Capturing Knowledge from Research Projects: From Project Reports to Storytelling

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Abstract--Research projects are essential tools for creating knowledge and fueling societal developments. Consequently, research efforts are consistent with requirements from accepted scientific methods as they are exhaustively recorded and stored. Traditional approaches are equally effective in helping assess the robustness of research methods. However, approaches to recording research projects leave behind a wealth of tacit knowledge and contextual information. Tacit knowledge and contextual information are essential to enable the development of individual researchers and research teams, which in turn have the potential to increase productivity, effectiveness and impact of future research. Found within the project management literature is the idea of utilizing storytelling to record projects' lessons learned. This paper's main research question is "how would a storytelling framework for capturing and sharing knowledge and contextual information improve organizational memory and the management of research projects?" The framework will be piloted at Canadian, Finnish, and Japanese universities. The effectiveness of the framework will be assessed by comparing it with established procedures to record research projects. In terms of organization, this paper will include a review of the literature, a description of the logic and application of the framework, findings from pilot studies, next steps, and opportunities for future research.

I. INTRODUCTION

Research projects are essential tools for creating knowledge and fueling innovation and societal developments. Innovation is built on both individual and collective knowledge [1]. Conflict and divergence are often associated with group creativity. More specifically, Pelled [2] proposed that education and professional experience generate intellectual conflict, essential for innovation. . Conversely, Kreiner [3] proposed project work as a way for organizations and researchers to enable creativity and collaboration instead of a tool for planning and control. Nevertheless, research efforts are consistent with requirements from accepted scientific methods as they are exhaustively recorded and stored to, amid other goals, avoid ambiguity. Traditional approaches are equally effective in helping assess the robustness of research methods. However, approaches to recording research projects leave behind a wealth of tacit[1] knowledge and contextual information. The human mind's peculiar capability of making sense of previous experiences (e.g., recognizing patterns) and applying to present and future contexts is very difficult to capture [1]. Tacit knowledge and contextual information are essential to enable the development of individual researchers and research teams, which in turn have the potential to increase productivity, effectiveness and impact of future research. A group's, in this case a project team's, tacit knowledge exists partially in the minds of each individual within the group [1] . Therefore, an approach to capture it is made paramount. Found within the project management literature is the idea of utilizing storytelling to record projects' lessons learned [4]. This paper's main research question is "how would a storytelling framework for capturing and sharing knowledge and contextual information improve organizational memory and the management of research projects?"

In terms of organization, this study includes a review of pertinent literature. It also describes the process of developing the framework and the framework's internal logic. Furthermore, the results of a pilot study with projects conducted at Canadian, Finnish, and Japanese universities are described. The effectiveness of the framework was assessed by comparing it with established procedures to record research projects. Finally, a discussion of initial findings, next steps for this on-going research, and opportunities for future research are presented.

II. LITERATURE REVIEW

A. Projects

Projects are of crucial importance to organizations [5] [6] [7]. In fact, according to Williams [8] the business world has become project-oriented, which lead to the development of very flexible organizational structures [9], based on numerous strategic projects [10]. Keil and colleagues [11] went to say that the majority of the work that gets done in organizations is done as projects. Nevertheless, typically companies fail to establish a structured approach to learning from projects [4] [9]. It is evident the importance of learning from projects as there is a clear need to systematically collect and disseminate lessons from project-to-project [8] [9]. More specifically, Schindler and Eppler talk about knowledge and experiences from different projects not systematically integrated in the organizational memory [12]. Ultimately, Ayas and Zeniuk [13] claimed learning is not a natural outcome of projects. Consequently, knowledge created within a project is not shared across projects.

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[1] The concept of tacit knowledge was originally proposed by Polayni [43] and popularized by the works of Nonaka and Takeuchi [44]. Polayni argued that some parts of knowledge are not easily externalized (the tacit dimension) whereas Nonaka and Takeuchi proposed that knowledge is created through a process that essentially, continuously converts tacit knowledge into explicit (externalization) and explicit knowledge into tacit (internalization).

B. Project review

The many approaches to project review (e.g., lessons learned, post-mortem) normally refer to two basic ideas: 1) capturing knowledge generated during project work to be applied in future projects [4, 14, 15, 13, 16]; 2) preventing mistakes from happening again [17, 18, 19, 20]. Kasi et al. synthesize the second idea by stating that "failure is a learning opportunity" and this learning represents the whole value of doing reviews after projects [21].

