models for other types of FLOSS tools.

1 INTRODUCTION

There is a wide variety of tools in the market that support the different disciplines addressed in software product development. Software developing organizations must adjust to the market demands and use tools that allow them to be efficient. The selection of an adequate tool for the development process that meets to the organization needs is a complex process, since it requires a fair amount of objectivity to make the best decision.

This impartiality is promoted through the use of a product quality model that specifies the proper quality features for a specific type of tool.

According to the current rise and projection of the Free/Libre Open Source Software (FLOSS) industry, FLOSS Tools have not only become popular, but have helped software developing organization meeting time, quality and cost restrictions in their developments.

Therefore, the quality model should consider this to benefit from the advantages incorporated by the FLOSS philosophy.

The purpose of this paper is to present the results obtained from the application of ISO/IEC 9126 (2001) through the instantiation of the Systemic Quality Model (MOSCA) from the product perspective (based on ISO/IEC 9126) and suggest 3 models for quality specification of Analysis and Design (A&D), Business Modeling (BM) and Software Testing (ST) tools.

Thus, the Systemic Methodological Framework (SMF) for Information Systems Research of the Information Systems Research Laboratory (LISI by Spanish acronym of Laboratorio de Investigación en Sistemas de Información) (Pérez et al., 2004) was used, which is based on the Research-Action method (Baskerville, 1999) and the DESMET methodology (Kitchenham, 1996). SMF provides for infinite iterations, if necessary, to obtain the research product sought, but for the purposes of this research, 3 iterations were considered (1 for each type of tools). In addition, the Goal Question Metric (GQM) approach (Basili, 1992) was used in the operationalization of each model proposed. In order to test the models and perform a preliminary evaluation thereof, the DESMET Feature Analysis Methods was used (Kitchenham, 1996).

The main contribution of this work is to provide to software developing organizations, especially Small and Medium-size Enterprises (SMEs), a model for assessing these three types of tools in accordance with three categories, namely Functionality, Maintainability and Usability. This
would help their decision making processes and their selection of the tools that best suit their needs, and would offer guidance to facilitate their enhancement and use.

The present paper has been structured as follows: first, a brief description of the MOSCA model and ISO/IEC 9126 is supplied; then, experiences with D&A tools, followed by the experiences with BM tools and ST tools, are discussed; and, lastly, conclusions and recommendation are provided.

2 MOSCA PRODUCT - ISO/IEC 9126

The model proposed for Quality Specification in A&D, BM and ST tools is based on the Systemic Quality Model (MOSCA by the Spanish acronym of MOdelo Sistémico de CAliidad) (Mendoza et al., 2005). This model encompasses three perspectives: Product, Process and Human.

For purposes of this research, we focused on the Product perspective, which is based on ISO/IEC 9126 (ISO/IEC 9126, 2001). To make it more appropriate, we used the adaptation guide described in (Rincón et al., 2004) and the algorithm to evaluate software quality through MOSCA proposed by (Mendoza et al., 2005).

From the six categories established by MOSCA, namely Functionality, Efficiency, Maintainability, Reliability, Portability and Usability, 3 categories must be selected to estimate quality. Functionality is a mandatory category and its features must meet a level of satisfaction greater than 75% to be deemed “accepted” and continue with the assessment of the remaining categories (Mendoza et al., 2005). The other 2 categories considered relevant to evaluate A&D; BM and ST tools and adapt the MOSCA model were Maintainability and Usability; the same acceptance criterion is applied to consider its presence. It should be noted that the selection of the Maintainability and Usability categories was ratified in conformity with other research works conducted on FLOSS tool (Alfonzo et al., 2008, Pessagno et al., 2008). Following is a definition of each category and the features corresponding thereto which make it possible to adapt MOSCA to each type of tool.

Functionality is the ability of a software product to provide functions that meet specific or implicit needs when software is used under specific conditions.

