Exploring Knowledge Transferring and Conversion in the Fuzzy Front End of Collaborative Innovation Development

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Abstract: The research goal is to investigate the specificity of activities of startup entrepreneurial teams that co-develop new product concepts with stakeholders.
We identified a specific pattern of knowledge conversions/transferring through observations of collaborative activities, followed by questionnaires and interviews with members of the entrepreneurial team.
The research pool comprised eleven entrepreneurial teams of 4-6 members each. The predominant objects of conversions and transferring among the entrepreneurial team members and external stakeholders were identified as tacit knowledge types: know-how (what, why), insights, intuition, attitudes, beliefs (as a type of attitudes), and entrepreneurial vision. Types of conversions and transferring were the same in all the teams but the application of managerial tools (facilitating means) that allowed transferring/conversions varied. The identified specificity of knowledge processing could be used to optimize those tools/methods by elaborating specific measurable criteria of how efficiently tacit knowledge was transferred and converted.

1. INTRODUCTION

The research project in progress has three phases (milestones) of research results. The first two were published at the conference proceedings Laptev and Shaytan (2021). The last phase result of the research is revealed in the current paper.

The research project started from a broad question of how we can improve the management of an entrepreneurial team (ET) that co-develops innovative product/service concepts with customers/users/consumers at the fuzzy front end of innovation (FFE). To narrow the broad research question, we decided to apply the ground theory (Birks and Mills, 2015; Chun et al., 2019) approach.

First, we gathered qualitative data by observing ETs working (acting) in a natural environment; then we identified prospecting research objects for hypothesis creation and more detailed investigation through observations, questionnaires, and in-depth interviews. The pool of ETs was at the premises of the university accelerator “innovationStudio”. The first milestone/result of the research project is the creation of the general knowledge transferring and conversion (KN&C) model specific for the ETs new/innovative product development at the FFE. The generalized overview of the KN&C model is presented at the conference proceedings Laptev and Shaytan (2021). The next research milestone is the identification and prioritization of barriers that impede knowledge transfer and conversion (Laptev and Shaytan, 2021).

The third, current phase milestone/goal of the research project is detailing the KT&C model to approach operationalization criteria that can be used to improve entrepreneurial management

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by using identified attributes (properties) of the KT&C. Managerial operationalization of the KT&C model and the barriers are the way to improve management of entrepreneurial teams in co-developing innovative products at the FFE. Somehow the initial broad research question became a strategic goal (or a vision) that drove the ongoing research in progress.

This paper contributes to the whole research project by offering a specific pattern/scheme of the KT&C at the ET in the FFE of collaborative new/innovative product development.

The fuzzy front end (FFE) is the stage inside the new/innovative product development (NPD) process where a feature set of innovative products is determined and validated (Koen et al., 2014); i.e. the stage that corresponds/overlaps with the “customer discovery” stage (Blank, 2013).

As a common best practice, the FFE is driven by four advanced paradigms.

(1) The “user centered design” (Zorzetti et al., 2022) that in a broader (more complex context) can be worded as the design driven by the requirements of stakeholders. Also, it can be regarded as part of the paradigm named “requirements engineering” (Yin et al., 2022), which aims to build a prioritized requirements list (product backlog) in the eyes of users/consumers/customers or even border category -stakeholders.

(2) The “lean startup” (Zorzetti et al., 2022) is a type of management that priorities validation of viability of a product and business idea in short incremental development cycles. If there is a lean startup manifest then it comprises statements: “fail fast”, “planning is a must, but your plan is zilch/insignificant”, “bootstrapping validated learning”, “customer/stakeholder feedback is worth more than your intuition/judgement”; i.e. the lean startup paradigm overlap with agile management approach/paradigm but has its own wordings to stress attention to particular entrepreneurial management attributes.

(3) The “customer discovery” is part of the “customer development model” (Blank, 2013) and is characterized by the set of managerial objectives and milestones in the development of a startup and new/innovative product/service development.

(4) Entrepreneurial management– a general type of managerial approach to identify and pursue opportunities without regard to resources currently controlled (Gartner and Baker, 2010). The type of management refers to the development of startups that are built around new valuable/competitive solutions (products/services) that address identified values of customers/users/consumers.

