Chapter

Exploring Critical Factors for Innovative Capacities: A Life-History Research

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Abstract

A large volume of literature within human resource management studies and related disciplines suggests that innovation and learning are key factors for economic growth in the knowledge economy. Yet, surprisingly little is known about the key actors in this process – the inventive actors – and the factors that influence their innovative capacities. Information about individual inventors is difficult to obtain and therefore previous research has refrained from performing systematic empirical studies on this topic. Existing studies are often based on quantitative analyses of patent data, and empirics often focus on specific industries or technologies. Such studies provide great knowledge of the importance of specific patent takers for innovation and the knowledge economy; however, patent data do not provide information on influential factors on the innovative capacity of inventors and therefore do not provide any explanation concerning what it is that creates successful inventors. In other words, what we have is knowledge of patent takers in specific industries or technologies, but we lack an understanding of the socio-cultural factors and environments that shape individuals' innovative capacities. Analysing the life-histories of three inventors allocated into three distinct ideal types, this chapter aims at understanding the links between socio-cultural factors and innovation. Life-history research through in-depth interviews provides a rich quantity of narratives and recorded experiences serving as a springboard for more comprehensive understandings of the actors, networks and events that influence innovative capacities.

Keywords: innovation, innovative capacity, inventors, life-history research, inventors, socio-cultural factors

1. Introduction

The aim of this chapter is to explore how different socio-cultural factors influence innovative capacities of individual inventors. When exploring innovation, the human research management literature have primarily focused on the management of organizations or organizational culture [1–3]. Meanwhile, individuals' background and upbringing is a theoretical and empirical blind spot, even though other disciplines, such as sociology and psychology, have shown that family and upbringing are key indicators of human and social capital known to be influential for individuals' general capacities [4–6]. As Lin and Sanders writes *"research on*

individual creativity and innovation has typically drawn on psychological theories to examine employee knowledge, skills and motivation as the antecedents of innovation (...) whereas research on organisational innovation comes from an intellectual capital or knowledge management perspective. The disparate literature leaves researchers with a rather fragmented picture" [7].

Innovation is a process that draws upon the social context in two distinct ways. First, inventors, as individual actors, are likely to be influenced by their social environment. Consequently, they may perceive innovative opportunities in a manner that is influenced by their upbringing. Secondly, the social capital of an individual is likely to influence behaviour; consequently, social capital influences the essential nature of the innovation process. Thus, we argue that using life-histories to explore critical socio-cultural factors of individual inventors will enrich research within human resource management with an opportunity to also understand some of the deeper processes of innovative behaviour.

Well aware that it may be difficult to evaluate the effect of socio-cultural factors, this chapter suggests that in-depth life-history interviews with individual inventors concerning their family backgrounds, upbringing, education and workplaces will provide detailed knowledge of the socio-cultural factors that influence inventors' innovative capacities. The innovative capacity of an inventor can be defined as their ability to come up with creative and marketable solutions to specific problems. However, as register of inventors is virtually non-existent, such a definition is difficult to operationalise for research purpose. Thus, this study applies listed patent takers as a proxy for innovative capacities. The argument for this is that patent takers at some point in life has invented something that is so different from what existed before that it can be granted a patent. Patents are not necessarily the most optimal way of measuring innovative capacities, as it can be very biased towards industries or products. However, patents are a relatively rigid indicator of an innovative activity. Thus we identify inventors by defining whether they have applied for and been granted a patent well aware that a substantial number of innovators will not be captured using this demarcation.

2. Theoretical framework

In our time, the striving for the next successful innovation is the greatest of all. Consistent with this argument, an increased number of disciplines have perceived the understanding of the processes of innovation as a key concern. Human resource management (HRM) research has primarily focused on understanding the factors that can contribute to building innovative organizations [1–3]. Here, focus has predominantly been on top-down models, arguing that factors such as organizational climates [8] in which employees feel psychological empowered are key [9]. In disciplines with an interest in regional studies, however, the question of how institutions and institutional relations influence the process of innovation has attracted attention. For example, see [10, 11]. However, as Törnqvist showed in his studies of Nobel laureates, "it should be emphasized that it is those individuals who are part of a physical or institutional milieu or who belong to a network that actually found the preconditions for a creative process" [12], and *not the milieu per se*. Still, only few examples of solid research explore how specific socio-cultural factors influence individual actors' behaviour. Complementing Törnqvist's extensive work on the time-geography of Nobel laureates [12, 14], Skytt-Larsen's exploration of the life-histories of Swedish patent takers [5] and the analysis of the impact of social and human capital resources on creative abilities [6], as well as Ejermo and Hansen's study of the influence of location history on individuals' future inventive

capacities [15] are significant contributions to this understanding. Further, a limited number of laudable studies on the relation between institutional factors and the capacity of actors can be identified. Among these, important contributions come from Johannisson's research on social networks of entrepreneurs in a regional context [13], Huggins and Thompson's research of the impact of community culture on the resilience of entrepreneurial activity [16], Fritsch and Wyrwich's study of the regional culture on the persistence of entrepreneurship [17, 18], and Schmitt-Rodermund's exploration of the role of the family in the process of becoming a successful entrepreneur [19].