Maintainability, according to (ISO/IEC 9126, 2001; Mendoza et al., 2005) it is the ability of a software product to be modified. Modifications may include software corrections, improvements or adaptations to changes in the environment, requirements and functional specifications. The tool should meet this category since this will enable any improvements, if necessary.

Usability is the ability of a software product to be understandable, learnable, usable and appealing to the user, under certain specific conditions (ISO/IEC 9126, 2001; Mendoza et al., 2005).

The features selected for Functionality (ISO/IEC 9126, 2001; Mendoza et al., 2005) include: Suitability, Accuracy, Interoperability, Correctness and Encapsulation.

The following Maintainability features were considered: Analyzability, Changeability, Stability, Coupling, Cohesion and Software Maturity Attributes.

As to Usability, the following features were selected: Understandability, Graphical Interface, Operability, Effectiveness, and Self-description.

Once the categories and respective features are selected, the metrics for measuring their level of software presence are formulated, thus achieving MOSCA adaptation for A&D, BM and ST tools.

3 A&D EXPERIENCE

3.1 Definition and New Metrics

The related literature has established a separation between System Analysis and Software Design which still prevails. System Analysis is a problem-resolution technique that breaks down a system into compounds to analyze how parties should work together and interact as a whole, so that the system meets its objective (Whitten and Bentley, 2006). Where conceived as a process, software design is the main activity in the software engineering lifecycle, where requirements are analyzed to generate a description of the internal software structure that will be used a basis for its construction (IEEE-SWEBOK, 2004). However, the term A&D can be conceived as a discipline (Kruchten, 2003) that has transformed into a critical set of activities for early system development stages, since it is aimed at the systematic analysis of all data input-output, processing, transformation, and storage, and the system output to be built, modified or enhanced (Kendall and Kendall, 2005).

The model proposed to evaluate FLOSS-based A&D tools contains 102 metric, 52 of which are new and distributed as follows: 41 correspond to
3.2 Evaluation

To be considered as an A&D tool, a tool should not only allow plotting, but it should provide functionalities that help integrating the analysis process to the diagrams; therefore, tools such as Microsoft Paint, Power Point and even UML plotters, which generate graphics from plain plots as Graphviz and UMLGraph, do not offer the necessary functionalities to link such diagrams and manage their relations, thus restricting analysis activities.

The tools subjected to study are StarUML, ArgoUML, BOUML, Fujaba, UMLet, Papyrus, DIA and DBDesigner. All tools allow draw UML diagrams with the exception of DBDesigner. This tool is oriented to A&D for Data Bases. Even though all A&D tools evaluated are based on FLOSS principles, they show a low Maintainability level, which is common for this area, since in most cases, access is granted to the source code, without complete documentation of the product. Upon adoption of the MOSCA algorithm, and having obtained a satisfaction percentage over 75%, StarUML is the only tool that reached an Intermediate quality level for two of the three selected categories, including Functionality.

Table 1 shows the result of the application of metrics to the FLOSS tools evaluated.

4 BM EXPERIENCE

4.1 Definition and New Metrics

Business Modeling is a Business Process Modeling activity (Osterwalder et al., 2005), since it deals with the representation of such processes, whereas the Business Modeling concept is generally understood as a vision of the organization’s logics to create and commercialize value. Eriksson and Penker (2000) conceive Business Modeling as an instrument to represent Business Models, since they state that the main objective of BM is to generate an abstraction from a complex reality that captures the core business functions to create common understanding to be communicated to the stakeholders: owners, managers, employees, clients, etc. Also, Kruchten (2003) states that Business Modeling is a discipline aimed at defining processes, roles, and responsibilities to develop a vision that allows understanding clients, final users, and developers, as well as the structure and dynamics of target organization.

The instantiation of MOSCA for Business Modeling FLOSS tools consist of 128 metrics, 75 of which are new metrics (42 in Functionality, 9 in Usability, and 24 in Maintainability).