Management can be defined as processes/activities of identifying goals/objectives/requirements, establishment of process to pursue those goals/objectives, and establishment of attributes and metrics to control the achievement of these metrics. The above paradigms outline a common advanced management structure for NPD and startup development by entrepreneurial teams. When we say outline, we mean that a manager has fundamental general principals and milestones to follow in detail to implement a management system for a particular NPD project (milestones, i.e. goals and tasks that the validation of achievements identifies and moves on to the next development phase).

Nowadays, mostly all NPD projects are managed with components of Agile (flexible) type of management structure, and commonly use concepts from “SCRUM” or “Kanban”. Modern teams consist of designers, engineers, business analytics, and entrepreneurs.
For our research, it is necessary to distinguish an entrepreneurial team, the object of our research, from the design/engineering teams as both types manage NPD process. An entrepreneurial team that works on a new/innovative product has broader product acceptance criteria related to business model construction-validation, broader responsibilities in relation to start-up building, etc. to use it as a means for a value proposition implementation. Those extras over common responsibilities of designers and engineers add new risks to be taken by entrepreneurial teams (ET) and add extra management complexity.

The first part of our research project revealed that the extra management complexity at ETs leads to a significant reduction in explicit-to-explicit knowledge conversions (Laptev and Shaytan, 2021). ETs, in comparison with design and engineering teams, don’t have “time” (i.e. don’t have enough motivation) to document explicit or implicit knowledge. Documentation is regarded as an extra burden with no significant “pay off”. At the FFE of NPD, entrepreneurial teams demonstrated extreme follow-up of the Agile manifest principle that the delivered feature is more important than a document. In case of limited resources (bootstrapping and lean startup strategy of development) and extra complexity of management system, entrepreneurial teams (ETs) sacrifice common design and engineering practices of documentation. The 4-mode SECI (socialization, externalization, combination, and internalization) model (Nonaka and Takeuchi, 1995) of the knowledge conversion have a distinct form of the 3-mode SEI (socialization, externalization, and internalization) model of knowledge conversion in the case of ET in the FFE of NPD process according to Laptev and Shaytan (2021). At an ET in the FFE of NPD that leads to “Combination” mode loss and affect significantly new knowledge generation. Contrary, for design and engineering teams a new knowledge generation is significantly based on pre-coded knowledge (for example, libraries), the “combination” mode.

In this research project, ET in the FFE of NPD had collaborative counterparts – innovative/lead users. These users are allowed to follow requirements engineering principles in the form of user/customer centered design. Moreover, collaboration with innovative/lead users is regarded as co-creation through the exchange of the most valuable innovative asset - tacit knowledge.

The collaboration concept was investigated before from various directions as a process for cross-organizational linkage (Emden et al., 2006), cross-enterprise processes (Deck and Strom, 2002; Bodas Freitas and Fontana, 2018; Sinkovics et al., 2018), as well as customer co-creation of innovation in corporations and SME’s (Vrandea et al., 2009; Frow et al., 2015; Kleber, 2019).

Knowledge is built up from data and information, and, of course, prior knowledge. The knowledge, and its various concepts, bear various meanings that depend on ontological perspectives and contexts. In a broad sense, knowledge is defined as awareness or understanding of something. Levels of awareness and understanding vary; and, in some contexts, researchers even require opposing the awareness concept to the knowledge one (Trevethan, 2017). However, the scope of our research requires us to set knowledge concepts around the transition of knowledge and to leave discussions about concepts of familiarity, awareness, and understanding over the paper.

Knowledge is one of the strategic assets of an organization. Knowledge management has the potential to produce a sustainable competitive advantage (Bollinger & Smith, 2001; Murray & Peyrefitte, 2007; Constantinescu, 2008). There are research papers devoted to knowledge management not only in large but also in small organizations and entrepreneurial entities (Hutchinson and Quintas, 2008). Knowledge management practices in small and large organizations
differ significantly (Hutchinson and Quintas, 2008). Transferring knowledge, and understanding of its conversions through learning and experience, is the essential competitive advantage in an environment with a rapid change in customer requirements and shortening product life cycles (Wang & Noe, 2010).

In this regard, it’s important to further explore nuances of the knowledge transferring and conversions to extend opportunities for management methods/tools improvements.

In this paper, we refer to implicit knowledge as “easy” to codify knowledge but that was not codified yet. In the literature “implicit” and “tacit” are used interchangeably; however, at the point of building a knowledge management system, interchangeable usage will lead to misidentification of the knowledge (object) qualities and, therefore, mess up the management by using wrong strategies to its processing. The implicit knowledge is a matter of codification strategy. Tacit knowledge cannot be processed under a management system built under the codification strategy that has a lack of approaches/methods for its transferring and sharing.

