Date	19.03.2024	Overall rating	5
Panel	RC24_24 Human factors and technology design		
Experts	Andreas Eckhardt, Darryl Charles, Frank Steinicke, Katrien Verbert, MARIA VIRVOU, Madeline Balaam, Rachid Alami, Shaun Lawson, Sonia Sousa, Tang Tang, Thomas Hillman, Torkil Clemmensen		
Support reviews			
Application No.	363860		
Call	Academy Research Fellowship 2024 15.11.2023 - 17.01.2024		
Applicant	Jose Teixeira Apolinario		
Research topic	Investigating Strategy, Diversity and Multiplexity in Open and Coopetitive Software Ecosystems		

1 The applicant

1.1 Competence, expected achievements and potential of applicant   5

Please review:

- applicant's personal achievements and scientific expertise
- applicant's professional competence and independence, i.e., merits in supervising and mentoring, merits in existing or planned joint projects, and more independent publishing
- experience of working in different research environments across international and/or sectoral borders
- significance of this funding to advancement of applicant's professional competence
- applicant's career development potential
- applicant's ability to generate scientific renewal during and after the project

The applicant can be judged to have a strong track record in relation to the proposed project with significant experience of working in different academic and industry environments. In terms of independence, the applicant has a track record of funded projects and of leading projects in industry. The proposed project can be judged to offer a significant opportunity for career development in-line with the applicant's existing experience. (Hillman:5)

● Applicant's Personal Achievements and Scientific Expertise: The applicant possesses a diverse background in both technical and management fields, having studied computer science and management at academic institutions. He has accumulated extensive practical experience in software development and project management at renowned companies such as Sonae, Wipro, Tesco, and Nokia. Eventually, his research has focused on cooperation among competitors in open-source ecosystems, leading to the coining of the term "open-coopetition" during his doctoral studies. His work has been cited in prestigious journals, indicating his impact across disciplines.

● Applicant's Professional Competence and Independence: The applicant has demonstrated independence and competence in his research endeavours, collaborating with industrial practitioners and contributing to various projects funded by organizations such as the Academy of Finland, Tekes, and the EIT ICT labs. Despite facing challenges in securing post-doctoral positions and personal commitments, he has remained committed to his research interests and has recently returned to exploring open- coopetition in the automotive industry. His ability to supervise and mentor others is evidenced by his experience working within diverse research environments across multiple universities in Finland and Portugal.

● Experience of Working in Different Research Environments: He has gained experience working in diverse research environments across international borders, including institutions in the USA, Ireland, Italy, and Portugal. He has collaborated with researchers from various disciplines, contributing to projects within Software Engineering, Information Systems, Information Studies, and Business units across different universities. This diverse experience has enriched his research perspective and allowed him to adapt to different academic and cultural settings.

● Significance of Funding to Advancement of Applicant's Professional Competence: The funding will provide the applicant with the resources and support needed to advance his research competence, particularly in the areas of open-source software, "coopetition" strategy, and network science. It will enable him to conduct advanced social network analysis and analyse multiple layers of software development cooperation simultaneously, further enhancing his research skills and expertise.

● Applicant's Career Development Potential: With the support of the funding, the applicant aims to pursue research positions that align with his interdisciplinary orientation, focusing more on research and less on teaching. His ambition is to become a leading theorist on "open-coopetition" empirical studies and an expert in the analysis of software ecosystems with social network analysis, with cooperation with industry stakeholders. Ultimately, the project will contribute to his career development, positioning him as a national expert within Finland.