4.2 Evaluation

The instantiation of MOSCA was applied to 4 tools, namely Eclipse Process Framework Composer (EPFC), StarUML, Intalio Designer and Dia. All tools allow modeling Business Processes through the use of languages, such as BPMN (BPMI, 2006), UML business profile (Johnston, 2004), SPEM and EPM (Stemberger et al., 2004). Besides being a tool used to represent diagrams, EPFC also manages processes. However, the interest in our research is much more focused on the analysis of a subgroup of the Functional part, specifically the business process visual modeling.

As can be seen in Table 2, from the four FLOSS tools assigned to BM, 3 reached over 75% of Functionality, since very few promoted interoperability. On the other hand, only 2 tools...
reached over 75% for Usability, where the lowest levels corresponded to documentation. With regards to Maintainability, only one of the tools evaluated shows an acceptable value in this category, where Stability and software maturity attributes accounted for the lowest levels. Lastly, the one tool that satisfied all three categories selected for the instantiation with a percentage greater than 75% was EPFC.

5 ST EXPERIENCE

5.1 Definition and New Metrics

ST is a process aimed at providing software reliability (IEEE-SWEP0K, 2004; Utting and Legteard, 2007) both, from the system developer and client perspectives, since software must satisfy all functional and non-functional requirements for its operation or production passing. That is to say, the Reliability of ST tools has direct impact on the software product reliability. Accordingly, the minimum quality expected by the client, according to the acceptance criteria agreed upon, must be assured. One part of the ST strategy is the use of tools, which allows validating all expected quality features; hence, the relevance of determining which testing tool is the most suitable.

In summary, 15 features have been suggested for quality specification of ST tools (4 in Functionality, 6 in Maintainability and 5 in Usability) and 83 metrics, thus accounting for 50 of the original model (Mendoza et al., 2005), 11 taken from (Alfonzo et al., 2008) and 22 new metrics for Functionality, which formulated during this research work.

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<thead>
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<th>Feature</th>
<th>Category</th>
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</tr>
</thead>
</table>
| EPFC    | Usability|            | 76.5%

5.2 Evaluation

Three FLOSS tools (JUnit, CPPUnit and PHPUnit) were analyzed and evaluated. Following the parameters of the Features Analysis Method (Kitchenham, 1996), the features analyzed for each tool correspond to those categories, features, and sub-features, for which values were obtained from the measurement of metrics formulated as a result of MOSCA adaptation. The results of such measurement are presented in Table 3.

After having applied the proposed model, we may state that the ST FLOSS tools lack acceptable Usability; sub-features susceptible of being improved include Understandability, Graphic Interface and Operability. Same sub-features should be improved only for one of the proprietary tools. Regarding Maintainability, all FLOSS tools must improve, to a large extent, all sub-features corresponding to Analyzability, Changeability, and Software Maturity Attributes. As for proprietary tools, except for the License sub-features, minor improvements should be made to the same Maintainability sub-features. Regarding Functionality, except for the Consistency sub-feature, all tools must undertake significant improvements for the rest of the sub-features (only Checking and QACenter obtained 100% in taxonomy).

6 CONCLUSIONS

This paper has presented all three models proposed for Quality specification of A&D, BM and ST tools, respectively. We performed a preliminary reevaluation of their effectiveness through the application of the model on a set of different types

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<thead>
<tr>
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</tr>
</thead>
</table>
| JUnit   | Functionality |            | 43.9%
| CPPUnit | Functionality |            | 45.6%
| PHPUnit | Functionality |            | 43.9%

Table 2: Evaluation of 4 BM FLOSS Tools.

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<thead>
<tr>
<th>Feature</th>
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<th>Value</th>
</tr>
</thead>
</table>
| JUnit   | Functionality |            | 43.9%
| CPPUnit | Functionality |            | 45.6%
| PHPUnit | Functionality |            | 43.9%

Table 3: Evaluation of 3 ST FLOSS Tools.
of tools. This preliminary evaluation shows that such models are susceptible of being applied, given their simplicity. Also, the attempt for quality specification in this type of tools was achieved in this first version.