The capability of becoming explicit and vice versa is an important quality that enables the continuous evolution of the knowledge base of practical and theoretical understandings. This quality is the focus of the current research and is described below through the SECI (Socialization–Externalization–Combination–Internalization) model of knowledge conversion (Nonaka and Takeuchi, 1995).

Tacit knowledge transferring and conversion among entrepreneurial team members, and stakeholders is a core process in innovative products/services development. Our research is of value for the entrepreneurial management domain.

In reviewing the theoretical backgrounds of the tacit knowledge, we should also mention skills. Skills, according to McAdam et al. (2007), “is the epitome that is most used without any form of definition; some other terms such as ability, crafts and practical knowledge are closely related and often used in the same meaning” in the knowledge management literature. Skills, as ability and practical knowledge, are the “backbone” of the activity of any group and organization including ETs. However, our research requires to keep the focus on innovative/lead user’s know-how capture/sharing/transferring as a type of skills (knowledge) facilitating opportunities for innovation insights. We left skills (in its common sense) out of the research scope and kept focus on the know-how concept.

Somech and Bogler (1999), formalize practical intelligence as “a person’s ability to apply components of intelligence to everyday life”. Besides the concept of practical intelligence, there are many other types of intelligence. Gardner (2003), discuss in their research the theory of multiple intelligences that is constantly evolving with new categories: linguistic, musical, logic-mathematic, bodily-kinesthetic, inter- and intra-personal, emotional, spiritual, sexual, digital, and etc. intelligences. However, in our vision, the general notion (the level of detailing) of “practical intelligence” (Somech and Bogler, 1999) that incorporates other components of intelligence suits our research goal. In the research, we can determine elements/components of its transferring on to the group level (the process of collective practical intelligence development).

Mental models or cognitive schemas or mental maps are used with similar meanings (McAdam et al., 2007) and can be described as a model of reasoning of a person or a group when they are not
able or cannot apply the structure of logical forms from formal theories, for example, from mathematics or financial analysis. Mental model reasoning is based on the principal of truth, attitudes, selective perception, and “deeply held image of the world around us” (Byrne, 2005; Johnson-Laird, 2006). In our research, we are interested in the concept of mental models as it sets an approach to solving problems, decision making (like a personal algorithm), and doing tasks. By identifying changes in a group approach to solving problems or making decisions we can identify the process of mental models sharing or transferring inside an ET. Musk (2013), in his interview, in his self-appraisal, highlights the first principals reasoning approach. However, in our research the ETs showed heavy reliance on tacit knowledge and mental models based on analogy reasoning.

The conceptual analysis of “attitude” was done by Schwarz (2007) through the research literature review and suggested that “it is more parsimonious to think of attitudes as evaluative judgments, formed when needed, rather than as enduring personal dispositions; from a construal perspective, people do not have attitudes; they form judgments; their judgments stand in the service of action and high context-sensitivity is a necessary feature of any adaptive system of evaluation”. A lot of discussions were devoted to the measurement of attitude strength to address the attitude stability and change.

For example, a person’s/group’s changing attitude to time can present context-sensitivity and adaptability of the attitude (Przepiorka, 2012). Attitude context-sensitivity and adaptability play a significant role in a particular mental model transformation. Attitudes/judgments can be regarded as an item/object of the mental models, and they can be identified in the research by observations, questionnaires, and interviews. Detection of their transformation logically identifies a change in a particular mental model.

So, belief is a type/category of attitude distinguishing proposition about a particular case or matter from being true or false. The propositional attitude can be viewed as a dispositional quality of mind that appear in a context. For example, “Some cats are green”; “some customers require fur coats in summer”. A person that never came across these cases and had not had beliefs about them in his mind would respond with a propositional attitude. The attitude is adaptable if evidence shows acceptable evidence/revelation.

While investigating transferring of the vision among the team members Preller et al. (2020) found that “founders often purposefully do not communicate their entrepreneurial vision to teammates and stakeholders to avoid potentially negative consequences” and that “founding team members may hold different entrepreneurial visions” even not shared/transferred.