Regardless of the approach, project management literature appears to have focused on the more tangible aspects of project knowledge [22]. Arguably not all the wealth of knowledge involved in such projects can be externalized. The emphasis has been on results, not on how and why those are reached. Both tacit and explicit knowledge need to be captured and combined [23]. Schindler and Eppler [12] coined the term 'project amnesia' and claimed that most projects are essentially not well-documented, described in generic terms making them difficult to visualize, they are archived in an easy to find and retrieve way. Von Zedtwitz [4] talked about barriers to learning from projects. Among these barriers two types of barriers are particularly interesting for the current discussion. The first type of barrier is psychological. The second type of barrier is epistemological. The former greatly attributed to memory bias and the latter closely related to challenges in abstraction and articulation of tacit knowledge [4]. Additionally, Leonard and Sensiper [1] claimed inequality status and distance (physical and time-related) are also barriers for sharing. VonZedtwitz [4] hints to the development of myths, stories and corporate culture as a way to address some of those barriers. According to Snowden [24], deliberately creating teaching stories from organizational experiences is an essential skills. Ultimately, Snowden [24] proposes the use of stories to avoid the sometimes overly-explicit and ineffective academic debate.

C. Project review in terms of storytelling

Roth and Kleiner [25] specifically mentioned storytelling as a much richer way to refer to the chronological chain of events that a project represents. According to Esser [26], arguably storytelling is one of the few possible ways tacit knowledge can be shared and project teams already do it informally. Denning [27] stated there is no single way to tell a story but proposed different ways of approaching storytelling. One approach will be to develop a story to spark action. Another would be to develop a story to share knowledge. Referring back to the influential work of Collison & Parcell [16], an after action review should focus on understanding the gap between what should have happened and what actually happened. That would naturally lead to learning and consequently modifying future behavior. Combining Denning [27] and Collinson & Parcell [16] perspectives, stories should be used to share knowledge and spark action. Boyce [28] went further to talk about storytelling as a symbolic way by which teams construct shared meaning. Furthermore, according to Koners and

Goffin [29], stories and metaphors are useful for understanding tacit knowledge exchanges. Conversely, MacMaster [30] declared that the most valuable type of learning comes from listening to individuals' stories. Their accounts provide context and nuances hidden within project documentation. Borges and Vivacua [31] mentioned the idea of a good story containing objective and subjective, emotional and rational aspects. According to the authors, each element of the project team contributes with complementary pieces of the story.

D. Storytelling framework

Considering the literature on storytelling itself, the work of Campbell [32] proposed a storytelling framework based on some of the world's most popular stories. Such stories represent traditional approaches for sharing knowledge (including tacit knowledge) for generations, across many cultures. He claimed that most of those stories shared a common structure. According to Campbell [32], there are three main phases within a story (i.e., departure, initiation, and return) and a total of 17 steps. This structure is known as the Hero's Journey. Campbell revived it and gained even greater notability with another work - The Power of Myth [33]. Vogler [34] , condensed and generalized Campbell's original idea by proposing 12 stages of the Hero's Journey. From Vogler [34] the 12 stages are the starting point for the framework developed and applied to this study.