● Applicant's Ability to Generate Scientific Renewal During and After the Project: The applicant's research on open-coopetition and software ecosystems has the potential to generate scientific renewal by advancing theories and methodologies in these areas. His interdisciplinary approach and engagement with industry stakeholders facilitate the translation of research findings into practical applications, contributing to innovation and knowledge dissemination within academia and industry. The resulting "Handbook of metrics for the analysis of digital ecosystems" will further promote scientific renewal by providing valuable insights and tools for analysing and understanding digital ecosystems from both business and technical perspectives. (VIRVOU:5)

2 Quality of research

2.1 Scientific quality, novelty and innovativeness of research

Please review:
- scientific quality and significance of project's objectives and hypotheses
- ambitiousness and state of the art of objectives, including possible novel concepts and approaches or development across disciplines
- impact of research within academia
- potential for breakthroughs or exceptionally significant outcomes including possible high risk-high gain research
- project's potential to generate new knowledge, new methods, new technology or new practices

The proposed project can be judged to be of high scientific quality with strong potential to contribute new knowledge to network science and to understanding of software development ecosystems that has potential to speak more broadly to understanding of highly distributed knowledge intensive work more generally. (Hillman:6)

● Scientific Quality and Significance of Project's Objectives and Hypotheses: The project's objectives are aligned with current needs in open-source software technology and software ecosystems and hence they are significant with respect to updating scientific knowledge on key research questions in these fields, which are changing rapidly. The research aims to reveal complex phenomena such as the connection between firm strategies and developer actions within software ecosystems, as well as the effects of diversity on joint production of software. By addressing these questions, the project contributes to the further theorisation of software ecosystems and offers valuable insights into the dynamics of collaborative software development. The project has formulated several hypotheses to explore them in software eco-systems. However, a limitation on these hypotheses is that they are not based on a theoretical foundation but they are rather ad hoc. In the case of hypothesis H4 "Diversity: Gender diverse teams (including developers from different genders) tend to review and reject contributions more often than non-diverse teams (including developers from a single gender)" it is not obvious what the underlying reasoning of it may be.

● Ambitiousness and State of the Art of Objectives: The objectives of the project are ambitious and aligned with the state of the art in the field, by employing advanced methodologies and theoretical frameworks to explore novel concepts such as multiplex social network relationships in software ecosystems. The project's interdisciplinary approach, is based on expertise in software engineering, social network analysis, and business studies and reflects an approach that goes beyond the state of the art in understanding the complexities of current open-source environments and software ecosystems.

● Impact of Research within Academia: The research can make a substantial impact within academia by advancing theoretical understanding and contributing to the academic knowledge on topics such as open-source and software ecosystems. The project's exploration of new concepts and methodologies has the potential to stimulate further research in these areas.

● Potential for Breakthroughs or Exceptionally Significant Outcomes: The project has the potential to exceptionally significant outcomes, particularly through its exploration of research questions related to strategy, diversity, and collaboration in software ecosystems. By challenging existing assumptions and theoretical frameworks, the research may uncover new insights and paradigms that have far-reaching implications for both academia and industry.

● Project's Potential to Generate New Knowledge, Methods, Technology, or Practices: The project has the potential to generate new knowledge, methods, technology, and practices in several key areas. Through the development of theoretical frameworks, empirical methodologies, and analytical tools for studying software ecosystems, the research will contribute to the advancement of knowledge in the field. Additionally, the creation of a "Handbook of metrics for the analysis of digital ecosystems" represents a tangible outcome with practical implications for both researchers and practitioners, facilitating informed decision-making and fostering innovation within real-world ecosystems.
(VIRVOU:5)

2.2 Additional comments on aspects of societal effects and impact of the project, if relevant

The proposal includes a statement on societal effects that emphasises the possibility to influence software development management. (Hillman)

The project has the potential to create knowledge useful to decision makers concerning software development. Moreover, this kind of knowledge will also be useful to practitioners. Among the deliverables of the proposal is the creation of a book that will serve practical or functional purposes that eventually can enhance the development of software.
(VIRVOU)

