



ERCIM "ALAIN BENSOUSSAN"
FELLOWSHIP PROGRAMME



Scientific Report

First name / Family name

Silverio Juan Martínez Fernández

Nationality

Spanish

Name of the *Host Organisation*

Fraunhofer IESE

First Name / family name
of the *Scientific Coordinator*

Andreas Jedlitschka

Period of the fellowship

01/10/2016 to 30/09/2018

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

The main research application area of the fellow has been the management of quality in agile and rapid software development. Optimal management of software quality and strategic planning of technical debt demands the appropriate integration and measurement of quality requirements in the software development and maintenance process. In Fraunhofer IESE, the host organization of the fellowship, this research area is also applied in industry, such as in the industrial partners of the “Q-Rapids” European research project (Quality-Aware Rapid Software Development, H2020-ICT, No. 732253).

The research goal during the fellowship has been to advance in the state-of-the-art with respect to real-time software analytics and the data-driven decisions taken from them to improve software quality. The main contribution of the postdoctoral research of the fellow has been to provide an integrative approach that helps organizations to systematically develop an appropriate decision making infrastructure in the context of managing quality requirements in rapid software development (see publications 3, 4, 5, 7, 8, 9, 10, and 11 below). To this end, the approach systematically assesses the level of software quality during development and at runtime, in order to provide integrated information about current quality issues from both the development and the actual system usage. This information support the planning of and decision-making on the next development steps to ensure appropriate levels of quality of service. This research has provided methods and

tools for collecting raw data on software quality characteristics at development time and at runtime, and at realizing analytical functionality to extract relevant information about actual quality issues by means of a quality model for actionable analytics. The results have been evaluated in the four industrial partners of the Q-Rapids project.

Additionally, during his stay, the fellow has also had the opportunity to discuss with Fraunhofer IESE and NTNU colleagues about the results of his previous research areas, such as quality on software architecture and software reference architectures. A few publications were derived from these follow-up works during the fellowship in Fraunhofer IESE (see publications 1, 2, and 6 below).

Furthermore, he has been widely introduced via Fraunhofer IESE network to the “Empirical Software Engineering” research community (i.e., ISERN, ESEM, and PROFES), being invited to give seminar talks and being actively involved in the organization and PC committees of several events (see Section III).

Regarding teaching, the fellow has taught in lectures and exercises sessions of the “Empirical Model Building and Methods (EMBM)” course in TU/Kaiserslautern in two academic semesters (April-July 2017 and April-July 2018).

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

All the papers in this section were prepared during the fellowship period and are accepted and published. Because of space limitations, papers under review are not included.

Journal papers

1. J. Criado, Silverio Martínez-Fernández, D. Ameller, L. Iribarne, N. Padilla, and A. Jedlitschka, “*Quality-Aware Architectural Model Transformations in Adaptive Mashups User Interfaces*,” *Fundamenta Informaticae*, vol. 162, iss. 4, pp. 283-309, 2018. **Q4. (JCR 2016. IF: 0,687. Position: 91/106. Area: COMPUTER SCIENCE, SOFTWARE ENG).**
2. Silverio Martínez-Fernández, C. P. Ayala, X. Franch, and H. M. Marques, “*Benefits and Drawbacks of Software Reference Architectures: A Case Study*,” *Information and Software Technology*, vol. 88, pp. 37-52, 2017. **Q1 (JCR 2016. IF: 2,694. Position: 16/106. Area: COMPUTER SCIENCE, SOFTWARE ENG).**

Conference papers

3. Silverio Martínez-Fernández, A. Jedlitschka, L. Guzmán, and A. M. Vollmer, “*A Quality Model for Actionable Analytics in Rapid Software Development*,” in 44th Euromicro Conference on Software Engineering and Advanced Applications (SEAA 2018), pp. 370-377. **CORE2018: B.**
4. L. López, Silverio Martínez-Fernández, C. Gómez, M. Choras, R. Kozik, L. Guzmán, A. M. Vollmer, X. Franch, and A. Jedlitschka, “*Q-Rapids Tool Prototype: Supporting Decision-Makers in Managing Quality in Rapid Software Development*,” in Information systems in the Big Data era (CAiSE Forum 2018), pp. 200-208. **CORE2018: A.**

5. X. Franch, C. Gómez, A. Jedlitschka, L. López, Silverio Martínez-Fernández, M. Oriol, and J. Partanen, “*Data-Driven Elicitation, Assessment and Documentation of Quality Requirements in Agile Software Development*,” in *Advanced information systems engineering (CAiSE 2018)*, pp. 587-602. **CORE2018: A**.
6. M. Galster, S. Angelov, Silverio Martínez-Fernández, and D. Tofan, “*Reference Architectures and Scrum: Friends or Foes?*,” in *11th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering, (ESEC/FSE 2017)*, pp. 896-901. **CORE2018: A***.

