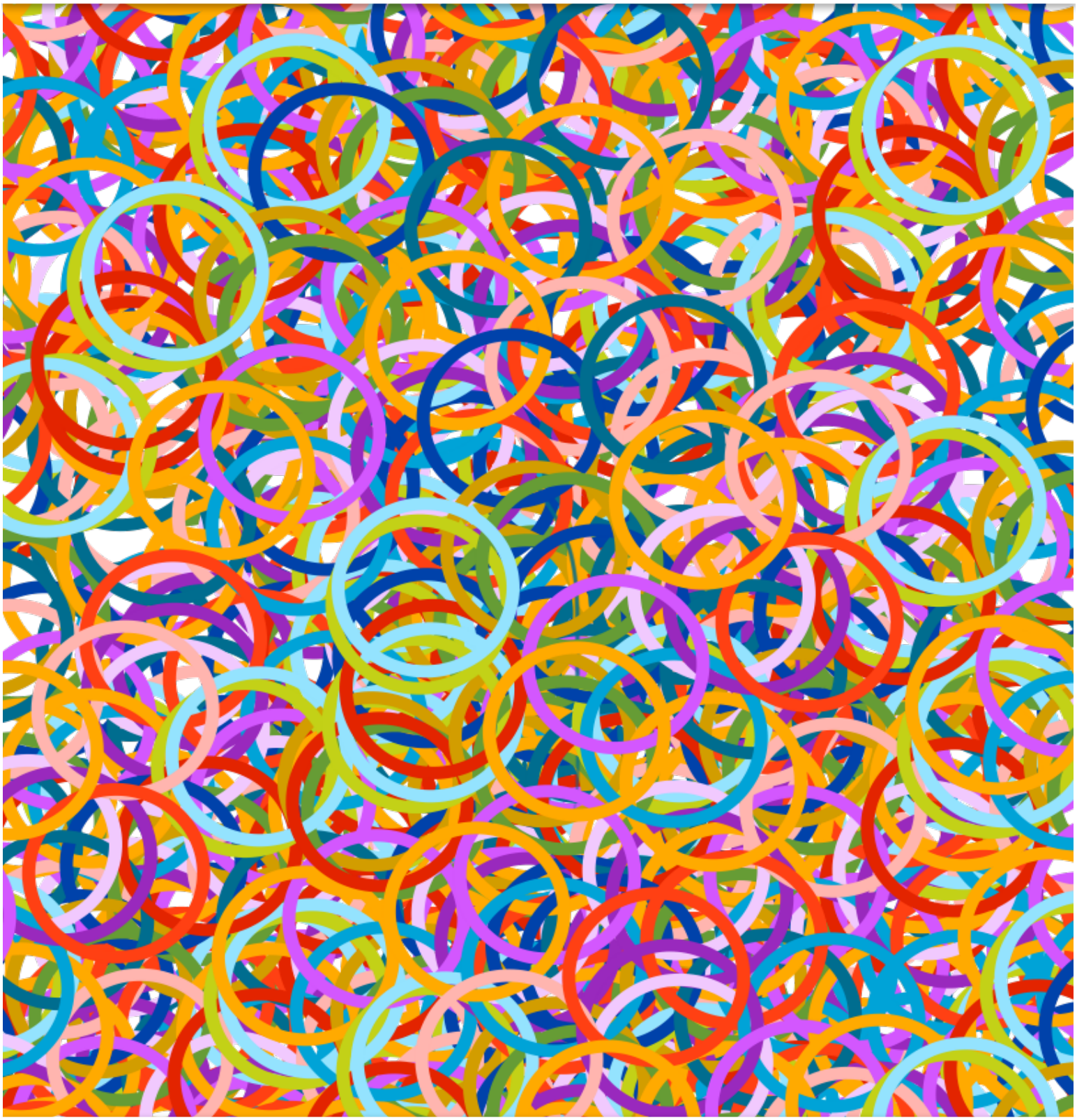
JIM
Journal of Innovation Management
The International Journal on Multidisciplinary Approaches on Innovation
Volume 4 Issue 4 | open-jim.org



ISSN 2183-0606
FEUP Edições

Journal of Innovation Management
JIM 4, 4 (2016) i-iv
HANDLE: http://hdl.handle.net/10216/102610

Table of Contents

Editorial

Letters

Articles

ISSN 2183-0606
http://www.open-jim.org

Journal Editors

Economic and Social Science Areas

Associate Editors

Journal of Innovation Management
JIM 4, 4 (2016) 1-2
HANDLE: http://hdl.handle.net/10216/102610

Editorial

Revisiting Universities: The Challenge of the 21st Century

Anne-Laure Mention, João José Pinto Ferreira, Marko Torkkeli

[1] RMIT University, Australia, ; [2]INESC TEC - INESC Technology and Science and FEUP - Faculty of Engineering, University of Porto, Portugal; [3]Lappeenranta University of Technology, Finland

anne-laure.mention@rmit.edu.au, jjpf@fe.up.pt; marko.torkkeli@lut.fi

Delivering impact is nowadays on top of the agenda of universities, worldwide. But what exactly does that mean? Universities' primary mission is to educate the young generations, by providing them with basic knowledge on a wide array of topics and disciplines and most importantly, by training them how to continuously learn - learn by doing, by reflecting, by challenging facts and perceptions, critically and constructively. Yet, the education mission, which can be seen as a long term investment from nations into the development and nurturing of their capabilities, competitiveness and growth, is increasingly complemented and supplemented by another role: supporting economic growth in the short run. This pressure to generate and disseminate actionable knowledge, and support its application and immediate implementation into real life, contemporary businesses, entails a tremendous shift in the way universities operate, both in terms of time and space. And this undeniably creates tensions: it is common knowledge that universities and private sector firms are not sync in the way they think, act and deliver.

The next obvious question is: what can be done to ensure that universities do support economic competitiveness, growth and wellbeing? And how can they realistically and reasonably perform this while keeping their intrinsic features, i.e. allowing for reflective thinking, and stepping back from the effusive, fast evolving and increasingly profitability-driven environment? It is obvious that there is no one-size-fits-all solution for this, and that every country, every institution has and needs to find its own way, yet there might be common hints: Interdisciplinary, Stakeholder Engagement and Translation.

Interdisciplinary has always been a key and distinctive feature of this Journal and we will keep advocating it - interdisciplinary is the key for innovation to take root, flourish and blossom. Combining STEM (Science, Technology, Engineering and Mathematics) and obviously STEMM (same, adding Medicine) with HASS (Humanities, Arts, and Social Sciences) is undoubtedly a key success factor for innovation. Breaking silos within universities is however easier said than done, and creating a shared understanding on a subject matter can be a difficult task. A shared understanding does not mean a common understanding though, as divergent and complementary views should be catered for, and even emulated, to stimulate intellectual richness and diversity on a singular matter. Breaking the silos, leveraging on T-shaped individuals should however be promoted and rewarded, and HR incentives, and promotion mechanisms

ISSN 2183-0606
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should embrace this multi-, cross-, inter- disciplinary perspective, thus departing from the outdated, yet still widely spread, discipline-based system. In the short run, accommodating for reverse contribution (we would even call it reverse engineering, fully acknowledging to be engineers ourselves) and publication in respective disciplines to accommodate the restrictions of current promotion schemes - yet, these need to be changed and we strongly advocate for a revision of HR promotion systems to align with a multi-, inter-, cross- disciplinary vision of the world and an impact-driven mission of universities.

Stakeholder engagement, in whatever forms - pre-research focus consultation, participation in research experiments and observations, or research research results adoption, is another must. Amazingly, and despite the policy pull or even push, numerous research initiatives are conducted without any stakeholder engagement. Blue sky research is undeniably needed, yet eventually, sooner or later, any discovery should lead to an invention and further to an innovation - and this needs stakeholder involvement, with the broadest understanding of stakeholder - from policy to business. Our view is the sooner, the better, with respect to stakeholder engagement. Without falling into the trap of lobby-driven research, obviously.

Translation - most of the world has not yet, sadly, taken up this concept. And we advocate for its wide and unconditional adoption. Beyond Technology Transfer, knowledge adoption, diffusion and conversion, Translation infers a grounded, deeply rooted set of mechanisms and belts to ensure the ingraining of knowledge into practices, routines and social behaviors. It conveys the multidimensional features of knowledge as academia can generate, across all disciplines, and combining various disciplinary insights in an integrative way, and paves the ways - multiple, in essence - to value creation. Because value creation is in itself a multifaceted concept, value being measured in monetary or non monetary terms. But value creation entails the interaction, or even integration, in an ecosystem. These editors view ecosystems as self-sustaining systems, which are market-oriented, yet not exclusively driven by market considerations and where all stakeholders, civil society and governments have a role to play.

This Issue has unearthed some features of the power of technologies to support and foster invention, translate it into innovation and foster its adoption, acknowledging its heterogeneous and multifaceted nature. We wish you a stimulating journey in your reading of this issue of the Journal of Innovation Management.

Innovatively Yours,

Anne-Laure Mention, João José Pinto Ferreira, Marko Torkkeli

Editors

Journal of Innovation Management
JIM 4, 4 (2016) 3-7
HANDLE: http://hdl.handle.net/10216/102610

Self-Transcendence: Maslow's Answer to Cultural Closeness

Henry J. Venter

Professor of Psychology and Regional Lead Faculty, National University, Los Angeles, USA
hventer@nu.edu

Letter from Academia

In the editorial, Revisiting Openness: A Must for Society (Mention, Ferreira & Torkkeli, 2016), the authors address the issue that despite predominance of openness in contemporary organizations – porous boundaries, virtual and agile teams, as well as interconnectedness, - Western Societies and some of their elected leaders are currently advocating closeness. They raised the questions: How we can build an inclusive society while rejecting difference? How can we achieve innovation when turning our backs on variety and diversity? And could the Maslow Hierarchy of Needs help the mechanics of these trends? This paper shows how Abraham Maslow, before he died, identified a sixth tier of need – self-transcendence – and how a worldwide focus among academia, organizational leaders and political leaders of countries can prevent closeness and isolation among countries and cultures all over the world.

Keywords. Self-transcendence, globalization, culture.

1 Abraham Maslow and Self-transcendence

Abraham Maslow, widely considered the founder of humanistic psychology, is best known for his system of personal development, the hierarchy of needs. Traditionally it was believed that Maslow's hierarchy of needs only entailed a five-level hierarchical pyramid to explain a person's motives for development. He organized his different motivational levels in ascending order from lower basic human needs, such as physiological needs, at the bottom of the hierarchy, to higher progressing needs, such as the needs for safety, belongingness and love, esteem and self-actualization, at the top. He identified physiological (survival) needs as those where the person seeks to obtain the basic necessities of life; safety needs involve those where a person seeks security through order and law; belongingness and love needs entails seeking affiliation with a group; esteem needs are typified by those where a person seeks esteem through recognition or achievement; and lastly, self-actualizing, at the top of the hierarchy, is where a person seeks fulfillment of personal potential (1968; 1971; 1973). In recent years theorists postulated the notion that before Maslow died, he identified a sixth tier of need – self-transcendence (Koltko-Rivera, 2006).

Maslow described self-transcendence as a person's ability to obtain a unitive consciousness with other humans (1964; 1968). The transcended person is able to view the world and their purpose in the world in relation to other human beings on a more

ISSN 2183-0606
http://www.open-jim.org

global scale and is aware that they can have an impact, not just within their own geographical boundaries, but on the whole world. Maslow (1973) postulated that one main characteristic of self-transcended people is autonomy and independence from culture and environment. They do not need the approval of other people; their opinions are not formed in light of their own immediate circumstances. Maslow held that self-transcendence is reached when a person seeks to further a cause beyond the self and to experience a communion beyond the boundaries of the self (1968). These transcended individuals who reach the top of Maslow's revised hierarchy typically seek a benefit beyond the mere personal, identifying with something greater than the purely individual self, often engaging in selfless service to others (Koltko-Rivera, 2006). Maslow came to the idea of self-transcendence because he felt that too many theorists defined the Self simply in terms of what other people think or their perception of a person, which he saw as an extreme cultural relativity in which a healthy individuality gets lost altogether. He reasoned that the healthy, fully developed person is characterized by their transcendence of other people's opinions. Maslow specifically used the term transcendence to differentiate this kind of person from the dichotomization of self and the environment, stating that it was a person freed from the "dichotomous way of thinking" (Maslow, 1968, p. 180).

2 Maslow's Self-Transcendence and Cultural Encapsulation

According to Maslow (1968; 1973), a healthy personality, while including success in appropriate coping behavior involving mastery, effectance and competence, must also include a point where the individual is freed from the influence of their environment, specifically from the way that environment effects their personal development. One of the main forces inhibiting personal growth he identified was culture. Although culture is important, he reasoned that one needed to reach transcendence of, independence of, or resistance to enculturation, or else such forces could distort the way one sees the world in that such a person only identifies him or herself as the culture prescribes and would eventually perceive the world and people from other cultures only through the prism allowed by their culture. To be clear, Maslow reasoned that a person that transcends their culture is not alienated from it – they are not separated from it, necessarily - but they are no longer grounded or anchored in their own culture alone; they are not exclusively defined by their immediate environment or have an over-identification with one group alone (Frick, 1989; Maslow, 1968). Without distortion of their own cultural identity or developing crippling insecurity, they can identify and side with other people, different groups, entities, causes and nationalities.

3 The Effect of Self-transcendence on Worldview

Another implication of Maslow's revised model - with the inclusion of the level of self-transcendence - is the affect it has on the worldview of individuals. Worldviews are sets of assumptions held by individuals and cultures about the physical and social universe (Koltko-Rivera, 2006). An aspect of worldview specifically affected by Maslow's self-transcendence is one's purpose or meaning of life. Self-transcendence

allows for a richer conceptualization of the meaning of life dimension of worldviews. Such a person develops a deeper sense of purpose, a sense of purpose not only focused on the needs of the self, but a sense of purpose anchored in the plight of the whole world. People with a transcended level of perception of the world are less determined by habitual abstraction and are not need-determined, but rather their cause is determined by perceptions of higher unity. They find meaning in life by connecting their life's journey and happiness to the condition of others; not only those from the same culture directly around them, but from others all over the world, regardless of race, gender, class, sexual orientation, religion or nationality. The person in a state of transcendence is freed from the practice of categorizing, pre-judging and stereotyping the world and other people in it. They are, therefore, able to view the world differently – not as dichotomous, different, separate, individual, but as a whole, as one interdependent unit (Frick, 1989; Maslow, 1968). Maslow argued that people at this level of motivation transcended their dichotomous nature and became autonomous, ruled by the laws of their own character rather than by the rules of society (1968). These people, he postulated, "should have less national character and that they should be more like each other across cultural lines than they are like the less-developed members of their own culture," becoming members at large of the human species (Maslow, 1968, p. 181). At one stage he called people like this universal men, not guided by their own culture and external environment, but by the needs and the plight of the whole species – people guided from within, by their inner voices and looking within for the guiding values and rules to live by (Frick, 1989). At the level of self-transcendence, the individual's own needs are put aside, to a great extent, in favor of service to others and to some higher force or cause conceived as being outside the personal self (Koltko-Rivera (2006).

3 The Need for Self-Transcended World-Citizens and Leaders

Changes in the migration patterns all over the world as well as the interconnectedness of people across the globe, is driving a need for change. Actions are now driven by the lower tier needs of Maslow's Hierarchy - safety and belonging - leading to a drive towards policy of closeness and cultural encapsulation among some leaders in the Western societies. For years, the academic and organizational world failed to see that without Maslow's previously omitted sixth level of motivational development, self-transcendence, and exclusive focus on self-actualization, people will become infatuated with the self. In addition, when lower order needs are perceived to be threatened by some, such as migration of jobs and influx of immigrants, it will trigger regression and closeness with a focus on policies that will signal a return to fragmented, individualized, and isolated societies. We need an urgent focus among leaders in academia, organizations and governments on ways to foster self-transcendent thinking and action in cultures. Self-transcendent people are bound together with a common purpose, a global perspective, and joint responsibility for the fate of the planet. They belong to a global community that defines itself not so much by race, gender, class, sexual orientation, religion or nationality, but by the definition of what it is to be human; they elevate themselves beyond the immanence to which they were previously resigned to by society. They are indeed emulating the level of self-transcendence Maslow

described - a position where one takes responsibility for oneself and the world, a transcended freedom that knows no boundaries. In a world where countries, regions, and different groups of people are increasingly connected and dependent upon each other, world problems and crises cannot be solved in isolation and closeness any longer. Narrow minded, distorted and region-bound people are now at more of a disadvantage than ever as they will not be able to understand or empathize with the plight of others in the world and are, therefore, blinded by their isolation and unable to solve their own problems or ensure growth for their people effectively and, in addition, are of little help with problems on a global scale. Without self-transcendence, leaders will remain stuck in dichotomous thinking, and due to their isolation, will trigger a need to force attributes of security, familiarity and sameness unto others, to create a sort of manageability to alleviate their growing insecurity, trying to find their solace in an artificially created, simplistic universe, in stereotypes and in a static, polarized world (Frick, 1989). This type of functioning becomes the foundation of the global world conflicts – people unable to perceive the world on a wider plane enter into disputes, conflicts, and war in order to convince or conquer other groups that do not perceive the world as they do (Venter & Venter, 2010).

4 Conclusion

Transcendence is the means by which to solve global conflicts – citizens all over the world connecting and banding together to make their voice known and support peace and combat social crises such as poverty. Globalization is the impetus that is propelling self-transcendence to spread across the globe and connecting like-minded transcended people seeking to solve problems on a global scale. We need self-transcended people – leaders and everyday citizens alike - all over the world advocating not only for their own needs, but for the needs of others – for other's not only in their immediate nation and culture, - but for others in need all over the world. We need people expanding the idea of human rights and freedoms to take the plight of the environment and global health of the planet up as a cause and a personal responsibility. Maslow's self-transcendence is the most accurate description of the type of person the world needs now: people taking responsibility not only for themselves, but for the world; people living in a transcended freedom that know no boundaries regardless of their continent, culture, or region; people who discover the power to shape the future of the world, an interconnected and open world, free of isolation.

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JIM 4, 4 (2016) 8-31
HANDLE: http://hdl.handle.net/10216/102610

Studying Open Innovation collaboration between the high-tech industry and science with linguistic ethnography - battling over the status of knowledge in a setting of distrust

Els De Maeijer[1], Tom Van Hout[2], Mathieu Weggeman[3], Ger Post[1]

[1]Fontys University of Applied Science, Department of Industrial Engineering, Education & Management, Eindhoven, The Netherlands
e.demaeijer@fontys.nl
g.post@fontys.nl

[2]University of Antwerp, Antwerp, Belgium
tom.vanhout@uantwerpen.be

[3]Technical University of Eindhoven, Eindhoven, The Netherlands
m.c.d.p.weggeman@tue.nl

Abstract. Open Innovation collaborations often pit academia against industry. Such inter-organizational collaborations can be troublesome due to different organizational backgrounds. This paper investigates what kind of knowledge a multinational high tech company and a research institute share with each other, how they collaborate to innovate and what role trust plays in this process. Linguistic ethnography is used to analyze the relationship from within, based on the interaction between the parties during project meetings. Tracing the knowledge status of the topics discussed during project meetings and interviews with participants across social time and space, we tease out *how* (dis)trust develops and shapes the ongoing interaction. Debating which knowledge can be *project harvested*, reveals an interactional dynamic of distrust. The company tries to control the proceedings of the meeting and expresses distrust in the research institute. Its project management minded approach pushes the institute in a position where the latter has to prove its value. This dynamic is due to the level of operational secrecy, the short time to market, and the exploitative nature of the collaboration. Openness is highly valued by the participants, yet the type of knowledge that is allowed to be harvested as project knowledge determines how open – or closed – the collaboration process is in real time. Finally, flexibility and dedication are found to not necessarily lead to more trust, openness or sharing.

Keywords. Knowledge sharing, interaction, trust, ethnography, management, open innovation

1 Introduction

High-tech companies live or die by their ability to share knowledge and work together with knowledge institutes such as university spin-offs. The growing mobility of highly experienced and skilled people, the increasingly fast time to market for many products

ISSN 2183-0606
http://www.open-jim.org

and services (Chesbrough, 2003a) and the apparent limits to innovations experienced within the company, make inter-organizational collaboration necessary. When these collaborations purposively make use of the inflow and outflow of knowledge to accelerate internal innovation and expand the markets for external use of innovation, they fit the paradigm of open innovation (OI). This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology. (Chesbrough, 2003a).

However, the success of industry-science collaborations is limited by the different time horizon and the approach to open dissemination of results science and industry have. (Perkmann et al., 2011) In addition, science institutes are often involved in projects with multiple industry partners and interactions are plagued by opportunism and appropriability problems (Arikan, 2009). Yet, extensive knowledge sharing is necessary to reach full innovation potential (Simard and West, 2006). With an effective sharing process organizations can develop their knowledge-base and competitiveness (Andrews and Delahaye, 2000; McEvily et al., 2015).

To minimize the above mentioned problems, formal governance mechanisms like non-disclosure agreements are in place. Nonetheless, it is argued (e.g. by Poppo and Zenger (2002) and Faems et al. (2004)) that such formal agreements are not sufficient to create openness and to counter a certain 'knowledge-sharing hostility' (Michailova and Husted, 2003). Additionally a form of relational governance, informal governance focusing on social ties and interpersonal contact (Leimeister et al., 2010), is crucial to encourage desirable behaviour in a cooperative environment shaped by trust, flexibility, commitment and communication (idem).

With this paper we have two goals. First, an understanding of how and what kind of knowledge professionals in science-industry collaborative innovation teams share with each other when they meet during the collaboration process. Secondly, we want to describe the effect of this process on the development of the meetings, and on the relationship. Specifically we focus on how trust unfolds during the meetings. We study the interactions of actors expressing relational attributes like commitment and flexibility and embed the interactions in the wider social context and structure (Copland & Creese, 2015). We thus provide a linguistic ethnographic account of high-tech industry-science open innovation in action.

1.1 Trust during science-business meetings

To analyse the interactional dynamics of the meetings we have observed, we can define trust on an individual level as a positive expectation regarding another's thoughts, words, and actions (Idrissou et al., 2013). Since we focus on the collaborative process or the relationship between two groups of people, it also useful to draw on McEvily et al. (2015) who use trust as a property of collective units rather than isolated individuals, thereby rooting it in the sociological tradition of e.g. Lewis and Wiegert (1985). On an inter-organizational level, when different collective units interact, trust can be defined as a set of expectations of a collective unit towards all the other units in an exchange. In these exchange processes or collaborations trust can be defined in terms of exchange hazards (McEvily, 2015), the costs and risks of engaging in an exchange. As trust is such an essential element in collaborations, it can also be seen as an equivalent for

success in that regard. Lastly, trust is also a strategic act, in which the individual expression of trust influences choices and decisions of collective units in collaborative processes (Idrissou et al., 2013). Thus, when we view trust as the outcome or product of an exchange, we should see it as relational concept, present in groups or dyads of any form of collectivities (Lewis and Wiegert, 1985), and open to debate, contestation, and renegotiation. However, when individuals decide to express their expectations towards other individuals of an exchange, this expression shapes the relational concept of trust.

Secondly, we use the conceptual framework of Boden (1994) on meetings, which are the primary source of observations for this study. In an open innovation context meetings are a means of organizing structural relational governance, ideally allowing parties to develop joint cognitive models and collaborative attitudes and where they can engage in processes of joint problem solving and information sharing, useful for their innovative activities (Gulati, 1995). This framework defines the role that meetings play within organizations. Boden (1994) distinguishes between a reality inside and outside the meeting, thus focusing attention on meetings as 'meeting places' of stocks of professional knowledge and different identities, rights and responsibilities they entail (Nissi and Lethinen, 2015). Meetings are the prime sites where organizational roles and relations are manifested (Putnam and Fairhurst, 2001; Taylor, 2006). This means, for our investigation, that the specifics of the relationship between the partners should be visible in the dynamics of the meeting. Based on literature and on interviews with different collaborators in science-industry high-tech sector it is expected that issues of openness in knowledge sharing (because of opportunism and appropriability issues) will be visible. As one interviewee noted '*We can never be completely open*'. Vice versa, we can expect the expression of openness or the lack of it to affect the collaboration since talk and interaction in meetings are vehicles for organizational practices, and thus, for the activity of organizing on a wider level. (Nissi and Lethinen, 2015).

Finally, considering meetings as that very social action through which institutions produce and reproduce themselves (Boden, 1994), we can find out how the interaction in the meeting characterizes the science and industry collaborations and partners as such. Previous research by Van Gils et al. (2015) on industry-science collaboration in the chemical sector makes a distinction between different configurations within the various existing partnerships. Time-to-market was found to be the discriminating factor, influencing secrecy, intensity of contact and the exploitative nature of the collaboration amongst other variables. This raises the question whether what we find in the meetings supports the character of specific configurations, and if it does, how and to what extent.

1.2 Methodology

Ethnography involves close and intensive fieldwork to understand how managers manage, how organizational change comes about (Watson, 2011). When carried out thoroughly, specific managerial concerns of strategy-makers, can be wrapped up within broader attention to 'the construction of cultural norms, expressions of organizational values, and patterns of workplace behaviour' (Bryman and Bell, 2003; Watson, 2011). Linguistic ethnography as a methodology shows the same rigour as ethnography,

breaking up reality like a prism, through which the familiar becomes unfamiliar again. It pushes ethnography towards the analysis of clearly delimitable processes, increasing the amount of reported data that is open to falsification, looking to impregnate local description with analytical frameworks drawn from outside" (Rampton et al., 2004). Because of the interactive and dynamic nature of workplace interaction (Asmuß and Svennenig, 2009), we use linguistic methods as a means of analysing the data. Hereby we attempt to live up to the demand for adopting a more interdisciplinary methodology that combines various kinds of language data together with ethnographic research methods (Moyer, 2016) to gain insight into questions of efficiency, leadership, and group dynamics in meetings (Asmuß and Svennenig (2009) with 'working scientists' (Latour and Woolgar, 1986) in an industrial workplace.

This research examines meetings between a global high-tech company based in the Netherlands and a high-tech, non-profit research institute in Belgium. The Company and the Institute (capitals refer to the specific partners of our case study) have a long history of working together. The Institute has been a supplier to the Company, yet at the same time a customer and a collaborating partner. Four months prior to the start of the research, the Company and the Institute had renewed and strengthened their collaboration with a new contract that stipulated new obligations and offerings on both sides. The main point of the agreement entails that the Company offers two manufacturing tools to the Institute, making the Institute in fact a customer, while the Institute offers its facilities and research expertise, thereby acting as a supplier of data. In this way the Company has the opportunity to have its product lines optimized, working on incremental innovation. Secondly, without having to spend internal R&D resources, it can also be involved in the development of significantly new technologies or ideas into markets that are either non-existent or require dramatic behaviour changes to existing markets, or in other words, to be involved in radical innovation (McDermott and Colarelli O'Connor, 2005). It is against this background of radical innovation that we can see the Institute and the Company as collaborators. For the Institute this means that data produced can be used for scientific publications or to stimulate innovations with other partners. However, data generated at the Institute within the collaboration contractually remain the property of the Company. We can describe this current collaboration mostly as an exploitative configuration which is comparable to what Van Gils et al. (2015) call 'research services-plus configurations'. These configurations are characterized by a high level of secrecy, a short time to market and exploitative rather than explorative activities. Furthermore there's extensive contact between the Company and the Institute in combination with high mobility of people between the two plants. However, the frequency and extent of the contact depends on the role of the people involved.

The focal point of interest during the 10 months of fieldwork was the *process* of collaboration between the Institute and the Company, in the year after the set-up of the joint research formation. The data collection process was ethnographic in orientation and consisted of formal and informal meetings, formal semi-structured interviews, the analysis of secondary data-sources and non-participating observation and recordings. Observation took place at four so called Business Line Review (BLR) meetings, quarterly meetings that had been initiated after the renewal of the contract. With this new contract, the value of the exchange and the number of people involved increased, requiring more regular and intense contact between both parties. During the meetings

different project groups discuss the status of the different projects and future actions within the business lines. Some of the participants of the meeting, from the Company's side, had confided to the researcher that there was a need for better communication between the Company and the Institute, which was also the reason why the researcher was allowed to do her investigation. In their view the BLR-meetings would offer a good insight into the problems that they encountered while collaborating. The BLR-meetings took place at the Institute's research centre or at a hotel conference room close to the Company. Topics were spread out over two days. Subjects for the business lines were grouped as much as possible, leading to two different teams being present on the two days with an overlap in some people (those responsible for the operational aspects of the project, the account manager and some directors). Project leaders presented the progress made since the last meeting in front of project members and managers. They used PowerPoint presentations to do so. Contents were prepared beforehand, but not necessarily internally pre-discussed. Most meetings had between fifteen and thirty people present from both sides, from various hierarchical positions. Prior to the meeting an agenda was sent out, set up by both the Institute and the Company. In the lead up to the meetings, agendas often were modified and resent a couple of times.

Additional observations were done at lunch meetings, corporate training programmes and during an executive meeting. Documentary sources were examined, including meeting agendas, PowerPoint presentations on the background of the projects, websites, emails and some participant notes on the meetings. Finally, interviews were carried out with employees from the Institute and the Company. Ten employees were formally interviewed, equally divided between the Company and the Institute. Throughout the entire process field notes were made allowing for reflection on whether the original research questions are aligned with the observations or new foci emerging (Copland and Creese, 2015). Formal meetings and interviews were audio-recorded and transcribed according to the guidelines proposed in Copland and Creese (2015). When participants spoke Dutch, only an English translation is taken up for reasons of space. People, products and companies are anonymized. Because of the sensitive nature of the information recorded, the researcher signed non – disclosure agreements with the Company and the Institute. Participants involved were informed about the recordings and the goal of the observations. Representatives from both the Company and the Institute gave their permission for publication.