III. THE FRAMEWORK

Vogler [34] is the starting point for developing the framework. Considering the objectives of this study, Vogler [34]'s 12 steps are summarized in Fig.1 and adapted to the context of research projects in Fig.2.
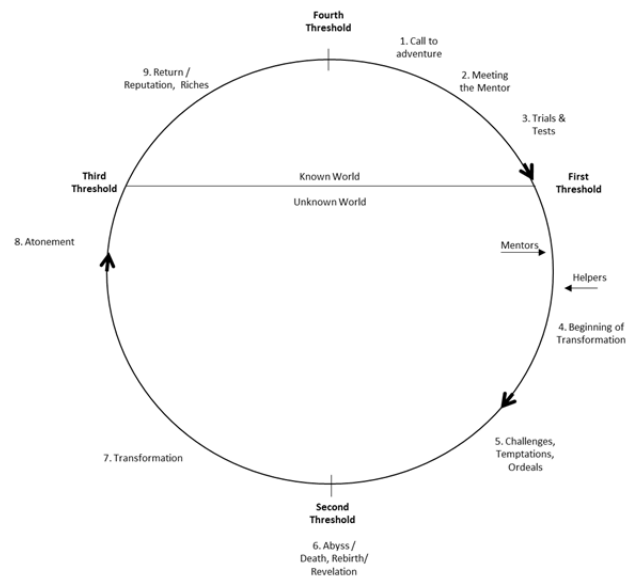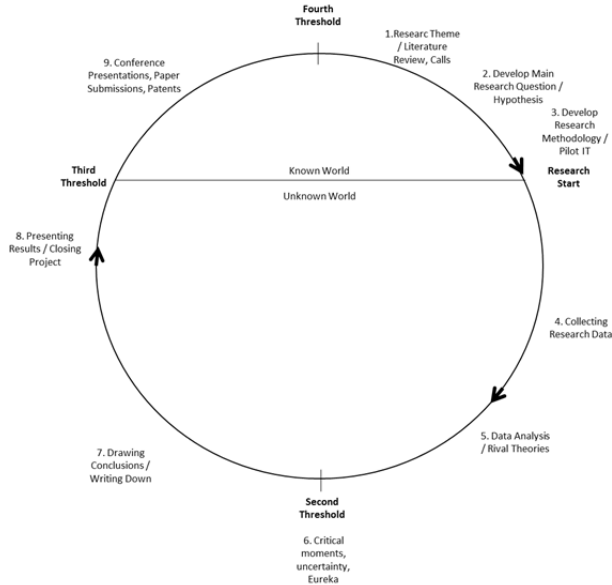

Fig. 1, Vogler's Framework

Fig.2, Vogler's Framework Adapted

In the proposed framework, step 1 is equivalent to a call to adventure. It happens when a trigger first sparks an idea for a research theme. This trigger can come from a variety of sources. For instance, it may come from a researcher's access to literature, observation from practice, participation in conferences or specific calls made by funding agents (public or private) or combination of these. During step 2, sometimes through interactions with a more senior researcher (in this case equivalent to a mentor), main research questions are formed. It is also in this stage that research teams are formed. Step 3 is when the research methodology is developed and tested. This phase is equivalent to trials and tests in the Hero's Journey. During step 3 the research team becomes more knowledgeable about the research theme and research methodology is refined. It is also during step 3 the project clears its first threshold. It must be formally initiated by the institution. During step 4, data starts to be collected and initial observations start to take effect. This is the beginning of the transformation, when knew knowledge starts to be generated. Step 5 refers to data analysis. It is a phase researchers need to clear their personal bias, rival theories, and rely on robust data analysis to be able to draw reliable conclusions. This is equivalent to temptations and ordeals within the Hero's Journey. Step 6 represents critical moments during the project. Uncertainty, discrepancy within results, disagreements between team members are some of the challenges that may occur. This phase is expected to be intense in knowledge creation. It is also expected that projects may fail at this point. In the case of a successful project, it is during this phase that a Eureka moment occurs and the project clears the second threshold. Step 7, equivalent to transformation, when conclusions and main findings of the

project are compiled and prepared to be translated to the outside of the project team. Step 8 is about presenting the results of the project internally and, when applicable, to funding institutions. This represents the closing of the project and it is equivalent to atonement. At the end of this phase the project will have cleared the third threshold. Step 9 is about presenting the results of the research to the wider community. Conferences, presentations, journal publications, and patent fillings are common ways of achieving this. It is also time for researchers to collect accolades related to successful projects. Awards, keynotes speeches, media exposure are some examples of that. This is the equivalent of the return of the hero. Because of the dynamic aspect of research and knowledge generation and because of the nature of research work, the conclusion of step 9 is expected to trigger new research interests. This represents the fourth threshold and the reiteration of the cycle.

IV. PILOT STUDY

For the pilot study three research projects from Canadian (i.e., Kwantlen Polytechnic University or KPU), Finnish (Tampere University of Technology or TUT), and Japanese (University of Tsukuba or UT) were chosen. The choice of multiple countries was to test the framework in potentially different research cultures as each of the pilot project represented a typical research project in the country Finished projects with multiple researchers that involved a minimum of two years of research work were selected to allow a certain level of comparison of results. Single case studies have been frequently criticized because they are incapable of providing generalizing conclusions [35]. Nevertheless, Hamel et al. [36] and Yin [37]argue that the relative size of the sample used, however small or large, does not transform a single or multiple case into a macroscopic study. The single case could be considered acceptable, provided it meets established objectives for the study. Outcomes from individual case studies are not statistically generalizable but analytically generalizable [38]. Considering this study a first step toward developing the framework, the current samples should be considered suitable. A questionnaire was developed to test the effectiveness of the framework to uncover information and more importantly tacit knowledge within select research projects. The questionnaire followed Vogler's framework [34].

