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Object: Review of PhD Thesis " SPIRAL: A Method of Software Development with Older Adults' Participation", author Wieslaw Kopec from Department of Computer Science, Polish-Japanese Academy of Information Technology

Technology has been largely explored as an instrument to improve the delivery and quality of care in health and well-being of older adults. The key research objective considered in this thesis has been the creation of a fast and comprehensive method of software development with direct participation of older adults, named SPIRAL. Related sub-goals have been: (1) identify barriers to the active engagement of older adults in the software development process and propose methods of overcoming these barriers; and (2) verify methods for overcoming barriers to direct cooperation between older adults and developers in the software engineering process. Both the main objective and the two sub-objectives have been clearly described and analyzed in the introduction of the thesis and detailed in the included three published paper.

The state of the art is presented in the Introduction chapter and repeated in the specific sections of the three included paper. The presented analysis demonstrated a good level of knowledge of the author in the field. However, in the Introduction to the thesis (without the typical length constraints of the published articles) I would have appreciated a more detailed and expanded systematic



literature review on the research context, in place of just a summary of the state of the art of the individual papers.

The description of an appropriate scientific methodology is probably a weak point of the overall thesis work, specifically for the utilized evaluation methodology of the proposed method of software development and methods for overcoming barriers to direct cooperation between older adults and developers. In particular a specific section on the used scientific methodology in the introduction is missing. Also the first two articles do not cover sufficiently this aspect. Scientific methodology is covered adequately in the last article published in Empirical Software Engineering journal. However the related section there covers only the second part of the SPIRAL process. It is not clear what was the research methodology and evaluation used by the PhD candidate to identify barriers to the active engagement of older adults in the software development process. So in this sense the used scientific methodology in the overall thesis work for the complete SPIRAL model remains partially uncovered.

The entire thesis is well structured and written with scholarly language and appropriate grounding.

The thesis work provides relevant contributions, namely:

- a proposal for a fast and comprehensive method of software development with the participation of older adults; specifically the proposed SPIRAL method includes two stages (preparatory and co-design) articulated in two steps each;
- identification of specific barriers towards participation and active engagement of older adults in the software development process and proposal of methods for overcoming these barriers;
- some (limited) evaluation of the above mentioned methods for overcoming barriers towards direct cooperation between older adults and developers in the software engineering process.



The mentioned contributions provide an incremental evolution of current software engineering practices, with a special focus on older adults population.

The main research work has been published in:

- one workshop article (2018) published in the proceedings (indexed by Web of Knowledge) of IEEE/ACM 11th International Workshop on Cooperative and Human Aspects of Software Engineering
- one conference article (2017) published in the proceedings (indexed by Web of Knowledge) of eHealth 360° conference;
- one journal article (2018) published in Empirical Software Engineering indexed in Web of Knowledge and Journal from the list A of Polish Ministry of Science.

The publication record is thus aligned and qualified for a doctoral dissertation. In the final list of publications included in the thesis (last page), a number of other publications in the same period (2017-2018) are listed. Some of them seem possibly related to the thesis topic (at least from the titles) and it is not clear to me why they are not included both in the overall discussion in the introduction and in the compilation of articles.

Results are clearly summarized in Section 1.3 in the Introduction chapter. They are then detailed in the three included articles. Results presented in the second (“A Location-Based Game for Two Generations: Teaching Mobile Technology to the Elderly with the Support of Young Volunteers”) and third (“Older adult and hackathons: A Qualitative Study”) articles are sufficiently presented and analysed. Results presented in the first article (“Guidelines Towards Better Participation of Older Adults in Software Development Processes using a new SPI-RAL Method and Participatory Approach”) could be presented and analysed with more details, if not in the article (due to page



limits constraints) at least in the Introduction chapter. In particular in Section 5 of the first article devoted to demonstration of the “SPIRAL” approach in action, I would have been interested in more exhaustive and quantitative (collected data) description. I found again odd that one reference to some results is an article from the PhD candidate, not included in the compilation of articles. But maybe here I am missing some internal regulations about the maximum number of articles to be included in the Phd thesis.

The main strong point of the thesis results are the interesting and well designed two user studies presented and analyzed in the two last articles. They touch relevant problems (how to improve older adults engagement as well as intergenerational cooperation) and provide experimentations in real world settings.

The main weak point of the presented research results is the evaluation of the overall proposed novel method of software development with the participation of older adults. In the current thesis the proposed method has been empirically validated separately for the two stages of the SPIRAL model. It is not clear to the reader if the group of target users (older adults) has been the same or not in the two included use cases. In any case, a stronger validation could have been achieved with the validation on a specific tool/application of the complete proposed SPIRAL approach. In this way, it could have been possible also to collect quantitative data (time, cost, efficiency, perceived quality etc.) very relevant to some claims made in regard to the SPIRAL approach, namely to be “fast” and more effective in terms of “cost and time” with respect to other approaches (e.g. OASIS).

In particular, it is not clear to me how the proposed method could be more effective in terms of “cost and time” since the identified and piloted four steps of the overall method, seems to be in any case rather complex to implement and in any case time consuming. A stronger discussion, based on



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quantitative data, of the improvements of the novel SPIRAL methods compared to others would have been an important contribution to the software engineering domain.

The thesis substantially contributes to the computer science discipline, namely software development and human-computer interaction domains with a special focus on participatory design and direct end-user involvement through co-design.

The overall impression is that of a good scholarly work including a sufficient analysis of related work, a complete proposal of a novel method of software development, a complete implementation and a sufficient evaluation of the proposed novel methodology, evolving current approaches in the selected research domain.

Overall the thesis work provides interesting contributions to the field of software development and human-computer interaction. Overall, the scientific achievements of the author in the present thesis are sufficient to grant him a doctoral degree in the field of technical sciences in the discipline of computer science or software engineering.

Sincerely Yours,

A handwritten signature in blue ink, appearing to read 'Maurizio Marchese'.

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