Adapting the scrum framework for agile project management in science: case study of a distributed research initiative

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ABSTRACT

This study explores the adoption of agile methods for the management of projects in a collaborative research initiative. The use of the scrum framework, a specific set of agile principles and practices for self-organizing cross-functional teams in software development projects, is currently being expanded to other types of organizations and knowledge management processes. The study addresses the extent to which key principles and tools usually used in scrum, due to their potentially positive influence on team dynamics and efficiency, can contribute to the collaborative management and coordination of tasks in research processes. Results indicate that integrating agile methods and principles for interdisciplinary collaboration requires a high degree of flexibility and a "learn by doing" approach.

TEAM-BASED COLLABORATION IN RESEARCH

Team-based collaboration is a critical factor in research organizations and the majority of scientific fields, as knowledge is increasingly being generated by research teams (Wagner et al., 2017). Literature on research practices indicates that teamwork and collaboration dominate knowledge production in academic organizations and is prevalent in large-scale international research networks (Cooke & Hilton, 2015).

The benefits of research collaboration range from an increase in citations, as a result of the co-authorship of papers, to better use of existing resources (Ynalvez & Shrum, 2011). Other benefits include the capacity to generate wider social impact, and more opportunities for knowledge transfer and learning (Lassi & Sonnenwald, 2010).

Challenges in collaborative research management relate to the need for supervision and coordination among peers, and organising and assessing an activity that is continually evolving (König et al., 2013). Large-scale research projects usually imply more dedication to leading and coordinating each process, from research design to the collaborative authorship of papers and reports. In this sense, collaborative research projects can benefit from new project management techniques (Vom Brocke & Lippe, 2015).

AUTHOR

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AGILE PROJECT MANAGEMENT

Agile project management (APM) is a team management approach and a productivity framework that supports continuous and incremental progress on work priorities, even in the face of changes. APM has its origins in the agile processes of software development, with programming methodologies based on adaptability as a means to increase the chances of success of a project (Cohen et al., 2004). Most agile methods try to minimize risks during the execution of a project by developing software in iterations, which usually last from one to four weeks. APM, more so than other management frameworks, emphasizes teamwork by focusing on the social aspects of software development, channelling co-creation between programmers and other participants in self-organized, cross-functional teams (Hoda et al., 2013). With collective ownership and collective responsibility as key attributes, the scrum framework is one of the most adapted APM principles and practices (Lei et al., 2017).

APM and scrum have gained in popularity in recent years, primarily in the software industry, but they are progressively breaking into other domains (Ciric et al., 2018). In parallel to evidence of the contribution of AMP to a more flexible and responsive organizational culture outside of the software development world, there is increasingly more academic literature on the adoption of agile methods for different types of collaborative research processes and scientific projects. For example, studies highlight the successful utilisation of APM in academia-industry collaboration (Sandberg & Crnkovic, 2017); the application of agile methods to faculty work (Pope-Ruark, 2017) or bridging the gap between research and practice in the management of case studies (Barroca et al., 2015).

BACKGROUND OF THE CASE STUDY

The UK-based Centre for the Evaluation of Complexity Across the Nexus (CECAN, cecan.ac.uk) is the focus of this case study. CECAN, a research centre hosted by the University of Surrey, was established in 2016 and comprises more than 50 members working in 14 different academic organisations such as the University of Warwick, the University of York, Cranfield University and Newcastle University. Conceived as a network of social scientists, policy makers, policy analysts and experts, CECAN explores, tests and promotes innovative policy evaluation approaches and methods pertaining to food, energy, water and the environment across nexus domains. As a distributed initiative, incorporating experts from diverse knowledge areas with varying levels of dedication and time capacity for projects, and in the absence of a central physical office or shared space, it required a specific approach to coordination and management. For this purpose, from its early operations, CECAN adopted some APM principles and practices derived from the scrum framework, as well as a digital Kanban board for managing the information and knowledge generated by its teams.

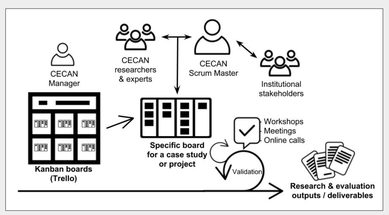
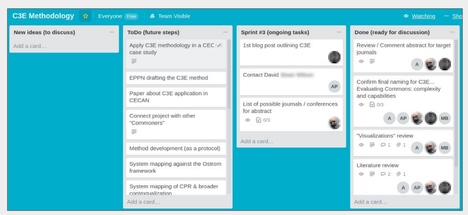


Diagram of the scrum adaptation for research and evaluation projects at CECAN.