A. Questionnaires

Research team members were interviewed according to the questionnaire and answers were transcribed and summarized. Table 1 summarizes each of the projects.

A questionnaire reflecting the framework to investigate select research projects was developed (Table 2).

TABLE 1, PROJECTS SYNOPSIS

	Project 1	Project 2	Project 3
Project Title	The role of happiness in organizations on job performance	UXUS (User Experience and Usability in Complex Systems)	MOOR (Massive Online Open Research)
Institution / Country	Niigata University of International and Information Studies, University of Tsukuba, Nihon University / Japan	TUT / Finland	KPU/TUT/Institute for Material Innovation (Canada)
Project's General Theme	This project examines the effect of subjective well-being, often referred to as happiness, on job performance. Other constructs related to the organization of the firm and its culture will also be included, and the mediating and/or moderating role of happiness assessed. Findings will include comparative results in Japanese and French companies.	Various perspectives to user experience, more detailed information available on program's web page (http://www.fimecc.com/content/uxus-user-experience-and-usability-complex-systems)	This project proposes the creation of a massive collaboration network to deal very complex research problems.
Project Timeline (Starting Date / Finishing Date)	04/2014 – 03/2017	2010-2015	2013-2014
Project Team	Professor from Niigata University of International and Information Studies, Professor from Nihon University, Two Professors from the University of Tsukuba.	Team in TUT composed by Ph.D. and Master's Students working with a Professor.	Two researchers from KPU and a Researcher from TUT.

TABLE 2, DEVELOPING THE QUESTIONNAIRE.

Heroes Journey Phase	Adapted Heroes Journey Phases	Questions
1. **Call to Adventure**	1. **Developing a Research Theme & Main Research Question.**	1. How did you first come-up with an idea for a research theme? 2. What were the triggers (e.g., literature review, conference presentations, and previous research) for this research project? 3. Describe the process within which a research theme and main research questions were developed.
2. **Meeting the Mentor**	2. **Team formation / onboarding**	4. Describe the process of forming the project's research team. 5. How did team members were integrated into the project? 6. Was there clearly define roles, reporting structure and communications protocol within your research team?
3. **Trials & Tests**	3. **Developing Research Methodology & Piloting It.**	7. Describe the process by which a research methodology was developed. 8. Describe how the research project was formalized by the institution (s). 9. Describe the process of acquiring funding for the project. 10. Was there a pilot study to validate the research methodology? If yes, how did it happen?
4. **Beginning of Transformation**	4. **Collecting Research Data, Observations, conducting experiments.**	11. Describe the process by which the project was initiated? 12. Describe the approach and process of collecting data for the project? Illustrate the above with specific examples.
5. **Challenges, Temptations and Ordeals**	5. **Performing data analysis, comparing rival theories.**	13. Describe the approach and process by which research data was analyzed. How was the team involved in the process?
6. **Abyss, death, rebirth, revelation**	6. **Discussing discrepancies, seeking common understanding, resolving conflicts, eureka moments.**	14. Was there any discrepancies or unexpected results? If yes, how did the team deal with them? 15. Was there conflict in dealing with research data (observations)? What was the approach to mitigate conflict? Illustrate with examples. 16. Was there any incidents or situations not directly related to the project, but that may have influenced it? If yes, illustrate them with examples.
7. **Transformation**	7. **Describing findings, drawing conclusions, writing-down results.**	17. Describe the approach and process by which research findings and conclusions were reached. Illustrate, provide examples. 18. Describe the team's sentiment about findings, conclusions, and overall perception of the projects accomplishments.
8. **Atonements**	8. **Communicating results, closing project.**	19. Describe the approach and process by which research findings and conclusions were communicated and shared. If applicable, provide samples (e.g., reports, bulletins, website posts, blogs, wikis).
9. **Return, Accolades, Riches**	9. **Conference publications, journal publications, awards, press releases, keynote talks.**	20. Describe and exemplify the project's main achievements (e.g., conference presentations, research papers, awards). 21. How would describe the team's overall perception of the projects success? Was it in line with the perception of the organization & funding agent?