3 Implementation

3.1 Feasibility of research plan, including aspects of responsible science

5

Please review:
- feasibility of project, taking into account extent to which proposed research may include high risks
- materials, research data and methods
- working arrangements and management of research tasks
- research environment including research infrastructures
- identified potential scientific or methodological problem areas and mitigation plan
- consideration of research ethics, open access to research publications and data, data management, promotion of equality and nondiscrimination in society at large, and sustainable development within the project

The proposed project can be judged to be highly feasible in terms of research data, methods and organisation. The proposal includes a strong consideration of responsible science issues and identification of possible risks with specific accommodations of relevance to the project plan. (Hillman:6)

Feasibility of Project: The project's feasibility is supported by a well-structured work plan comprising four work packages, each addressing specific research questions. While the first three packages will focus on addressing the research questions sequentially, the fourth package will involve producing a "Handbook of metrics for the analysis of digital ecosystems" across the entire project duration, with emphasis in the last project year. The potential data collection challenges are expected to be mitigated by the existing relationships and familiarity of the applicant with the OpenStack and Automotive Grade Linux. Strategies to engage practitioners include attending community conferences, conducting preliminary research using public domain data, and ensuring transparency about data collection practices. However, there are some limiting factors possibly affecting the feasibility due to the complexity of emerging data and the need for advanced analysis techniques, as for example in the sentiment analysis techniques in social networks, in combination with other kind of analysis, which may pose challenges in interpreting and synthesising the results effectively and without biases.

Materials, Research Data, and Methods: The project will rely on Natural Occurring Digital Trace Data (NODTD) from open-source software projects and input from industrial practitioners. Detailed data collection methods are outlined, including qualitative analysis of strategy announcements, quantitative assessment of competition, and social network data mining for cooperation. Methodological approaches span various disciplines, integrating virtual ethnography, case study methodology, and software repository mining. Established guidelines and tools from Software Engineering and Social Network Analysis inform the data analysis process. However, the engagement of industrial practitioners in data collection and interpretation could introduce biases or conflicts of interest, which may need to be carefully managed to ensure the integrity of the research. Working Arrangements and Management of Research Tasks: The project's working packages are organised sequentially to address the research questions, with institutional cooperation and visits facilitating collaboration and data collection. Tasks involve a multidisciplinary approach, with practitioners engaged in various stages from data collection to interpretation of results. Risk mitigation strategies, such as avoiding engagement with developers during peak workload periods, are outlined to ensure effective management of research tasks. Research Environment: The applicant's prior experience and collaborations across international borders provide a good research environment. Data collection efforts will be supported by established contacts within the OpenStack and Automotive Grade Linux communities, along with institutional cooperation, support. Access to relevant research infrastructures and tools enhances the project's feasibility and potential for scientific advancement.

Identified Potential Scientific or Methodological Problem Areas and Mitigation Plan: Potential challenges include the complexity of emerging data and the need for advanced visualisation and analysis techniques. To address this, the applicant plans to employ quantitative approaches such as Relational Event Modeling if visualization tools prove insufficient. Additionally, participation in workshops and research visits will enhance methodological capabilities and address potential problem areas. Consideration of Research Ethics and Open Access: The project emphasises transparency and ethical data collection practices, ensuring practitioners' consent and promoting open access to research publications and data. Ethical considerations, data management, and promotion of equality and nondiscrimination align with principles of responsible research conduct, contributing to sustainable development within the project and broader society. (VIRVOU:4)

3.2 Expertise, human resources, and collaboration, including aspects of responsible science

Please review:

- scientific expertise of applicant in terms of project implementation
- (if relevant) complementary expertise of applicant's team, who are directly working for/funded in the project, including appropriateness and sufficiency for the proposed project
- adequateness of human resources in terms of project implementation, with attention to promoting equality and nondiscrimination within project
- contribution of both national and international research collaborators, who are engaged with their own funding, and impact of their environment on the project's potential success
- significance of planned mobility for implementation of research plan and researcher training

