Ready-Set-Transfer! Technology Transfer in the Requirements Engineering Domain (Panel)

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Abstract—**Though the primary goal of requirements engineering research is to propose, develop, and validate effective solutions for important practical problems, practice has shown that successful projects take from 20-25 years to reach full industry adoption, while many projects fade and never advance beyond the initial research phase. In this interactive panel, teams of researchers, representing different requirements engineering research areas, bring ideas for technology transfer to a panel of industrial and government practitioners. The teams make interactive presentations and receive feedback from panelists. Beneath the game-show genre of the panel is the serious goal to foster conversation between practitioners and researchers to improve the effectiveness of technology transfer in the requirements engineering community.**

I. Introduction

Requirements Engineering research topics range from requirements elicitation techniques to studies of formal specification methods in safety critical systems. While these research areas are quite different in nature, they all focus to some extent on improving the ways in which requirements are elicited, analyzed, specified, and managed. Furthermore, they all share the ultimate goal of impacting the state of practice through identifying important research problems, and then proposing, developing, and evaluating novel solutions. Unfortunately, the path from conception of a research idea to full industrial adoption is a challenging one which typically requires the long-term commitment of a community of researchers. To explore these challenges, this panel provides an opportunity for academics and practitioners to engage in an open discussion of the issues affecting the technology adoption path. The panel is designed along the lines of an interactive game-show in which teams of researchers pitch ideas for technology transfer projects to a panel of industrial experts.

II. Phases of the Research Life-Cycle

A study conducted in the 1980s by Redwine and Riddle followed the maturation path of several software technologies from their conception to their widespread adoption [4]. Redwine et. al found that successful research projects often took from 15-20 years to reach the final phases of adoption. They identified the following six phases of the research process: (i) the basic research stage in which critical research questions were formulated and foundational ideas and concepts were established; (ii) concept formulation in which a research community was established and started to make headway in addressing a clearly articulated problem, or set of problems; (iii) development and extension, in which there were early signs of adoption and participants worked towards refining and generalizing the approach; (iv) internal enhancement and exploration, in which the approach was applied to other domains and the technology was used in industrial-strength problems; (v) external enhancement and exploration, which extends the previous stage to include a more extensive and broader group of adopters, and further validates the utility and value of the approach; and finally (vi) popularization, in which the tool is fully industrialized for marketing purposes.

Having used these structures to evaluate advances in the software architecture community [5], Mary Shaw discussed several different practices that helped research ideas to mature through these various stages [6]. She noted that research typically proceeds from informal conversations, to position papers, to more formal conference and journal presentations. Furthermore, as the research area matures, it is supported by community activities such as workshops, special topic journal editions, and books. Shaw points out that these activities help to propel the research through the middle phases of the maturation process. As such, most successful research is ultimately dependent upon an active community of researchers who work together over a period of time to solve clearly articulated research problems.

In a panel entitled "What industry wants from research" [1] at the 2011 International Conference on Software Engineering, panelists gave their industrial perspective on the challenges of technology transfer. They highlighted several issues such as the very real financial and career risks that an industrial sponsor incurs when he or she supports a pilot study, and the problem of researchers failing to fully understand the problem or to assess the viability of the solution within a realistic context.

III. Models for Successful Transfer

Wieringa pointed out that research should go far beyond proposing new ideas, which he referred to as design activities, and should provide a rigorous investigation of problems, solutions, and implementations of these solutions, so that

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researchers can understand and clearly communicate when and where their proposed solutions can be practically applied [7].

Several researchers have proposed, and implemented, successful technology transfer models along these lines. For example, Gorschek et al. [3] developed a model that assumes close collaboration between industry and academia from the beginning until the end of the research process. Their model involves six steps including area identification, agenda formulation, solution proposal, presentation to practitioners, and full pilot studies. Gorshek et al. have used this model effectively in industry.

There are numerous other models for effective research - industry partnerships. For example, research at the Center of Excellence for Software and Systems Traceability (CoEST) has not only been funded by government agencies such as NASA (US National Aeronautics and Space Administration) and NSF (US National Science Foundation), but has also been sponsored by industries such as Siemens Corporate Research and ABB. This synergy has enabled cutting-edge research ideas to be explored simultaneously with technology transfer in the form of tool development and pilot studies [2]. For example, industrial funding has enabled the development of trace retrieval tools which have been used to conduct industrial pilot studies that correspond to Redwine's development and extension phase of the research lifecycle.

IV. Starting the Conversation

If the entire research and publication process is perceived as part of the long-term technology transfer process, then perhaps one of its weaknesses is the lack of conversation between academic researchers and practitioners. This inhibits the research goal of technology transfer as researchers may fail to understand the issues and problems that industry struggles with and as a result may focus their efforts on obscure or unimportant areas of research. On the other hand, once a researcher or group of researchers have identified a non-trivial industrial need, they require a significant incubation period to develop and validate their work before it is ready for industry adoption. While successful projects may take time to come to fruition, long-lived research projects that never make it to market, show no promise of future technology transfer, and produce no useful side benefits are clearly problematic.

Healthy discussions between academics and practitioners are therefore an essential part of the research process, and will help the requirements engineering community to integrate technology transfer plans into the ongoing research process.

V. Ready-Set-Transfer

In this panel, several different research teams will be invited to present ideas for technology transfer from their own areas of research (through an open call, and then personal invitations if this does not suffice). The teams will likely represent a variety of requirements related research areas such as requirements traceability, creativity in the requirements elicitation process, modeling, formal methods, recommender systems, and visualization. The panel is set up as a 5-Across competition, often run as part of a Start-Up weekend or other entrepreneurial events. Typically there are 5 teams/entrepreneurs, each given 5 minutes to present their pitches to panel members. Attendees pay a $5 entrance fee. The winning team (decided by the audience) gets $500 (hence the 5-Across moniker). In our offering at RE, there will be two or three teams and two rounds. In round one, teams will make 5 minute presentations on their research solution or technology transfer idea (motivating its importance to industry). The panelists will then ask questions/provide feedback for 5 minutes (the panel feedback is designed to present practitioners' perspectives on technology transfer issues). In round two, teams will have 5 minutes devoted to evidence of how the product has been validated and is ready for technology transfer. This will be followed by 5 minutes for panel questions and answers (Q&A), followed by 5 minutes of audience Q&A. Finally, the audience will vote to determine the "winner."

VI. Conclusions

This panel is designed around the genre of a game show, but it addresses a serious and potentially far-reaching issue affecting the requirements engineering research community. As such it provides an interactive forum for identifying and exploring many critical issues related to technology transfer. Our hope is that the outcome of this panel will strengthen and foster ongoing collaborations between industry and academia that in turn will lead to more effective research projects and successful technology transfers.

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