The original idea was to adapt a script that is proven to be very effective to capture and share stories across cultures to a more specific context. Namely, we developed the questionnaire to match the typical phases of a research project with the steps found in a previous script found in Vogler [34].

The questions were developed to spark reflection by team members with the objective of going beyond what is normally reported in formal processes. As previously stated the emphasis is on tacit knowledge and contextual information. Answers from each of the team member will help compose a story that is a more accurate representation of what happened and more importantly the learning that occurs in the process.

Utilizing tacit knowledge requires trust and transparence between stakeholders, which are elements of processes that might be difficult to be documented in written form. Utilizing the framework presented previously, it is possible to flesh out the experience of less glorious moments in the project, including side-tracks, handling indirect turbulence around the project, etc. and to increase wisdom based on research projects.

B. Project findings

The project led by KPU was the most loosely coordinated project of all. First of all, researchers were engaged in other daily activities. As a matter of fact, two of the team members had administrative roles instead of typical research roles. Second of all, team members could not work collocated. One of the team members was overseas separated by a 9h time difference. It was not possible to schedule face-to-face meetings, not even during the project's kickoff. Moreover, the funding institution (as stated on the grant) had mostly quantitative expectations in terms of the project's completion. Ultimately, there were no clear roles or reporting structure in place. The team's cohesiveness came from the notion that each team member brought to the project complementary and valuable expertise. The team's motivation came from a shared vision of the potential impact the research could have. The team collegiality came from the trust team members had in each other due to the several previous interactions. Cohesiveness, collegiality, and motivation combined guided the team toward a positive outcome. Such positive outcome goes beyond the strictly academic outcome to include learning concerning engaging in cross-cultural, multi-

location, complex research projects with loosely define roles and limited time commitment. Such learning is mostly tacit.

The research program of TUT had formal structure and the research in the program was the main activity for the researchers involved. The research program for TUT was reported by two stakeholders; a person who was a PhD candidate at that time and a Professor who had program-wide, bi-monthly meetings which build awareness among various research institutes and private companies involved. However, the interesting question was how to make this knowledge available also to those that are not involved in the project and therefore not a part of these meetings? The current and most used way to publish results will increase our knowledge (including knowledge of those that were not part in the project) to solve problems but not necessarily help us find better practices to solve those problems. Furthermore, interviews indicated that in spite of large programs and a diversity of backgrounds for researchers, data analyses were mainly individual driven and possibilities for collaboration were not fully used.

In the case of the Japanese UT team, the members went through a discovery process whereby team members had to prove their contribution to the project, first and foremost in the time invested during regular research meetings. Early on after funding was obtained, and in part because of the loosely-structured nature of the research team, leadership was taken over by the member with a higher contribution (in terms of time and tangible output) to the project. The original leader and other team members accepted the takeover for different reasons: a learning opportunity; limited time devoted to the project. The no-contribution of one member lead to his removal from any output (publications) of the project, with the approval of all other members; however, his name remains of the funding applications and he kept receiving (minimal) funding to avoid creating problems for him and drawing attention from the funding agency. This painful event led to the establishment of mutually-created and accepted working norms for the group which were internalized by all members and became part of their group culture.

Our results indicate that using the Hero Journal framework will support sharing tacit knowledge with important academic and managerial implications. As follows table 3 has a summary of findings from each project.

TABLE 3, SELECT FINDINGS FROM PROJECTS.