All data were coded inductively with the help of Dedoose, a web application for mixed methods research. After setting out the themes related to the goals of the research, a first selection of data took place. However, it is important to stress that the data themselves determined which themes were up for further investigation. Looking for indicators of openness in knowledge sharing and trust made other themes arise. Throughout the analysis, which is non-linear, initial assumptions about communicative practices were empirically investigated (Copland and Creese, 2015). Our starting point for the analysis of data were the so called 'rich points' (Agar, 2008); sections of data which stand out as being unusual in the interaction in some way, which seem to the researcher difficult to understand (Copland and Creese, 2015) or otherwise surprising. These rich points contain turns indicating disagreement, a lack of compliance or confusion. These turns served as the pivot of an ethnographic analysis that integrates wider observations, field notes, interviews and a wide range of interdisciplinary literature. In this paper we use excerpts from the data to illustrate the findings.

2 The status of knowledge is contested during project meetings

During the BLR-meetings technical and organizational knowledge of the joint collaboration project is presented and discussed. However, there is disagreement about what exactly should be discussed and what shouldn't. Participants do not agree to which extent knowledge can be shared. To describe the dynamics of this disagreement accurately, we created an inventory of the different statuses knowledge can have in this specific collaboration between the Institute and the Company. The status of knowledge is determined by two dimensions; the source of the knowledge and the use of the knowledge. We name the former *grown knowledge* and the latter *harvested knowledge*.

Possible sources of knowledge in this collaboration process can be the Institute, the Company or the project itself. Whereas the first two sources are self-explanatory, the third one needs some specification. Project grown knowledge is joint knowledge that is talked into existence within the framework of the project, mostly during meetings, by the parties involved. When we talk about where knowledge can be 'harvested', the same 'locations' exist. However, while there is rarely a discussion about the source of knowledge, the harvest location is contested frequently during the meetings. During meetings, participants determine where knowledge can be used and to which extent. For example, related extensive knowledge on the central subject of the project may initially be company grown knowledge, e.g. internal alignment of business responsibilities, yet participants may feel it needs to be harvested in the project meeting. It thus becomes a topic to be discussed and subject to scrutiny of the participants. The same movement of knowledge can take place with institute grown knowledge, e.g. scientific research or results. Even the third party grown knowledge can be pulled towards the centre and harvested as project knowledge.

It should be clear that the status of knowledge is not static; there are forces at work that influence the moving in (but also out) of knowledge of the project location. The following two sections discuss third party grown knowledge and project harvested knowledge. Section 2.3 focuses on the forces that influence which knowledge is actually harvested in which location. Our findings show that there are full time push & pull mechanisms in place that determine which topics of knowledge can be project harvested and which should stay growing at the company or the institute.

2.1 The need for third party grown knowledge

To understand the importance of third party grown knowledge, it is helpful to have some background about the position of the Institute. The Institute performs research for multiple partners, some of which are competitors of the Company in question. From the Institute this requires a certain level of secrecy when it comes to the research projects that are carried out. Non-disclosure agreements are used to govern which knowledge the Institute can and cannot share. The agreements apply to direct knowledge, e.g. the results of a specific research or collaboration project and to indirect knowledge, e.g. the roadmap of a Company or the current status of a joint R&D-project. Such knowledge could be indirectly derived from the assignment that had to be carried out for a company. This may also mean that the Institute cannot even reveal who is its client. However, this third party grown knowledge is needed in the project to make progress. In what follows we describe two cases to illustrate the difficulties that arise

when this knowledge needs to be shared.

In the first example of third party grown knowledge, taken from a BLR-meeting, the knowledge is of direct importance to the progress of the project (excerpt 1). One of the presentations is interrupted by the Institute and the Company discussing the sharing of third party grown knowledge. During this discussion one of the Company managers reveals to the mixed public that the night before the meeting the third party, a supplier of the Company (Supplier), told one of his team members that it doesn't want the Institute to have a certain topic of knowledge. It also wants to block the Company from discussing any of the contents with the Institute. The Company Manager 1, who manages the work onsite at the Institute for this topic, argues the scientific value of being able to solve a related problem together with Supplier. The Company Director 1 has a specific set of responsibilities for the Company's products and also manages the matching of suitably skilled people to the different needs of the project. Hierarchically he takes a middle to higher managerial position in the Company. The Company Manager 1 doesn't report directly to the Company Director1 and is part of the lower placed, operational management.

Company Director1:
But in this .. investigation to, to be clear about Supplier, Supplier .. does not allow the Company and Supplier jointly to work on this topic here on the research center xx Institute.
[…]
Yeah. And the action that we took is that we will align this with Company B ..
Company Director 1:
xxxx
eh I think in 2 weeks when they will go- come to the city of the Company
Company Director 1:
Are we planning on doing this investigation xxx Supplier ourselves? Just the Company and Supplier?
[…]
Company Manager1:
[…] it is a bad surprise to us as well that Supplier says to us no you can not discuss with three, the Institute.
[…]
Company Director 1:
So what is your preferred play of continuation?
Company Manager1:
Uhm: well .. scientifically this a very important .. path forward […] [to solve the problem]. And well .. the, the outcome of that was-eh or the next steps so to speak that .. the 'Subject matter expert' had on the back of of her head but eh that she couldn't say here that had not spoken to me about even at that moment, was the idea of [Supplier]. Which is now killed as part by Supplier so, encounter that xx
Company Director 1:
Is, is that also .. it's killed by Supplier in .. cooperating in three-way. If we tell Supplier we do it ourselves 'the Company'–Supplier, we exclude the Institute, sorry folks, then we could continue.

Fig.1. Excerpt 1: BLR – meeting, February 10, 2015

Participants didn't know the reason for this obstruction by the third party, but it was suggested by some Company employees that the precarious position of the Institute played a role in this and that it wasn't an isolated incident. In the eye of the employees,

there have been more cases where companies have refused to work with the Institute as a partner. In any case it affects the collaboration. Company Director 1 expresses willingness to go ahead with working with the third party (lines 12-13 and 29-31), in order to obtain the results, even if that means that on this topic, he has to stop the collaboration with the Institute. In line 12-13, the Company Director 1 already opted for a two-way collaboration between the Company and Supplier without the Institute.

Company Director 1:
Okay. For last meeting there was an action to define a list of topics, one-liners, which we can share in the corporation between the Institute and the Company with third parties... to give the supplier hub, somewhat more boost. So together with the business line managers we reviewed the list of SOW's titles or things which where we working on, what we can share with other parties outside the Company – Institute corporations. So for example supply materials ..., with all the partners at the Institute. And we have from both- all the three business line a shortlist of just single line, text which we are, what we are doing, which we can share with other partners. So from business line A this is, ja
[…]
Company Director 1:
From business line A this is the list of things which we do under the umbrella of the research centre, which we can share with the outside world and this is just the one-liner these titles which we can share. Any additional information behind this, can only be shared after approval of the BL-manager at the Company.. So for the Institute people to talk about items what you're doing together with the Company and which you want to share with other colleagues working on other topics and other with other partners, just these one-liners, single lines can be shared. This is for A the topics for applications, topics on high level which we can share where the Company and the Institute are working on together. And for B, and off course for B a lot of these things are already covered in the advanced X - program so they're out to the other partners and shared with other partners as well. I'll share these three slides with the Account Manager Institute, Director Institute and Vice-President Institute so they can be shared to other partners.
Account Manager Institute:
Uh, to jumble up, I have similar lists under approval from the Competitor and Supplier as well, they are really strict and they're asking hey, what is the Company sharing back? So this is perfect to share back immediately and this will smooth the discussion with them in general well, they're, they're equally careful.
Company Director 1:
Yeah, this is what you can share back, just these titles, what we are doing.
Account Manager Institute:
Yes, we have a similar list, from the others
Company Director 1:
Can you share that today or tomorrow?
Account Manager Institute:
Uh, not in complete shape yet, a couple of companies like prefer to have it condensed into one package. If you insist I can put something together.
Company Director 1:
Share us a preview somewhere in the afternoon
Account Manager Institute:
Yeah.

Fig. 2. Excerpt 2: BLR-meeting, May 12, 2015

The second type of third party grown knowledge, where it is only indirectly valuable, can be seen in excerpt 2. During the first quarterly BLR-meeting the Institute made a

promise to the Company that it would provide the Company with names and information on the projects that it has with third parties. In an interview with the account manager of the Institute (September, 2015) it became clear that this promise was made in response to a question from the Company. It wanted to have information on third party collaborations that could be commercially relevant for its own development; a request that is not unusual since firms utilize networks "both to develop new technologies […] and to exploit technology-based business opportunities" (Vanhaverbeke and Cloodt, 2006). For the next BLR-meeting the item was put on the agenda again. Company Director 1, acting as chairman, proactively elaborates on this action point. He uses Statements of Work (SOWs) or the titles that would be on those SOW's as a summarizing document that shows what activities the Company is carrying out and what can be shared about those activities. The Account Manager of the Institute, who brought up the subject during the previous meeting adds information from the Institute.

Participants of both sides show a certain degree of apprehensiveness towards each other. Such apprehensiveness is understandable because of third party pressure on secrecy. Company Director 1 repeats this urge for caution several times, hereby complying with the Company's official non – disclosure policy. He is making sure that '*Any additional information behind this, can only be shared after approval of the BL-manager [business line] at the Company'*. However, Company Director 1 considers it very important for the Company that the Institute shares the information (*Can you share that today or tomorrow?*" and the use of the directive '*Share us*'). The Company offers the list firstly, although the initial request was from the Company to the Institute. Hereby the Company anticipates to the fact that '*they [other suppliers] will be smart and ask a return favour'* (Senior Vice President Technology Company, February 12, 2015), before the Institute has offered its own list. The Institute had to be asked repeatedly to share this list. Moreover, talking to one of the project leaders afterwards, such a list has never been distributed from either side.

The apprehension expressed in both examples shows that it is not evident to make third party knowledge accessible to harvest as project knowledge. There is a fear that doing so may damage the trust that a third party has in either of the partners. Furthermore, reckless sharing of third party knowledge may also indicate that the partners own knowledge is not safe from being dangerously spread by the other partner. This apprehension is perfectly explicable from an Open Innovation perspective. After the intentional agreement by the presidents of the Company and the Institute to collaborate to tackle future challenges together, legal steps were taken to assure the non – disclosure of information. However, as we will see, this apprehension also influences the interpretation of commitment and hence the development of trust within the dyad.

2.2 Project harvested knowledge

Third party knowledge is important for the continuation of the project and adds value to the collaboration. The second type of knowledge, is project knowledge or any knowledge that is considered important for both parties in the collaboration. As already stated, we make a distinction between project grown knowledge and project harvested knowledge. When knowledge gets the latter status, the interaction and the participants determine if knowledge deserves a place on the agenda of the project meetings.

1 ***Director Institute:***
2 Any questions on .. these hires? (6.3)
3 ***Company Director 1:***
4 Good progress .. xxx
5 ***Director Institute:***
6 Also eh with respect to who we're hiring, we wanna give guidance to the
7 business lines and what kind of competencies they have to draw from, so
8 this is the chart that is just put together in December, we wanted to wait
9 until all the SOW were finalized and to see really the picture of what
10 FTE's are x obligated to which business lines. […]
11 And your input in this is, is, is desired as well, to make sure
12 that we're hiring the right kind of xx meat.

Fig. 3. Excerpt 3: BLR-meeting, February 10, 2015

1 ***Project Development Manager Company:***
2 So ehm but, but who's eh, who is doing all this?
3 Who's going to, to ,to eh .. go after to this information an eh xxx?

Fig. 4. Excerpt 4: BLR-meeting, February 10, 2015

The BLR-meetings reveal which topics have the status of project harvested knowledge. Firstly, every BLR-meeting starts off with the current state of projects and an evaluation of the amount of time and money (expressed in total number of paid hours in most cases) spent. This part of the meeting, often done through a PowerPoint presentation, should make it visible for the Company if the Institute carries out the work as agreed in the contract. This is knowledge created by the very existence of the project. Secondly, the project works with a 'statement of work'; '*you're asking this, we can get you these deliverables and that will cost us that many people, that much time and that much money to realize it*' (Interview Company Director 1, February 10, 2015). Working with these SOW's means that throughout the meetings there is a high focus on numbers (excerpt 3), the execution of agreed plans (excerpt 4 and 5) and the follow up of the contract (excerpt 6).

1 ***Company Director 1:***
2 Are there x blocking thing that you need to get solved?
3 ***Company Project lead 1:***
4 Uhm, I don't think so there is budget and xx for ehm: yeah, but a small
5 remark on the division here.
6 And we need to sort out the logistics for the stress test but a few lots from
7 the Company Town for one test, I don't think that's, that's really a
8 blocking issue.
9 ***Company Director 1:***
10 So that's something you can solve yourself, you say I take charge of
11 doing this?
12 ***Company Engineer 1:***
11 Yes
12 ***Company Director1:***
13 Okav

Fig. 5. Excerpt 5: BLR-meeting, February 10, 2015

1 ***Company Manager 2:***
2 […] You need help?
3 ***Company Project lead 1:***
4 Yeah, nee we can eh use the use the existing products and it's all ok. And
5 eh if not, then eh these things have to be ordered and then [ ]
6 ***Company Director 1:***
7 But if it's money involved please state that you need it.
8 ***Company Manager 2****:*
9 Yeah
10 ***Company Director 1:***
11 because it needs to be discussed and needs to be finalized and get
12 executed in the statement of works

Fig. 6. Excerpt 6: BLR-meeting, February 10, 2015

These excerpts are examples of topics that are created in the project and also need to be discussed in the project meetings. There is very little discrepancy between the source and the place of discussion. In one instance, this similarity of source and location of discussion is remarkable. As can be seen in excerpt 3, the topic of the people who will be or are hired by the Institute is considered directly relevant to the project, although those people never spend their time exclusively doing work for the project. Nonetheless, both the Institute and the Company seem to consider it project knowledge.

In the above cases both the Institute and the Company agree on the topics of the meeting actually belonging in the meeting. The topics of knowledge are considered project grown. However, there are also topics of which the Institute doesn't seem to agree that they should be harvested or discussed during the meeting. For example, the Institute has made some specific progress on the production of a semi-finished product, outside of the project. The Company considers this piece of knowledge Institute grown knowledge as necessary to be project harvested, yet the Vice – President of the Institute seems reluctant to share this piece of information with a Senior Director Program Manager of the Company as witnessed during an informal lunch meeting with both people. There is unwillingness to share or discuss topics, because one party, in this case the Institute, considers this knowledge not suitable or desirable to become project harvested. Again, being open on this topic could reveal third party knowledge or sharing this could put the knowledge under scrutiny of the Company.

A second difference of opinion on what is project harvested knowledge becomes clear through what we call the *project management minded approach* that the Company takes during the meetings. With this approach it is the Company that asks for numbers, plans and responsibilities to become project harvested, while the Institute doesn't reveal those spontaneously. The Project Development Manager (PDM) of the Company asks for clarity on responsibility for the actions that need to be undertaken (excerpt 4) and Company Director 1 pushes for reports of progress and finalization into a statement of work (excerpt 6). Company Director 1 confirms this project management mind-set of the Company as seen in excerpt 7:

1 ***Company Director 1:***
2 Yes, I suspect that our PDM he has a very clear, I have seen him come
3 back with the same dashboard several times
4 ***INTERVIEWER:***
5 Yes
6 ***Company Director 1:***
7 makes a clear set up of what do I want to see, I want to see the risks, I
8 want to see the plans, I want to see the financials, that dashboard he
9 clearly communicated to all five project managers as in fill it in.

Fig. 7. Excerpt 7: Interview Company Director 1, February 10, 2015

Company Director 1 is very strong about the necessity of applying a project management minded approach during the meetings (use of repetition, directives) and believes this necessity is shared within the Company (as he identifies with the PDM using his 'direct words').

The Institute allows the Company to use its project management minded approach and focus on numbers, contracts and progress during the BLR-meetings. The Institute offers an elaborate update to the Company at the start of every meeting (even on internal hires). Moreover, the Institute also explicitly asks the Company to vent its opinion on the suitability of those new people, hereby not only accepting it is project harvested information, but at the same time proving that it is willing and will be carrying out the work contractually agreed with the Company to its *best* efforts. Lastly, the BLR-meetings are chaired by Company Director 1, regardless of who is hosting the meeting. Formally both the Institute and the Company take turns in chairmanship, informally, the Company chairs the meetings.

To summarize, it is the Company that mainly determines which knowledge is project harvested because of the project management mind-set which is determines the setup of the BLR-meetings with the questions for numbers, plans and contractual execution. This is ascertained through a self – appointed Company chairman, i.e. Company Director 1. The Institute on the other hand complies with this setup and the vast majority of the topics of knowledge discussed.

However, tensions arise when the sharing of third party grown knowledge and internal progress (Institute grown) as necessary for the project is concerned. Because of the pressure from third parties, both parties, but specifically the Institute, show some apprehension to sharing knowledge.

The label 'project harvested knowledge' is not fixed on a type of knowledge or topic. The criteria to stick such a label onto a topic may be different for Company and the Institute. In the next section we will discuss two ways in which the interactional dynamics can be observed to directly or indirectly allocate or remove the status of project harvested knowledge. In other words, we reveal which interactions create a sense of openness.

2.3 The dynamics of project harvested knowledge

There are two interactional processes that influence the project harvested status. The first one is the expression of the specific research paradigm. The onsite Company Manager 1 pleads for a certain topic to be taken up into the project because *'well* ..

scientifically this a very important .. path forward […] [to solve the problem]'. (Company Manager 1, February 10, 2015). The fact that the third party does not want the Institute to collaborate with the Company on this topic, makes it harder to keep this topic as part of the project activities. The Institute stresses the scientific value of the third party grown knowledge and assumes that this is a good argument to give the topic a project harvested label. Instead the reaction of the PDM of the Company to follow suggests a difference in paradigm (excerpt 8).

1 ***Company Manager 1:***
2 eh PDM if I can interrupt you?
3 The idea of eh doing X is Y, is an exact example of where we
4 have inspired from the Institute side to the Company, hè this is an
5 opportunity you have a specific Y but you don't have the idea of having
6 the specifics imagable into the field.
7 It's here now, we have the results what we have, we have a path forward
8 which we defined, we have xx interest but now it depends on what we do,
9 do with Supplier. But this is a clear inspiration, please allow me to say.
10 [ ]
11 ***Product Development Manager Company:***
12 Yeah, yeah, yeah that's fine .. that's okay
13 All I am saying is that please don't let eh small little eh drempels
14 [hiccups] , eh what do we call it, small ..
15 […]
16 ***Product Development Manager Company:***
17 small problems, eh destroy the, the strategy, the strategy is to put
18 together.
19 If Supplier now has, has in a telephone conference conversation
20 yesterday night
21 eh showed a problem .. it will be solved

Fig. 8. Excerpt 8: Business Line Review Meeting, February 10, 2015

The matter of the Supplier is brushed aside as a small hiccup (*drempels*, line 13); it shouldn't determine the execution of the project because it is not relevant to the project in the eyes of the PDM. The PDM urges the Institute to make sure that it offers enough capacity and efforts to 'not lose the synergy' (PDM Company, February 10, 2015). As the PDM reveals afterwards in an interview (March, 2016): the activities of the Institute are only of interest to the Company if they add commercial value to the Company. In this case the topic of discussion is only of very limited commercial value for the further development or innovation of the Company's product. The PDM shows irritation (*Yeah, yeah, yeah*, line 12) and does not seem to take the operational issue seriously (*small, little eh drempels*, line 13; *small problems*, line 17) or as a matter that needs to be discussed during the BLR-meetings (*it will be solved*, line 21). The PDM tries to safeguard a strategical contribution from the Institute, but his focus is on the commercial value of that contribution, disregarding the scientific purposes of a possible collaboration with the third party. The higher management (PDM) views the relationship and what each party should contribute or push for with other parties from a commercial, rather than a scientific paradigm. Hence, by denying the importance of the matter, the PDM of the company pushes the subject back into the Institute grown knowledge that should be harvested internally rather than in the project itself.

Moreover, the interaction leading up to reaction of the PDM, as shown in excerpt 1, already shows this difference in paradigm. As described, Company Director 1 expresses his willingness to carry on without the Institute to reach certain goals; the relationship is thus only of instrumental value. It should be noted that socially, this act of excluding the other can be threatening to the Institute, a possibility that Company Director 1 seems to consider too as shown by his interjected apology: '*If we tell Supplier we do it ourselves 'the Company'–Supplier, we exclude the Institute, sorry folks, then we could continue'* (line 29 – 31, excerpt 1). Through the '*sorry folks'* he tries to minimize the damaging impact (e.g. perceived lack of commitment to the relationship) of this act of exclusion on the other party.

Secondly, the process of agenda manipulation denies a topic project harvested status. During a joint executive meeting with, amongst others, the executive VPs and Presidents of both parties, the agenda had been adapted to push problems and issues with the project away from the project (excerpt 9).

1 ***Account Manager Institute:***
2 we had expected a lot more fireworks and fussing. The VP Institute
3 really didn't look forward to that bit, uh, we made a lot of efforts to get
4 the agenda adjusted so that this bit wouldn't appear on the agenda.
5 Dependent on the atmosphere, we would get to that last bit, uh, and I
6 think that it came out pretty well

Fig. 9. Excerpt 9: Phone interview, account manager Institute, September 15, 2015

Depending on the atmosphere in this executive meeting, more or less project difficulties, matters that may be project grown, could be discussed in front of the higher management. Agenda manipulation also occurred in the last observed BLR-meeting when the Executive VP of the Company had openly doubted the value of the Institute in the collaboration. Before this BLR-meeting, slides had been shared and checked with managers from both sides. Regardless of the fact that the project managers from the Institute made the strategic decision to let the Companies' project employees themselves present the progress made within the Institute. The result was a smooth meeting indeed, which was well received by the executive VP. Difficulties were no longer part of the agenda. First of all they had been removed directly; secondly, by letting the Company speak for the Institute, agreement and harmony was indirectly implied.

3 Discussion

Sharing knowledge and differences of opinion on which knowledge should be shared as project knowledge and which should not, creates friction during the meetings. At the same time, the dynamics of pushing and pulling the topics of knowledge into a certain field, reveals the relationship between the partners: the Company as a dominant player and the Institute in the one-down position.

The Company is the dominant player during the BLR-meetings. Its position becomes clear in three ways. During the meetings there's a project minded approach in place,

initiated and demanded by the Company. The Institute on the other hand *'doesn't necessarily have its […] roots, you know [in] timelines and milestones and project planning'* (Interview Director Institute, February 11, 2015). Questions on internal progress mostly come from the Company. Secondly, the Company performs a great deal of openness or directness when it comes to criticizing meeting matters, like personal performance, slides, the length of a topic, or the way discussions on numbers progress etc. This openness is mainly performed by people higher up in the organizational hierarchy. The organizational roles of the Company are clearly manifested in the meetings with the Institute. Finally, we see the Company taking chairmanship during the meetings hosted by the Company and during the meetings hosted by the Institute where it was presumed that a director of the Institute would act as chairman. By doing so, the Company not only increases the control over the numbers and the accountability issues, but the outcome is that it also takes control over the meetings.

This position of the Company is clearly felt by the Institute: '*They push on us hard*'. (Interview Director Institute, February 11, 2015) At the same time the Company feels like the Institute is being evasive on reporting its needs and the progress made: '*The Institute should position itself more proactively'*. (Email Senior Engineer Company, December 2015) This perception is strengthened by attributions to the Institute indirectly referring to its lack of sharing the appropriate knowledge in the eyes of the Company ('*vague*', hard to understand '*what the key message'* is, etc.). The Company blames the Institute for not showing initiative and has its doubts about the dedication to collaborate. The Institute's caution to share third party grown knowledge can be interpreted in the same way. The conclusion is thus an easy one for the Company; if the Institute can't add value by sharing these things, what value does the collaboration have for us?

In response, the Institute can be seen to deliver extra proof of its flexibility and dedication by allowing the Company to offer an opinion on a project grown issues like new hires. In addition, the Institute promised to offer indirect additional value to the Company by *'going way beyond what program we normally do'* (Account Manager Institute, BLR-meeting, February, 2015).

Finally, we can see that the project management minded approach doesn't just reveal an image of the Institute as uncooperative or lacking value, it also reveals that there is internal tension within the Company itself. First of all, when looking into the questions for clarity on progress, we can see that those in hierarchical higher positions in the Company actually directed its questions to internal project members, rather than to project members of the Institute. This points into thinking that the Company also has some internal alignment issues, which is confirmed in interviews with different project members. The second instance where this tension became clear, was when the atmosphere of an executive meeting determined whether issues would be addressed or not. The aim was to adapt the meeting agenda in such a way that it would go effortlessly and without too much of '*fireworks*'. In front of the higher management, it seems that only positive results should be a part of reporting on the progress of the process. This is remarkable, because in several interviews participants on both sides expressed their appreciation for those meetings that brought issues out in the open as can be seen in excerpts 10 – 12.

Excerpt 10:
1 Uhm, so we have, in any case now, and we are very happy about that,
2 the problem open and clear, uh, it is not a solution but the problem is
3 there, is seen and understood by everybody, so that, that is, I think, a
4 step in the right direction which we may not have expected (Account 5 Manager Institute)
Excerpt 11:
6 Furthermore, I thought the topic Z discussion was very good, at least the
7 issue came up now (Company Director 1)
Excerpt 12:
8 All and all, the good, bad and ugly in the relation came up, which was
9 good (VP Business Line Company).

Fig. 10. Excerpts 10-12: Emails on feedback Executive meeting, September, 2015 & BLR-meeting, February, 2015

3.1 Distrust unfolding

When we analyse which effect the positioning of the Company and the occurring dynamics has on the development of trust and openness, it is useful to look at earlier research by De Vries et al. (2014). Investigating the implementation process of a governmental policy by local provinces, researchers found that during the collaboration process, based on a contractual agreement, the expressions of trust and distrust evolved in a different way. Especially when talking about the development of distrust, several phases in a collaboration could be distinguished. Those phases show similar interactional characteristics to those of the meetings between the Company and the Institute. De Vries et al. showed that in the collaboration process researched, there were talks about the importance of trust, followed by debates on the correctness of the contractual numbers and questions about accountability and control by the one who should control the other one. Most of the BLR-meetings showed the organizational practice of focusing on numbers and planning. This practice is also in line with Rottenburg's (2009) research on development projects which showed that projects are often ill defined and very open when they start off. The BLR-meetings do fit in the set-up of the joint research formation, but the organization and monitoring of the project is in the hands of several people of three different business lines at different levels. On top of that, the collaboration being a high-tech innovation project, high technological and market uncertainty (West et al., 2006) prevents both partners to have clear expectations about the outcome of the collaboration. For Rottenburg this uncertainty carries on through the middle of projects because the uncertainty prevents a simple comparison of the *actual* state achieved with the contractually agreed-upon target state (Czarniawska, 2012, own emphasis). In the case of the governmental policy research relations were frustrated because of the difficulty finding out the 'right' numbers and 'real' progress made (De Vries et al., 2014). In the meetings between the Institute and the Company, the Company acted surprised on the numbers shown by the Institute and demanded clarity on the responsibility and needs. This manifestation of power where the Company makes use of direct, agentive managerial talk can be seen as an attempt to make alignment possible (Hill 2000) and reduce uncertainty. The 'difficulty' lies both with the Institute and the Company, yet as explained before, the Institute is seen as the source of frustration.

The next phase starts when under the influence of these discussions on numbers and accountability, the participants shed new light on the initial process of the contract design. The incident where the value of the Institute was openly doubted by the executive VP of the Company, is an example of this. The initial collaboration with the terms and conditions as determined at the start was questioned and the effect was indeed that the then performed distrust was now felt more strongly as it became part of a larger story of distrust (De Vries et al., 2014). The Institute becomes the bad-guy character against whom one can team up. This view is supported by the reaction of some of the project members of the Company (excerpt 13) in the realm of the incident with the executive VP of the Company.

1 ***Company Project Lead 3:***
2 In general I thought the meeting was pretty tame/boring. The risk of this
3 approach: possible that the problem didn't get discussed: purposefully
4 not spoken about to avoid unpleasant discussions. A lot of speakers were
5 afraid for the feedback of the X Management (Executive & Sr. Director)
6 For that reason too(?) much time put into preparation.

Fig. 11. Excerpt 13: Email Company Project Lead 3 on BLR-meeting, December 10, 2015

The Institute prepared the meeting together with the members of the Company in such a way that the Company project members would present the majority of the progress. The Institute tried to make sure that the executive VP of the Company would really be convinced of the Institute's value, it coming from the mouths of his own employees. Yet, the response of some of the Company's employees, unaware of this strategy, was that, yet again the Institute showed no initiative, no pro – activity and no visibility. This incident and its extended effects, supports our view of trust as a relational concept, a property of groups (team up against the bad guy character), but where the individual expression of it shapes the relation between both groups (more distrust). Lastly, the individual expression of distrust was also a strategic act that influenced the decision to get the Company project members to present the progress made.