Tacit knowledge represents internalized knowledge, engrained with actions and experience, while including cognitive and technical elements, e.g., mental models, skills, and ingenuity (Nonaka and Tackeuchi, 1995; Agan et al., 2018).

SECI (Socialization–Externalization–Combination–Internalization) model of knowledge conversion illustrates how two types of knowledge are converted to one another (1-from tacit to tacit, 2- from tacit to explicit, 3- from explicit to explicit, 4- from explicit to tacit) and create new knowledge model (Nonaka and Tackeuchi, 1995).

In response to expanding importance and demand for knowledge transferring/sharing both in society and the business environment, the study of knowledge transferring/sharing barriers in
different organizations took place (Zammit, 2015; Riege, 2005; Yeşil and Hırılak, 2016 Akgün et al., 2017). Innovation activities stimulate research of tacit knowledge transferring barriers (Haldin-Herrgard, 2000; Cumberland and Githens, 2012).

2. RESEARCH DESIGN AND PROCESS

In this research project, we study eleven ETs that iterate through hypothesis-validation loops in the FFE of innovation product co-development process with objectives to create a validated value proposition, minimal viable product backlog, and business model concept. ETs’ co-development (Co-PD) was in collaboration with innovative/lead and “ordinary” users by different models of their integration in FFE of Co-PD. The research team did not affect ETs management and Co-PD with the users. We used the case study research methodology and the grounded theory methodology. By its definition, a case study is a research approach that is used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context (Yin, 1994). The grounded theory method is based on inductive reasoning with the goal to construct a theory that is grounded in collected data (Birks and Mills, 2015; Chun et al., 2019). The data was collected through observations in a natural environment (the “shadow” method and observed details of interactions), follow-on questionnaires (survey results to prepare guides for the in-depth interviews), and follow-on in-depth interviews.

After observations we looked for concepts/codes that can describe observation data, and create categories, we selected the core/priority ones. Questionnaires and in-depth interviews were used for clarification of findings and to get self-wordings and self-assessments from the fifty-nine participants (eleven ETs).

The previous research results of the research in progress were the 3-mode SEI (socialization, externalization, and internalization) model of knowledge conversion and identified a list of priority barriers to the knowledge transferring and conversions (Laptev and Shaytan, 2021).

3. RESEARCH RESULTS

The current results are the scheme/pattern of the tacit knowledge transferring depicted in Figure 1.

When an ET collaborates with innovative/lead users in the FFE of NPD, knowledge transferring/conversions could be described by this pattern in Figure 1.

Types of tacit knowledge (in orange boxes) and types of explicit knowledge (in blue boxes) transferred and converted in directions (violet arrows) and by means of actions (violet boxes) were identified. The knowledge transferring and conversions originate/proceed:
- on three levels: innovative/lead user, individual ET member, and group ET level;
- and along with hypothesis-validation iterations towards validation of milestones of the FFE (of the customer discovery stage in the customer development process).

According to the research, there are three basic steps (as depicted in figure 1: step 0, step 1, and step 2), and step 2 iterate until the ET decides that the FFE successfully passed; or terminate the project.
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Figure 1. Pattern of the knowledge transferring and conversion in entrepreneurial projects in FFE of collaborative new/innovative product development

Source: author’s elaboration based on own research

4. FUTURE RESEARCH DIRECTIONS

The research in progress will use the identified pattern of the knowledge transferring/conversions to build it operationalization model for ET management in FFE.

5. CONCLUSION

The research in progress identified entrepreneurial teams’ operation negligent component of the combination (explicit-to-explicit) knowledge conversion in FFE of the collaborative new/innovative product development. This can be regarded as the key difference between an ET and a design/engineering team also working on NPD. The identified specifics of the pattern of the knowledge transferring and conversions at an ET in FFE of collaborative new/innovative product development allow assigning metrics for selected objects of the process to improve operationalization of the tacit knowledge transferring/conversion; to improve the ET management.

Our current findings are outlined in the process of how and by what means knowledge transferring and conversion happen in the entrepreneurial teams’ up-to-the stage of minimum viable product concept verification. The further detailing of entrepreneurial new product creation, as a knowledge management process, could give new insight into improving methods and tools.
in entrepreneurial management. This paper has limitations on the types of involved stakeholders and the scope of respondents limited to innovative/lead users and the stand-alone micro-entrepreneurial teams (i.e. they are not spinoffs, or do not have institutional/corporate level of investments).

REFERENCES

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