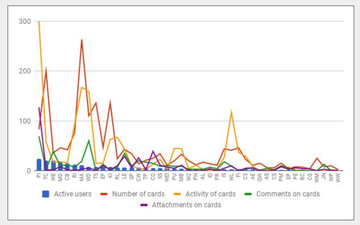


Screenshot of one of the CECAN Kanban boards (Trello platform), with different tasks on cards.

MAIN RESULTS AND DISCUSSION

Data was obtained from 17 interviews with CECAN researchers and with experts from other institutions, as well as from participant observation and the content analysis of 43 Kanban boards. Results suggest that the adoption of agile methods in research collaboration is suited to organisations embedded in complex and changing settings with some capacity for self-organisation, flexibility and adaptivity to new management approaches. The most relevant challenges identified for APM adoption in research point to issues related to: (1) a needed balance between efficiency and autonomy of participants; (2) limitations of the online context for coordinating activity; (3) a tendency to proliferation of kanban boards; (4) need to build trust in relationships when coordinating; (5) the type of research activity carried out; (6) time and resources constraints; (7) the importance of tailoring scrum principles to specific activities, and (8) the institutional culture of academic research organisations.

Integrating agile methods and practices for interdisciplinary collaboration requires high degrees of flexibility and "learn by doing". In this sense, scrum constitutes a methodological framework that can be counterproductive if it is too ambitiously or rigidly implemented. Teams perceived positive attributes that are also referenced in previous studies about agile methods, including easy adoption and relation to project success, as well as improved teamwork through the focus on human and social factors.



Statistic of cards and activity on each Kanban board, ordered by number of active users.

REFERENCES: https://www.heliyon.com/article/e01447/

Barroca, L., Sharp, H., Salah, D., Taylor, K., & Gregory, P. (2015). Bridging the gap between research and agile practice: an evolutionary model. *International Journal of System Assurance Engineering and Management*, 1-12. ⚫ Ciric, D., Lalic, B., Gracanin, D., Palcic, I., & Zivlak, N. (2018, March). Agile project management in new product development and innovation processes: Challenges and benefits beyond software domain. In 2018 *IEEE International Symposium on Innovation and Entrepreneurship (TEMS-ISIE)* (pp. 1-9). ⚫ Cohen, D., Lindvall, M., & Costa, P. (2004). An introduction to agile methods. *Advances in Computers*, 62, 1-66. ⚫ Cooke, N. J., & Hilton, M. L. (Eds.). (2015). *Enhancing the effectiveness of team science*. Washington, D.C.: National Academies Press. ⚫ Hoda, R., Noble, J., & Marshall, S. (2013). Self-organizing roles on agile software development teams. *IEEE Transactions on Software Engineering*, 39(3), 422-444. ⚫ König, B., Diehl, K., Tscherning, K., & Helming, K. (2013). A framework for structuring interdisciplinary research management. *Research Policy*, 42(1), 261-272. ⚫ Lassi, M., & Sonnenwald, D. H. (2010). Identifying factors that may impact the adoption and use of a social science collaboratory: a synthesis of previous research. In *The Seventh International Conference on Conceptions of Library and Information Science (CoLIS)—" Unity in diversity"* (Vol. 15, No. 3). ⚫ Lei, H., Ganjeizadeh, F., Jayachandran, P. K., & Ozcan, P. (2017). A statistical analysis of the effects of scrum and kanban on software development projects. *Robotics and Computer-Integrated Manufacturing*, 43, 59-67. ⚫ Sandberg, A. B., & Crnkovic, I. (2017). Meeting industry: academia research collaboration challenges with agile methodologies. In *Proceedings of the 39th International Conference on Software Engineering: Software Engineering in Practice Track* (pp. 73-82). IEEE. ⚫ Pope-Ruark, R. (2017). *Agile Faculty: Practical Strategies for Managing Research, Service, and Teaching*. University of Chicago Press. ⚫ Vom Brocke, J., & Lippe, S. (2015). Managing collaborative research projects: A synthesis of project management literature and directives for future research. *International Journal of Project Management*, 33(5), 1022-1039. ⚫ Wagner, C. S., Whetsell, T. A., & Leydesdorff, L. (2017). Growth of international collaboration in science: revisiting six specialties. *Scientometrics*, 110(3), 1633-1652. ⚫ Ynalvez, M. A., & Shrum, W. M. (2011). Professional networks, scientific collaboration, and publication productivity in resource-constrained research institutions in a developing country. *Research Policy*, 40(2), 204-216.