	KPU	TUT	UT
Call to Adventure	The call to adventure was perceived as such by one of the researchers during a conference. The team was built based on affinity in research interests and previous relationships. The journey became official when the main researcher was awarded a research grant to pursue the project (i.e., the project was officially endorsed by the university)	Call to adventure for the core team came from a visionary person in private company. After project got funding the amount of member expanded and formal structure was established	The call to adventure for most members, except one (the initiator and original leader), was external in that it came from someone else. Members acted on that external opportunity.
Meeting the Mentor	All researchers shared the mentor role at different periods of the project. They have complementary expertise and experience. For a short period of time, the researcher with the original idea took the mentorship until that idea was fully comprehended by team members. Literature and records from other projects and initiatives with similar theme also served as guidance.	The mentor of the whole program gathered the core team based on her existent relations. 'Mentor' of the TUT side was introduced to his research group partly by administrator and partly by his own selection (recruitment)	Personal affinities, socialization activities, and past relationships played an important role in on-boarding. Roles were not formalized at the beginning of the project and tasks were left to spontaneous resolve by specific members.
Trials & Tests	The methodology evolved with the investigation. Literature review and the many cases studies were paramount to define it. Researchers worked in multiple iterations adding contributions and refining the project as they went.	For the whole program there was not one methodology, but each researcher made his/her own decision based on the current task, with help of the leader of the sub project / work package leader	The methodology was decided by those with the most past experience, and approved by other members. Funding was in fact the key moment which green-lighted the project; until then, the members had only informally agreed to take part, without any real obligation to follow through.
Beginning of Transformation	As the work progressed, new findings by specific team members would inspire further advancement and understanding of the research problem at hand. Only two of the researchers were in the same institution, so the team extensively employed video conferencing software for building consensus. Because of previous relationship the workflow was delivered in a very collegial fashion,	The core team elaborated the project plan for 2 years before it was accepted by the funding agency. After the funding decision, there were bi-monthly meetings for all stakeholders, and since the second funding period also weekly online meetings among work package leaders. Those bi-monthly meetings were considered very helpful and meaningful to share knowledge and results among all members of the program (and beyond the core team).	Face-to-face meetings played an important role at the beginning of the project. In addition, regularly-scheduled whole day meetings served to deeply socialize the team members who have enjoyed spending time together, for the purpose of the research project but also of forming personal relationships beyond their work.
Challenges, Temptations, Ordeals	Managing time and integrating contributions from individual researchers was the main challenge. Finding cases and initiatives that could potentially be employed in study was another. Complementary expertise that were essential for the success of the project, at times, made it difficult for reaching consensus. Finally, there was a clear element of cultural differences in terms of communications and approaches to get the work done. Luckily, team members were good acquaintances before initiating the project.	The knowledge of the whole program was not utilized on the data analysis, but it was mainly up to the current researcher and in some extent the research team. One of the whole program wide questions was how to define the user experience. There was no need for the definition during the early stages (before the funding decision) but as more people were involved in the program, a variety of perspectives arose.	Tasks were not assigned but instead willfully undertaken with the required abilities; interpretation of findings, which can be undertaken by all members, were indeed done by all as a group, building upon the diversity of the group.
Abyss, death, rebirth, revelation	The main challenge within the project was related to coordinating the work and everyone's contributions. One of the team members was separated from the remaining of the research team by thousands of kilometers and a 9h time gap. To make the matters worse, all team members have multiple commitments and the time dedicated to project had to be split with other everyday activities. A specific moment of suspense and doubt happened when an initiative with a very similar name to the name of the project was spotted online. Likely, despite a similar name and somewhat the same general theme, the initiative was completely diverse to the one proposed within the project.	Even though there was channel for information sharing between research organizations, the preparation process for manuscripts was not transparent and all relevant parties were not necessarily able to contribute. As the program got bigger after the first funding period, the funding agency agreed to increase funding accordingly but they decreased the funding for another program later . That generated some challenges for research institutes that had dedicated different resources for these two programs.	Because of the loosely-structured nature of the research team, leadership was taken over by the member with a higher contribution to the project. The original leader and other team members accepted the takeover for different reasons: a learning opportunity; limited time devoted to the project. The no-contribution of one member lead to his removal from any output (publications) of the project, with the approval of all other members; however, his name remains of the funding applications and he kept receiving (minimal) funding to avoid creating problems for him and drawing attention from the funding agency.