Tools show a low Maintainability level, which is common for FLOSS area.

The final objective of this research in progress is proposing models that can be used to evaluate FLOSS tools for other software development disciplines, and support their selection and use by SMEs and further software developing organizations.

ACKNOWLEDGEMENTS

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REFERENCES


<table>
<thead>
<tr>
<th>Author Name</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbo, D.</td>
<td>342</td>
</tr>
<tr>
<td>Ádahl, K.</td>
<td>423</td>
</tr>
<tr>
<td>Akkermans, H.</td>
<td>131</td>
</tr>
<tr>
<td>Alencar, F.</td>
<td>347</td>
</tr>
<tr>
<td>Al-Maati, S.</td>
<td>376</td>
</tr>
<tr>
<td>Araújo, R.</td>
<td>292</td>
</tr>
<tr>
<td>Araújo, J.</td>
<td>351, 416</td>
</tr>
<tr>
<td>Armenteros, A.</td>
<td>49</td>
</tr>
<tr>
<td>Aruga, M.</td>
<td>307</td>
</tr>
<tr>
<td>Ates, M.</td>
<td>324</td>
</tr>
<tr>
<td>Audy, J.</td>
<td>231, 363</td>
</tr>
<tr>
<td>Azevedo, L.</td>
<td>243</td>
</tr>
<tr>
<td>Baião, F.</td>
<td>243, 262, 292</td>
</tr>
<tr>
<td>Bala, S.</td>
<td>77</td>
</tr>
<tr>
<td>Barjis, J.</td>
<td>213</td>
</tr>
<tr>
<td>Barn, B.</td>
<td>168</td>
</tr>
<tr>
<td>Beest, N.</td>
<td>188</td>
</tr>
<tr>
<td>Belkhatir, M.</td>
<td>77</td>
</tr>
<tr>
<td>Belkhatir, N.</td>
<td>77, 403</td>
</tr>
<tr>
<td>Bertino, E.</td>
<td>63</td>
</tr>
<tr>
<td>Biffi, S.</td>
<td>41</td>
</tr>
<tr>
<td>Bokma, A.</td>
<td>376</td>
</tr>
<tr>
<td>Borges, M.</td>
<td>225</td>
</tr>
<tr>
<td>Bouanaka, C.</td>
<td>137</td>
</tr>
<tr>
<td>Boutsinas, B.</td>
<td>33</td>
</tr>
<tr>
<td>Campos, M.</td>
<td>225</td>
</tr>
<tr>
<td>Cappelli, C.</td>
<td>243</td>
</tr>
<tr>
<td>Castro, J.</td>
<td>347</td>
</tr>
<tr>
<td>Catalano, A.</td>
<td>389</td>
</tr>
<tr>
<td>Champclaux, Y.</td>
<td>279</td>
</tr>
<tr>
<td>Chaves, V.</td>
<td>292</td>
</tr>
<tr>
<td>Choudhary, M.</td>
<td>194</td>
</tr>
<tr>
<td>Ciaramella, A.</td>
<td>206</td>
</tr>
<tr>
<td>Cimino, M.</td>
<td>206</td>
</tr>
<tr>
<td>Dai, W.</td>
<td>411</td>
</tr>
<tr>
<td>Damij, N.</td>
<td>298</td>
</tr>
<tr>
<td>Dibo, M.</td>
<td>403</td>
</tr>
<tr>
<td>Dkaki, T.</td>
<td>279</td>
</tr>
<tr>
<td>Domínguez, K.</td>
<td>367</td>
</tr>
<tr>
<td>Dustdar, S.</td>
<td>69</td>
</tr>
<tr>
<td>Ebling, T.</td>
<td>363</td>
</tr>
<tr>
<td>Edge, M.</td>
<td>194</td>
</tr>
<tr>
<td>Espindola, R.</td>