The participants thus fail to agree when Institute grown knowledge or third party grown knowledge should become project harvested. The sensitivity of knowledge causes apprehension, interpreted as knowledge-sharing hostility (Michailova and Husted, 2003). Furthermore, the Institute doesn't share the project management minded approach to spontaneously push numbers, deadlines and factual progress onto the agenda. Internal alignment issues of the Company make it harder for the Institute to show the right numbers. On a macro-level the high-tech nature of the collaboration prevents a satisfying comparison between specific expectations and the real state of affairs. The value of the Institute is doubted and attempts to fix this backfire for the Institute. As De Vries et al. (2014) describe, consequently the distrust becomes bigger, creating more tension as it is unclear what can be expected next, leading into the last phase. In this phase the story of distrust becomes bigger with other small events adding on to it that may have had nothing to do with the initial events at the start of the relationship. Indeed, already at the start of the observations there were rumours of confidentiality breaches in the Institute, but they were never specifically named. During

and after the observations, there were at least four more incidents where third parties refused to work with the Institute due to fear of breaches. However, no major incidents occurred during the year that the observations took place. Only one 'incident', where '*someone who walks around here [at the Institute] did some work with CompanyC*' could be mentioned specifically (Interview Company Project Lead 4, November 18, 2015). The Executive VP of the Company took it '*the wrong way'*. Although what exactly happened (a breach may not even have taken place) remained vague, these rather undefined threats had already created a sense of distrust.

3.2 Safeguarding the relationship

With the organizational practices and roles of the Company being so dominant in the meetings and the effect it has on the meetings, we may expect that the relationship wouldn't hold out too long. The pushing and pulling of topics of knowledge in and out of the meetings and the apparent instrumental view on the relationship, possibly undermines trust and the performance of the Institute during the meeting. Nonetheless the relationship remains intact. The reason for this may be inherent to the Open Innovation – nature of their collaboration; both parties need each other for innovation, technical progress and third party value (the latter is definitely the case for the Institute). In that sense it could be argued that, although they don't necessarily act like equal partners with reciprocal expectations, it is their interdependence that mitigates for the lack of trust. As it is the presence of relatively equal power (i.e., joint dependence) that enhances trust among exchange partners (Gulati and Sytch, 2007). Secondly, the project management discourse is not unique for this company as a business partner of the Institute. Although '*the relationship with the Company is a unique one'* (Interview VP Institute, May 12, 2015), other partners in similar configurations with the Institute apply similar commercially driven management talk. This also means that for the Institute, with its university related background, to reshift from a research-driven focus to a customer-driven focus is not something new nor did it happen overnight. The shift has been accompanied by the gradual and phased introduction of new processes and practices (Asimakou and Oswick, 2010) like working with the statements of work and as a result meaningful resistance is absent (idem) and hence the relationship can stay intact. Finally, during joint meetings Company's hierarchically higher positioned participants also take part in 'smoothing things over'. The dominance of the Company is not only visible through pushing and pulling knowledge from and to the project meetings. Participants like the Company PDM take up several opportunities to express their gratitude with the Institute on progress made, technical achievements and in stressing that the Institute is of value to the Company: '*We cannot do it without you hé'*, '*It's part of your expertise here'* (Company PDM, BLR-meeting, February 10, 2015). These expressions can be seen as an attempt to stress reciprocity and interdependence to compensate for the lack of relational trust. We find proof for this in the fact that the above cited expressions are used in the context of the PDM brushing a scientific topic aside as a small hiccup (*drempels*, line 13, excerpt 8) not worth talking about because of lack of significant commercial value. He compensates for this expression by stressing the reciprocal character of the collaboration, possibly enhancing trust and permitting him to disagree on the value of the particular topic brought up by the Institute. Finally, the agenda manipulation 'protects' the Institute

engineers from the judgement of the higher Company management. Project members of the Company thus actively safeguard the relationship by helping out Institute's project members to prove value to the higher management.

Summarizing, the Company is the dominant party in the collaboration and its project management minded approach pushes the Institute in a position where the latter has to prove its value. This dynamics is very similar to the previously researched development of trust and distrust in governmental collaborations and to the development of project work in general. Agenda manipulation seems to be the result of the distrust between the participants, yet this strategy has backfired for the Institute. Through the interactional dynamics of pushing for project harvested knowledge it also becomes visible that the Company has issues with internal alignment. The entire process puts stress on the relation, yet contextual factors and relational safeguarding strategies are deployed to compensate for the development of distrust.

4 Conclusion & future work

The BLR-meetings are the primary site for a collaborative relationship between the commercial company and the research institute investigated. Assigning a specific knowledge status to the topics discussed during project meetings and in interviews with participants, allowed us to see *how* the (dis)trust developed throughout the interaction. Furthermore, we aimed to discover if the findings of this investigation support the characteristics of the 'research services-plus configuration'. If they do, it explains *why* trust unfolds the way it does in this collaboration. We can conclude that the high level of secrecy, the short time to market and the exploitative nature of the collaboration, all characteristic to the research services-plus configuration, contribute to the creation of an interactional dynamic in the meetings that allows for a story of *distrust* to unfold.

The high level of secrecy, typical for industry-research collaborations on radical innovations, is also in place in the high-tech competitive sector investigated here. This secrecy comes with caution on sharing knowledge and on trusting the Institute. The very nature of the Institute, being financially and scientifically dependent on external commercial partners, makes it a problematic partner for this level of secrecy. Hence, the starting point is one of distrust rather than one of trust. Secondly, although the Institute and the Company work together for a longer period of time on several products and innovations, the innovations have a short time to market. The need for innovation is determined by the end user. The always nearing closing of windows of opportunity, makes a project management minded approach necessary in the eyes of the Company. This includes control mechanisms like a strict 'a priori planning' with milestones and only some flexibility. There is an agreed assignment in place and the BLR-meetings thus function as a time and place to check the milestones and the progress made within the project. With our knowledge of how trust and distrust have developed in the implementation of governmental policy and of how project work develops in general, we can infer that, because of the initial caution, this focus on numbers and accountability causes a further development of distrust, the more because the project lacks an accurate reference point. Acts, like agenda manipulation, utilized to counter this distrust, are counterproductive and add on to the story of distrust. Finally, the research services-plus configuration is merely an exploitative configuration, just like

the Company-Institute configuration is. This means that the Company appreciates those competences that contribute to the commercialization of the developments of the Company. Research targets 'an sich' are not interesting enough to add value to the Institute as a partner. Hence, the Company refuses related topics as project harvested topics which leads to more insecurity with the Institute as how it should prove its value.

The discourse of the collaboration thus explains why we can speak of a lack of trust showing during the meetings between a high-tech company and a research institute in the high-tech sector working together to innovate. The interactional data seem to support the labelling of this collaboration as a 'research services-plus configuration'. In that regard it is no surprise that to the Company, who is the dominant partner in this collaboration, some topics (like third party knowledge) are more important to be harvested as project knowledge than others (scientific research without direct commercial value).

Furthermore, our research has shown that concepts like flexibility and commitment are all variables that don't necessarily contribute to the development of a more cooperative environment, more openness or the sharing of knowledge. It depends on the phase of the development of (dis)trust how the expression of those concepts will be interpreted. Commitment and flexibility are explicitly expressed on several occasions through offering the other partner a voice in what are essentially project or third party grown matters. Yet, in the former case, this is a response to a perceived lack of value, while the latter is perceived as showing a lack of initiative. Openness is something that is highly valued by the participants, yet in the end, the amount and type of knowledge that is openly shared or allowed to be harvested as project knowledge determines how open or knowledge-sharing 'friendly' the collaboration process is in reality.

Finally, we started off by saying that trust is such an essential element in collaborations that it can be seen as an equivalent for the definition of success. Our analysis has shown that we can narrow this definition of success down to perceived value of the collaboration. It seems that on the one hand there is trust, or in this case distrust, regarding the sharing of knowledge and granting it the status of project harvested knowledge. On the other hand though, distrust is also a negative expectation in the performance, or the ability to perform of the other party, in this case of the Institute. This performance or perceived lack of it, brings down the value of the collaboration, and the perceived success of it. This last observation calls for an additional specification of trust as competence trust, meaning the expectation of technically competent role performance' (Barber, 1983) and goodwill trust (idem). It seems that in this specific collaboration the distrust is a collective negative expectation of the business partner *ability* of the science partner to perform according to agreements (competence trust), but even his *intentions* to do so (Nooteboom, 1999, emphasis in original).

Further cases and more detailed research on this case can help to further support the conclusions presented here. First of all, when we investigate the interactional processes with more detail, we can discover if next to dynamics like agenda manipulation or using a project management minded approach, there are other acts that influence the development of (dis)trust and if so, how these acts influence concepts like commitment, initiative and flexibility. This paper describes the top layer of a micro level analysis of the very complex reality of Open Innovation collaborations. When we use a larger magnification to look at the data, we can expose deeper interactional processes that

influence the relationship and the unfolding of trust and distrust and perhaps a different unfolding of competence and goodwill trust throughout the dynamics. The use of the micro – narrative (using someone's direct words or 'petits recits' for identification purposes e.g.) may play a role in affirming one's position in relation to the other and in managing perceptions. Agenda altering (taking topics 'off line' to discuss elsewhere or not at all) could signal that there is knowledge which should be project harvested, but not publically. When considering a redefinition of trust into competence trust and goodwill trust, the expression of modality (e.g. the use of '*can*' and '*will*') can be suspected to characterize the meetings with low or high trust of one form or the other. The expressions are also suspected to influence the perception of the other's party initiative and dedication. Finally, in describing the strategy of safeguarding the relationship through expressions of interdependence, the concept of face – threatening acts (violations to participants feeling affirmed in social interaction, (Foley, 1997)) can give us a means to describe the role of power and dominance during the meetings. As power plays an important role in the dynamics of the meetings, we should also focus on linguistic expressions of power and leadership, because in line with our definition of trust, power is not only a relational concept, but also an individual expression of a state of mind. Powerful parties tend to anchor too heavily on their own vantage points" and ignore the perspectives of other less powerful parties (Galinsky et al. 2006) and hence the expression influence the unfolding of the relationship.

When diving deeper into existing and new data, there are two concerns. First of all, when issues rise from theory on collaboration, innovation and collaboration governance, it is sometimes easy to see these issues represented in the data. As pointed out though before, the data should be allowed to 'speak' (Copland & Creese, 2015) to you and researchers should be open to be pointed into different directions as for what is going on in the organization of the relationship between partners. As a researcher you can't presume that certain dynamics are per se interactional representations of the open innovation context. Consequently, apprehension should be shown when trying to integrate these bottom up findings into the creation of a realistic, definition of open innovation and when transforming these findings into useable best practices for managers. Participant verification is key in interpreting interactional data to limit possible interpretations. Only through formal and informal interviews and extensive contact with participants for a longer period of time it is possible to characterize sequences as being typical the context investigated.

This brings us to our second concern, which is accessibility and relation of the researcher to the work field; from getting permission to enter a company, to positioning throughout the research and assuring time for the validation process. Investigating collaborations between parties with different backgrounds requires an extra reflexivity of researchers to be aware of the different positions, that are available to them and how these roles and identities influence access (Lønsmann, 2016) to a field with players that don't fully trust each other, are often on different locations and work in different, flexible settings. The research is a continual balancing act, in which the researcher needs to reconcile the roles of an insider and outsider, subordinate and sounding board, sympathizer and critic, therapist and spy, academic and consultant (Welch et al., 2002). Ironically it requires trust from the participants that, although the research can be very time consuming and slow, the outcome will have practical relevance. From the

researcher this requires the transformation of micro-analytical pieces of analysis into *useable* findings. Lastly, especially when doing research in a high-tech environment crowded with exact scientists, where the lack of familiarity with disciplines outside natural science can provoke suspicion (Latour and Woolgar, 1986), it requires the ability to persuade participants of the value of qualitative research as such. Being conscious of these concerns is extremely important, as we cannot really learn a lot about what 'actually happens' or about 'how things work' in organizations without doing the intensive type of close-observational or participative research that is central to ethnographic endeavour (Watson, 2011).

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Journal of Innovation Management
JIM 4, 4 (2016) 32-54
HANDLE: *http://hdl.handle.net/10216/102610*

Taming the Beast: A Scientific Definition of Fintech

Patrick Schueffel[1]

[1] Hochschule für Wirtschaft Fribourg, Switzerland
patrick.schueffel@hefr.ch

Abstract. There is currently no consensus about what the term Fintech means. This paper explores the complexity of Fintech, and attempts a definition, drawn from a process of reviewing more than 200 scholarly articles referencing the term Fintech and covering a period of more than 40 years. The objective of this study is to offer a definition which is distinct as well as succinct in its communication, yet sufficiently broad in its range of application. As the origins of the term can neither be unequivocally placed in academia nor in practice, the definition concentrates on extracting out the quintessence of Fintech using both spheres. Applying semantic analysis and building on the commonalities of 13 peer-reviewed definitions of the term, it is concluded that Fintech is a new financial industry that applies technology to improve financial activities. The implications as well as the shortcomings of this definition are discussed.

Keywords. Financial services, innovation, banking, financial institution, technology, research, terminology.

1 Introduction

The Fintech genie is out of the bottle. According to an industry report the value of investments in Fintech firms have grown by 75% in 2015 to USD 22.3 billion compared to the previous year (Skan et al., 2016). In total more than USD 50 billion have been globally invested in Fintech firms since 2010 (Skan et al., 2016). The population of Fintech firms is estimated to be currently beyond 12'000 worldwide (Drummer et al., 2016). What is more, the development has not peaked out and observers hailed the disruption that Fintech will bring about (Schneider et al., 2016).

Ever since its inception Fintech has been pivotal to innovation in the financial services industry. In their paper on the evolution of Fintech Arner et al. (2015, p.1) describe the development of Fintech as an ongoing process "during which finance and technology have evolved together" and which led to numerous incremental and disruptive innovations, such as Internet banking, mobile payments, crowdfunding, peer-to-peer lending, Robo-Advisory, online identification etc. In a similar vein editors Chishti and Barberis (2016) present an entire nexus of cases on how the marriage between finance and technology has led to innovation in the financial services sector, let that be through startup firms (e.g. eToro), at incumbent companies (e.g. Citi), at government level (e.g. Israel), or through supraorganizations (e.g. SWIFT). In each of these cases Fintech has significantly spurred innovation.

Due to its innovativeness and potentially disrupting effects on the financial services industry (Ferreira et al., 2015), Fintech is said to have a comprehensive and lasting impact on entire sector (Heap and Pollari, 2015). According to the industry augurs no area of the business will be spared (Grebe et al., 2016; Gulamhuseinwala et al., 2015):

ISSN 2183-0606
http://www.open-jim.org

offerings, i.e. products, services, and market segments will change. Operations, comprising middle- and back-office client support, product servicing, and risk management functions will be affected and so will be distribution, encompassing online and physical channels, agents, financial advisers, and other third-parties. Furthermore, Fintech will have its impact on customer experience, meaning the entirety of all experiences the customer has with the service provider. Besides it will have its implications on business economics, i.e. revenue, costs, and margins. Last but not least the sector experts predict Fintech to alter the Industry dynamics altogether, causing changes in the competitive structure and ecosystem of financial services (Deloitte, 2016). Moreover, no type of financial services provider will remain unscathed as Fintech will bring change to all types of banks, asset and wealth managers, fund and payment providers, brokers, exchanges, insurers alike (PWC, 2016). While the attention received in academia is nowhere close to the attention which is paid by practitioners, some scholars do perceive the phenomenon of Fintech as a fundamental shift. Kauffman & Ma, for instance, refer to the ongoing "global fintech revolution" (Kauffman and Ma, 2015, p.261) and so does Mackenzie when heading her article on innovators in financial service "The Fintech revolution" (Mackenzie, 2015, p.50).

What is striking, however, is that despite the consensus on the major impact that Fintech will have on the financial services industry, little academic literature has explored this area (Shim and Shin, 2016). Moreover, no common definition of Fintech has yet been derived. On the contrary, the question "what is fintech" currently ranks on place eight on the most searched queries related to Fintech according to Google (Google, 2016b). This result highlights the desperate need for a common understanding of the word Fintech.

The term Fintech has been applied in various business contexts, often inconsistently and ambiguously. No attempts have been made so far to extract a consensual meaning of Fintech. But if Fintech is truly meant to be meaningful and comparable, then the methodology and definitions used must be precise and uniform. Citing the works of Jakobson (1933), Waugh remarks that "[s]cience is a dialogue, not a series of monologues" (Waugh, 1997p. 103). Applied to the case at hand, however, this necessitates that some agreement must be reached as to what constitutes Fintech. A basic common understanding must be established to appreciate the nature of the developments in banking and financial services and to create a solid foundation for scientific research. Otherwise a meaningful conversation cannot emerge.

Apart from the scientific rationale, this paper is also motivated by the need for a common understanding of the word Fintech by practitioners. As pointed out above, the Fintech phenomenon has become too important and too pervasive over the past years to be neglected, neither by managers of the financial services industry or related fields, nor by consumers of financial services nor by policy makers. Only if there is minimal common understanding of the term Fintech, a straightforward communication about the topic can emerge which is as void of misunderstandings as possible. Correspondingly, management can only then make optimal decisions if there is a certain consensus on the subject to be decided on. As far as clients are concerned, a representative study among German consumers recently highlighted the need for definitional education: 70% of the respondents did not know the term Fintech at all (Absatzwirtschaft, 2017). This nescience of Fintech among consumers then raises the next question about

economic policies in general and consumer protection in particular: How can policy makers shape adequate rules and regulations in the interest of their constituents if there is no common understanding on the topic?

Hence, the objective of this article is to shed light on Fintech by constructing a definition of the term which is acceptable by academia but also firmly grounded in the practical world. By doing so this text aims at constructing intertextual coherence (K. Locke and Golden-Biddle, 1997) in a field which otherwise can be described as unstructured and scattered at best.

The remainder of this paper is organized as follows. First, the background of the term Fintech is expounded as it presents itself to us in the most recent times, but it is also put in an epistemological context and the historical background is derived. This elaboration on the background is followed by a methods section describing the methodology used to attain the objectives outlined above. The results segment that follows outlines the actual findings from surveying the literature on Fintech and conducting a semantic analysis. The discussion segment thereafter debates the findings before the conclusion paragraphs provides final thoughts on the research.

2 Background

According to the Google the term Fintech receives currently monthly on average approximately 201'000 google searches worldwide (Google, 2016a). This count may not appear to be large, especially when comparing it to the term "banking", resp. "bank" which currently reach more than 2.24 million search requests per month. Yet, it is rather sizeable when comparing it with the search term "financial services" which reaches approximately 40'500 counts globally per month (Google, 2016a). What is more striking however, is the trend in the search popularity of the term Fintech. When normalizing the scale between the fewest search entries and the most search request over the past five years on a scale between 0 and 100, we can observe a significant increase in the interest in the term Fintech. From a count near zero in 2011 it has climbed to 100 in 2016 (Google, 2016b). Figure 1 depicts this trend.

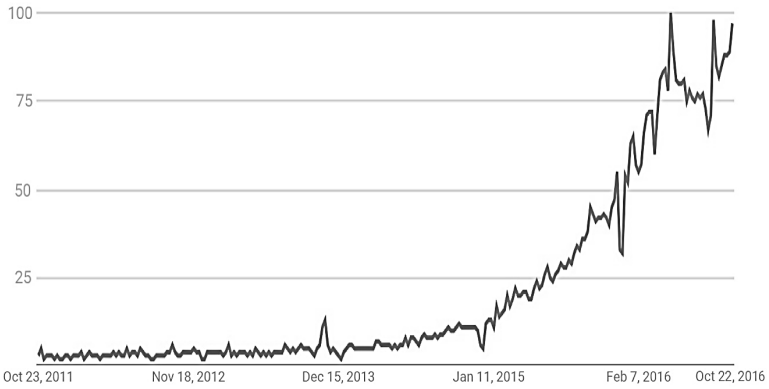

Fig. 1. Popularity of the search term "fintech" at Google

Hence, the term Fintech has long past the test of popularity with the broader business world. It has gained acceptance worldwide and is about to find its way into dictionaries. The most authoritative source for British English, the Oxford English Dictionary, for instance, suggests that Fintech are "Computer programs and other technology used to support or enable banking and financial services: fintech is one of the fastest-growing areas for venture capitalists" (Oxford English Dictionary, 2016). Another highly popular dictionary of our times, Wikipedia suggests that "[f]inancial technology, also known as fintech, is an economic industry composed of companies that use technology to make financial services more efficient." (Wikipedia, 2016a).

2.1 Epistemological considerations

Yet, despite its existence in widely used lexicons the word "Fintech" has nonetheless to be tried for meaningfulness. In science that test is typically formal logic which commands that definitions be broad enough to capture the essential qualities of a class of objects defined, yet narrow enough to discriminate these objects from other objects (Copi et al., 2013). Deriving such a meaningful definition, however, requires us to broadly understand the types of definitions existing and their purpose (Robinson, 1963).

In his work "An essay concerning human understanding" John Locke divided definitions into two classifications: the first category comprises real or essentialist definitions and second one includes the so called abbreviatory, nominal or verbal definition (J. Locke, 1841). When saying a square is a 4-sided flat shape with straight sides where all sides have equal length, and every interior angle is a right angle (90°), it is considered to be a real or essentialist definition. By comparison when stating that a 4-sided flat shape with straight sides where all sides have equal length, and every interior angle is a right angle (90°) is a square, an abbreviatory, nominal or verbal definition is provided. The latter type of definition is particularly helpful to increase efficiency in science as they commonly replace a long expression with a shorter one. It is acknowledged that variations exist of how philosophers used this distinction between types of definition. Immanuel Kant, for instance, claimed that nominal definitions "serve merely to distinguish a thing" whereas real definitions provided insight "into the possibility of things" (Kant, 1992, p.493). According to Kant concepts of experience could only be defined nominally whereas concepts of cognition could be defined using real definitions. Yet, for the purpose of this paper I will stick to the classification provided by J. Locke (1841).

Following the reasoning of Scherer (2005) on the nature of definitions I argue that we need sound definitions for the term Fintech primarily for two reasons: First, a real definition is a prerequisite of significant theoretical and empirical research. It is the basis of an efficient communication with others as the "systematic scientific approach" demands to "define central working concepts in universal, invariant, and consensual fashion" (Scherer, 2005, p.698). Secondly, a nominal definition of the expression Fintech is needed as a linguistic convention. Scherer pointed to this fact by stating that "definitions cannot be proven". Rather than that, he argued that " [t]hey need to be consensually considered as useful by a research community in order to guide research make research comparable" (Scherer, 2005, p.724).

Hence, a real definition of the term Fintech is especially important to the community of scholars in order to apply a systematic scientific approach to the research object(s). A sound real and nominal definition is required to enhance efficiency when communicating about the research object.

2.2 Historical background

In their 2015 research paper on the evolution of Fintech Arner et al. (2015) state that "[t]he term's origin can be traced to the early 1990s and referred to the 'Financial Services Technology Consortium', a project initiated by Citigroup to facilitate technological cooperation efforts". Indeed, the source that the authors provide, an article published by the media outlet American Banker, mentions a project by the name of "Fintech" initiated by Citigroup in the early 1990s (Hochstein, 2015a). The American Banker furthermore published yet another article on the term Fintech with the title "Friday Flashback: Did Citi Coin the Term 'Fintech'?". This article is preceded by an editor's note asserting that "[t]he article below appeared in American Banker on August 13, 1993 and contains the earliest use we could find of the now-trendy word 'fintech.'" (Hochstein, 2015b). It is a reprint of an article published by the American Banker in August 1993 (Kutler, 1993) and it indeed mentions Fintech as a project label used by Citibank. This article is the original work that Hochstein (2015b) and later on Arner et al. (2015) refer to when suggesting that the term Fintech had its origins in the early 1990s.

Yet, the term Fintech was already used as early as 1972. In a scholarly article where he was detailing models on how he had analyzed and solved daily banking problems encountered at the bank Manufacturers Hanover Trust, the Vice President of the bank, Mr. Abraham Leon Bettinger (Prabook, 2016) provided the following definition "FINTECH is an acronym which stands for financial technology, combining bank expertise with modern management science techniques and the computer." (Bettinger, 1972, p.62). An early citation of Bettinger's work by Warschauer (1974) furthermore proves that Bettinger's work did not go entirely unnoticed during his times. Yet, it still may well be the case that the imitators of the Fintech project at Citibank in the beginning of 1990s did not know of Bettinger's research and used the identical term for their undertaking by coincidence. It is already noteworthy at this point that neither academia nor practice can unambiguously be identified as the birthplace of the term Fintech as a practitioner published a scholarly journal article first applying the term.

Next to the explanations of the word Fintech emanating from the seventies and nineties of the last century, a plethora of accounts for the term have been proposed in the most recent years. The following section describes how these definitions were sampled and processed.

3 Methods

The research method of choice for the investigations at hand was a comprehensive literature review combined with a thorough semantic analysis. The purpose was to capture the full scope of definitions of the term Fintech in a first step and to then distill the pivotal components of the explanations by semantic analysis in a second step. The

corresponding sample frame applied and the analysis conducted are described in the subsequent paragraphs.

With regards to linguistics, semantics can be defined as the science of the meanings of words and of the changes in their meaning (Bréal, 1900). Broadly speaking semantic analysis is therefore about understanding language. It is the process of identifying the meaning of linguistic input. Its objective is to process language in order to produce common-sense knowledge about the world. It does so by extracting data from language, processing the data and subsequently building representations of the world (Bloch and Trager, 1942). As the term Fintech has been used for more than 40 years now (Bettinger, 1972) it is not my objective to reinvent the wheel by producing yet an entirely new definition of the term and thus to nullify large parts of previous research by making it incompatible. Rather than that I intend to build on the previous findings of scholars and apply semantic analysis in order to capture the meaning of this word as it was previously used by other scholars. By doing so I attempt to put forward a definition that is consensually considered useful as posited by Scherer (2005). Consequently, and since my intention is to develop a common denominator that can be used as widely as possible, I take into account the broadest possible variety of definitions from as many authors as possible.

3.1 Sample frame

For this literature review, I conducted a systematic search of all major literature databases related to Management Sciences as well as Economics for all papers published until October 16, 2016, using the keyword "fintech". Those data bases included EBSCO, Business Source Premier, Directory of Open Access Journals (DOAJ), Emerald Insight, JSTOR, SAGE, Science Direct, Springer Link, Taylor Francis, and Wiley Online Library. To be fully inclusive, I did not define a start date. In order to control for the quality of the articles a delimiter so set that only scholarly journal articles, i.e. peer-reviewed papers would be included in the results. Moreover, the relevant language was set to English. It was ensured that the searches were not case sensitive so that all notations of the search term were included, i.e. "fintech", "Fintech", and "FinTech".

The search was executed in six phases. During the first phase I solely searched for the term Fintech in the individual paper titles. During the second stage I extended the search to the corresponding abstracts and in the third phase I opened it up to title and/or abstract and/or full text. The purpose was to receive a quantitative overview of how many articles had been published thus far related to the term Fintech. Throughout step four I sorted out duplicated results as some articles are indexed in and accessible through more than one data base. In phase five I then carefully examined each one of the articles that I had identified in the previous phase for any potential definition of the term Fintech. The purpose of stage six was then to further extend the search beyond the literature databases listed above in case some of the identified articles had cited works that were not accessible through those sources. The objective here was to find any documented precedent of the definitions being applied. If these second level searches revealed yet additional referenced work, corresponding third level searches were executed for those sources.

3.2 Analysis

The definitions obtained were examined using semantic analysis (Goddard, 2011). The overall goal of this analysis was to set apart the definiendum, i.e. the defined term, which is Fintech, and the definientia, i.e. the defining formulas provided by the various authors (Tarski, 1969). In this context, it should be noted that I attached equal importance to any definition found. As the academic treatment of the topic is still in its infancy and thus very little scholarly output exists yet, I did not make further distinctions among ratings of journals or the number of citations an article has received etc.

Syntactic structures from definitions of the term Fintech were related to more abstract levels in order to derive a meaning that was as independent as possible from the specific wordings used in the individual definitions. Moreover, specific features were condensed or removed where necessary in order to lay the basis for developing a clear-cut, commonly acceptable definition of the term.

Throughout the analysis a particular emphasis was put on the objects that the authors used to define the term Fintech and attributes they applied to further characterize the object. It was further delineated what Fintech comprises / involves and which objectives were pursued by Fintech. Furthermore, note was taken of the results Fintech produces, in case this information was provided by the individual authors.

The subsequent results section provides an overview of the quantitative occurrences of the term Fintech but also about the specifications used to define the term. It furthermore offers a synthesis of the term.

4 Results

The number of counts of the word Fintech being used in article titles, abstracts and full text searched as well as the number of definitions provided for the term are presented in the table below.

Table 1. Counts of the word Fintech in databases

Sources	Hits in Title	AND/OR Abstract	AND/OR Full Text	No of definitions provided
EBSCO	10	12	60	-
Business Source Premier	16	25	28	-
DOAJ	2	3	4	1
Emerald Insight	-	-	-	-
JSTOR	2	2	11	-
SAGE	-	-	-	-
Science Direct	2	2	53	1
Springer Link	-	-	26	2
Taylor Francis	1	1	38	3
Wiley Online Library	2	2	3	1
Subtotal Literature Databases	**35**	**47**	**223**	**8**

Sources	Hits in Title	AND/OR Abstract	AND/OR Full Text	No of definitions provided
others, peer-reviewed				3
Subtotal Scholarly Sources	**42**	**54**	**354**	**11**
others, non peer-reviewed				3
Subtotal all sources	35	47	223	14
Total corrected for duplicated results	**28**	**37**	**203**	**13**

The results vary strongly among the data bases consulted, yet the total sums are considerable as far as the pure word counts are concerned: Across all literature databases and prior to adjusting for duplicated entries 35 scholarly articles display the word Fintech in their title. 45 academic papers make use of that term in the title and/or abstract and a total of 223 peer-reviewed works make use or reference the expression one or multiple times throughout the full text, including footnotes and biographies. The count of 223 texts contrasts sharply with the number of definitions provided, i.e. 14.

After adjusting for repeated entries, still 28 peer-reviewed papers display the word Fintech in the title. 37 scholarly works make use of that term in the title and/or abstract and a total of 203 works scientific use the expression on one or multiple occasions throughout the entire text. Yet only 13 articles or 6% actually define the concept.