Workshop papers

7. Silverio Martínez-Fernández, P. Jovanovic, X. Franch, and A. Jedlitschka, “*Towards Automated Data Integration in Software Analytics*,” *12th International Workshop on Real-Time Business Intelligence and Analytics*, 2018.
8. L. López, J. Partanen, P. Rodríguez, and Silverio Martínez-Fernández, “*How do Practitioners Manage Quality Requirements in Rapid Software Development: A Survey*,” *1st International Workshop on Quality Requirements in Agile Projects*, 2018.
9. M. Manzano, C. Gómez, C. Ayala, Silverio Martínez-Fernández, P. Ram, P. Rodríguez, and M. Oriol, “*Definition of the On-Time Delivery Indicator in Rapid Software Development*,” *1st Intl. Workshop on Quality Requirements in Agile Projects*, 2018.
10. X. Franch, C. P. Ayala, L. López, Silverio Martínez-Fernández, P. Rodríguez, C. Gómez, A. Jedlitschka, M. Oivo, J. Partanen, T. Raty, and V. Rytivaara, “*Data-driven Requirements Engineering in Agile Projects: The Q-Rapids Approach*,” *2nd International Workshop on Just-In-Time Requirements Engineering*, 2017, pp. 411-414.
11. C. Gómez, C. P. Ayala, X. Franch, L. López, W. Behutiye, and Silverio Martínez-Fernández, “*Towards an Ontology for Strategic Decision Making: The Case of Quality in Rapid Software Development Projects*,” in *Advances in Conceptual Modeling: MREBA @ER 2017 Workshops*, pp. 111-121.

Co-supervised master thesis

- Pramod Guruprasad, “*Software Analytics for Agile Software Development*”, TU/Kaiserslautern, September 2018.

III – ATTENDED SEMINARS, WORKSHOPS, CONFERENCES

Events organized

- Silverio Martínez-Fernández, M. Galster, F. Queda Bueno da Silva, M. Ciolkowski: “*6th International Workshop on Conducting Empirical Studies in Industry*”, CESI@ICSE 2018, Gothenburg, Sweden, May 28, 2018. ACM
- C. P. Ayala, Silverio Martínez-Fernández, P. Rodríguez: “*1st QuASD Workshop: Managing Quality in Agile and Rapid Software Development Processes*”, QuASD@PROFES 2017, Innsbruck, Austria, November 29, 2017. Springer
 - The 2nd edition of the QuASD workshop has already been accepted.

Events attended

- *44th International Conference on Very Large Data Bases (VLDB)*, Rio de Janeiro (Brazil), August 2018. Participation: Attendee

- *12th International Workshop on Real-Time Business Intelligence and Analytics (BIRTE)*, Rio de Janeiro (Brazil), August 2018. Participation: Speaker (publication 7)
- *40th International Conference on Software Engineering (ICSE)*, Gothenburg (Sweden), May 2018. Participation: Attendee and co-located workshop organizer
- *18th International Conference on Product-Focused Software Process Improvement (PROFES)*, Innsbruck (Austria), November-December 2017. Participation: Attendee and co-located workshop organizer
- *11th ACM / IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)*, Toronto (Canada), November 2017. Participation: Presentation of in the journal first track (see publication 2)
- *11th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE)*, Paderborn (Germany), September 2017. Participation: Speaker (see publication 6)

Events involvement

- PC member: NIER track of ICSME 2018 (CORE A), poster/demo/tool tracks of ECSA 2018 (CORE A), QuaRAP@RE 2018, CSRSQ@QRS 2018, research/industry/poster tracks of ACM/IEEE ESEM 2018 (CORE A), SET track of CibSE 2018, industry track of ACM/IEEE ESEM 2017 (CORE A).
- Social media and publicity co-chair in PROFES 2018
- Journals reviews during 2017, 2018: IST (JCR 2016 Q1), JSS (JCR 2016 Q1)

Presentations and dissemination in universities

- *“Empirical Software Engineering: Experiences from two Industry-Academia Collaborations”*, seminar talk in University of Almeria (Spain). May 18th, 2017
- *“Q-Rapids: A big data solution for quality-aware rapid and agile software development”*, seminar talk in University in Norwegian University of Science and Technology (Norway). June 6th, 2017
- *“How to design and implement data collection strategies?”*, Guest lecture in University of Stuttgart (Germany). February 1st, 2018
- *“Q-Rapids: A data-driven solution for quality-aware rapid and agile software development”*, two seminar talks in University of Sao Paulo (Brazil, August 22th, 2018), and in Federal University of Rio de Janeiro (Brazil, August 31st, 2018)

IV – RESEARCH EXCHANGE PROGRAMME (REP)

The REP of the fellow was done in the Norwegian University of Science and Technology (NTNU, Norway). The fellow visited Prof. Pekka Abrahamsson, from the Department of Computer Science. The visit was performed between June 5th and June 9th in 2017.

During his visit, the fellow gave a seminar for the faculty, getting feedback and suggestions for his work. Also, he was widely introduced to the “Information Systems and Software Engineering” research group and its research projects, having a total amount of twelve technical meetings to discuss and identify collaborations opportunities with the head of the department Prof. Pekka Abrahamsson, post-doctorates and PhD students.