<td>231</td>
</tr>
<tr>
<td>Espinosa, J.</td>
<td>137</td>
</tr>
<tr>
<td>Falbo, R.</td>
<td>262</td>
</tr>
<tr>
<td>Author Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Lau, J.</td>
<td>83</td>
</tr>
<tr>
<td>Lazzerini, B.</td>
<td>206</td>
</tr>
<tr>
<td>Leite, A.</td>
<td>156</td>
</tr>
<tr>
<td>Lemmen, K.</td>
<td>338</td>
</tr>
<tr>
<td>Li, W.</td>
<td>13</td>
</tr>
<tr>
<td>Liang, Q.</td>
<td>411</td>
</tr>
<tr>
<td>Libourel, T.</td>
<td>372</td>
</tr>
<tr>
<td>Lijie, W.</td>
<td>182</td>
</tr>
<tr>
<td>Lin, Y.</td>
<td>372</td>
</tr>
<tr>
<td>Liu, S.</td>
<td>307</td>
</tr>
<tr>
<td>Lopes, M.</td>
<td>243, 262</td>
</tr>
<tr>
<td>Louw, S.</td>
<td>162</td>
</tr>
<tr>
<td>Lundberg, J.</td>
<td>200, 423</td>
</tr>
<tr>
<td>Maciel, R.</td>
<td>27</td>
</tr>
<tr>
<td>Magalhães, A.</td>
<td>27</td>
</tr>
<tr>
<td>Mañã, A.</td>
<td>49</td>
</tr>
<tr>
<td>Mansour, E.</td>
<td>109</td>
</tr>
<tr>
<td>Marcellis, M.</td>
<td>420</td>
</tr>
<tr>
<td>Marcelloni, F.</td>
<td>206</td>
</tr>
<tr>
<td>Marín, B.</td>
<td>347</td>
</tr>
<tr>
<td>Marín, N.</td>
<td>355</td>
</tr>
<tr>
<td>Markovic, I.</td>
<td>286</td>
</tr>
<tr>
<td>Marques, A.</td>
<td>407</td>
</tr>
<tr>
<td>Martínez-Ruiz, T.</td>
<td>359</td>
</tr>
<tr>
<td>Mateo, P.</td>
<td>124</td>
</tr>
<tr>
<td>Mauro, C.</td>
<td>19</td>
</tr>
<tr>
<td>McNeile, A.</td>
<td>338</td>
</tr>
<tr>
<td>Méndez, E.</td>
<td>367</td>
</tr>
<tr>
<td>Mendoza, L.</td>
<td>367</td>
</tr>
<tr>
<td>Montesi, D.</td>
<td>389</td>
</tr>
<tr>
<td>Moon, Y.</td>
<td>13</td>
</tr>
<tr>
<td>Moreira, A.</td>
<td>416</td>
</tr>
<tr>
<td>Moser, T.</td>
<td>41</td>
</tr>
<tr>
<td>Mothe, J.</td>
<td>279</td>
</tr>
<tr>
<td>Mougenot, I.</td>
<td>372</td>
</tr>
<tr>
<td>Muñoz, A.</td>
<td>49</td>
</tr>
<tr>
<td>Murase, H.</td>
<td>329</td>
</tr>
<tr>
<td>Nascimento, G.</td>
<td>57</td>
</tr>
<tr>
<td>Neubauer, T.</td>
<td>320</td>
</tr>
<tr>
<td>Nickerl, R.</td>
<td>95</td>
</tr>
<tr>
<td>Nobre, Á.</td>
<td>273</td>
</tr>
<tr>
<td>Ohki, M.</td>
<td>329</td>
</tr>
<tr>
<td>Ohmori, K.</td>
<td>116</td>
</tr>
<tr>
<td>Oliveira, A.</td>
<td>416</td>
</tr>
<tr>
<td>Omran, E.</td>
<td>376</td>
</tr>
<tr>
<td>Oussena, S.</td>
<td>168</td>
</tr>
<tr>
<td>Park, J.</td>
<td>393</td>
</tr>
<tr>
<td>Pastor, O.</td>
<td>347</td>
</tr>
<tr>
<td>Peng, L.</td>
<td>268</td>
</tr>
<tr>
<td>Pereira, C.</td>
<td>237</td>
</tr>