The definitions of the term Fintech along with the corresponding authors and a semantic analysis can be found in Table 2.

Table 2. Definitions of term fintech, sources, and semantic analysis

Level	Definition	Authors	Source Type	Page	Citing	Object	Attribute(s)	Comprises / involves	Objective	Results
I.	"FINTECH is an acronym which stands for financial technology, combining bank expertise with modern management science techniques and the computer."	Bettinger, 1972	PJA	p.62		Technology	financial	bank expertise; modern management science; computer	n.a.	n.a.
I.	"Financial Technology, also known as FinTech, is a new sector in the finance industry that incorporates the whole plethora of technology that is used in finance to facilitate trades, corporate business or interaction and services provided to the retail consumer."	Micu & Micu, 2016	PJA	p.380		Sector	new	plethora of technology	Facilitation of financial activities	n.a.
I.	"Fintech is an emerging financial services sector that includes third-party payment, MMF, insurance products, risk management, authentication, and peer-to-peer (P2P) lending"	Shim & Shin, 2016	PJA	p.170	Barberis, 2014	Sector	emerging	third-party payment, MMF, insurance products, risk management, authentication, and peer-to-peer (P2P) lending	n.a.	n.a.

Table 2 (continued). Definitions of term fintech, sources, and semantic analysis

Level	Definition	Authors	Source Type	Page	Citing	Object	Attribute(s)	Comprises / involves	Objective	Results
I.	"Driven by technological advances, new service models have developed in the financial industry which offer additional opportunities to customers. Under the common denominator 'fintech', these new businesses aim to challenge existing financial institutions by using technology to deliver value to the customer in an alternative way."	Maier, 2016	PJA	p.143		Business	new	technology	Offering additional opportunities to customers	n.a.
I.	"FinTech is an economic industry composed of companies that use technology to make financial services more efficient".	Čižinská, Krabec, & Venegas, 2016	PJA	p.1	Wharton FinTech, 2014	Industry	economic	companies that use technology	Enhancing efficiency of financial services	n.a.
I.	"In addition to this, a particular evolution and use of technology (commonly referred these days as fintech) in finance is disrupting traditional business models in financial markets, as well as bringing about new and uncharted risk territories".	Lončarski, 2016	PJA	p.2		Evolution and use of technology	disrupting	new and uncharted risk territories	n.a.	n.a.

Table 2 (continued). Definitions of term fintech, sources, and semantic analysis

Level	Definition	Authors	Source Type	Page	Citing	Object	Attribute(s)	Comprises / involves	Objective	Results
I.	"Internet finance, which is often referred to as 'digital finance' and 'Fintech' outside China, was coined by Ping Xie and Chuanwei Zou (2012)."	Shen & Huang, 2016	PJA	p.221	Xie & Zou, 2012	Finance	Internet; digital	n.a.	n.a.	n.a.
I.	"Internet finance is a spectral concept. It covers all forms of financial transactions and financial intermediaries and markets, such as commercial banks, securities firms, insurance companies, and stock exchanges, to the scenario under Walrasian equilibrium (where neither financial intermediaries nor markets exist) caused by the impacts of internet technologies." and "We think internet finance and Fintech are essentially different words for the same concept"	Xie, Zou, & Liu, 2016	PJA	p.241 p.250		Concept	spectral	financial transactions and financial intermediaries and markets	n.a.	n.a.
I.	"Recent advances in information and communications technology (ICT) have led to the rapid development and expansion of new and innovative financial services, often termed FinTech."	Jun & Yeo, 2016	PJA	p.159		Services	financial; new and innovative	n.a.	n.a.	n.a.

Table 2 (continued). Definitions of term fintech, sources, and semantic analysis

Level	Definition	Authors	Source Type	Page	Citing	Object	Attribute(s)	Comprises / involves	Objective	Results
I.	"Fintech is a service sector which uses mobile-centered IT technology to enhance the efficiency of the financial system. As a term, it is a compound of 'finance' and 'technology', and collectively refers to industrial changes forged from the convergence of financial services and IT"	Kim, Park, & Choi, 2016	PJA	p.1058		Sector	service	mobile-centered IT technology	Enhancing efficiency	industrial changes
II.	"Beside indirect financing via commercial banks and direct financing through security markets, a third way to conduct financial activities will emerge, which we call 'internet finance'".	Xie & Zou, 2013	PJA	p.1		Activities	financial	n.a.	n.a.	n.a.
II.	"FinTech refers to the application of technology within the financial industry. The sector covers a wide range of activities from payments (e.g. Contactless) to financial data and analysis (e.g. Credit scoring), financial software (e.g. risk management), digitized processes (e.g. authentication) and, perhaps most wellknown to the wider public, payment platforms (e.g. P2P lending)."	Barberis, 2014	Rep	p. 5	Langley, 2014	Technology	n.a.	industry; sector covering payments, financial data and analysis, financial software, payments	n.a.	n.a.

Table 2 (continued). Definitions of term fintech, sources, and semantic analysis

Level	Definition	Authors	Source Type	Page	Citing	Object	Attribute(s)	Comprises / involves	Objective	Results
II.	"Fin·Tech noun : an economic industry composed of companies that use technology to make financial systems more efficient"*	Wharton FinTech, 2014	Web	n.a.		Industry	econmic	companies that use technology	Enhancing efficiency of financial services	n.a.
III.	"Technology applied to financial services (Fintech) has a significant impact on our daily lives, from facilitating payments for goods and services to providing the infrastructure essential to the operation of the world's financial institutions."	Langley, 2014	Rep	p.1		Technology	n.a.	financial services	facilitating payments; providing infrastructure; operating financial institutions	impacts daily lives

Legend

Technology	-related
Industry/Sector	-related
financial	-related
Efficiency enhancing / Facilitating	

PJA	Peer reviewed journal article
Rep	Report
Web	Web page
*	double entry

When looking at the "genealogical tree" of the definitions it becomes apparent that two scholarly articles actually cite practitioner work: Shim and Shin (2016) cite a report by Barberis (2014) and Čižinská et al. (2016) refer to the Web page of the Wharton Fintech Club (Wharton Fintech Club, 2014). One peer-reviewed article by Shen and Huang (2016) cites scholarly work by Xie and Zou (2012). The remaining eight definitions are explanations sui generis. The definition provided by Wharton Fintech Club was taken out of the total number count as it represented a double entry for it was quoted verbatim by Čižinská et al. (2016).

The term Internet Finance that Shen and Huang (2016) referred to and which was - according to the authors - identical to the term Fintech, was mentioned in the article by Xie and Zou (2012). The original article by Xie and Zou (2012), however, was written in Chinese. I therefore reverted to another article by Xie and Zou which was published in 2013 and which also defined the term Internet finance aka Fintech [according to Shen and Huang (2016)], yet this time in English (Xie and Zou, 2013).

The semantic analysis yielded the following commonalities as far as the definientia are concerned: Four of the ten discriminable scholarly definitions claim Fintech to be a sector or industry. Two further explanations define it as a technology. Three sources are detailing Fintech as a type of action, let that be a business, a services and or very broadly activities. When looking at the attributes used in conjunction with the term Fintech five sources speak of Fintech as something novel, i.e. they describe it as new, emerging, innovative or disrupting. The attribute financial is used twice. When further investigating the peer-reviewed works what Fintech comprises or involves in a broader sense, technology is directly mentioned three times and one more time as "computer". Two see Fintech as involving financial activities in the broadest sense. When examining the academic definitions for the objectives of Fintech, enhancing the efficiency of or facilitating financial services comes up as the common denominator three times. No common grounds could be identified regarding the results Fintech brings about.

With these most often mentioned commonalities of the scholarly definitions of Fintech in mind, the following definition for the terms Fintech is proposed:

> *Fintech is a new financial industry that applies technology to improve financial activities.*

After proffering this definition it will be discussed in depth over the next paragraphs.

5 Discussion

The definition provided above is a synthesis building on commonalities of the definitions that have been applied to Fintech in literature. In its current form, it is a real or essentialist definition. Putting the definiendum at the end, it can also just be used as a abbreviatory, nominal or verbal definition. Hence, this definition can by expected to not only serve the research community as a real definition, but also the practitioner's sphere by applying it as a nominal definition. Moreover, and as the epistemological guard rails suggest that I have presented above, the derived definition of Fintech is broad enough to capture the essential quality of the object, i.e. it is a new financial industry that applies technology to improve financial activities, yet it is narrow enough

to discriminate these objects from other objects. For instance, this definition is broad enough to capture financial services improving technologies which are incremental (APIs, device independent technology, signature scanning) as well as disruptive ones (Chat Bots, the Block Chain, artificial intelligence etc.). At the same time it clearly excludes the largely mainframe and paper-based old type of banking services which are oftentimes even delivered through a human interface.

Representing a synthesis of many previously suggested definitions, it may serve as a common denominator, yet it may not be comprehensive or distinct enough for all authors and under all circumstances. In this context it is important to note that building on the thoughts of Scherer (2005) I am of the opinion that a definition is never true or false per se, but more or less useful in a specific context. For instance, if we consider the term "power". How would a physicist define it? How a politician? Which definition would a judge provide? Which explanation would an athlete give? Moreover, even within the domain of sports you are likely to receive different answers, depending on whom you ask. A weight lifter will most probably provide you with a different answer is than the fellow athlete from the same Olympic team who competes in synchronized swimming. Hence it has to be accepted that - contingent on the counterparty one asks - one may well receive varying answers on the identical question. There is no reason to believe that varying definitions of Fintech may be more or less useful under differing circumstances.

Another reason why the definition provided above can merely serve as a starting point for future explanations of the term is, because definitions change over time. Here, too, we can draw on analogies from other fields. Information technology or "IT" serves as a good illustration. In the early days of computing IT stood for items such punched tapes and cathode ray tubes (Ifrah et al., 2000; Metropolis, 2014; Williams, 1997). Today, however, we much rather associate things such as Motion User Interfaces, Bots and the Internet of Things with IT. Consequently, it is also safe to assume that the expression Fintech undergoes change. The definition of the term Fintech provided by the Web page Investopedia pays tribute to this fact: "Fintech is a portmanteau of financial technology that describes an emerging financial services sector in the 21st century. Originally, the term applied to technology applied to the back-end of established consumer and trade financial institutions. Since the end of the first decade of the 21st century, the term has expanded to include any technological innovation in the financial sector, including innovations in financial literacy and education, retail banking, investment and even crypto-currencies like bitcoin.". Hence, for the authors of Investopedia, Fintech was originally an expression describing banking backend technology, but widened over time to also encompass technological innovations in financial services and related areas (Investopedia, 2016). Moreover, it must be stressed that the definition derived above asserts that "Fintech is a new financial industry […]". The word "new" is inherently hard to elucidate in this context and it is therefore safe to assume that this component of the definition will be altered in the near future. Hence, the definition for Fintech will then be the following "Fintech is a financial industry that applies technology to improve financial activities".

However, other fields of business and academia have proved that science as well as practice can cope with a certain degree of definitional ambiguity. Terms such as "strategy", "innovation" or "business model" are being used on daily basis by

practitioners and academics alike, yet we have not established one common definition for any of these words [insights in the definitional difficulties regarding the term strategy are provided by De Wit and Meyer (2010), for innovation see Baregheh et al. (2009), for business model consult Morris et al. (2005) respectively]. Thus, having not one single static definition for the word Fintech has so far not prevented scholar and practitioners from using it. However, when applying the term Fintech one should make clear to the audience or readership what is meant by it. Providing such an explanation significantly improves the efficiency of communication and reduce the potential for misunderstandings. Moreover, only a shared definition will permit the emergence of a meaningful which is fundamental to science (Waugh, 1997).

6 Conclusion

The overall claim of this article is that no one single definition of Fintech exists. After more than 40 years that the term has been used in practice as well as literature there is no agreement as to what Fintech entails. The process of deriving a shared language for business phenomena has long been recognized to be a daunting task (Daft and Wiginton, 1979). By demonstrating elusiveness of Fintech as a concept this paper corroborated this assertion. The differences in definitions revealed by the literature review, underscore that there are definitional problems with Fintech. This is often compounded by the interchangeable use in the practice, but also in scholarly literature.

In order to nevertheless derive commonalities among definitions of the term Fintech, I pursued the most comprehensive review of definitions of the term Fintech that has thus far been published. By applying a semantic analysis, I then closely examined the similarities of the definitions of Fintech that have been used in scientific literature and pointed out the major commonalities. On the quest for a common understanding of the term Fintech I also ventured into the spheres of practice as the notion of Fintech seems to be repeatedly crisscrossing the boundaries between academic and practical domains. Building on the common grounds that these definitions possess, I extracted a new definition as the least common denominator.

This research has implications for scholars, practitioners and policy makers alike. With regards to the first group of stakeholders, this study solidifies the basis for scientific research on Fintech by crafting a network of existing scholarly works to constitute a single definition for the term Fintech. In this way it contributes to constructing intertextual coherence in a novel area of studies and thus helps to lay the foundation for sound scientific work in this area. Moreover, it will facilitate teaching the subject of Fintech as the area can now be delimited to a higher degree. This delineation will increase focus and efficiency of passing on subject-related knowledge. As far as practitioners are concerned, the clear definition of the subject will also decrease the likelihood of misunderstandings and increase the efficiency of communication on the topic. It is safe to assume that many board room meetings in the financial services industry and beyond nowadays revolve around the topic of Fintech, yet participants may not have a common understanding of this term. Finding common grounds on the subject will facilitate any Fintech related discussion. In a similar vein, this clarification of the term Fintech will provide policy makers with a more tangible accord of this subject. Fintech has various ramifications to be observed by policy makers. Being a

means of job creation is certainly one of them, yet topics such as consumer protection will also become increasingly important. Having a common denominator for discussions will certainly help policy makers shaping their discussions. However, what should be kept in mind by all stakeholders using the term Fintech, is that differing definitions may still continue to exist, especially amongst languages. Clarifying and communicating one's own definition of the term prior to any decisive discussion thus becomes paramount, should any dialog on Fintech be meaningful and efficient.

Nonetheless, the definition of Fintech offered above should be seen as a mere starting point for harmonizing and encompassing all the varied perceptions in order to obtain consensus, if only in operational terms. Once this is settled researchers and educators may begin researching and teaching this concept using the same definitional backdrop.

7 Limitations and future research directions

Obviously, no research is without limitations and this paper is no exception. In this study the term Fintech was examined without prefixed article. However, during the research for this paper I have also encountered the expression "a Fintech" in texts as well as in conversations. This leads to the questions whether a difference exists between "Fintech" and "a Fintech". To my experience people typically refer to a Fintech company or more specifically to a Fintech start-up when they talk about "a Fintech" (e.g. see Treasury Today, 2016). Hence, the difference is to be located on the level of analysis: "Fintech" without article typically to industry whereas "a Fintech" is just one single entity belonging to this industry. This apparently small difference by the prefix "a", can give rise to serious misunderstandings. To a policy maker, for instance, it will make a large difference, whether he or she is asked to support creating an industry cluster or even entire industry or just one single firm. The same goes for a venture capitalist albeit with opposite signs. Another semantical limitation results from the fact that this study considered Fintech solely to be a noun. However, Fintech is also being used as an adjective. The business press progressively talks about fintech hubs, fintech suppliers, fintech businesses, even about fintech Careers (Hughes, 2016).

Another limitation of the paper emerges from the fact that the research solely focused on the English language. Yet, the term Fintech may substantially vary across languages. To illustrate this fact, definitions of the term Fintech were polled from different language versions of Wikipedia. Relating to the Wharton Fintech Club's definition of the term, the English version of Wikipedia, states that "[f]inancial technology, also known as fintech, is an economic industry composed of companies that use technology to make financial services more efficient." (Wikipedia, 2016a). The Italian site by comparison asserts that Fintech is the "provision" of financial products and services using information technologies ["La tecnofinanza, o tecnologia finanziaria (in inglese Financial Technology o FinTech) è la fornitura di servizi e prodotti finanziari attraverso le più avanzate tecnologie dell'informazione (TIC)"] (Wikipedia, 2016d). By contrast, the German Wikipedia definition of Fintech suggests that Fintech is an umbrella term for "modern technologies in the area of financial services" ["Finanztechnologie (auch verkürzt zu Fintech bzw. FinTech) ist ein Sammelbegriff für moderne Technologien im Bereich der Finanzdienstleistu ngen"] (Wikipedia, 2016b). The French Wikipedia version is much closer to the English one, yet it does not define Fintech as an industry,

but more loosely as an "area of activity" ["La technologie financière, ou FinTech, est un domaine d'activité dans lequel les entreprises utilisent les technologies de l'information et de la communication pour livrer des services financiers de façon plus efficace et moins couteuse"] (Wikipedia, 2016c). Hence, just by comparing across a small random sample of languages one can already fathom the potential for misunderstandings. While the Frenchman may be talking about Fintech as a business segment, the German may be speaking about technologies, the Italian about a delivery channel and the native English speaker may refer to an entire industry. Being aware of potential pitfalls is all the more important as the term Fintech has been derived from the English words financial technology, yet it is also used as such in various other languages. Thus people may automatically assume that they talk about identical things whilst they are not. In addition one should bear in mind that Fintech is a global phenomenon (Mackenzie, 2015). Running into questions of semantics across languages may happen easier than anticipated. An in-depth study of the applications of the term Fintech in different languages would undoubtedly be of interest.

A third shortcoming of this article emanates from the fact that the term Fintech is already showing offsprings. Especially in the popular press as well as on Internet media outlets one can regularly come across terms such as Wealthtech (see e.g. Cheok, 2016), Insurtech (see e.g. Ralph, 2016), Regtech (see e.g. Crosman, 2016) etc. in the context of Fintech. These expressions have not been touched upon in this article. As Fintech will grow more mature it would certainly be beneficial to established common definitions for these terms, too.

Last but not least definitional problems with the term "definition" should be noted. In his article "what is a definition" James Brown attempted to provide some explanation on what a definition is. After lengthily discussion the problems of defining a definition his article ends with the words "The question in the title – what is a definition? Remains. It's a wide open problem" (Brown, 1998, p.131). Hence, if - from a scientific perspective - the term definition is already standing on shaky grounds, one always needs to bear in mind that any new definition derived will be standing on at least as instable lands.

From an academic point of view Fintech is still an untilled field. Hence, plentiful new research strands are perceivable. One of the most pressing one is surely the relationship between Fintech firms and incumbent players. Do they view each other as complements or competitors? Would mergers and acquisitions make sense or would strategic alliances yield more value? Another research question on industry level could be what sets apart Fintech firms from incumbent players. They oftentimes serve identical clients, yet Fintech firms and incumbent companies are in general fundamentally different. How do they differ in terms of vision and strategy, organizational structure, processes, and culture? Moving down the value chain, additional research questions arise from marketing and sales, i.e. How do Fintech firms approach clients? Which client segments are they typically targeting? What is their pricing model? Valuable insights could also result from investigating the support functions of Fintech firms: How is finance ensured? Which kind of HR model do Fintech firms pursue?

So what has Fintech in store for us? Fintech is poised for further growth. So far, we have been witnessing individual Fintech startups that have just begun seizing individual parts of the financial services value chain and optimizing them. This puts incumbent

players in a difficult position as parts of their oftentimes most lucrative businesses are breaking away whilst they are left with the regulatory burden and the associated costs. At the same time, Fintech still needs to prove that it is not just a fleeting star. Despite its remarkable growth in the recent years, Fintech still needs to provide evidence that it is a sustainable phenomenon even in markets which are on the downturn.

Developing at a very high pace, it is safe to say that parts of current Fintech momentum will slow down in the years to come. Some market observers even go as far to say that there is a Fintech bubble building up which is likely to burst soon. However, the Internet and eCommerce did not disappear with the burst of the Dot-Com bubble. On the contrary, the innovations made in the years leading up to the bubble burst prevailed. Web technologies have never been as pervasively applied as today. A Web sales channel or at least an information outlet has become a standard for most enterprises in the western world. Hence, Internet technology did not disappear with the burst of the Dot-Com Bubble. Rather than that, it was absorbed, transformed, and adopted by the majority of firms in the western world and turned into a business standard.

It is likely that similar things will happen to Fintech. Turning into an outcast in the eyes of investors in the event of a bubble burst, Fintech will then disappear as a label. However, a good share of the innovations brought forward by Fintech firms will then be absorbed by other players, such as by incumbent banks, insurers and software companies and be kept alive. In other words, even if the Fintech genie deflates it will still continue to live in its bottle. And this time we will be able to stick a proper label on it.

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Journal of Innovation Management
JIM 4, 4 (2016) 55-67
HANDLE: *http://hdl.handle.net/10216/102610*

Towards a framework for New Service Development Practices

Katja Maria Hydle[1], Tor Helge Aas[2], Karl Joachim Breunig[3]

[1] IRIS - International Research Institute of Stavanger, Oslo, Norway
katja.hydle@iris.no

[2] University of Agder, Kristiansand, Norway
tor.h.aas@uia.no

[3] Oslo and Akershus University College, Oslo, Norway
karl.joachim.breunig@hioa.no

Abstract. Different frameworks for New Service Development (NSD) practices have been suggested by prior conceptual research. We have assessed three frameworks frequently referred to in extant research, and exposed how these three cover different dimensions of NSD practices. By exploring the practices of NSD empirically, this paper continues the ongoing discussion of what the relevant aggregated dimensions of NSD practices are. The detailed practices identified by interviewing 25 employees, all with key roles in relation to NSD in five large Scandinavian service firms, about their NSD practices, are clustered into three aggregated overarching dimensions of NSD practices: 1) identifying needs, 2) assuring support and 3) dividing work. The findings suggest that the NSD process is the prime focus of NSD practices and that different resources are integral parts. The findings provide both managerial implications and implications for further research.

Keywords. New Service Development, service innovation, practice theory

1 Introduction

The potential role of New Service Development (NSD) in creating financial performance and competitive advantage for both service and manufacturing firms is increasingly acknowledged (e.g. Aas & Pedersen, 2011). At the same time, frameworks of successful NSD practices remain scarce (den Hertog, van der Aa, & de Jong, 2010). Recently, Lusch and Nambisan (2015) suggested that the core value of both services and products are the utility they render. However, the innovation process for physical products as opposed to intangible services can be very different. In particular, den Hertog et al. (2010) explain how service innovation involves multiple dimensions ranging from changes to the service concept, customer interaction and business models, to technical and organizational changes. In spite of this, the empirical innovation management literature has focused primarily on the development of new physical products when exploring the practices that firms undertake when they innovate successfully (K. B. Kahn, Barczak, & Moss, 2006).

An extensive series of empirical studies has identified relevant practices when new physical products are developed (K. B. Kahn et al., 2006). Insights from this empirical

ISSN 2183-0606
http://www.open-jim.org

research stream have formed the basis for developing frameworks of New Product Development (NPD) practices and for suggesting normative advice for NPD managers. Because of this research stream the Product Development and Management Association (PDMA), for example, now applies strategy, portfolio management, process, tools, metrics, market research, teams, people, and organizational issues as key aggregated dimensions in their framework of NPD practices (PDMA, 2016). This framework works as a guide for NPD practices research (Kenneth B. Kahn, Barczak, Nicholas, Ledwith, & Perks, 2012), as well as a guide for practitioners and the training of practitioners (PDMA, 2016).

Due to the differences between services and products and between service innovation and product innovation (Droege, Hildebrand, & Forcada, 2009), there is, however, no guarantee that the frameworks based on studies of physical product innovation are also relevant for NSD. From a managerial perspective, this gap in the literature is disconcerting. Managers need to facilitate efficient practices to succeed with innovation, and due to the lack of frameworks of NSD practices, and lack of corresponding normative guidance, this is now a difficult and hazardous task for managers pursuing a business strategy reliant upon NSD (den Hertog et al., 2010). A recent review of the NSD research literature even concludes that the literature "fails to provide managers with consistent answers to basic questions about how to most effectively manage NSD processes" (Biemans, Griffin, & Moenaert, 2015, p. 1).

An important first step in improving this situation would be to develop a framework of the key aggregated dimensions of NSD practices, like those developed for NPD. There have already been a few attempts at this in the literature, but the few frameworks suggested are predominantly based on conceptual discussions (den Hertog et al., 2010; Froehle & Roth, 2007). We therefore argue that more empirical research is needed to confirm, or alternatively contradict, the NSD practices frameworks suggested by prior conceptual research. Therefore, in this paper our aim is to contribute to filling this literature gap by asking the following research question (RQ): What are the key aggregated dimensions of NSD practices that firms undertake to succeed with their NSD efforts?

Instead of deploying a conceptual theory-based top-down approach, like prior research, to answer this question, we follow an empirical bottom-up approach where the starting point is the identification of NSD practices, and where these practices then are aggregated into key NSD practices dimensions on higher levels. The paper is structured in the following way: In the next section, we review the literature discussing NPD and NSD practices as well as practice theory. In the third section, we describe the empirical method deployed to answer the RQ. The findings are reported in the fourth section. In the two latter sections, we discuss the findings and conclude.

2 Literature review

To elucidate the research question, we need to combine insights from the results of NPD and NSD practices research together with practice theory; highlighting practices of service development necessitates a thorough understanding of practices as phenomena; the different frameworks all refer to practices without engaging in what

practices are. Recently, Aas, Breunig, Hydle, and Pedersen (2015) assessed the relevance of extant NPD frameworks for NSD and identified PDMA (2011) and Froehle and Roth (2007) as the two most frequently cited frameworks. In addition den Hertog et al. (2010) introduce an understanding of the multidimensional service innovation process. All three frameworks claim to offer insight into NSD practices, and consequently, we compare these frameworks to assess the aggregate dimensions suggested.

2.1 Dimensions of NPD Practices

The innovation management literature has focused primarily on the development of new physical products when exploring the practices that firms undertake when they innovate (K. B. Kahn et al., 2006). This research stream has resulted in a set of aggregated innovation practices dimensions. K. B. Kahn et al. (2006) for example, suggest that NPD practices are delineated across six dimensions: 1) strategy, 2) portfolio management, 3) process, 4) market research, 5) people, and 6) metrics and performance measurement.

Similar aggregated practices dimensions are used by professional NPD organizations and associations, such as the Product Development and Management Association (PDMA) when they for example carry out best practices surveys (e.g. PDMA, 2011) and certification work (PDMA, 2016). In their latest NPD best practices survey, PDMA uses the following NPD dimensions: 1) culture, 2) strategy, 3) portfolio management, 4) process, 5) front end, 6) tools and 7) measures and metrics (PDMA, 2011), and in their latest certification work seven similar aggregated NPD dimensions are deployed: 1) strategy, 2) portfolio management, 3) process, 4) tools, 5) metrics, 6) market research and 7) teams, people, and organizational issues as dimensions (PDMA, 2016).

Although the practices dimensions used by PDMA are a result of research on the development of physical products, they have also been used by several researchers as a framework for studying NSD practices empirically (K. B. Kahn et al., 2006; Zomerdijk & Voss, 2011). However, due to differences between products and services and between NPD and NSD (Droege et al., 2009) it is unclear to what degree the NPD practices dimensions are suited to guide empirical studies of NSD practices.

2.2 Dimensions of NSD Practices

The attempts to develop frameworks of the key dimensions of NSD practices are limited, and the few frameworks suggested in the literature are predominantly based on conceptual discussions. A recent example of a framework derived from theory, is “the resource-process framework of NSD” suggested by (Froehle & Roth, 2007). This framework suggests two key dimensions of NSD practices: resource-oriented practices and process-oriented practices, and the authors further suggest that the resource-oriented practices may be subdivided into intellectual resources, organizational resources and physical resources, whereas the process-oriented practices may be subdivided into design stage, analysis stage, development stage and launch stage.

Froehle and Roth (2007) also conduct an empirical study (i.e., multiple rounds of interviews and card-sorting exercises with senior service managers) to detail the description of NSD practices within each dimension, and based on this exploration they

suggest 45 detailed constructs for NSD related practices. However, the aggregated top-level NSD practices dimensions are not discussed in light of empirical findings. Consequently, there is a risk that if these aggregated levels are irrelevant for NSD, the 45 detailed constructs they derive are inaccurate.

Another example of a conceptual study suggesting a framework of NSD practices dimensions is den Hertog et al. (2010). Based on insights mainly from the strategic management literature, the authors discuss conceptually what activities firms should undertake to build the capabilities needed to succeed with NSD. Although the authors do not use the term "innovation practices", their suggested framework may be perceived as a framework describing the practices firms undertake to build (service) innovation capabilities, thus a framework of NSD practices. Perceived like this the framework suggested by den Hertog et al. (2010) consists of six dimensions of NSD practices: 1) signalling user needs and technological options, 2) conceptualizing, 3) (un-)bundling, 4) co-producing and orchestrating, 5) scaling and stretching and 6) learning and adapting. The frameworks are set out in Table 1.