Transformation	The average perception was that the project demonstrated to have great potential for further development; the concept was very attractive. Because none of the researchers involved was entirely dedicated to the project (all researchers have other daily responsibilities), the results were considered satisfactory. Nevertheless, the main proposition within the project could not be proven.	Members of the program seemed to consider the program very successful. It generated numerous academic publications and reports.	Research members experienced the project differently, based on their past experience and original expectations; some took it as a learning opportunity without much expectation of productive output, while others as an opportunity to productively accomplish research outputs.
Atonements	The main output for the project was a conference presentation and conference paper published within its annals. Despite displaying the main proposition and results of an ongoing research, the paper and presentation were well-accepted. Later, the paper was uploaded to a popular research platform and has been sparking a lot of interest, considering the hundreds of researchers that have thus far accessed it.	Academic publications were submitted to academic outlets and more practical reports shared program wide, and through open access portals. As the program received public funding also all results are public. Internet was used and printing hard copies of results.	As an academic research project, the output and its communication is purely through expected academic channels.
Return, Accolades, Riches	The acknowledgement stemming from the conference presentation and the attention sparked on select researched communities gave the team a sense of accomplishment. From an institutional perspective (in the case of the main researcher), the paper is a material proof that the project was successfully completed. As a matter of fact, that is the single requirement to officially close a research project (as stated by the rules of the specific grant obtained). An official report accounting for the publication and conference presentation is uploaded to a research platform and becomes searchable within the university's firewalls. Specifically from the team's perspective the collaboration itself was a learning experience that can be transferred to other research projects.	Even as all members were very pleased afterwards, the financial situation in Finland has changed and similar large consortium won't get funding anymore. The work continues in smaller research projects, and there are few in the pipeline. However, UXUS members benefit from the mutual experience and increased amount of personal connections they have developed.	The team has exceeded its expectations in that it was quite low at the beginning; it was the first time the team was working together and the achievement of research output reinforced the team's desire to work together on subsequent projects, under the new leader who emerged after the original leader agreed to hand over its informal authority. The team has acquired tacit knowledge on how to run projects with that particular team composition; it is aware of the members' technical abilities, working styles, behaviors with authority, and willingness to work together.

C. Comparative case analysis

Although only three country cases are included in the analysis, we can already see some patterns emerge when projects are analyzed using the Hero's Journey framework.

Call to Adventure. It is either internal or external to the team, possibly made by one of the core team members. In these academic projects, funding becomes the external validation and official starting point. In all cases there was somewhat fuzziness before the research actually started.

Meeting the Mentor. The mentor can be introduced as an outsider to the team based on his/her recognized merits. Or a more experienced team member can act as an informal mentor, so long as the team is built on strong inter-personal relations.

Trials & Tests. Several methodologies can be used based on the previous knowledge of different members, sometimes leading to cross-learning. The methodology can be negotiated by the team based on one team member's past experience, leading to shared explicit and tacit knowledge.

Beginning of Transformation. Time spent together designing the project before and/or after funding was obtained is key. Personal affinities are also important for members to develop trust.

Challenges, Temptations, Ordeals. While the team structure is loose at the beginning, a more formal approach is taken in order for the team to reach its goals of concrete outcomes. Time management and cultural differences among team members from several nationalities were recognized.

Abyss, death, rebirth, revelation. Challenges can appear in terms of funding, unbalanced member contributions, project originality and legitimacy in light of other similar projects stumbled upon during the previous phases.

Transformation. Besides the satisfaction coming from academic publications, some members took the project as a learning opportunity without much expectation of productive output, while others as an opportunity to productively accomplish research outputs.

Atonements. Because the focus of this paper is on academic research projects, outputs and their communication are purely through expected academic channels, which are often requirements from the funding agencies.

Return, Accolades, Riches. Besides academic achievements, members report that they have gained valuable experience, research skills, and personal connections which will be useful for future projects, either in teams or individually.

From the previous comparative case analysis, several elements are found to influence the projects, namely, funding, institutional pressure, and team composition. First, funding is a required component of each project, and it often marks the official start of the formal project, although preliminary work has often started ahead of funding approval. In addition, the source of funds, whether public or private, determines whether the projects are considered and evaluated from an academia or practice perspective. Second, research – and research projects – may be mandatory or optional depending on the team members involved and their job description or expected contributions. Different levels of involvement and commitment derive in fact from institutional pressures at the universities or institutes where research projects are carried out. In all projects, whether research is part of the members' jobs or not, the learning which resulted from the projects is considered to be an important byproduct regardless of direct project output. Third, some teams are more diverse in terms of nationality, and sometimes their members are geographically distant. Team composition and physical layout emerge as important factors which affect the teams' transformation, trials & tests, and challenges, temptations, ordeals.

V. REFLECTION TO THE WRITTEN REPORTS/DOCUMENTS ETC.

The written documents produced in the projects mainly address aspects like academic and managerial contributions. Those documents can be used to justify the research conducted and serve as reference for future research (see Table 4).

TABLE 4, AVAILABLE PROJECT DOCUMENTS.