The applicant can be judged to have a particularly strong track record in relation to the project plan. In addition, the proposed plan involves significant mobility for the applicant to research environments of high relevance for the project. These visits and the complementary backgrounds of the collaborating partners indicate a positive impact on the project's potential success. (Hillman:6)

Scientific Expertise of the Applicant: The applicant demonstrates robust scientific expertise relevant to the project implementation in open and "coopetitive" software ecosystems. His background in both computer science and management, combined with industry experience, renders him an excellent leader for this kind of research. He has previously contributed to the theoretical understanding of "open-coopetition", indicating his capability to advance knowledge in this area. He has a lot of publications to his name and has attracted a lot of funding. He also has a lot of international collaborations and speaks many languages to allow him to conduct surveys and establish international collaborations more effectively.
Complementary Expertise of the Applicant's Team: The applicant's team comprises collaborators with diverse expertise and locations, including researchers from institutions such as Tampere University, Åbo Akademi University, Universidad Rey Juan Carlos, and University of Texas. Each collaborator brings complementary insights and expertise, enhancing the project's comprehensiveness. Their collective experience in software engineering, management, and innovation studies aligns well with the project's objectives, ensuring appropriateness and sufficiency for its successful execution. Adequateness of Human Resources and Promotion of Equality: The human resources allocated for the project appear adequate in terms of their qualifications and expertise. Contribution of National and International Research Collaborators: The contribution of both national and international research collaborators, each engaged with their own funding, significantly enriches the project's environment and potential success. Their diverse perspectives and experiences enhance the project's scope and depth. Significance of Planned Mobility for Research Implementation and Training: Planned mobility, including visits to collaborating institutions, is of significant importance for the implementation of the research plan. Expertise, human resources, and collaboration, includ (VIRVOU:5)

4 Review panel's summary assessment of proposal

4.1 Main strengths and weaknesses of proposal and their justifications; possible other remarks
TO BE COMPLETED ONLY AT THE PANEL MEETING

Section 4 of the form is applicable only to the top-tier applications selected for discussion during the review panel meeting.

4.1.1 Main strengths and their justifications

• Summary assessment of the application's main strengths with justifications.

The panel agrees that the proposed project shows a high scientific quality. It has potential to contribute new knowledge to network science and to understanding of software development ecosystems, by employing advanced methodologies and theoretical frameworks to explore novel concepts such as multiplex social network relationships. The project's interdisciplinary approach goes beyond the state of the art in understanding the complexities of current open-source environments and software ecosystems.

A key strength is the applicant's diverse background in technical and management fields, significant experience of working in different academic and industry environments, and history of collaborating with industrial practitioners. The panel agrees that the project shows potential for the applicant to enhance their expertise in the domain of the project, as well as to expand their network of collaborators. In particular, it involves significant mobility for the applicant to research environments of high relevance for the project.

4.1.2 Main weaknesses and their justifications

• Summary assessment of the application's main weaknesses with justifications

The panel agrees that while the proposal presents an interesting research plan, the hypotheses advanced are not clearly supported by arguments drawn from or in contrast to existing literature, and they are not clearly linked to the research questions and objectives. In terms of methods, the project involves the complexity of emerging data and the need for advanced analysis techniques, such as sentiment analysis in social networks. The panel view is that these may pose difficulties for the interpretation and synthesis of the results. Similarly, the project also requires the engagement of industrial practitioners in data collection and interpretation, which may introduce issues for the integrity of the research, a concern not well-addressed in the proposal. In terms of track record, the panel agrees that the applicant shows evidence of a good range of research activity, but somewhat limited output in terms of the most relevant venues for the proposed project.

4.1.3 Other remarks (if any):

Hillman: 6
VIRVOU: 5

Your application was ranked 6th of all the 18 Academy Research Fellowship 2024 applications reviewed in this panel. Only applications with the final rating of 5 or 6 are ranked. Altogether, Academy Research Fellowship 2024 applications addressed to Scientific Council for Natural Sciences and Engineering. were reviewed in 25 panels.