Table 1. The frameworks for new products and service development practices

Source	Froehle and Roth (2007)	den Hertog et al. (2010)	PDMA (2011)
Framework	7 dimensions for best practices for management of service innovation	6 dynamic service innovation capabilities	7 dimensions of best NPD practices
Dimensions	*Process oriented practices* 1) design stage 2) analysis stage 3) development stage 4) launch stage *Resource oriented practices* 5) intellectual resources 6) organizational resources 7) physical resources	1) signalling user needs and technological options 2) conceptualizing 3) (un-)bundling 4) co-producing and orchestrating 5) scaling and stretching 6) learning and adapting	1) strategy 2) portfolio management 3) process 4) tools 5) metrics 6) market research 7) teams, people, and organizational issues

From these frameworks, little can be understood about the actual activities taking place and how these activities are performed. The frameworks of both den Hertog et al. (2010) and Froehle and Roth (2007) are based on theoretical discussions where the theoretical insights are used to derive relevant practices dimensions. There is a risk, however, that these theoretically derived "maps" are inconsistent with the real activities or practices implemented by firms. Furthermore, there is little focus on customers and customer interaction. This is particularly concerning since client interaction and co-production is in extant research regarded as highly relevant and important in service development (Chesbrough, 2011; Fosstenløkken, Løwendahl, & Revang, 2003; Gronroos, 2000; Løwendahl, 2005; Normann & Ramírez, 1993; Ramírez, 1999; Skjølsvik, Løwendahl, Kvålshaugen, & Fosstenløkken, 2007; Vargo & Lusch, 2004). To extend knowledge on the actual activities being performed during service development, we lean on practice theory. Practice theory has been used in numerous empirical studies to identify what people actually do (Jarzabkowski, 2003; Orlikowski, 2000; T. R. Schatzki, 1996; Whittington, 2006)

2.3 Practice theory

Studying the practices of service development requires an understanding of the activities involved. Practices consist of activities, which again are different actions of doing and saying (T. Schatzki, 2010, 2012). These doings and sayings are bodily actions, which are intentional actions for the sake of performing a project towards a given end. Action is what is done, while the activity is the performing and the doing. A practice is composed of multiple activities involving teleological orders that are normative regarding what should be done and what is accepted within a specific practice. The activities of a practice are performed by multiple people; the practices are social phenomena (T. Schatzki, Knorr Cetina, & von Savigny, 2001). T. Schatzki (2005) argues that practices are non-individualist phenomena: "It is people, to be sure, that perform the actions that compose a practice. But the organization of a practice is not a collection of properties of individual people. It is a feature of the practice, expressed in the open-ended set of actions that composes the practice" (p. 480). The activities of a practice are performed by using material entities such as ICT (Orlikowski, 2007; T. Schatzki, 2012). Thus, organized human activities are practices.

Uncovering the practices of NSD, thus requires us to identify the different activities involved to reach a new service. Therefore, instead of deploying a top-down conceptual approach like den Hertog et al. (2010) and Froehle and Roth (2007) to derive the relevant innovation practices dimensions for NSD, we start with the activities to uncover the practices, and then these practices are aggregated into practices dimensions on higher levels.

3 Research methods

To view the recurrent activities performed while developing services, we chose a qualitative case oriented research approach to identify NSD practices. The study is based on empirical case materials derived from interviews with twenty-five informants from five large international Scandinavian service firms. The five firms selected operated in both business to consumers and business-to-business markets; they all provided services both to other firms and to consumers. The five firms provided different types of services: One firm provided telecom services, three firms provided financial and insurance services and one firm provided logistics services. All firms were successful in the market, as they had expanded beyond the national border to more than three countries.

Between four and eight employees in each firm were interviewed. We followed a semi-structured interview guide, where the informants were asked open questions about how they conduct innovation activities. Each interview lasted between one and two hours. The interviews were recorded and transcribed. To reflect the overall NSD practices of the firms, informants with different roles, and from different levels of the firm, were chosen: Top/line managers, project/innovation managers and specialists. During the interviews, we investigated what the employees did, the types of problems the employees solved, what kind of tools they used and how the actors interacted. Table 2 provides details on the interviews.

Table 2. Data sources

	Key informants	Management	Innovation	IT	Other	Total
Insurance	1	1	1	1		**4**
Telecommunications	1	2	2	2	1	**8**
Banking	1	1	1	1	1	**5**
Mail services	1	1		1	1	**4**
Insurance & banking	1	1	2			**4**
Total	5	6	6	5	3	**25**

To make sense of the data, the analysis progressed in several stages. First, the material was thoroughly discussed and made into presentation form in Power Point. The aim was to present it to selected employees and managers in the firms to validate the data's veracity and enhance the trustworthiness of the analysis (Lincoln & Guba, 1985). Second, the data was examined in light of the research question, specifically looking at how service innovation was performed in the firms, and the data was coded in two main steps which focused on informant centric and research centric coding respectively (Gioia, Corley, & Hamilton, 2013). According to what the practitioners told us that they did, we coded their explanations according to the language they used into first-order categories. Then we clustered them together into different groups, being researcher induced concepts and second-order themes. Further, these second order themes were assembled in overarching dimensions to gain a theoretical framework that linked the practitioners' explanations of their ways of performing service innovation.

4 Analysis

The findings from interviewing those who were involved in and managed NSD in the case organizations resulted in the identification of a great number of detailed first-order categories of successful NSD practices. A small, but representative, selection of these first-order categories is provided in Table 3 in the form of representative quotes. The clustering of these first-order categories of NSD practices resulted in the identification of six second-order NSD practices categories: 1) initiating projects, 2) focusing on customers, 3) legitimizing, 4) convincing, 5) involving units and 6) collaborating. These six second-order categories of NSD practices were then grouped into the following three overarching key dimensions of NSD practices: 1) identifying needs, 2) assuring support, and 3) dividing work.

Table 3. Empirical data supporting interpretations of NSD practices

1st order dimensions of NSD practices (representative quotes)	2nd order dimensions of NSD practices	Overarching dimensions of NSD practices
"I started out by asking, 'Ok, what do we want? Why shall we stake a lot on the youth segment? What do we need?' …I do not want ideas, as the only things that count are deliveries. And ideas are not a problem when you know what you want…it is about rewinding and asking what kind of needs do we solve… it is a handcraft, to be worked on, using time and energy, to systematize and try	Initiating project	**Identifying needs**

1st order dimensions of NSD practices (representative quotes)	2nd order dimensions of NSD practices	Overarching dimensions of NSD practices
to think of customer scenarios. Try to think which areas are suitable to compete in and deliver something…"		
"So, I started with a concrete area where there would be substantial differences for the customers and went on to prove it. I then got responsibility for the project 'Simplification' and took on that project. It suited me well to start here due to the 275,000 customers involved."	Focusing on customers	
"It is a fine line: What do customers want? And we ask in many forums, like 'What can we do better?' Then we ask questions covering what customers think we should solve. And there are a lot of good answers. That is one way of doing it. Another way is to try to think what customers need that the customers don't know that they need. Because I work in a bank, I know that this and that would be damn good for the customers to get. So, then I try to catch both these perspectives."		
"I got the project... And I made a budget which I presented to the steering committee. As all projects do. There is a steering committee for all the projects I lead…I put forward a document to the steering committee and held this presentation: what are we going to do, what is the solution, what are we changing, a gross prototype, yes we have to work with the first page…When I presented this to them, we found out that it was a good idea…There were logical arguments mixed with ethos: our competitor had done it, and pathos: we can't rule this out. All together it made them say yes, go for it."	Legitimizing	**Assuring support**
"It is as if my job is a talking job, I go around and talk and talk, and I get so fed up of my own voice. And I get people to meet and often it gets to, 'Why don't you talk with him, why don't you know each other?' Then they answer, 'I have never talked to him' and I reply, 'But I know that he is sitting and working on exactly the same things as you do.' I take it for granted that people collaborate, if not we won't make it. That is why all these ideas have been lying around unsolved, because they have not collaborated…So mainly it is about walking around, talking to people and making them talk together."	Convincing	
"What I did? I approached the management group, for instance, for e-business and marketing and asked who the right human resources were and got the manager for the unit to recommend me. And from then on I have worked very closely with e-business and marketing."	Involving units	**Dividing work**
"We have some agencies that we have an overall agreement with. For instance, an advertising agency and they are really good in digital services, and then we have a PR agency as well. So, it is not about getting more agencies on board, but on using the agencies we have an agreement with, the right way. Because then we have the network, we know they deliver. And then I have worked a lot with some people in our IT department who are way ahead in relation to services. And that is so much fun. A thing I just initiated: There is a conference named 'Innovate' taking place in London and San Francisco twice a year, and I took one person from IT and one from e-business there to assure that we have the same understanding since we are dependent on each other to succeed in what we do."	Collaborating	

Source: Authors' research.

From a NSD point of view *identifying needs* refers to the activities conducted by employees to focus on customers' needs and initiate NSD projects (sometimes in the reverse order) to become more competitive and to differentiate the services from others in the market. *Assuring support* refers to the activities conducted by employees to

legitimize and convince the group of internal decision makers (e.g. boards and managers) and other internal stakeholders (experts and "ordinary" employees) that investment in the NSD project is worthwhile. *Dividing work* refers to the activities conducted to involve both internal and external people, and define their tasks and roles, to enable the successful implementation of the NSD project.

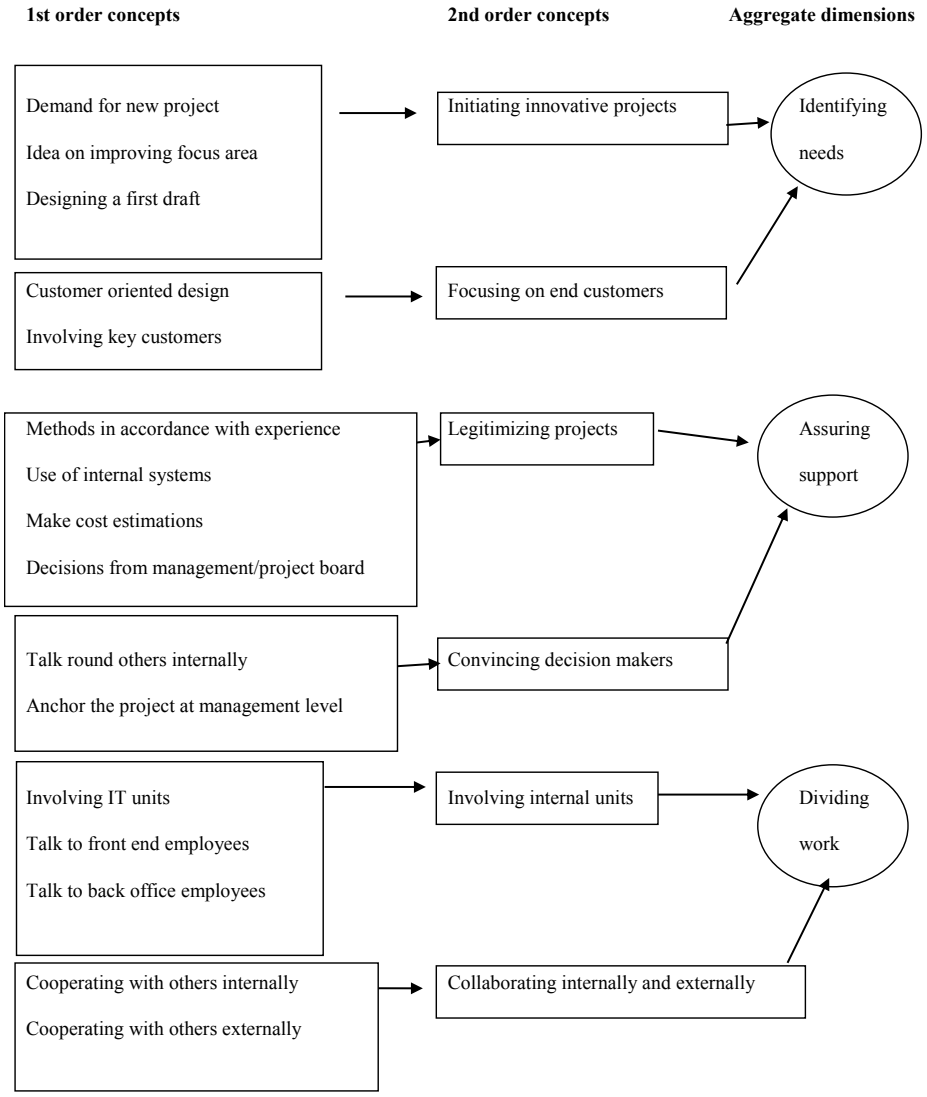

Fig. 1. NSD practices framework. Source: Author´s work

5 Discussion

Our study is an empirical contribution to the ongoing discussion on what the key dimensions of NSD practices are. To answer our research question – What are the key aggregated dimensions of NSD practices that firms undertake to succeed with their NSD efforts? – we compared the existing frameworks, used practice theory to uncover activities performed for new service development and identified empirically different dimensions than those already theoretically derived. When we compare our findings with the NSD practices frameworks suggested by prior conceptual research (den Hertog et al., 2010; Froehle & Roth, 2007) we observe that we have relatively different findings (Table 3). For example, our findings suggest that the resource-oriented practices dimension suggested by Froehle and Roth (2007) should not be perceived as an overarching dimension since intellectual resources, organizational resources and physical resources are integral parts in all the dimensions. Our findings suggest that such intellectual, organizational and physical resources are integrated into the different activities and they should hence not be separate parts. Thus, for NSD it does not seem to be relevant to build a set of general NSD resources that can be used during the entire NSD process. Rather, it seems to be important to focus on what is needed for the different activities to be performed, then facilitate, and enable the resources that are needed for these activities (our second-order themes).

Our findings are more similar to the framework suggested by den Hertog et al. (2010); den Hertog et al. (2010) dimensions called "signalling user needs and technological options", "conceptualizing" and "(un-)bundling" correspond to a certain degree with our "identifying needs" dimension, and den Hertog et al. (2010) dimensions called "co-producing and orchestrating", "scaling and stretching" and "learning and adapting" correspond to a certain degree with our "dividing work" dimension. However, there seems to be one important distinction between our framework and that of den Hertog et al. (2010): Our overarching dimension called "assuring support" seems to be lacking (or at least hidden in sub-dimensions) in den Hertog et al. (2010) framework, whereas our findings suggest that this is a key dimension of NSD practices.

Table 4. Key dimensions of new service development practices

Key dimensions (the present study)	NSD activity focus (the present study)	NSD project focus (Froehle & Roth, 2007)	NSD capabilities focus (den Hertog et al., 2010)	NPD process focus (PDMA, 2011)
Identifying needs	1) initiating projects 2) focusing on customers	1) design stage 2) analysis stage *[5) intellectual resources* *6) organizational resources* *7) physical resources]*	1) signalling user needs and technological options 2) conceptualizing 3) (un-)bundling	1) strategy 6) market research
Assuring support	3) legitimizing 4) convincing	3) development stage 4) launch stage		2) portfolio management 5) metrics

Key dimensions (the present study)	NSD activity focus (the present study)	NSD project focus (Froehle & Roth, 2007)	NSD capabilities focus (den Hertog et al., 2010)	NPD process focus (PDMA, 2011)
		[5) intellectual resources *6) organizational resources* *7) physical resources]*		
Dividing work	5) involving units 6) collaborating	*[5) intellectual resources* *6) organizational resources* *7) physical resources]*	4) co-producing and orchestrating 5) scaling and stretching 6) learning and adapting	3) process 4) tools 7) teams, people, and organizational issues

Source: Authors' research, (den Hertog et al., 2010; Froehle & Roth, 2007; PDMA, 2011).

By comparing the different dimensions in existing NSD and NPD frameworks, it becomes clear that the key focus of the different frameworks varies (see Table 4), e.g.:

- Froehle and Roth (2007) have a NSD project focus as all their dimensions are related to the stages of NSD projects with a prime focus on the resources needed to conduct the projects. In contrast, our findings suggest that the prime focus should be on the activities to be undertaken and the resources form integral part of these activities.
- den Hertog et al. (2010) have a NSD capabilities focus, as their dimensions expose service innovation capabilities within an organization. However, a focus on capabilities has a viewpoint on the organization. Our focus on activities highlights what to do, where agency is integral.
- The PDMA (2011) framework exposes dimensions with a focus on managing NPD processes. The PDMA focus exposes what the organizations should have in place, instead of what to do for new service development as in our activity framework.

In contrast, the key focus of the framework resulting from our empirical approach is the NSD activities. Our findings expose key activities that focus on customers and work division, indicating who is involved during NSD activities. Our findings thus confirm earlier research that has found that a focus on customers and customer interactions is important for service development (Fosstenløkken et al., 2003; Gronroos, 2000; Løwendahl, 2005; Skjølsvik et al., 2007), and research highlighting the importance of involving relevant actors (de Brentani, 2001). However, our findings show which activities are performed during NSD and reveal that customer focus is at play, extending the existing frameworks. Furthermore, our activity focus exposes what is necessary to do for the actors involved. Our activity focus is therefore different from the other frameworks: which resources are necessary to have (Froehle & Roth, 2007); or which capabilities to enable (den Hertog et al., 2010); or what an organization needs to have in place for NSD (PDMA, 2011).

6 Conclusion

By using practice theory and empirically exploring what actors actually do, we have identified three aggregate dimensions of service innovation practices. The implication of these three aggregate dimensions to extant innovation management theory is that they integrate the dimensions suggested in prior research. The three dimensions suggested reveal the different dominant focus previous studies have had on the different aggregate dimensions involved in service innovation. By comparing and contrasting frameworks suggested in existing research we show how these largely overlap and focus on the NSD project, service innovation capabilities or what the organizations need to have for the actual NPD process. In addition, extant frameworks emphasize to a limited degree customer interaction and the allocation of work.

The new framework of NSD practices suggested in the paper may serve as a valuable guiding map to managers aiming to improve the NSD practices of their firm. By using practice theory, the normative advices are integral, since we highlight which activities are at stake within the practices of developing new services.

However, our research design does have limitations since the research has been conducted in a specific service sub-sector, i.e. large service firms providing standardized services at a large scale, and it is difficult to assess whether the findings are generalizable to firms in other service sectors. Due to the small sample size, the findings cannot be generalized which is why we urge future studies to test the framework. Another limitation is that we have not performed a practice-based study, following all the activities through participant observation during a NSD project. Instead, we opted to ask several involved practitioners in retrospect to uncover the different activities involved in several firms. Thus, further empirical research is needed in different service contexts to validate and confirm the relevance of our findings for NSD in general.

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Journal of Innovation Management
JIM 4, 4 (2016) 68-97
HANDLE: http://hdl.handle.net/10216/102610

Innovation Labs: Leveraging Openness for Radical Innovation?

Lidia Gryszkiewicz[1], Ioanna Lykourentzou[1], Tuukka Toivonen[2]

[1] Luxembourg Institute of Science and Technology, Belval, Luxembourg
{lidia.gryszkiewicz, ioanna.lykourentzou}@list.lu

[2] The Institute for Global Prosperity (IGP), University College London, London, United Kingdom
tuukka.t@gmail.com

Abstract. A growing range of public, private and civic organisations, from Unicef through Nesta to NHS, now run units known as "innovation labs". The hopeful assumption they share is that labs, by building on openness among other features, can generate promising solutions to grand challenges of systemic nature. Despite their seeming proliferation and popularisation, the underlying innovation principles embodied by labs have, however, received scant academic attention. This is a missed opportunity, because innovation labs appear to leverage openness for radical innovation in an unusual fashion. Indeed, in this exploratory paper we draw on original interview data and online self-descriptions to illustrate that, beyond convening "uncommon partners" across organisational boundaries, labs apply the principle of openness *throughout* the innovation process, including the experimentation and development phases. While the emergence of labs clearly forms part of a broader trend towards openness, we show how it transcends established conceptualisations of open innovation (Chesbrough et al., 2006), open science (David, 1998) or open government (Janssen et al., 2012).

Keywords. Innovation labs, openness, open innovation, collaboration, open government, innovation hubs

1 Introduction

A growing range of public, private and civic organisations, from Unicef through Nesta to NHS, now run or support units known as "innovation labs". The hopeful assumption they share is that labs, by building on openness among other features, can generate promising solutions to grand challenges of complex, systemic nature. To highlight just a few examples, the eLab is grappling with the key challenges of the electricity sector; London's Finance Innovation Lab, showing yet more ambition, aims to rework the entire financial system, whereas the Unicef Labs innovate to alleviate the problems faced by children around the world. Recent practitioner publications, such as Labcraft (Tiesinga & Berkhout, 2014) and i-teams (Puttick et al., 2014) have shed some light on how labs work in practice while stirring broader interest in this phenomenon.

Despite their seeming proliferation and popularisation, the underlying innovation paradigm embodied by labs has so far received scant academic attention. This is a missed opportunity, because innovation labs are potentially fruitful vehicles for

ISSN 2183-0606
http://www.open-jim.org

leveraging openness for radical innovation1. Indeed, labs seek to span organisational, sectoral and geographical boundaries, welcoming a variety of actors, including representatives of business, NGOs, governments, arts, science and local communities. They claim to embrace radical ideas and out-of-the box thinking. But what are innovation labs really about? How do they differ from other innovation initiatives and intermediaries? Is the way in which labs embrace openness a key factor that defines them?

In this article, we contextualise and analyse the innovation labs phenomenon. Our focus is on how labs apply the principle of openness at different points in the innovation process. The organisational literature on openness in innovation and invention has, as we survey below, developed through the concepts of open innovation (Chesbrough et al., 2006), open science (David, 1998) and open government (Janssen et al., 2012). It has recently turned its attention to more precise questions around when openness is and is not useful for problem-solving purposes (Felin & Zenger, 2014; Hemphälä & Magnusson, 2012) and which stages of the innovation process should be opened up or kept closed (Laursen & Salter, 2014). But even in light of this expanded vocabulary and range of perspectives, the innovation labs analysed in this paper add several contrasting elements, for instance through issuing open calls for participation in hands-on, continued innovation processes (as opposed to asking users to address well-defined, relatively simple tasks in a one-off fashion).

In terms of structure, we first illustrate the innovation lab phenomenon with four prominent examples. We then conduct a literature review of "openness" in the innovation management literature, touching also on open science and open government. Next, following a description of our methodological approach, we present our main empirical findings, focusing on openness aspects that characterise innovation labs. We then compare and contrast innovation labs with other innovation-focused organisational forms, showing that they cannot be easily subsumed under any pre-existing organisational form or category. Finally, we provide a preliminary lab definition and clarify innovation labs' unique approach to openness, concluding by setting out the limitations of our work, its practical implications and the avenues for further research it points towards.

2 Innovation labs: some examples

In this section, we provide four innovation lab snapshots to illustrate what real-world labs do and familiarise the reader with this emergent phenomenon. A natural example to start with is the London-based Finance Innovation Lab (FIL), founded in 2008 at the height of the global financial crisis (www.thefinancelab.org). FIL builds on a diverse international community of over 2,500 people who have joined the lab voluntarily and are "committed to reworking the financial system". Members comprise a diverse mix of social entrepreneurs, bankers, activists, design students and academics, and their

[1] Radical innovation can be defined us "a product, process or service with either unprecedented performance features or familiar features that offer potential for significant improvements in performance or cost (...) radical innovations create such dramatic change in products, processes, or services that they transform existing markets or industries, or create new ones" (Leifer, 2000, p. 5).

interactions are facilitated by the lab founders as well as host organisations such as WWF-UK (World Wide Fund for Nature) and ICAEW (Institute of Chartered Accountants in England and Wales). They regularly participate in collaborative workshops and use novel approaches such as crowdsourcing to solicit ideas that might contribute to a better financial system. They turn the most attractive proposals into projects and prototypes that the lab helps resource. To effectively orchestrate these activities, the core lab team has broadcast its transformative vision as widely as possible to attract a range of participants with different views and areas of expertise. It has learned to segment its membership into smaller teams according to individual members' readiness to collaborate and move from ideas to implementation (Jen Morgan, personal communication, 11 February 2016). At the same time, FIL has provided focused support to various new and existing financial startups that share its vision, one example of which is Abundance Investment that facilitates peer-to-peer investment into projects with positive environmental and/or social impact (https://www.abundanceinvestment.com/). Another example of tangible impact and systemic change that the lab is delivering is The Lab's Fellowship programme that "supports innovators who are building financial businesses that put people and planet first, incubating the next generation of change-makers in finance". The programme aims to build "strategic know-how, collaborative leadership skills and a community of peers who will support each other to succeed" (FIL website, 2016). This programme is as central to FIL's strategic model as its other efforts that focus on convening and advocacy, and it generates startups and other projects that implement FIL's mission in a distributed fashion.

The Colorado-based eLab is a pertinent second example. In its own words, the eLab is an "assembly of thought leaders and decision makers from across the U.S. electricity sector [that] focuses on collaborative innovation to address critical institutional, regulatory, business, economic, and technical barriers to the economic deployment of distributed [electricity sector] resources" (http://www.rmi.org/elab). As the issues in the electricity sector are "occurring at the 'seams' where no single stakeholder or industry group can control the outcome", making systemic shifts requires the innovators to work well in complex multi-stakeholder environments across traditional institutional boundaries. eLab members collaboratively explore complex issues in the electricity field, develop insights, and partner with stakeholders to test and apply new ideas. Currently, eLab is working on several ambitious topics such as Transforming How Communities Use Energy, New Business Models ("framing clear objectives and principles around the design of electricity business models, reflecting the variety of perspectives on this topic, and taking the first step towards identifying viable new models") and Shared Vision ("to orient eLab participants around a common sense of purpose, align project efforts for greatest effect, and ultimately inform and engage others"), to name just a few. One specific example of eLab's impact is eLab Leap that is currently working in New York, enabling diverse stakeholders to "form untraditional working partnerships and co-develop creative and new solutions that empower low-income households and communities to benefit from a clean energy future" (eLab website, 2016). Community Power Programme and Community Energy Project are just some of the many concrete initiatives put in place by eLab in New York City.

A third example, MaRS Solutions Lab, describes itself in terms of its team's commitment to "tackling complex societal and economic challenges that require

systems change" (https://www.marsdd.com/systems-change/mars-solutions-lab). Not unlike the two foregoing initiatives, it strives to assemble a mix of different individuals and organisations, with an emphasis on experimentation between stakeholders and citizens as well as new ventures. It aims to support the diffusion and scaling of new effective solutions. In terms of its toolbox of approaches, MaRS Solutions Lab is eclectic: it draws on social innovation, design thinking, change management and social movement theory, among other methodological strands. Its larger aspiration is to "build capacity for systems change" through advancing "policies and learning opportunities that support people and organizations to drive change (https://www.marsdd.com/). MaRS Solutions Lab is working on several specific challenges: Future of Health, Future of Food, Future of Work and Learning, and Future of Government, engaging with a variety of collaborators including government, foundations, corporations, NGOs, and many others. One tangible example of the labs' work is the creation of highly popular GovMaker - a network, community, events platform and telepresence series on social innovation for "civil servants and open government enthusiasts" (MaRS website, 2016). GovMaker has been working to change public servants' mindsets, encouraging collaboration on (potentially) high impact initiatives in Ontario and beyond.

Finally, Quartier Stuff in Luxembourg (http://quartierstuff.lu) is a community innovation lab aiming to empower the citizens, workers, visitors and other stakeholders in one district in Luxembourg city to shape the future of the area. The lab's aim is to "innovate ... to ensure long-term social cohesion and high quality of life." Quartier Stuff has kicked-off with a highly successful "shape your district" crowdsourcing campaign which brought in more than 1,250 suggestions on how to "co-create the district". As part of another initiative, teams of lab participants involving a range of stakeholders from different backgrounds (including young children) have been working on several co-defined challenges (in the fields such as "green", "mobility", "public space", "social life", "services" and "youth"), using a bespoke methodology based on open innovation and design thinking. Concrete innovative solutions for the district are presently entering the prototyping phase, yet the lab process has already been shown to contribute value to the life of the district by giving the stakeholders a way to not only express their opinions but to truly engage in hand-on co-design of concrete solutions to pressing challenges. This is reflected in the local and international interest in the initiative and numerous inquiries on how the process could be transferred to other areas and contexts.

These examples suggest, at the very least, that innovation labs set ambitious goals; seek ground-breaking solutions; convene "uncommon" collaborators; and frequently engage the wider public (through methods that include but are not limited to crowdsourcing or crowdfunding).

Yet, further conceptual and empirical work is needed if we are to confidently distinguish innovation labs from other innovation-based approaches and understand them as a coherent, distinctive organisational form. In the present article, our aim is to contribute to this task by examining how labs apply the principle of openness, and hence we devote less space to other significant but (for present purposes) less definitive aspects such as lab funding.

3 Literature review

Three streams of literature are helpful when trying to place innovation labs in a broader innovation context: open innovation (3.1), open science (3.2) and open government (3.3). These will be reviewed here in some depth, followed by an overview of the scarce existing literature on the innovation labs themselves (3.4).

3.1 Open innovation

Open innovation describes the shift of corporate R&D from an in-house discovery focus to external engagement (West et al., 2014, Chesbrough 2003), and recognises that innovative ideas can also come from outside the firm. Open innovation involves an external "crowd", and research suggests the exact way that this crowd will be used to generate innovation depends on two factors: the complexity of the innovation problem and the degree of expertise identifiability (Felin & Zenger, 2014). Regarding problem complexity we can distinguish: i) simple problems, which involve a well-defined set of knowledge disciplines, are easily decomposed and their solution can be solicited by independent actors (Leiblein & Macher, 2009), and ii) complex problems, which are ill-structured in terms of the involved disciplines, and their solution cannot be easily decomposed to independent actor level. Simple problems are best served by a trial-and-error search strategy for identifying the solution, where the crowd sequentially builds the solution, while complex problems require a theory-guided, often carefully staged search approach (Deutsch & Baby, 2013), which first identifies relevant knowledge disciplines and then solicits crowd contributions. As for expertise identifiability, we can also distinguish two cases. In case that expertise is easy to identify then a centrally-coordinated crowd governance, where the firm appoints contribution roles to the crowd participants, is preferable. In the case that expertise is difficult to identify, then broadcasting the problem becomes a necessity in hope that those with valuable knowledge will reveal themselves (Jeppesen & Lakhani, 2010).