	KPU	TUT	Tsukuba
Formal final report	X	X	X
Sub results also available	No	X	No
Utilization of social media for sharing results	X	X	No
Lessons learnt -material available	X	X	No
Majority of researchers are the same in further studies/projects	X	No	No

Informal discussions and in particular conflicts and indirect changes in the research ecosystem were only partly documented, yet those might have had a fundamental role in the documented results. On the other hand, type, amount and content of documented results are emphasizing the aim to increase the awareness of deliverables, which is naturally one of the preferred outcomes of any research project. Congruently, neither the sharing of tacit knowledge nor learning (internalization of tacit knowledge) are central motives of project documentation. Furthermore, depending on the elements discussed previously (Funding, institutional pressure, team composition), the cohesion of the research team impact on the amount tacit knowledge that is shared informally and also what kinds of formal reports are written.

Contrasting interviews following the Hero's Journey framework and the existing project documentation, the main finding is that those are supporting each other as they are addressing the same project but from different vantage points. The former highlights the path over the results, and the latter focuses on results without paying too much attention to the path. The strength of the Hero's Journey framework seems to be the possibility to unveil the wisdom behind the decisions. Bringing knowledge to the equation, formal documents recording research project work focus on products, the output of a process, largely composed of explicit knowledge. The proposed framework based on the Hero's Journey tends to focus on the process, the experiential and relational part of the research work, greatly related to tacit knowledge. Furthermore, the fuzzy front end of the research project is not typically addressed in reports and publications especially in a way that they deliver the description of the mist around sparking action and offer any guidance for future research projects.

VI. CONCLUSION

The original research question refers to a framework that is able to improve knowledge sharing, consequently improving the building of organizational memory and management of research project. The proposed framework based on the Hero's Journey demonstrates, taking all three projects into consideration that it is able to reveal learning that goes beyond the focus on objective outcomes. Such outcomes, normally preferred by funding organizations for the sake of management and control, focus on the product of a research effort, primarily relying on explicit knowledge (e.g., research papers, patents, bulletins, blog postings). Additional learnings from the framework are likely to be the most valuable ones. They refer to learnings related to the process of engaging in research. Those learnings can be categorized in two general groups. The first is experiential learnings about conducting research work, from data analysis to the synthesis of conclusions. The second is relational learning, closely associated to working in a collaborative environment with other researchers. These two types of learning, tacit knowledge based by definition are normally restricted to individual researchers or are embedded into the modus-operandi of a research group, particularly when there is a longer tenure involved. If by employing the framework a research team is able to build a story about the project in addition to the formal process to record research work adopted by the host institution, the learning from the project product & process, explicit & tacit will be available beyond the research project, throughout the organization. Hence, resulting on increased organizational memory. By recording learnings about the process of conducting research, the project team will be sharing learnings that will ultimately help improve the organization capability of conducting research itself. Consequently, the management of research project is proven to be improved.

According to Shenhar and Dvir [6], despite decades of building a discipline, project management research is still young, developing, and lacking of a strong intellectual basis. Referring back to a previous study from 1996 about the typology of project management research [5], in more than 20 years learning from projects is not a theme mentioned in an otherwise very influential and comprehensive work. Within such frame of mind, the main theoretical implication is the development of the framework, which can be further develop and applied beyond the constraints of this study. We also propose a set of questions that link a general Hero's Journal - framework to research projects. A secondary theoretical implication is to emphasize the need for a complementary focus on process and tacit knowledge within research projects.

The main practical implication is to inspire research groups elsewhere, regardless the field, to engage in storytelling (or conversations) to elicit the learning from engaging in research projects. In the long-run improving the process will lead to better productivity. Academic productivity is the engine that powers the academic research world.

One of the limitations of this study refers to the size and nature of the sample of projects studied. A related limitation refers to the development of conceptual model to test the validity of the framework using a larger and more varied sample of case projects. Future studies should focused on both to validate the framework with bigger sample size. Another opportunity for future studies is to focus on other types of projects different than research projects. Project performance in business is alarmingly low [6], despite the widely employed project management practices such as the PMBOK [39].The PMBOK has knowledge areas and processes centered on Human Resources and Communications, but the PMOK does not directly refer to learning or the knowledge dynamics within projects. Hence, some of the potential areas for investigation are new product development and information technology projects. .

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