<tr>
<td>Pérez, M.</td>
<td>367</td>
</tr>
<tr>
<td>Peters, G.</td>
<td>256</td>
</tr>
<tr>
<td>Pfeiffer, J.</td>
<td>383</td>
</tr>
<tr>
<td>Philpott, O.</td>
<td>194</td>
</tr>
<tr>
<td>Plattini, M.</td>
<td>359</td>
</tr>
<tr>
<td>Pinto, F.</td>
<td>407</td>
</tr>
<tr>
<td>Pirklbauer, G.</td>
<td>399</td>
</tr>
<tr>
<td>Polo, M.</td>
<td>124</td>
</tr>
<tr>
<td>Pons, O.</td>
<td>355</td>
</tr>
<tr>
<td>Pozo, S.</td>
<td>176</td>
</tr>
<tr>
<td>Prikладникі, R.</td>
<td>363</td>
</tr>
<tr>
<td>Ramler, R.</td>
<td>399</td>
</tr>
<tr>
<td>Razvan, P.</td>
<td>144</td>
</tr>
<tr>
<td>Reichert, M.</td>
<td>57, 83</td>
</tr>
<tr>
<td>Rocha, P.</td>
<td>273</td>
</tr>
<tr>
<td>Rodrigues, A.</td>
<td>351, 416</td>
</tr>
<tr>
<td>Rodrigues, B.</td>
<td>5</td>
</tr>
<tr>
<td>Rosa, N.</td>
<td>27</td>
</tr>
<tr>
<td>Rossi, G.</td>
<td>416</td>
</tr>
<tr>
<td>Roubtsova, E.</td>
<td>338, 420</td>
</tr>
<tr>
<td>Sampaio, P.</td>
<td>194</td>
</tr>
<tr>
<td>Santoro, F.</td>
<td>243</td>
</tr>
<tr>
<td>Santos, M.</td>
<td>407</td>
</tr>
<tr>
<td>Sarmiento, E.</td>
<td>225</td>
</tr>
<tr>
<td>Serrano, D.</td>
<td>49</td>
</tr>
<tr>
<td>Silva, B.</td>
<td>27</td>
</tr>
<tr>
<td>Siqueira, S.</td>
<td>243</td>
</tr>
<tr>
<td>Soares, A.</td>
<td>237</td>
</tr>
<tr>
<td>Soares, M.</td>
<td>313</td>
</tr>
<tr>
<td>Sousa, C.</td>
<td>237</td>
</tr>
<tr>
<td>Stückl, T.</td>
<td>256</td>
</tr>
<tr>
<td>Stumptner, M.</td>
<td>256</td>
</tr>
<tr>
<td>Sun, L.</td>
<td>342</td>
</tr>
<tr>
<td>Sunyaev, A.</td>
<td>19</td>
</tr>
<tr>
<td>Szirbik, N.</td>
<td>188</td>
</tr>
<tr>
<td>T., F.</td>
<td>176</td>
</tr>
<tr>
<td>Tatsiopoulos, C.</td>
<td>33</td>
</tr>
<tr>
<td>Thom, L.</td>
<td>57, 83</td>
</tr>
<tr>
<td>Tribowski, C.</td>
<td>95</td>
</tr>
<tr>
<td>Tröger, R.</td>
<td>95</td>
</tr>
</tbody>
</table>
AUTHOR INDEX (CONT.)

Urbieta, M. .............................. 416
Vanags, J. .............................. 150
Villiers, C. .............................. 162
Vrancken, J. ............................ 313
Wedemeijer, L. ........................ 338
Woo, H. ................................. 249
Wortmann, J. ........................... 188
Yim, J. .................................. 393
Yingbo, L. .............................. 182
Zeilinger, R. ............................ 399
Zhang, L. ............................... 5
Zhaoxia, W. ............................ 182