Table 1 illustrates the most commonly used methods to evoke crowd contributions in the context of open innovation, transposing the above-mentioned two-by-two categorisation of Felin & Zenger (2014) to the crowd-sourced domain. Reading from left to right and top to bottom, the first quadrant includes a micro-task based search approach, i.e. when the innovation task solicited by the crowd is simple, easily decomposable and expertise is evident, such as data categorization, curation, or enrichment (Kittur et al., 2008, Mohamed & Deepak, 2013). When the task becomes complex, but still expertise is easy to identify (second quadrant) then centrally-coordinated expert-evoking search solutions are the best, for example through platforms like UpWork intended to hire expert crowd workers for complex tasks like knowledge synthesis or product design. The third quadrant describes the case of simple, straightforward tasks, which nevertheless entail a high degree of hidden knowledge. Idea contests, like Innovation Jam's discussion forums or Lego Mindstorms (Majchrzak & Malhotra, 2013) belong to this category, relying on the crowd for novel ideas about a product and then improving these through a sequential search strategy. Crowdsourcing innovation brokers, such as Innocentive, Yet2, NineSigma, YourEncore, also belong to this quadrant, with the addition that they act as intermediaries between the firm and the crowd to address privacy concerns (Simula &

Ahola, 2014). The fourth quadrant describes the case of complex problems entailing a high degree of hidden knowledge and it is the one posing the most challenges for organisations, possibly requiring emerging forms of openness. The reason is that, as also pointed out by Felin & Zenger (2014), solving grand challenges necessitates collaboration and elaboration on the ideas of others, rather than simply gathering bursts of initial designs (Madsen et al., 2012). Multiple studies provide evidence that collaborative idea-creation by the crowd yields superior results in terms of innovation quality compared to autonomous individuals (Blohm et al., 2011; Madsen et al., 2012; Ye et al., 2012). In practice, however, implementing collaboration at crowd-scale is anything but easy: the competitive nature of crowdsourcing often makes people unwilling to share information with others (Adler & Chen, 2011); idea evolution takes time and crowd participants generally do not stay involved for extended periods; and co-creativity requires familiarity while crowd teams consist of strangers (Majchrzak & Malhotra 2013, Almirall et al. 2014). To make things worse, open innovation inherently involves a high degree of appropriation by organisations through capture of IP rights relating to innovations generated, yet such strong appropriation has been found to hamper collaboration (von Hippel, 2005, Murray and O'Mahony, 2007) and the motivation to participate (West et al., 2014, von Hippel, 2007). Due to these factors, the exact architectures, knowledge governance mechanisms and motivators that would optimally reconcile the need for IP protection *as well as* collaboration and motivation in the context of open innovation remain an ongoing subject of research. Methodological suggestions drawn from other successful innovation paradigms, like those adopted by Living Labs, could be examined to resolve such problems of practical applicability faced by open innovation scholars and practitioners, as discussed in the recent studies by Schuurman (2015) and Schuurman et al. (2016).

Table 1. Transposing Felin and Zenger's (2014) taxonomy to the crowd-sourcing context.

	Simple **(Trial & error search)**	**Complex** **(Theory-guided search)**
Low hidden knowledge **(Centralized selection)**	(1) Micro-tasks	(2) Expert crowd-based platforms
High hidden knowledge **(Self-selection)**	(3) Innovation brokers Idea contests	(4) Emerging forms of openness

Along with open innovation, two important axes to understand innovation labs include open science and open government. The similarity these share with open innovation is that all three appeal to an external crowd of contributors. They differ however in the importance and desirability they place on the rights of the participants over their contributed innovation (West et al., 2014): open innovation is firm-centric and naturally the firm is mostly interested in attaining the innovation rights (West and Lakhani, 2008), whereas open science and open government are more focused towards individual, consumer or societal welfare (von Hippel, 2007, von Hippel & Krogh, G., 2006), and therefore more flexible in appropriating the contributors with rights, or even releasing the latter for the benefit of the greater public.

3.2 Open science

Citizen science (Bonney et al., 2014) is a particularly relevant variety of open science involving amateur or nonprofessional scientists in collaboration through web or mobile technologies, with central coordination by an expert research team. Example projects include biodiversity monitoring (Kobori et al., 2015), community mapping (Ellul et al., 2012), astronomy like Galaxy Zoo (Masters et al., 2015) and volunteer computing projects like SETI at home (Korpela et al., 2015), or griderpublic[2]. Most of these projects are meant to feed into science projects run by professional scientists and not to involve citizen scientists in the final analysis or application of the science findings, though something called "extreme citizen science" (Haklay, 2013) strives to overcome this limit by opening up each stage to collaboration.

Another branch of citizen science, one that brings researchers and volunteers closer, is the newly introduced model of Massive Open Online Research (MOOR) (Vaish et al., 2015). MOOR projects, such as "The Aspiring Researcher Challenge"[3] rely on the volunteers not only for speeding up the research work, but also for changing the volunteers' motivations to get more involvement and potentially better contributions. They offer volunteers the chance to collaborate with top scientists and to be involved in all stages of the research process, from idea conception, to data gathering, to analysis, and even to article writing and publications (see for example the paper by the Stanford Crowd Research Collective, 2015, with 61 crowd authors).

A third thread of open science aims at the massive collaboration of researchers, to promote better science practices. Illustrative are the recent studies by the Open Science Collaboration (2012, 2015), which through the coordinated community efforts of multiple scientists proved the low reproducibility of a considerable volume of psychology publications, initiated a general discussion questioning the standards of current science publications, generated the "Transparency and Openness Promotion (TOP) guidelines"[4] for journals, and eventually highlighted the need for more data openness to ensure integrity. In another related effort, the Montreal Neurological Institute (MNI) recently announced its intention to examine whether forgoing patents and freeing up data can boost neuroscience research through duplication and cross-validation by independent teams around the globe (Owens, 2016).

3.3 Open government

Open government (OG) refers to a set of government initiatives to promote transparency, empower citizens and use new technologies to strengthen governance (Huijboom & Van den Broek, 2011; Robinson et al., 2009). The expected benefits can be political and social, such as improved policy-making processes, economic, like investor encouragement for innovation, and operational, such as data reuse and external validation. OG could also help explore tactics for reform in public organisation, including tactics that are necessary for overcoming the typical bureaucratic model of organising and allowing these organisations to more effectively cope with today's challenges (Thompson and Sanders, 1998). The OG concept has been strongly

[2] http://www.gridrepublic.org/
[3] https://aspiringresearchers.soe.ucsc.edu/
[4] https://osf.io/ud578/

encompassed at government level worldwide, including the US administration (Open Government Progress Report to the American People, 2009, the European Commission (European Commission, 2013), the governments of Canada (2016) and Australia (2010), local governments in China (Li, 2011), as well by the United Nations (United Nations Division for Public Administration and Development Management, 2013). At a public-private level, the Open Government Partnership (2016) initiative, providing open access to government data for a diverse set of private investors and public states, gathers 69 Member States. Finally, at local level, civic accelerators, such as Philadephia Change by Us and the New York Big Ideas (Almirall et al., 2014) are only indicative examples of the significant interest that open government attracts.

Despite its promising vision, open government initiatives often rely on the oversimplified belief that merely publishing government data will automatically yield the expected benefits, because the published data will be used by their intended recipients (Janssen et al., 2012), and that more open data will result in better democracy (Strathern, 2000). Accordingly, many current open government initiatives focus more on transparency in information dissemination rather than on citizen participation and collaboration (Hansson et al., 2015). Recent attempts to address these concerns and to achieve sustainable public engagement include the five engagement maturity levels by Lee and Kwak (2012), the ecosystem model for planning and designing OG programs by Dawes et al. (2016). Indeed, open government proponents are also moving more and more towards the "lab" model, which is illustrated greatly by the growing number of policy labs as an answer to policy-making. For instance, the Policy Lab, a specialist team based in the Cabinet Office of the UK government, "was set up within the context of Civil Service reform and in particular the Open Policy Making agenda. Funded by and working with government departments, the Policy Lab team brings new methods and tools to policy making and supports their practical application by civil servants." (Kimbell, 2015, p. 1)

3.4 Innovation labs

Besides the general openness literature described in the above three streams, some publications have already been released on innovation labs[5] themselves. However, labs are still being mostly discussed by practitioners. For instance, The Change Lab Fieldbook (Hassan & Bojer, 2005), the Reos Change Lab (ReosPartners, 2013), Social Innovation Lab Guide (Westley et al., 2014) or Unicef's (2014) "do-it-yourself" guide are all practical handbooks on how to run an innovation lab process. The Labcraft (Tiesinga & Berkhout, 2014) elucidates "how labs cultivate change through innovation and collaboration". Bellefontaine (2012) introduces a noteworthy idea of innovation labs as bridging think-tanks and so-called do-tanks, and discusses the potential of labs for policymaking purposes. The Social Labs Revolution book (Hassan, 2014) discusses

[5] "The early literature on new kinds of innovation labs has, as one would expect, an experimental character, which applies to the search for a settled, agreed upon label. While acknowledging the multiplicity of labels used and the evolving trends in this field, we have decided to use the term "innovation lab" to signify the types of labs examined in the present paper. We find this decision justified because (1) the vast majority of emerging labs would themselves recognise this label, making our paper accessible to this group of practitioners and founders; (2) paradigmatic labs such as the Finance Innovation Lab use this term; and because (3) innovation lab is sufficiently generic as a label to speak to diverse types of labs that share underlying shared features (as set out in section 5).

the rise of the lab phenomenon in a narrative fashion without rigorous empirical or theoretical frameworks.

Social innovation funders have also been supporting innovation lab research. The Bridgespan Group and the Rockefeller Foundation have commissioned a series of lab surveys (see e.g. Bliss & Sahni, 2014). Nesta's "i-teams" (Puttick et al. 2014) report uncovers how labs are used by local governments; "Innovation teams and labs" (Puttick, 2014) is a collection of lab practices from around the world; and a paper by Nesta's CEO (Mulgan, 2014) looks at the various social and public labs and describes some of the challenges they face – in particular, having to work both inside and outside established systems. The presence of innovation labs in the public sector is also studied by Tõnurist et al. (2015), who find that although labs have a significant potential to become change agents, their viability heavily depends on whether they can "evangelize" their results to other public sector units through informal networking.

Despite the unquestionable stir the labs have already caused among innovation practitioners and funders, the topic has gone largely unnoticed in academic innovation studies research. As confirmed by Google Scholar and EBSCO searches, besides a couple of working papers in progress (Gryszkiewicz et al., 2015, Gryszkiewicz et al., 2016; Toivonen et al., 2016) that approaches labs as collaborative innovation intermediaries, there are no peer-reviewed works on innovation labs available thus far. Our paper is an exploratory attempt to address this literature gap.

4 Method

The near-absence of existing research on innovation labs - a multi-dimensional phenomenon - demands an explorative approach, with qualitative methodology as a suitable choice for an initial investigation (Miles & Huberman, 1994). Two main steps were taken by us to this end.

First, we performed a discourse analysis of the self-descriptions of 25+ labs from around the world, based on material published on their websites. The labs were chosen through theoretical sampling to cover a sufficiently wide range of sectors and geographies. We selected the websites that self-identified as an "innovation lab" or "social lab" - the list of investigated labs is presented in Appendix 1. Salient quotes from labs' self descriptions were analysed using sorting and clustering techniques (Miles & Huberman, 1994).

Second, as suggested by Edmondson and MacManus (2007) for a nascent state of prior theory and a novel research field as ours, we have carried out semi-structured interviews with the founders and leaders of 12 labs (Charmaz, 2000; Eisenhardt, 1989; Legard et al., 2003). The list and duration of interviews is presented in Appendix 2 and the interview guide is included in Appendix 3. The interviews were complemented by secondary data analysis (including labs' annual reports, relevant information from their websites, publications, strategy documents, internal tools, external articles, activity on social media sites such as Twitter, Facebook etc). The data collection process as a whole has been iterative (Edmondson & McManus, 2007, Yin, 2009). The interviews were transcribed by professional transcription agency. Data analysis was supported by NVivo-facilitated iterative coding process (Miles & Huberman, 1994), focusing on

each lab's self-description, innovation process and evidence of openness.

5 Results: Common characteristics of innovation labs

In this section, we introduce key findings from our original interviews and labs' self-descriptions (collected from their websites). We group these findings according to each shared lab characteristic that emerges from the data.

5.1 Open-ended innovation themes that are pre-designated

While innovation labs seek contributions from a variety of sources, they designate the core theme(s) of innovation in a largely top-down manner, whether related to young people's mental health, finance or park enhancement. In many cases this theme emanates from the founders' personal experiences, as in the case of The Comms Lab that strives to transform advertising from a system "propagating the myth of endless growth" to a sustainability catalyst. Founders are often linked to larger organisations in the private, public or civic sectors, or have worked extensively in a particular field (as the co-founder of The Comms Lab has done in advertising), which influences the choice of themes. In the case of larger labs run and/or funded by Nesta (including the Innovation Growth Lab that develops Randomised Controlled Trials as a methodology for tracing social impact) the origin of core themes is more opaque, to the extent that the programme coordinators we interviewed were unaware of how these come about (though they did agree that department heads and the CEO are in an influential role). Funders can also set core themes, as in the case of InnovationLabs that was founded at the initiative of three funders (Paul Hamlyn Foundation, Comic Relief and Nominet Trust) keen to generate digital solutions to youth mental health problems. All of this reflects the fact that, while a degree of collective decision-making may be present, labs can be viewed as instruments or vehicles for the furthering of their founders' (and/or funders') visions.

This said, labs intentionally leave room for the further specification of the focal problem, as their themes are far from narrowly defined (e.g., "revolutionising the energy sector", as in the case of eLab). This owes to the assumption that the problems labs tackle are highly complex and often ambiguous; it thus makes sense for them to start with *open-ended* themes rather than precise (but wrong or simplistic) definitions. In this way, labs allow for co-definition and co-creation without going as far as starting with an entirely open slate or sourcing their key themes through a participatory process of some kind. (Indeed, it would be challenging to imagine how innovation labs could function without any pre-designation of themes whatsoever; in this sense the "top-down" elements of labs seem to some extent necessary).

5.2 Open or semi-open call for heterogeneous participants (including stakeholders)

Rather than appoint an internal or otherwise well-defined group of experts at the outset, innovation labs typically broadcast an open or semi-open call for participants. Such calls function through a symbolic logic whereby key messages broadcast by a lab trigger what is essentially a process of self-selection (rather than a formal lab-controlled application or recruitment process, though such processes may be utilised to a small

extent when launching sub-programmes such as lab fellowships or related startup incubation programmes).

While core teams that initiate labs and enact their basic architectures may or may not be diverse, as a rule labs seek to engage a wide range of heterogeneous participants from across different industries, professions, and cultures, something the open call approach can support. Thus, Dan Hill, the then-chief design officer of the Future Cities Catapult (that runs several lab-projects, including Sensing Cities) stated in 2015 that:

> *To make the cities we really want to live in requires all these elements to begin working together: architects with coders; city planners with ethnographers; engineers with interaction designers. That's always been a core belief of Future Cities Catapult [...]. (Hill, 2015).*

The founders of the Finance Innovation Lab describe the process that led to the birth of their lab as follows:

> *ICAEW [one of FIL's host organisations] invited their stakeholders; accountants, financiers, the business community. WWF [another FIL host organisation] invited theirs; environmental activists, civil society and the responsible investment community. Despite the bizarre spectacle, we had brought together people who don't normally meet each other, to talk about things they cared deeply about and the energy generated in that room showed us it was a conversation that wanted to continue [emphasis added] (FIL, 2016).*

After this first meeting between "uncommon partners", FIL openly called for a wider range of participants to join its many events and asked them to self-organise into effective teams according to shared interests and goals.

This aspiration for breadth is motivated by the assumption that diverse lab participants can construct a more complete "view" of a given problem or system, including an understanding of their consequences to key stakeholder groups. As importantly, diversity is seen as a potential stimulant of experimentation and innovation, since a wider range of ideas and perspectives can enable a greater variety of creative recombinations.

Finally, open or semi-open convening is favoured due to the strong participatory orientation and values of labs.[6] For instance, InnovationLabs engaged not only doctors and coders, but regular young people to inform and co-develop apps that could support youth mental health in novel ways. It reached out to prospective participants in a semi-open fashion through its networks and its partners. London-based labs generally contend that those whose lives are being shaped by a given system should be involved in reshaping and reconfiguring it. In the words of the Comms Lab director:

[6] We are aware of the existence of more exclusive labs such as the Global Knowledge Initiative that works to reduce food waste through engaging CEOs (Bliss & Sahni, 2014; also see Hassan, 2014). While further systematic research is needed, our present view is that such "executive labs" should be distinguished from the far more participatory labs that characterise our sample.

> *[A lab is] a space [...] for people who represent a system and [...] who are influenced by a system to come together and - with the similar intention of wanting to change things - to come together and co-create [...].*

Thus, many labs stress openness due to their commitment to stakeholder groups, but also plausibly due to key challenges inherent in the implementation and management of open innovation (in particular, the challenges of coping in situations where knowledge is largely hidden and the core problem is complex, as elucidated in our literature review). We will return to this point in our concluding section.

5.3 Open collaboration across boundaries through shared formats and culture

In the above, we have shown how labs strive to convene a heterogeneous group of "uncommon partners" based on the perceived benefits of such an approach. But given that working together across established boundaries (e.g. organisational and disciplinary boundaries) is notoriously difficult, what makes continued collaborative activities possible between lab participants?

Clearly, lab founders and core staff play a vital role in catalysing collaboration through acts of intermediation. They facilitate interaction at lab events and introduce participants to one another through various means, serving as collaborative brokers. As labs work in a (semi-) open fashion and engage a range of diverse participants who do not share the same assumptions, collaboration is maintained through two further elements: interaction formats and collaborative culture. The former range from games and small group discussion to rapid prototyping and systems mapping exercises. These frameworks can support constructive and creative communication across differences and organisational boundaries by giving direction and structure to discussions that might otherwise be challenging to conduct (or produce no tangible outputs). For instance, the leader of the mHabitat Digital Discovery Lab explains that, after her lab gets approached by a clinical service (that is interested in new digital tools) and sets up an initial hypothesis, it proceeds to:

> *...run what we call a Discovery Day, but it's a bit like a hack day where we get patients, clinicians, academics, developers, designers, all together and we get them into teams answering the same question, and then we have a 'show and tell' where they share what they found, developed during the day [...].*

The Discovery Day forms an integral part of the lab's rapid prototyping approach, and the formats it incorporates have proven effective for getting diverse participants to co-create together.

Labs furthermore build a *collaborative culture* through less obvious ways, including by emphasising collaborative, egalitarian relationships over hierarchical or commercial roles (such as "client", "consultant" or "user"):

> *We work on a range of fairly long term projects with a range of partners where we don't see the relationship that we build with them as one of being consultants, but one of real collaborative partner in exploring certain things. Now, that is really important to us [...] (co-founder, Civic Systems Lab).*

Also, many labs frequently remind participants that they share the same values and work on complementary parts of the larger "puzzle" of systemic change in a given area. In the case of FIL, there is moreover a strong emphasis on informality and authenticity whereby participants are called to interact as "genuine whole-person individuals" first, rather than as professionals or representatives of formal organisations. The lab believes this intimate relational orientation helps increase trust and friendship between diverse participants who may never have met before.

Innovation lab core teams are usually themselves active in entering into partnerships with various external organisations, as they realise that labs have limited capabilities alone. This is why iLabs claims to be based on "cross-sector collaborations that bring people together", the eLab to be a "group [that] focuses on collaborative innovation" and Nesta's Innovation Growth Lab advocates for "global collaboration". Such a strong focus on partnership and collaboration raises the interesting question - that lies beyond the present account - of whether and how labs are shaped by the multiple institutional logics they become exposed to.

5.4 Continued open involvement throughout the innovation process

Labs not only convene heterogeneous participants and facilitate long-term collaboration - they strive to maintain an open approach *throughout* the innovation process. This stands in stark contrast to classic open innovation approaches that typically solicit a range of inputs at the ideation stage but revert to smaller (in-house) expert teams in subsequent phases, finally appropriating the resulting services and products as far as possible through intellectual property rights. Innovation lab participants, our sample suggests, are expected to co-create ideas *and* bring them towards implementation through concrete prototyping activities. In their own words, labs are "application-oriented" (InnovationLab) and "dedicated to the development of real solutions" (Civic Innovation Lab). Such hands-on collaboration is made possible by relatively close relations between participants - contrasting with anonymous online crowds or participants in one-off hackathons - and indeed the autonomous nature of innovation labs means there is usually no parent organisation hungry to appropriate the solutions generated (though the subsequent copying of attractive, successful ideas is likely to be common). Owing partly to the very recent emergence of the innovation labs phenomenon, most labs have not necessarily accumulated a significant amount of experience vis-a-vis the implementation of co-created ideas, but the generation of practical solutions in an open fashion is nevertheless fundamental to their ethos.

5.5 Solving large-scale innovation challenges in the context of open systems

Labs typically seek out-of-the-box solutions to large "systemic" challenges with serious implications for the future of our societies. In doing so they strive to apply creative multi-level approaches that span the boundaries of different sectors and organisations. Examples include: exploring and building different civic systems (Civic Systems Lab), changing the financial system by devising alternative business models that bypass large banks and rely on crowdfunding to direct investment into green energy (Finance Innovation Lab) and working towards solving "large health, safety and development problems" (iLabs) in multiple parts of the world simultaneously. Labs thus strive to make amorphous socio-technical systems seem malleable and accessible to hands-on

intervention; in other words, they "open up" systems for reconfiguration and realignment More fundamentally, they deal with open rather than closed systems, hence their use of terminology such as "wicked", "complex" or "systemic" problems. This is a vital point that helps explain how labs differ with classic R&D labs and product innovation approaches that often operate under a "closed system" assumption rather than dealing with the ambiguity and porousness of domain boundaries (and the full complexity of socio-technical challenges).

5.6 Open time horizons (long-termism)

Most of the innovation labs in our sample adopt an open-ended, broad-minded approach to their work as opposed to emphasising proximate deadlines or performance targets. This is reflected in the common use of evocative, imprecise terminology by labs when describing their goals (e.g., "discovering the future", as in the case of Nordstrom Labs; "exploring" and "building" better civic systems in the case of the Civic Systems Lab; or more generally, "systemic change"). Such a view beyond immediate results creates space for expansive thinking across longer time scales. This orientation is embodied in the frequent use of foresight activities such as horizon scanning, foresight scenarios, strategic planning or emergent signal analysis (sLab), as well as in efforts to map broader systems, from finance to energy and material production (that labs would admit can take years or decades to transform). Their long-termism allows labs to open up niche spaces (Schot & Geels, 2008) where new visions and innovations can be gradually incubated and developed. Here, much depends on the willingness of the founding individuals and organisations to commit a significant period of time - sometimes a decade or more - to realising the vision of their lab. In the case of FIL, the founding members (though not necessarily the two host organisations) agreed at the outset to commit the next 15 years of their lives to advancing the lab's mission together.[7] Since the majority of modern innovation labs - certainly including all labs in our sample - have been established in the past decade, it is too early to assess their actual longevity[8], and to evaluate their long-term impacts, though this will increasingly become possible in the next few years.

Other innovation lab characteristics. In the above sub-sections (5.1 through 5.6) we have reported innovation lab characteristics that, in light of our data, seem central to the labs included in our sample and elucidate their approach to openness in the innovation process. However, this has by no means provided an exhaustive analysis of innovation labs and it is clear that they possess many other features and dynamics of interest. We suggest that future research interrogate the following lab characteristics: pursuit of disruptive, "breakthrough" solutions rather than incremental innovation (e.g., inCompass Human-Centered Innovation Lab); autonomous or semi-autonomous organisational position (e.g. Nordstrom Labs) where labs are able to span

[7] Jennifer Morgan's presentation at the Global Systemic Change Roundtable (Academics Stand Against Poverty), Oxford, 3 March 2016.

[8] Our sample being exploratory, it includes one lab with an explicitly time-limited format: the InnovationLabs (2011-2013) intended to generate a small number of ideas that could be developed through grant funding into products to support young people's mental health. We are also cognisant that some labs, including the RSA Great Recovery programme that has focused on advancing the circular economy model, are designed to come to an end when their funding period concludes, though additional funding may allow for a longer life-span even in these types of cases.

organisational boundaries, allowing for diverse collaborative partnerships and increasing the freedom to experiment (e.g. Quartier Stuff); rich innovation toolboxes instead of a preoccupation with a single approach to innovation, ranging from design thinking and open innovation (sLab, Quartier Stuff) to RCTs (Nesta's Innovation Growth Lab) and Human Centred Design (inCompass). While none of the characteristics listed here (and in 5.1-5.6) are unique to innovation labs as such, it is their combination that makes labs a genuinely novel phenomenon - one with potent lessons for innovation management. The following section will clarify more sharply how innovation labs differ from other salient organisational forms and approaches that analysts sometimes associate them with (in the absence of prior clear definitions in the academic and practitioner literatures).

6 What is not an innovation lab?

While ostensibly similar to many other organisational types that utilise openness in processes of innovation, our research shows that a combination of certain critical differences makes innovation labs a distinct organisational form. In order to sharply elucidate these distinctions, in this section we build on the analysis thus far and take a look at what is *not* an innovation lab.

Innovation hub. Hubs (e.g. Impact Hub) serve entrepreneurial individuals by giving them access to a vibrant community, affordable workspace and valuable networks. While innovation labs share many features with hubs - like the belief that innovation benefits from the experimental mix of diverse cognitive resources (Friederici & Toivonen, 2015; Toivonen, 2016) - they differ with the latter in at least four respects. First, labs tend to serve a different clientele: members of established organisations rather than, or along with entrepreneurial individuals. Second, they essentially use top-down governance processes; where hubs seek to gently "enable" innovation (Gryszkiewicz & Friederici 2014), labs strive to more firmly steer it. Third, innovation labs set the parameters of innovation clearly around specific themes (e.g. sustainable finance or responsible advertising), as opposed to hubs' identification only with relatively broad domains such as ICT (Gathege & Moraa, 2013) or social impact (Bachmann, 2014). Finally, compared to hubs, labs are more directly linked to the agendas of larger corporate, public or civic organisations. For instance, the Finance Innovation Lab was originally co-convened by WWF-UK (World Wide Fund for Nature) and ICAEW (Institute of Chartered Accountants in England and Wales), though it subsequently became independent.

Corporate R&D lab. Corporate R&D labs (e.g. Intel, Lowe, Tesco, Walmart) are in-house departments with dedicated physical "facilities for encouraging creative behaviours and supporting innovative projects" (Lewis & Moultrie, 2005). An example, Lowe's laboratory (LIL, http://www.lowesinnovationlabs.com/), aims to be a disruptive innovation leader in the retail industry. While it relies on a team of uncommon partners to develop solutions such as the Holoroom (an augmented reality science fiction-inspired simulator for home improvement) and Autonomous Retail Service Robot (challenging the future of shopping experience), these innovations still fall under the auspices of corporate Lowe's top management. Innovation labs, by contrast, are stand-alone structures, often with a purposefully maintained "startup

culture", and much more open to the participation of external actors. Also, their teams are diverse compared to those of typical corporate R&D labs. Moreover, corporate-sector "innovative spaces" (Magadley & Birdi, 2009; Oksanen & Ståhle, 2013) are purpose-built physical environments whereas innovation labs, as proposed in this paper, are a broader concept, often with no designated physical space at all (e.g. as is in case of the The Comms Lab).

Community of practice (CoP). Communities of practice ("groups of people informally bound together by shared expertise and passion for a joint enterprise"; Wenger & Snyder, 2000: 139), are more homogenous than labs, usually representing a given profession or industry. Their focus is on "support for members interacting with each other, sharing knowledge, and building a sense of belonging within networks/teams/groups" (Li et al. 2009), whereas labs focus on seeking innovative solutions through engaging a wide group of stakeholders, with experts involved only part of the time. Moreover, CoPs tend to follow a single methodology ("learning while doing") rather than a mix of tools to stimulate innovation, as is the case in labs. Finally, CoPs are reported to innovate incrementally, embracing concepts such as continuous improvement or *kaizen*, whereas labs strive to make radical leaps through their innovation efforts.

Living lab. Living labs - initially defined as "real-world contexts in which users were given the opportunity to use state-of-the art technology" (Folstad, 2008, p. 49) - are now typically viewed as constituting "co-creation and appropriation of innovations by users, often in a (online or offline) community setting, and also involving business stakeholders" (Ballon & Schuurman, 2015). While living labs are closely related to innovation labs, there are some aspects that make them different. First of all, living Labs actually label themselves clearly as Living Labs and they often form part of larger networks (see the network organisation ENoLL), while innovation labs rarely do so. Another core difference with the innovation lab is that the living lab concept is fuelled mostly by the individual user experimentation and testing, or, as argued by Leminen et al.'s (2012) typology, living labs are either predominantly utilizer-driven, or enabler-driven, or provider-driven or user-driven. Either way, the user is always involved as key stakeholder in a living lab, which is not necessarily the case for innovation labs. The aspiration of an innovation lab, on the other hand, is to *always* involve a very broad representation of a variety of actors, inviting more stakeholder groups from beyond the user circle to contribute. For instance, the eLab participants represent all aspects of the electricity system: resource providers, customers, investors, regulators, grid operators, utilities representatives, advocates and experts. Secondly, living labs aim at operating within 'real-life environments' (Leminen et al., 2012) or a 'real-life context' , which is not necessarily the case for innovation labs that often innovate 'out of context'. In fact, pulling innovative participants out from their usual working environment is precisely what often makes innovation labs so powerful in terms of their creative potential.

Innovation network. The purpose of various innovation networks (whether professional networks, associations or business networks) is to bring dispersed actors together to share information. These 'loosely coupled' systems (Freeman, 1991) tend to focus on the 'network paradigm' (Cooke & Morgan, 1993) or 'networking' itself as their core activity. Therefore, they would put most their efforts into creating conditions for reciprocity, trust, learning, partnership and decentralism (Cooke, 1996) to

potentially affect their innovation performance and productivity (Pittaway et al., 2004) in the long run. By contrast, innovation labs typically define a clear purpose of the lab; invite participants; run projects and oversee collaboration. Hence an innovation lab cannot be reduced to a loosely coupled innovation network, even though it does actively exploit networking in its operations. Rather, it could be perceived as 'network orchestrator' (Dhanaraj & Parkhe, 2006).

Innovation task-force. Task forces are best known for being applied by organisations such as NASA or local governments (e.g. New Orleans Innovation Delivery Task Force) for the creative resolution of crisis situations (such as recent oil spills). What they share with innovation labs is that they are at the lookout for breakthrough solutions. Yet, while innovation task forces are typically reactive, the labs proactively search for new solutions, focusing on future challenges rather than on *ad hoc* issues of the present. As The Comms Lab puts it: "We're doing this because we care about the future of the world and we care about the future of our industry" (The Comms Lab, 2016).

7 Innovation lab: towards a definition

Based on sections 5 and 6, we are now in a position to provisionally define "innovation lab" as follows:

> *An innovation lab is a semi-autonomous organisation that engages diverse participants - on a long-term basis - in open collaboration for the purpose of creating, elaborating, and prototyping radical solutions to open-ended systemic challenges.*

It is clear furthermore that in order to function, labs require access to suitable interactive spaces (physical as well as virtual) and mastery of co-creation methods that can stimulate and channel collective creativity. Put more succinctly, labs can be viewed as systemic or societal - rather than merely intra-organisational - vehicles for transformative change.

8 Discussion and conclusions

In this article, we have reported the results of an exploratory survey of innovation labs that has allowed us to shed light on their key features - as well as their differences - vis-a-vis other innovation-focused organisational types. In light of these, we are now able to return to a key question set up in our introduction (and further contextualised in the literature review presented in section 3): how exactly does the way in which labs apply "openness" in the course of their work diverge with notions of openness given in the innovation management literature, as well as the open science and open government literatures?

First, to address innovation management research, innovation labs clearly do open up the front-end of their innovation process to many participants, suggesting that open innovation (Chesbrough et al, 2006) is indeed integral to their nature. Yet, the notions of inbound and outbound innovation (Chesbrough et al, 2006) fail to adequately capture

the more complex, multi-directional and networked nature of how innovation in labs takes place. Our data suggests that, in the case of labs, it is the breadth of stakeholders, combined with rich innovation toolboxes (or formats), that create an environment conducive to co-creation (Prahalad & Ramaswamy, 2013). This clearly contrasts with the conventional notion of open innovation. Moreover, while Chesbrough's paradigm has often been criticised for opening up merely the front-end of the innovation process, we suggest that labs would rather apply methods such as crowdsourcing (Howe, 2006), design thinking (Rowe, 1991), service design (Shostack, 1982) or user innovation (Von Hippel, 2009) to keep the whole innovation process open. Also, unlike typical open innovation initiatives, labs do not place too much focus on the contributors asserting the IP of their inputs. As shown in the related literature this reduced stress on IP can lead to increased collaboration and increased motivation: two elements that are absolutely necessary for solving grand challenges (fitting in the fourth quadrant of Table 1 in section 3), and two elements that current open innovation initiatives are missing. Finally, we theorise that labs' intensive efforts to create a collaborative culture help overcome some of the fundamental limits of open innovation and crowd-sourcing: long-term engagement and lack of familiarity (incl. mutual trust) with other participants often referred to in the literature (Majchrzak & Malhotra 2013, Almirall et al. 2014).

Second and in relation to open science (David, 1998), while some labs draw on approaches also seen in this field, including the pursuit of public knowledge and value, they go beyond this paradigm by moving from knowledge-generation to practical implementation by developing concrete solutions. Also, unlike most open science initiatives (except for the very new MOOR effort)**,** innovation labs involve the participants in the whole innovation process, not just data collection to feed the actual research.

Third, open government (Janssen et al., 2012) only partly overlaps with the labs' notion of openness. Some innovation labs indeed are set up as governments' instruments (Puttick et al., 2014), but many others are driven by non-governmental or corporate actors. Also, while governments might invite open consultations, they would typically still be bound by bureaucratic and policy-making processes to actually implement the collectively developed solutions. Innovation labs, on the other hand, thanks to their more independent nature, have more leeway to leverage the gathered ideas and actually create real innovations.

Fourth and more generally, if we define "openness" in terms of inclusiveness and transparency (Whittington et al., 2011), innovation labs would typically go further on at least one of these dimensions compared to typical open innovation, open science and open government initiatives. This is possibly shaped by the very nature of the "systemic" problems that labs aim to deal with, which requires an approach that is far broader and more participatory.

In summary, openness in labs partly overlaps with but significantly transcends each of the above paradigms (open innovation, open science, open government). The way in which labs combine various facets of openness - adding up possibly to a qualitatively different approach to openness in innovation - merits further research, as discussed in the following section.

On a critical note, while we do find that labs possess significant potential in terms of catalysing radical innovation, it is necessary to remain alert to differences between

openness on the level of discourse and openness in practice: for instance, even if lab participants appear to be "diverse", it is important to cast light on how they were selected and who got to do the selecting. The need for labs to serve the agendas of powerful actors is likely to militate against thoroughly serendipitous (self-)selection and team formation, as this may appear too time-consuming or random. If true, openness exists in a somewhat limited form here, with implications to the innovative processes that labs facilitate. There are also other potential openness dis-benefits associated with what can be an overwhelming coordination task. Finally, the expectation of radicalness raises distinct dilemmas: for instance, which degree of openness will simultaneously increase the chances of finding a breakthrough solution *and* allow for a fair distribution of the intellectual property created?

In conclusion, innovation labs offer a prime setting for the study of different aspects and limitations of openness. Further research efforts in this fascinating field of inquiry are strongly encouraged.

9 Research implications, limitations and key questions for future research

Our paper has several practical implications. Policy-makers and managers are increasingly looking for new ways to drive radical innovation and collaborative open approaches have been increasingly popular across a variety of policy domains and industry sectors. Despite their potential limitations and longer time to required to establish their true value, innovation labs can be an interesting option to consider by both types of actors. The rapidly rising profile of innovation labs, supported by the conclusions of this paper, suggests that labs have the potential to offer offer novel benefits for supporting radical innovation where open approaches are desired. At the moment, innovation labs have been under-used by both policy-makers (typically preferring public consultations or advisory boards) and corporations (typically using more classic open innovation approaches). This paper can inspire both groups to experiment with this novel form where current approaches are not sufficiently collaborative, do not allow for enough hands-on stakeholder involvement, or are not sufficiently geared towards radical solutions for grand challenges. For the more theoretically-inclined readers of this journal, our paper serves as one of the very first attempts to conceptualise what an innovation lab actually is and how it claims to leverage innovation for the purpose of radical innovation. This, of course, is a necessary starting point for future research endeavours which should take a much deeper look into innovation labs' actual practices, impacts, and also (emerging) typologies. Future research avenues are described further below in this section.

Admittedly, the most important limitation of this exploratory paper is the fact that we have relied on labs' self definitions and interviews, along with some practitioner publications. Indeed, thus far we have not had the chance to contrast these with long-term empirical observations of labs' organisational practices. Organisational ethnography (Neyland, 2007), structured observation techniques (Mintzberg, 1970; Martinko and Gardner, 1985) and practice-based approaches (Feldman & Orlikowski, 2011) will allow future research projects to set labs' self-discourses in the context of their actual practices. We also acknowledge the geographic limitations of our research

- we focused primarily on London in our empirical interviews, based on the recognition that it is a hotbed and leading centre for the lab phenomenon that disproportionately shapes innovation labs elsewhere. The far more global selection of labs for website analysis has served to counteract this limitation. Moreover, keeping in mind the exploratory nature of our paper trying to make sense of a fast-evolving field of labs that is in the middle of experimentation, our aim was to provide qualitative depth on self-definitions and central lab strategies instead of a global mapping of labs. We also wanted to generate a working definition that can bring further precision to future studies. This is a necessary step on the way towards papers that are able to respond to some of the expectations that could not, for reasons stated, be met by our paper, considering the stage of research at present.

Several promising research questions emerge that could help validate our first observations and further explore the fascinating phenomenon of innovation labs. Various theoretical perspectives could prove useful in answering these questions, and different research methods could prove salient for such investigations. A summary of future research avenues is presented in Table 2 below.

Table 2. Promising research directions and guidelines for future work in innovation labs topic

Research questions	Potentially useful theoretical perspectives	Exemplary research methods
What are the collaborative innovation practices and 'toolboxes' applied by innovation labs? What are the best ways for the innovation labs to organise themselves in that respect?	Organisational practice, Open innovation, Collaboration	Case studies, Observation, Interviews
What are the limitations of openness in innovation labs?	Open innovation, Resource-based view, (intellectual assets)	Case studies, Observation, Interviews
Do labs successfully produce new (diverse) teams that then become the central innovation agents advancing particular projects?	Team creativity, Recombinant innovation, Entrepreneurial teams	Interviews, Observation, Network mapping
How can innovation labs benefit from new collaboration technologies? How can new collaboration technologies be transformed to help radical innovation in labs?	Collective intelligence, Collaboration, Creativity	Experiments
What are the key organisational capabilities of successful innovation labs?	Resource-based view, Capabilities theory	Case studies, Interviews, Observation
What are the actual predominant 'units of innovation' at labs? (individuals, teams, labs themselves)?	Organisational practice, Capabilities theory	Multi-level analysis
What innovation labs typologies might be constructed to facilitate research?	Innovation labs literature	Case studies, Interviews, Observation, Coding, Patterns matching
For which industries/themes are innovation labs the most relevant?	Innovation labs typology	Case studies, Interviews, Observation, Coding, Patterns matching

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11 Appendices

Appendix 1: Innovation lab websites used for labs' self-discourse analysis.

Name	Website
BRAC Social Innovation Lab (SIL)	http://innovation.brac.net/
Campaign Lab	http://campaignlab.org.uk/about/
Civic Innovation Lab	http://www.civicinnovationlab.la/#section-0
eLab	http://www.rmi.org/elab
EvergreenCityWorks	http://www.evergreen.ca/
FreedomLab	http://www.freedomlab.org/#!contact/con8
Global Knowledge Initiative	http://www.globalknowledgeinitiative.org
inCompass Human-Centered Innovation Lab	http://www.incompass.org/?page_id=29
Innovation Co-creation Lab	http://icclab.com/
Innovation Growth Lab	http://www.innovationgrowthlab.org/
Innovation Labs	http://www.innovationlabs.org.uk/start-here/
InnovationLab	http://www.innovationlab.de/en/innovationlab/
InSTEDD's Innovation Labs (aka iLabs)	http://instedd.org/ilabs/
La 27e Région	http://blog.la27eregion.fr/
Laboratory for the City (Mexico)	http://labplc.mx/complices/
MaRS Solutions Lab	https://www.marsdd.com/systems-change/mars-solutions-lab/
MindLab	http://mind-lab.dk/en/om-mindlab/
Nutrition Innovation Lab	http://www.nutritioninnovationlab.org/
Sustainable Food Laboratory	http://www.sustainablefoodlab.org/
The Civic Systems Lab	http://www.civicsystemslab.org/contactus/
The Comms Lab	http://www.thecommslab.com/
The Finance Innovation Lab	http://www.thefinancelab.org
The Minnesota Social Innovation Lab	http://www.socialinnovationlab.net/
The Natural Step's Sustainable Transition Lab	http://www.naturalstep.ca/sustainability-transition-lab
The Stanford Change Labs	http://changelabs.stanford.edu/
Quartier Stuff	http://quartierstuff.lu
Unicef Innovation Labs	http://www.unicefinnovationlabs.org/?p=53

Appendix 2: Interview details and duration

- IDEA (face-to-face, 51 minutes excl. intro & closing)
- Fab Lab London (face-to-face, approx. 60 minutes, excluded from the sample as not relevant)
- Fab Lab Luxembourg (face-to-face, approx. 45 minutes, excluded from the sample as not relevant)
- GovLabs (face-to-face, approx. 45 minutes excl. intro & closing - not recorded)
- Innovation Labs (Skype, 50 minutes excl. intro & closing)
- Innovation Co-Creation Lab (face-to-face, 38 minutes excl. intro & closing)
- Living Lab Lux. (phone, approx. 30 minutes excl. intro & closing, excluded from the sample as not relevant)
- Nesta Innovation Growth Lab (face-to-face, 55 minutes excl. intro & closing)
- Nesta Innovation Lab (face-to-face, 55 minutes excl. intro & closing)
- mHealthHabitat (now mHabitat) Lab London (face-to-face, 76 minutes excl. intro & closing)
- mHealthHabitat (now mHabitat) Lab Leeds (Skype, 34 minutes excl. intro & closing)
- RSA the Great Recovery (face-to-face, approx. 90 minutes excl. intro & closing- not recorded)
- Future Cities Catapult (face-to-face, approx. 90 minutes excl. intro & closing- not recorded)
- The Comms Lab (face-to-face, 51 minutes excl. intro & closing)
- The Civic Systems Lab (face-to-face, 39 minutes excl. intro & closing)

Appendix 3: Semi-structured interview guide

Intro: introduce ourselves and the purpose of our study, ask for permission to record the interview and explain the data treatment

Please introduce yourself and your role in the organisation

What is the main purpose of [your innovation lab]?

What is the main challenge it addresses?

Who is the driving force behind this lab?

Who are the actors participating in the co-creation?

What are their key collaborative practices?

Which methodologies do you use to guide this process?

What are the main challenges practitioners face in collaborative innovation?

What is the role of technologies in collaborative innovation? And how much of collaborative innovation success conversely depends on non-technological factors?

What challenges do currently still remain unresolved?

What are some examples of projects that have recently been launched at your lab?

Which prior projects do you consider most successful or interesting?

What types of teams, leaders or facilitators have carried these projects forward?

Which backgrounds and areas of expertise have participated in these teams?

How would you define an innovation lab in general and how would it differ from other forms?

Journal of Innovation Management
JIM 4, 4 (2016) 98-121
HANDLE: *http://hdl.handle.net/10216/102610*

End-user Involvement Enhancing Innovativeness in Public Procurement. Evidence from a Healthcare Procurement

Lotta Haukipuro[1], Satu Väinämö[1], Hannu Torvinen[2]

[1] Center for Ubiquitous Computing, University of Oulu, Finland
{lotta.haukipuro, satu.vainamo}@oulu.fi

[2] Oulu Business School, University of Oulu, Finland
hannu.torvinen@oulu.fi

Abstract. This paper examines public procuring, aiming to increase understanding of how the living lab approach and end-user involvement create innovativeness and enhance public procurement results, providing effectiveness and better solutions. The empirical findings are based on a real-life unique public procurement in the healthcare field where the living lab approach was used through the product testing phase, which was included in the procurement procedure. The selected group of users performed product testing in a real homecare environment. The quality of the product formed based on product testing played significant role for the first time in public healthcare-related procurement in the City of Oulu, Finland; the winning solution was not the most inexpensive but the one obtaining the highest quality scores by users. The findings suggest that product testing as a part of public procurement should be more widely adopted, while considering the proper balance of the price-quality ratio that ensures innovativeness. Based on the findings, we propose a framework for product testing as a part of public procurement through an open procedure.

Keywords. Public procurement, Living lab, Innovation, Healthcare

1 Introduction

Innovation is defined as novelty or reform with significant productivity, economic efficiency, or other value-adding effect on the organization's performance (Yliherva, 2006). Accordingly, innovation is seen as something original, new, and important that breaks in to, or obtains a foothold in a market or society (Frankelius, 2009). The roots of common Western innovation policies can be found from Schumpeter's theories: according to Schumpeter's early thoughts (1934), innovations that lead to economic growth can be new products, production methods, markets, material sources, or operation forms of the organization. Lee et al. (2012) see innovations necessary for improving public sector's productivity and new more cost-effective operations. One of the key drivers behind the utilization of new differentiated public procurement approaches is the desire to create new innovations (Edler and Georghiou, 2007). An extremely prominent source for innovations is customer interfaces propitious to the exchange of know-how, information, viewpoints, experiences, cultures and resources (Yliherva, 2006). The possibility to enhance the involvement of end-users in the

ISSN 2183-0606
http://www.open-jim.org

procurement process is partly the result of advanced technology, and partly citizens' increased willingness to participate in the co-production of the services (Bovaird and Loeffler, 2012). According to Uyarra and Flanagan (2010), public procurement has a potentially crucial role in enhancing the innovations in Europe, thus creating wellbeing. As a growing trend in public procurement is to try new methods to add innovativeness, e.g. through end-user involvement, a new opportunity has appeared for living labs to provide their expertise of user-driven methods and tools to be applied in public procurement. Thus far, the involvement of end-users in the procurement process has raised some interest and attempts in practice as well (Ng et al., 2013).

Innovative procurement is currently part of the everyday lives of skilled procuring entities alongside other procurement. However, innovative procurement - in which the best possible long-term solution needed by a procuring entity is being sought after in such a way that the supplier is able, through the implementation of the procurement, to improve their products and services - is not yet common. Thus, there is need to research a few existing cases to form an understanding. In this research, we address the innovative public procurement *by a thorough exploration of a public procurement case, to increase the understanding of how the living lab approach and end-user involvement can create innovativeness, and possibly enhance public procurement procedure.* The unit of analysis is a public procurement case in which the living lab approach was applied through product testing. It is commonly known that the development and enhancement of public procurement has several beneficial impacts on e.g. the economy, growth and commercialization of innovations (Manninen, 2015). Therefore, evidence from successful innovative public procurement can be seen as valuable for different stakeholders. Although the field of public procurement often appears as complex and multi-faceted, which limits the ability of an individual study to cover it in its entirety, this paper may bring novel insights for policy-makers to enhance public procurement. Accordingly, the paper contributes to the scientific discussion on public procuring but also living labs, increasing understanding of how living labs can be exploited in public procurement.

Through long-standing cooperation and several successful co-development projects with the city as a background, a local living lab OULLabs[1] was selected to participate in a public procurement of the City of Oulu. The aim of the "Keyless homecare" process was to implement public procurement of a keyless mobile door-opening service for homecare in a new, innovative way including *product testing* and user involvement. The aim of the city was to purchase a service that would allow homecare personnel to open patients' doors via a mobile device. The background for Keyless homecare procurement was needs-based and problem-based: homecare nurses used to carry a huge keychain which led to different inconveniences and security issues. Procurement was aimed to solve the problems related to nurses' daily homecare work in the city. The Keyless homecare product testing phase was implemented within an EU-funded, living lab ecosystem developing project. The project team planned and implemented the product testing phase of the procurement, led by usability specialists. A user involvement online tool was additionally used to collect feedback from homecare employees who tested the keyless door-opening

[1] www.oullabs.fi

service in a real environment. As a result, innovative public procurement of a mobile door-opening service in which product testing had a significant role for the first time, was successfully performed. Furthermore, as a result of the process, the winning mobile door-opening service, which was not the most inexpensive one but the one with the highest quality and highest scores given by end-users and usability specialists through product testing, was put to use.

2 Related Research

2.1 Innovative Public Procurement

The public procurement of infrastructure and services can be regarded as essential for maintaining society's economic and social structures (Lähdesmäki and Kilkki, 2008). Conventional competitive bidding procedures performed in public procurement have experienced an increasing pressure for change in recent years, including increased demand for services due to the aging population, challenging economic situation and new technology solutions (Jamali, 2007; Pekkarinen et al., 2011). According to Aho et al. (2006), innovative public procurement has emerged, alongside the changing procurement environment, as a central theme in the 19th century's demand-driven innovation policy both at the national and European levels. In particular, the new market-oriented public procurement models not only aimed at generating innovations, but also accelerating the spread of innovations by strengthening the demand for new solutions, have attracted attention. Public procurement has multitude of social goals to serve, and its use as an innovation tool entails various challenges (Uyarra and Flanagan, 2010).

The general benefits of innovative procurement have been considered, in addition to increased innovation, to produce increased higher overall efficiency of procurement, quality, efficiency, risk management and transparency (Yescombe, 2007; Majamaa et al., 2008), and enhanced dynamics of innovation (Edler and Georghiou, 2007). Public procurement is also seen as a demand-side-oriented tool for stimulating innovation (Aschhoff and Sofka, 2009). At best, public procurement can have a greater incentive effect on firms' innovation activities than conventional public sector-funded R&D activities. The greatest barrier for the implementation of innovative procurement is not the legal elements guiding procurement, but the procuring entities' ability to explore and apply procedures enabling the development of providing innovative solutions. In addition, innovative procurement often involves higher risks, the consequences of which should be identified in advance.

Although public procurement has already been exploited as a tool to promote innovativeness in certain countries, innovative public procurement can be viewed as a rather new phenomenon. The most advanced countries in the development of innovative procurement have been the United Kingdom and the United States. Although Finland was recently ranked as the second most innovative country in the world in the World Economic Forum's report 2015-2016, the only category in which it did not score in the Top 10 was the public procurement of advanced tech products, where it was ranked 33rd (Schwab, 2015). In Finland, the promotion of innovation has generally not been the main goal of public procurement even in new procurement,

but rather a minor aim of the projects. The choice of an innovative procurement method in public procurement projects in Finland has been justified mostly based on achievable savings instead of innovativeness. As not only exclusively existing demand gives rise to innovation, essential for innovative purchase models is a dialogue between end-users and other key stakeholders considering the functionality of a procurement. Demand-driven public procurement can reach for higher customer orientation in procurement. The public procurement of infrastructure and services should not be judged according to mere decision-makers' interest, but based on end-users' desires. In the present research, the interaction between the actors in an innovative procurement is seen as a triad of the customer, the supplier and the value co-producer (Havila et al., 2004; Majamaa et al., 2008).

A major problem in public procurement is that the practitioners often lack a clear understanding of who the client of the public service is and, therefore, do not know whose needs they are supposed to satisfy (Bovaird, 2007). Although no generally agreed upon definition of public procurement partnerships is known to exist (e.g. Lawther and Martin, 2005; Yescombe, 2007), some market-based models like public-private partnership (PPP) and pre-commercial procurement (PCP) have gained vast interest from both the researchers and practitioners in the public procurement field. The most vital aspect of describing innovations within the PPP model is the added value the innovation creates for the end-users (Yliherva, 2006). If the PPP method were chosen more regularly based on the value gained by the end-users, the cooperation, commitment and networks would more often be considered the benefits of the model instead of the financial justification (Lähdesmäki and Kilkki, 2008).

2.2 Living Labs and Public Procurement

One solution for tackling problems related to public procurement is innovative public procurement practices that change the way suppliers are being invited to supply pre-existing solutions in an improved way (Knutsson and Thomasson, 2014) and allow for new actors such as living labs to be engaged in the purchasing process. The concept of collaborative innovation, presented by Hartley et al. (2013), emphasizes inter-organizational, multilevel, and cross-sector collaboration between a range of stakeholders from the public, for-profit, and non-profit sectors, as well as users and citizens.

The living lab approach emerges in between the concepts of open innovation (Chesbrough, 2006) and user innovation (von Hippel, 1986). Leminen et al. (2012) see living lab as a network that integrates both user-centred research and open innovation. Living labs are physical regions or virtual realities, interaction spaces, in which stakeholders form public–private–people partnerships (4Ps) of companies, public agencies, universities, institutes, users, and others that follow the philosophies of open and user innovation to collaborate for improving, developing, creating, prototyping, validating, and testing of current or new technologies, services, products, and systems in real-life contexts (Ballon, 2005; Westerlund and Leminen, 2011). A reform of open innovation, open innovation 2.O (OI2) is based on principles of integrated collaboration, co-created shared value, sophisticated innovation ecosystems, open exponential technologies and rapid adoption. (European Commission, 2016; Quesado, 2016). Living labs are one example of the OI2

ecosystem development as they apply user-centric co-design process for the development and implementation of innovative ICT-based products and services (Quesado, 2016). Living labs are driven by two ideas: involving users as equal co-creators with other participants, and conducting experiments in real-world settings (Almirall et al., 2012). A high degree of realism and user involvement separate living labs from other innovation approaches (Schuurman and De Marez, 2012), for instance, in field trials or user testing in which a living lab involves users in all stages of R&D and the product development lifecycle (Ballon et al., 2005).

Edler and Georghiou (2007) and Georghiou et al. (2014) noted that demand alone is not enough to strengthen the innovation dynamics, but the interaction between demand and supply is also focal, and organizing interaction between users, consumers and other actors in innovation operations becomes significant. As a difference between public and private sector end-users, the public sector has both an operational incentive to pay attention to individual clients' needs and a need to serve the social goals of a wider public (Hartley, 2005).

From an innovative public procurement point of view, the planning phase of a procurement is most critical as interaction between the actors in that phase is important (Enbom et al., 2014). A user-driven approach, also the cornerstone of living labs, has been a growing trend in public procurement. Users' desires are increasingly taken into account, and procurement in which methods of user-driven development have been performed is seen as an excellent way to develop procuring procedures (Knutsson and Thomasson, 2014; Enbom et al., 2014.) Living labs' are needed in innovative public procurement, as implementing innovative procurement requires cooperation among all actors: customer, supplier and end-users (Mattila and Silander, 2015). Accordingly, an important element in living lab research is to study the interaction of end-users with a technology or prototype in a real-life environment (Ballon et. al, 2005). Although cooperation with end-users and the surrounding community has been recognized essential for public procurement's success, the resources given to end-users' engagement in the public procurement processes are often slim (Bovaird and Loeffler, 2012). The desires of end-users often get neglected, which leads to solutions that are unusable or unsuitable, creating e.g. financial losses caused by the additional fixing costs and dissatisfaction's impacting the supplier's life cycle payments (Ng et al., 2013; Satish and Shah, 2009). The early detection of user requirements and needs guides the procurement towards better end results, efficiency and innovative solutions from the beginning (Laine and Junnonen, 2006; Majamaa et al., 2008; Satish and Shah, 2009).

In addition to new thoughts, users can also enhance the process for instance by positively influencing other users and lowering negative opinions (Bovaird and Loeffler, 2012). Thus, living lab user communities can be useful when involving end-users in innovative public procurement. The supplier and end-user share a common need to develop products or services, aiming to create added value e.g. through better quality, more efficient production processes, lower life cycle costs, environmental friendliness or usability (Mattila and Silander, 2015). By developing innovative procurement, end-users are able to participate in the process from the early planning to the implementation phase. Living labs' basic idea, the early involvement of end-users thus makes possible changes cost-effective in procurement cases.

2.3 Procurement Procedure

The EU legislation regulating public procurement has recently become more innovation-friendly. The earlier model in which the supplier with the most affordable price was chosen has been replaced with new "best price-quality ratio" model in which quality can play a significant role in bidding competition. The legislation sets certain thresholds to regulate public procurement. However, national regulation can be applied for tenders of lower value (EU, 2016). There are different models for procurement procedures, e.g. the *open procedure* model in which any supplier company can tender (Figure 1). Here, procurement is usually started by market research to identify existing solutions and required features for service to be procured. Potential suppliers can introduce their solutions and services in the technical dialogue phase, from the basis of which appropriate announcements are drawn up. After this, the bidding process starts with the below featured phases (Figure 1). Here, the minimum time limit for the submission of tenders is 52 days from the publication date of the contract notice, and if a prior information notice was published, this time limit can be reduced to 36 days (EU, 2016). According to the public procurement regulation in Finland, the bidding announcement also has to be published in an electronic service meant for public procurement announcements (JHS, 2013).

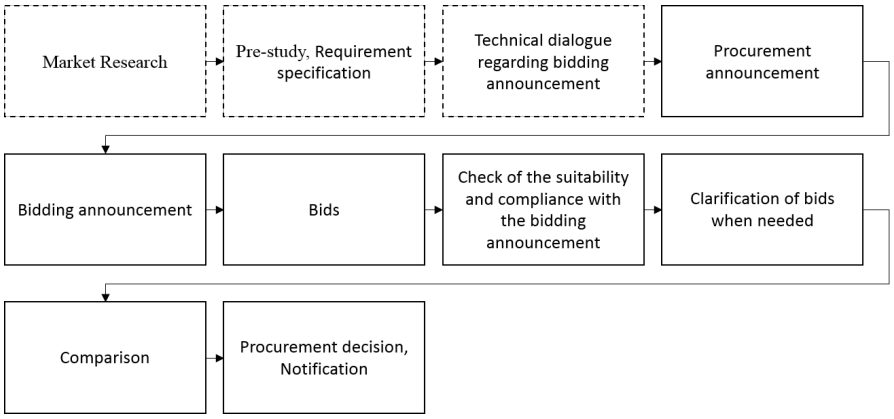

Fig. 1. Open procedure in public procurement (Adapted from JHS, 2013).

3 Research Design

3.1 Case Study Research

A case study is used as the primary research approach in this study. The case study approach to the data collection was chosen for the following reasons: According to Yin (2009), a case study design is considered suitable when the focus of the study is to answer "how" and "why" questions, or when the behaviour of those involved in the study cannot be manipulated, contextual conditions are thought to be relevant to the phenomenon under study or the boundaries are not clear between the phenomenon

and the context. Furthermore, a case study is beneficial because it facilitates the investigation of a phenomenon in its real-life context (Stake, 1995; Rowley, 2004; Baxter and Jack, 2008), bringing about new insights for stakeholders although the findings can not necessarily be widely generalized. The defining characteristics of the case study method according to Stake (1995) are the following: *holistic,* as the method considers interrelationship between the phenomenon and its contexts; *empirical,* as it builds on empirical data and observations; *interpretive,* as it rests upon intuition and views research as a researcher-subject interaction; and *emphatic,* as it reflects the vicarious experiences of the subjects in an emic perspective. Both Stake (1995) and Yin (2009) base their approach to case studies on a constructivist paradigm, where truth is seen as relative and dependent on one's perspective. The paradigm recognizes the importance of the subjectivity, but it does not reject outright some notion of objectivity either.

Despite some limitations and criticism towards the single case study method (Willis, 2014), here it is a justified choice for the research design due the *uniqueness* of the research subject as a whole (Yin, 2009). Moreover, the method produces empirically-rich, context-specific and holistic view of the research subject (Willis, 2014).

3.2 Data Collection and Analysis

Case studies typically combine data collection methods, e.g. archives, interviews, questionnaires and observations. In addition, multiple levels of analysis are characteristic (Eisenhardt, 1989). In this study, research data were collected via multiple sources of evidence. The primary data of the study are qualitative: the project team was informally interviewed and in-depth semi-structured interviews were conducted with identified key persons. These persons were closely involved in different roles during the case procurement, being likely to possess the most relevant information (Kumar et al., 1993), which was needed to develop a comprehensive and objective view of the case Keyless homecare procurement, which is the unit of analysis in this paper. All interviews were recorded and afterwards transcribed into text documents. The approximate duration of each interview was one hour. The interviewees were one technology specialist from the City of Oulu, who at the time of implementation of the Keyless homecare case, had the role of purchase planner in the City of Oulu's strategic procurement department; one project manager of an EU-funded project who was actively participating in planning and in charge of product testing as a part of purchase; one usability specialist who had a central role of product testing planning, implementation and reporting in the Keyless homecare case; one assistant usability specialist; one CEO of the supplier company and winner of bidding; one project salesperson of the supplier company; and one Dep. development manager for Strategic Procurement Operations of the City of Oulu (Table 1). Insights from the nine homecare employees who were involved in product testing were collected from an anonymized, private online discussion organized for the test group on a living lab user involvement platform. A report of the online discussion was used as additional source of data.

Table 1. Interview Informants

Role	Informant	Length	Date
procurer	technology specialist	70 min	Jan/15
living lab	project manager	110 min	Feb 2015
living lab	usability specialist 1	60 min	May 2015
living lab	usability specialist 2	60 min	May 2015
supplier	CEO	57 min	Sep 2015
supplier	salesperson	57 min	Sep 2015
procurer	Dep. development manager	40 min	Mar/16

In addition, the procurement related project reports, and documents such as the four test reports as well as public information available e.g. the bidding announcement (HILMA, 2013), the report of market dialogue for potential suppliers, legislation (EU, 2016) and several related articles were used as secondary archival data. There were also publicly available interviews with the Keyless homecare procurer (Tekes, 2014a) and supplier (Tekes 2014b) which were used as complimentary data sources. Furthermore, references from similar procurement cases were searched and retrieved from the literature and internet sources to form a view on the current state of innovative public procurement, e.g. Enbom et al.'s (2014) collection of practical experiments from healthcare and environmental business sectors.

All the data were connected and analysed, to form holistic understanding. As typical for qualitative studies, the data collection and analysis occur concurrently (Baxter and Jack, 2008; Yin, 2009). *Within-case analysis*, which is suitable for the single case study analysis method (Eisenhardt, 1989), was applied to explore the case thoroughly. Similarities, repetitions and differences were sought from the data, creating themes and typologies. The aforementioned primary and archival data were analysed to facilitate triangulation (Denzin, 1973), to ensure a comprehensive understanding of the case, and to answer the questions "how" and "why". Moreover, the data were analysed, attempting to maintain objectiveness, by involving research team members (Baxter and Jack, 2008) through analytical discussions to agree on the interpretation.

4 Case Description

4.1 Empirical Context

The annual value of public procurement in Finland is 35 billion and the direct impact of municipal procurement on employment is estimated to be 80 000 person-years. Thus, it is important to develop and enhance public procurement at the strategic level. The City of Oulu seeks to reform public procurement to make it professional, expertise-based, centralized and controlled. For instance, the city's strategy for 2020 states that 20% of the purchases have been made using innovative procurement procedures, as innovative public procurement increases vitality, develops markets, creates possibilities for co-creation and partnerships and produces better services and products for city, references for suppliers, employment and tax incomes (Manninen,

2015). The needs-based search for solutions often produces new innovations whereas legislative or process-oriented competitive bidding may stifle innovativeness (Tekes, 2009). Involving end-users is a growing trend in public procurement, and may add innovativeness to traditional procurement.

The Keyless homecare procurement which exceeded the EU threshold (HILMA, 2013), was implemented using the previously presented open procedure model in which any supplier company could tender. The procurement was implemented for approximately eight months in 2013-2014. The need for procurement arose from initiation of the social welfare and health services and specifically homecare services of the City of Oulu, which aims to search for cost-efficient services and tools for service production. During a shift, homecare employees visited more than 10 patients living at home, thus using at least as many different keys to open the patients' doors. Moreover, the keys were stored in the office of homecare employees, from where they had to pick them up individually between patient visits. Thus, the need for a keyless door-opening system arose mainly from practical reasons – the need to save time and make homecare work more effective, ease the work and improve safety by reducing the risk of e.g. losing the keys.

A few cities in Finland have already managed to make their homecare totally keyless. Reference cases were searched for and used as basis, in addition to the aforementioned practical needs of homecare in the City of Oulu, to start the procurement where product testing played a significant role for the first time as a part of public procurement in the city.

4.2 Product Testing within Procurement

The Keyless homecare mobile door-opening service was purchased partly (40%) based on the product testing of four door-opening products (lock module, mobile application and access control software). The product testing phase was planned and implemented by local living lab specialists. A two-month planning phase and the implementation phase including official decision making process (altogether six months), made overall duration eight months. A relatively long time was spent on planning, as product testing within public procurement of the City of Oulu was conducted for the first time in this scale: preliminary work including searching for references, minimizing the risks and considering the regulation, was time-consuming. In addition to the actual product testing, a living lab user involvement online platform PATIO2 was used for collecting feedback in a private online discussion area from homecare employees about the product testing process to develop the procedure of innovative procurement within the city.

Scoring Criteria. The selection criteria for purchase were based on the overall economical affordability. The criteria contained two main elements: price and quality. The supplier products were scored and points were given based on the formula described below. The maximum number of points was 100. The price had 60% and quality 40% weight. Scores given by the nurses and the usability specialists together formed the quality. User feedback questionnaire and homecare service manager (administrator user) questionnaire both had a 12.5% weight, product

[2] www.patiolla.fi

efficiency/opening the lock 7.5% weight, and time spent for software usage 7.5% weight, altogether 40% (Table 2).

Table 2. The scoring criteria

Criteria		Score %
price		60
quality		40
	questionnaire for nurses	12,5
	questionnaire for admin	12,5
	efficiency: opening the lock	7,5
	efficiency: use of the access software	7,5

The price of the product included all the costs of service provider. The most affordable product got 60 points. Other products were scored using the following formula (1):

a / b * 60 = y .	(**1**)

a = the lowest price b = company's price.

Example 1: Company1's product has the lowest price e.g. €100. The result is 100/100x60 = 60 points.

Example 2: The price of the company2's product is e.g. €200. The result is 100/200x60 = 30 points.

The quality criteria were scored based on the product testing. The testing objectives/indicators were defined based on the usability definition in ISO 9241-11 standard[3], which defines usability as follows:

> *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use".*

The factors related to the usability are defined in the standard in the following way:

- *Effectiveness:* accuracy, completeness and lack of negative consequences with which users achieved specified goals
- *Efficiency:* relationship between the result achieved and the resources used
- *Satisfaction:* positive attitudes, emotions and/or comfort resulting from use of a system, product or service

Usability specialists used these average points to calculate the final points for quality. The best product could receive a maximum of 40 points. Formulas used for scoring the quality elements were the following:

[3] https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-1:v1:en

a) To calculate the *user feedback* scores, the following formula was used:

a / b * 12.5 = y .	(**2**)

a = company's score b = the best score

Example 1: The product gets the best score e.g. 25. The result is 25/25x12.5 = 12.5 points
Example 2: The score of the product is e.g. 18. The result is 18/25x12.5 = 9 points

b) To calculate *the efficiency* scores the following formula was used:

x / z * 12.5 = y .	(**3**)

a = the fastest time b = company's time

Example 1: The lock opens the fastest e.g. 3 seconds. The result is 3/3x7.5 = 7.5 points.
Example 2: The opening time of the lock is e.g. 4 seconds. The result is 3/4x7.5 = 5.625 points

Product Testing Implementation. Product testing was carried out for two weeks in a sheltering house for elderly people in the City of Oulu. The four different products (a product refers here to an entity consisting of a lock module, a mobile application and access control software) delivered by four different suppliers were tested by seven homecare employees (nurses). Each product was tested for at least five days and 20 separate times during the test period. The nurses' more precise task was to test the opening of lock modules for each four products via mobile application and that of the service managers was to test the access control software (SW) for each four products. The products were anonymized and coded with colours. The access control software of each product, the meaning of which is to administrate and give access rights to users, was tested by four homecare service managers (administrators). The administrators used the SW for the whole duration of the test. All the users (nurses and administrators) were given a questionnaire to be completed by the end of the testing period. The questionnaire had five statements accompanied by five alternative answers and a field for justification. The statements were based on the effectiveness, efficiency and satisfaction objectives, which were identified by nurses and administrators. The criteria are described in the Table 3.

Table 3. The criteria for the locking device and access control SW

Locking device	Access control SW
The lock will close and open	The opening of the lock is recorded to the SW
Opening the locks via a mobile key is fast and easy. The lock shall open in less than 10 seconds.	The length of the client visit is saved correctly to the SW

Locking device	Access control SW
Nurses are satisfied with the mobile key and interaction with the system	The access right set by administrator will operate in the locks
	The administrator can effectively manage the data and access rights
	The administrators are satisfied with the SW

In addition to the user feedback collection, product efficiency was measured by two usability specialists. They measured the opening time of the lock/door and the time used to complete specific tasks. Each lock was opened ten times via a mobile key. In addition, the opening procedure was observed during the test. The usability specialists also performed the access control SW product testing. The predefined tasks were executed by one usability specialist, while another expert recorded the time. The procedure was carried out three times and the fastest time was selected. The predefined tasks were as follows:

1. Create a new profile for a nurse and give him/her access rights to the lock
2. Modify the access rights, so the nurse can open the lock only between 11 am and 1 pm
3. Remove the nurse's access rights (created in step one)
4. Remove the nurse's profile

5 Results

5.1 Product Testing Results

The selection criteria results are presented in Table 4 below. Company 2 (C2) had the lowest score in all elements. Companies 1 (C1) and 3 (C3) had the best quality scores. Companies' 4 (C4) and 2 (C2) software lacked the functionalities needed to perform the test properly, which affected the quality scores.

After the product testing, the sealed price envelopes from each supplier were opened and prices scored based on the formula presented earlier. Total scores were formed combining the total quality and price scores. As shown in Table 4, the winner was the product of Company 1 (C1), closely followed by the Company 2's product with the lowest price (C2) and Company 4 (C4).

Table 4. Selection criteria results

	Questionnaire: Nurses	Questionnaire: Admin	Efficiency: Opening the lock	Efficiency: Access control SW	Total Quality	Total Quality	Total
C1	12.5	12.5	2.7	7.5	**35.2**	32.8	**67.99**
C2	4.0	3.1	0*	0*	7.1	**60.0**	67.07
C3	9.3	11.6	7.1	7.2	**35.2**	30.6	65.78
C4	7.5	11.0	7.5	0*	26.1	41.0	67.07

* Efficiency tasks weren't able to carry out.

Moreover, feedback from the homecare employees regarding product testing was collected via online discussion on a moderated living lab user involvement platform PATIO. This feedback was not scored; thus, it did not directly affect the procurement, but was rather an additional tester feedback aiming to help develop the product testing process further. Anonymized logins for each test user were created and three open-ended questions about his/her personal experiences with the product testing, positive sides of the product testing and improvement ideas. Seven employees participated in the discussion and wrote a total of 24 posts varying in length.

Based on the scores formed by quality features (40%) and price (60%), the mobile door-opening system was procured. The overall size of the purchase was 500 lock modules and software, the total value of the procurement being 250 000 EUR. Compared to traditional public procurement in which the product with lowest price is typically selected, the result of the Keyless homecare procurement differed considerably: the selected mobile door-opening system was not the most inexpensive one but the one with the highest scores obtained from the overall price and quality together. This means that quality and user assessment played significant roles in the procurement. Interestingly, the product with the lowest price did not receive high scores on quality either.

5.2 Framework for Product Testing as a Part of Public Procurement

Figure 2 presents the process of the Keyless homecare procurement, forming *a framework of an innovative public procurement open procedure including product testing*. Added to the previously presented (Figure 1) open procedure model adapted from JHS (2013), the elements of the procedure in which the living lab and product testing were included are highlighted (Figure 2).

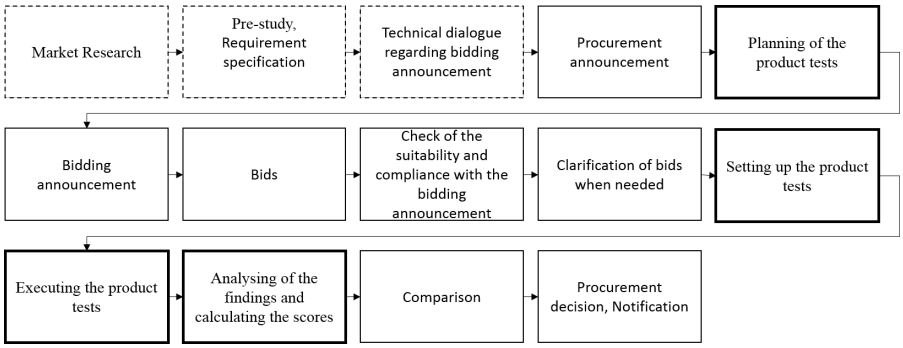

Fig. 2. Framework of the public procurement open procedure with product testing (Adapted from JHS, 2013).

The living lab had an important role in the early planning phase, as a detailed product testing description was attached in the bidding announcement. Based on the announcement, four bids from suppliers were received, and their solutions were installed to test in a real-life environment. The suppliers introduced their products to

the usability specialists to ensure efficient and smooth testing. A suitability check was done to ensure that the test users were not familiar with the products or there was not a conflict of interest. Living lab usability specialists organized the product testing and were also involved in the analysis of the results as a basis for decision making.

5.3 Stakeholders' Experiences

As several stakeholders were involved in the Keyless homecare project, the results can be viewed from different angles: *from the City of Oulu* point of view, first-hand experience conducting a successful procurement in which product testing was included and was valuable considering the further development of innovative procurement. From the *users/homecare employees'* point of view, the usability of a daily used product was ensured through comprehensive product testing: in addition to functionality testing, the users could provide overall feedback. From the winning supplier's point of view, the high quality of the product for once mattered.

From the *living lab's* point of view, valuable experience with the successful use of a living lab in an innovative public procurement was obtained, and conditions for using the living lab in future public procurement cases in the city were created. Moreover, the suitability of the living lab methodology for innovative public procurement in which i.e. legal aspects must be taken in account was piloted.

From the *winning supplier's* point of view, Keyless homecare procurement differs significantly from the earlier public procurement the supplier company had been involved. In this procurement, the company for the first time felt that they were participating in a "wise purchase", as the price was not the main indicator, but the usability and diversity of the service played significant role.

> *"As we are not selling cheap but aim to provide quality and sustainability, we saw this (bidding competition) as an opportunity and took it seriously. Wish all public procurement would be like this". (CEO, Company X)*

> *"This is the only time we have experienced product testing as a part of bidding, unfortunately". (CEO, Company X)*

According to the winning company, it was easy to participate in the bidding competition as it already had previous experience participating in public procurement.

> *"Good thing was that every supplier got an opportunity to discuss their offer/product with procurer, and the process was explained beforehand to enable investing in the case". (CEO, Company X)*

Although the procurement procedure was quite successful according to the winning company, there is always room for improvement: according to it, what was missing in this process was comprehensive feedback regarding product testing. Therefore, a general feedback discussion could have been useful. A public summarized report regarding the product testing phase would have helped all the suppliers to improve their products. This would have required permission from the suppliers. In addition, the test group could have been larger, as the sample was quite small. The company would have been willing to lengthen the testing period if they had accordingly received a broader view of user experience.

> *"More extensive user feedback would have been worth gold for this type of organization…" (CEO, Company X)*

The product testing phase schedule was too tight as there was only a short time between the bidding competition and product testing, considering that installations require time. At least three weeks would have been preferable over two. The schedule was tight for other parties as well; minor changes, such as test user's illness could have led to failure. *Homecare employees'* attitude towards the product testing was mainly positive, and fortunately they were able to test the products as planned although most of them criticized the schedule as well:

> *"It (testing) was time-consuming and challenging to settle with other tasks as it occurred in a busy week". (Test user 2)*

> *"It took a lot of time…really a lot of variance in instructions but wish this would affect a good choice (product)…" (Test user 1)*

Homecare employees also needed more time for the instructions and guidance. The scarcity of instructions (a paper sheet), however, came as a given in the bidding announcement, to maintain impartiality. Some of them also criticized the testing environment, the sheltered housing, as they saw it was not as authentic as possible:

> *"Testing should have been done outdoors as well…to see how the weather affected it". (Test user 3)*

Although the Keyless homecare public procurement process can be perceived as successful and to serve as a reference for future public procurement, there were several issues: even if a certain number of winning product have been procured, in practice less than half of the intended amount were supplied/installed when interviewing the winning supplier. The main reason for the delay was the rapid change in technology and choice of technologies to be used in the city.

> *"A technology breakthrough happened very rapidly (after the procurement)…proceeding has not been as smooth as thought". (Dep. development manager)*

According to the city representative, although the procurement results were satisfying, multiple challenges emerged: first, the *procedures of the city* were not mature enough for this type of operation model. Furthermore, there was *lack of resources*, as it was optimistically thought that existing resources would be sufficient to change the operation model, but in given timeframe it was not possible. Second, *a technological change* appeared: new solutions came to market making the existing mobile door-opening technology more comprehensive. A new *enterprise resource planning system* in which the purchased mobile door-opening service can be exploited as only one part of larger solution was adopted within the city, which to some extent slowed down the completion of the procurement. Moreover, there was also an issue with the *mobile phone operating system*: the city uses a specific mobile phone technology and the supplier was changed which also affected the completion of the procurement.

5.4 Outcome of the Living Lab Approach

In the Keyless homecare procurement, the living lab entered a completely new area, public procurement. Thus, close cooperation between the representative of the

procurer and the living lab was essential for the successful implementation. However, *closer interaction* between the actual procurement decision-makers of the city and the living lab would have been needed as here product testing played a key role in the success of the procurement: the living lab had to define the quality metrics and test procedures universally without knowing the potential suppliers' precise solutions to be able to test all kinds of solutions equally and avoid appeals. Moreover, the living lab was consulted when setting the price-quality criteria and to understand how to measure the quality of products.

> *"Usually when planning product testing you know how the product will function. Here, it was unknown which made product testing planning challenging, especially when we had to keep in mind that if we do not treat the products as equal they might appeal to Court". (Usability specialist 2)*
>
> *"The role of the usability specialist was the most important". (Project manager)*

The living lab must gain familiarity with the procurement procedure and regulations to be able to integrate the living lab into the process. Although the planning phase was relatively long, the strict schedule regarding decision making given by the procurer limited to the implementation of the actual product testing phase. Normally, the living lab would have planned the schedule to be more flexible for all stakeholders. As the city lacked user involvement expertise and resources, the living lab's role was perceived as crucial:

> *"Living labs are absolutely needed to enable testing in authentic circumstances". (Dep. development manager)*
>
> *"If we consider it from the perspective that we should use public taxpayers' money to acquire products or solutions that meet the needs, so it (product testing) is absolutely needed, and of course in as natural and authentic conditions as possible to obtain an accurate view of the product. And, of course, it would be best to do it before the procurement decision". (Dep. development manager)*

5.5 Selection Criteria Outcome

Although subjective metrics can sometimes be appropriate in the procurement where subjectivity is closely related to the procurement, it was questioned whether the *selection criteria* in this case were too subjective and could be used as such. There was some internal debate as to whether the product testing could have been conducted with different criteria. Accordingly, the selection criteria results presented in the previous chapter show that *there is reason to question whether the criteria were discriminating enough*: the difference between the winning bidding (with the highest-quality scores) and the one with the lowest price was subtle. The price of one of the mobile door-opening services involved in the bidding competition was considerably lower compared to others, which lead to these results. In the worst case, this product with the lowest price but the poorest quality would have won the competition and spoiled the whole idea of product testing and the innovative procedure. It is not clear, based on the research data, how the decision of the price-quality ratio in this case was

made, but the findings undoubtedly show that it is critical to consider this issue in depth.

> *"It is always challenging to find the balance: you cannot set a very low weight to price... well here the challenge was that an extremely cheap but extremely unusable product was close to winning. It was speculated that 50%-50% (price-quality ratio) would have been much safer, but this was the case, that luckily the most usable product won". (Technology specialist)*

Moreover, maximizing the objectivity of selection criteria limits the possibilities to take user feedback in account. More specifically, user feedback here was collected through methods that enable measurement.

Effect on Procurement Regulation. Traditionally in public procurement, the winner is typically the company who dares to make the "dirtiest promises". According to the experiences of the winning bidding company, in the case in which the weight of price counts for more than 50% of the purchase, nothing else matters. Moreover, the offer can be written so that it answers all the questions set by procurer despite the fact that, in practice, the products do not necessarily function in the manner in which the bidder has described in the offer. For this reason, the winning bidding company has supplied some products even when they have not won the bidding competition because the winning bidder has not been able to deliver the desired technology (but won the bidding competition due the lowest price) after all. Thus, there is a great deal of room for improvement in the implementation of public procurement according to the informant company:

> *"One reason for the poor economic situation (in Finland) is that there is a lack of professional, skilled procurers, especially in the public administration sector. Soon no one wants to bid because much is asked but less paid…there are smart thoughts and nice figures - but who will pay"? (CEO, Company X)*

A common problem in public procurement is that when making a bid, a customer might visit five to six suppliers, after which a bidding announcement will be made. Possible suppliers can then be recognized among the bids. It would be beneficial not to identify the technology, but rather describe the usability and the desired advantage. Based on the earlier experiences, a technology-driven approach often results in a poor outcome.

> *"It's a pity that in the public sector, a negotiated procedure is not commonly used within procurement legislation". (CEO, Company X)*

Although in public procurement, lost suppliers typically try to find issues to appeal to of, in the Keyless homecare procurement there were no appeals from suppliers. No one felt they had been treated wrongly in the bidding competition or that the criteria were not set right. In that sense, the procurement can also be seen as successful. The City of Oulu representative, however, reported not being afraid of appeals in procurement processes:

> *"We are open to trying new when there is justification for that. Even though there was chance to go to Market Court, I see it as a positive that new procedures become tested in case law. Sometimes I even hope*

> *that we will go to the Court to test and develop the interpretation of the law. Certainly, it might slow the process down and require a lot of resources". (Dep. development manager)*

Thus, the use of innovative methods within public procurement can be seen as a way to *affect improvements in procurement regulation* in case the procurement goes to Market Court.

What was innovative in the Keyless homecare procurement was that the product testing included in the public procurement for the first time ever in the city in this type of procurement. Considering the effect of product testing in procurement, it may also work as sparring suppliers to develop their products when included in the bidding competition phase. On the other hand, there are people who support keeping bidding as simple as possible, and conducting i.e. product testing in phases such as market research or after procurement, with contracting conditions. Overall, the case introduced unique knowledge on the implementation of product testing as a part of healthcare public procurement.

> *"This was an excellent example of a successful product testing as a part of public procurement. Despite sudden changes and challenges, the procurement process was successful: product testing clearly affected the winning bid, and price alone did not matter". (Dep. development manager)*

> *"When thinking of this as a process and public administration procurement process, this is one of the best. Even if we had lost the bidding competition, this case was like a spark of light in the dark. Whenever there will be (a procurement) like this we will be involved". (CEO, Company X)*

6 Conclusion

The study presented a public procurement case in which product testing service provided by a living lab was included for the first time in a public procurement in the City of Oulu. The Keyless homecare procurement case was unique and raised a great deal of interest among stakeholders. The successful implementation of the procurement process and the exceptional results obtained are an important reference for all stakeholders, particularly the City of Oulu and living labs. New means of shifting from traditional procurement towards innovative public procurement were identified and piloted in the process. The product testing within public procurement was carefully planned and documented; thus, the framework in this paper may serve as a reference for future public procurement cases in which product testing is included.

What was different in this procurement compared to the earlier procurements with which the winning company had been involved, was that it was open and consultative. Overall, the feedback from all companies participating in the Keyless homecare bidding competition was encouraging. The results of the study show that a living lab's role in strategic procurement is significant and reflecting earlier research (Havila et al., 2004; Majamaa et al., 2008; Almirall and Wareham, 2012; Schuurman,

2015), through end-user involvement increases innovativeness in public procurement. Furthermore, circulating the view that user-driven development method trials are an effective way to develop procuring procedures (Bovaird and Loeffler, 2012; Enbom et al., 2014), the results indicate that product testing included in public procurement may also help to develop the regulation regarding public procurement as the regulation has been recognized partly as inappropriate. The findings can be seen to influence the development and enhancement of public procurement thus obtaining several beneficial impacts (Manninen, 2015).

> *"…to not get a feeling of "buying a pig in in a poke" due to the Procurement Law…I think it can't and mustn't be that way". (Dep. development manager)*

For instance, in cases in which citizens would be involved in a public procurement, the role of a living lab could be even more significant, as user engagement tools and methods for facilitating users are among the strengths of living labs. Initial experiences such as Keyless homecare provide an opportunity to practice co-operation and build trust between operators in multi-stakeholder projects. To spread good practices and enhance public procurement it is important to document and disseminate the results of new experiments like this.

> *"Several cities have been interested to try same kind of procedure in their procurement". (Project manager)*

There is a considerable amount of discussion regarding what makes procurement innovative. The case of Keyless homecare contributes this discussion (e.g. Aschhoff and Sofka, 2009; Knutsson and Thomasson, 2014; Georghiou et al., 2014) through exceptional results: end-users genuinely, through a unique procedure, were able to influence the procurement decision. Thus, end-user involvement prevented the procurement of an unsuitable or unusable product (Ng et al., 2013; Satish and Shah, 2009) which could have led to severe problems. In the literature, there are many definitions of innovation and (Schumpeter, 1934; Yliherva, 2006; Frankelius, 2009) innovativeness and based on the study, academic discussion and definition works as a good basis for procuring in practice. Innovativeness can be seen not only as a procurement of an entirely new innovation, a solution that did not exist before, but an innovative element can also appear in any phase of procurement process or planning:

> *"Innovativeness may arise from the application of knowledge or expertise in a way that clearly differs from the old. That is, I would say, genuinely innovative". (Dep. development manager)*

It can be even thought that anything that changes something in the unusable or ineffective old method, is innovative enough from the point of view of public sector procurement effectiveness.

> *"If you even stop and consider whether this could be done in other way to obtain better effectiveness or better value for customer is innovative for me. Even if a definition would state that it must be something unique". (Dep. development manager)*

> *"I wish product testing would be used also in the future whenever it is suitable. It has to be well thought out and planned, though". (Dep. development manager)*

The empirical findings suggest increasing innovativeness in public procurement can be done in different ways, trying something unique. Modern-age tools, for example *online user involvement tools,* can be seen useful not only for the engagement of end-users but also to ensure a modern way interacting between actors, which is an important part of procuring (Edler and Georghiou, 2007; Georghieu et al., 2014). Virtual tools, such as the user involvement platform provided by a living lab, could be, according to the findings, applicable for the public procurement market research phase for instance as a "virtual discussion board" for all stakeholders involved. Based on the findings, technology suppliers are not afraid of using virtual tools, which could be a flexible and easy way to involve stakeholders, working as a tool of interaction and collecting insights.

Relying on the empirical findings, and confirming earlier findings (Enbom et al., 2014), the product testing phase is important to plan thoroughly, considering sufficient resourcing (Bovaird and Loeffler, 2012), scheduling and objectiveness. To summarize, at least the following features should be carefully considered when forming criteria and processes for innovative public procurement in which product testing is included:

- determining the price-quality ratio carefully
- planning the product testing phase thoroughly
- resourcing a sufficient amount of working hours
- detailed documenting
- communicating the process to suppliers
- disseminating the results

6.1 Limitations and Future Research

Here, the uniqueness of the research subject led to several limitations, as the single case study method has limitations regarding the interpretation of the results. It is commonly accepted that findings of a case study cannot be generalized but taken as such, merely evoking discussion and raising questions (Eisenhardt, 1989; Stake, 1995). Due to the single case being the unit of analysis, the sample in this study is relatively small. However, it is important to examine novel cases to contribute to the scientific discussion in the field as well as to share knowledge to the relevant audience. To maintain the reliability and validity of the study, research data was comprehensively collected from multiple sources, and from the identified key informants.

Future research could focus on combining similar cases and finding consistencies. In Keyless homecare product testing, the assessment criteria were set as thoroughly and as objectively as possible to avoid any misinterpretations and maintain impartiality between all suppliers. However, this affects the possibility of taking into account end-users' voice, as end-user feedback is always subjective. From the living lab point of view, this is a pity, as end-user engagement methods is the strength of living labs and their expertise plays major role here. Thus, we recommend further research and development to determine the most suitable methods for user involvement to be exploited in public procurement. Accordingly, the smooth implementation of living lab methods in the processes of public procurers should be further studied. Finally,

further research is required to obtain the right price-quality ratio balance in product testing.

Acknowledgement. We would like to thank the informants for their valuable insights. Parts of this paper have been published in the Proceedings of the XXVII ISPIM Innovation Conference: Blending Tomorrow's Innovation Vintage, Porto, Portugal, 19-22 June 2016. ISBN 978-952-265-929-3.

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