Exploring the trajectories of former Nobel laureates in time and space Törnqvist shows that home environments and schools influence creative capacities [12, 14]. Studying the influence of the local environment on the propensity of actors becoming inventive Ejermo and Hansen argue that the institutional fabric of the early childhood and a high density of future inventors in the place of birth has a significant positive effect [15]. In addition, Skytt-Larsen alludes to the early childhood, especially the educational backgrounds or creative skills of parents and grandparents, the social relations in the actor's final education and the organizational structures in the workplaces as highly influential for the development of actors' innovative capacities [5]. In another work, Skytt-Larsen further reveals that the socio-economic position an actor is born into strongly influences the nature of his or her future creativity [6]. All of these conclusions correspond to earlier studies on entrepreneurs where researchers working in different empirical settings conclude that actors raised in regions rooted in an open-minded entrepreneurial culture are more inclined to become entrepreneurs themselves [13, 16–19].

Accordingly, all of the abovementioned theoretical arguments stress that innovative capacities of actors are dependent on the environments they engage in during their lives. Thus, we maintain that examining the socio-cultural factors in early childhood, educational, workplace and inventive infrastructure provides valuable insights into explaining innovative activities. Well aware that it may be a difficult task to evaluate the effect of specific socio-cultural factors on the development of an individuals' inventive capacity, this chapter suggests that in-depth interviews with inventors concerning their life-history provide detailed knowledge from the key actors in the process of innovation of what they consider critical factors for shaping their innovative capacities.

3. Data and methodology

A critical issue in any qualitative research design is the trade-off between depth and breadth. As the primary aim of this chapter is to explore the links between socio-cultural factors and innovation capacity, we emphasize depth over breadth by interviewing a small number of diverse inventors about their life-histories. This is a less known approach to HRM research but it is highly valuable and relevant as it lets the respondents tell the narratives of their lives and gives them the opportunity, as completely and honestly as possible, to reflect on and describe the socio-cultural factors which they themselves believe to be critical to the formation of their innovative capacities. Thus, as argued by Geertz [20] we agree that the value of a research design lies in its capacity to provide insights, rich detail and thick description.

For this research, a database combining patent data with demographic information about all residents in Sweden was constructed. Based on the database, a list of inventors was extracted stratified by gender, age, geography, sector and technology. Three hundred corporate inventors who have been involved in at least one patent during their life-course were invited to an in-depth life-history interview, of which

23 agreed to be interviewed. To prevent biased findings, the sample of respondents is diverse, varying in age, education, profession, number of patents and formative background. This is in line with Henderson who argues that being perceived as an inventor by yourself or others has much more to do with your work activities than your corporate job title [4].

Eighteen face-to-face interviews were conducted at the workplaces of the respondents, in their homes or in a hotel lobby or cafe, while five interviews were done by phone. The interviews lasted between one and a half and five hours and were conducted between November 2013 and April 2014. The interviews were explorative and narrative, and all were initiated by the interviewer stating the overall purpose of the interview, namely to understand the relations between socio-cultural factors and innovative capacity. Guided by a list of open-ended questions addressing the respondent's family background, upbringing, education, social networks and the nature of their inventive work, the interviews gave the respondents the opportunity to describe and reflect upon events, actors and communities in their lives, which they themselves believe, have influenced their innovative capacity; that is their ability to come up with creative and marketable solutions to specific problems.

Like the methodological approach, the analytical approach is explorative. All interviews were audiotaped and transcribed. The transcriptions were used to develop the respondents' life-history narratives with focus on 'critical incidents' [21] and 'turning point events' [22] that the respondents stressed as important for the development of their innovative capacities. Thereafter all narratives were analysed to find illustrative relations between socio-cultural factors and innovative capacity.

Based on Skytt-Larsen's descriptive ideal types of inventors [5], this chapter presents the analysis of three inventor's life-histories. These are presented to explore how socio-cultural factors influence the innovative capacity of distinct inventor types. This reflects the need to provide rich detail and description as presenting all the life-histories collected would take up too much space with little added benefit [20]. The three life-histories nonetheless represent contrasts in respect of both gender, age, affiliation with companies, upbringing and of innovative capacity. Consequently, they are exemplars rather than representatives of the whole population of inventors and are included to enrich HRM research through a bottom-up perspective on innovation.

In respect of its limitations, the study relies on the responding inventors' narratives of their life-histories and thus on their memories of their life-time experiences. [23] has outlined the accuracy flaws inherent in study designs that rely on retrospective recall, and [24] stresses that a researcher must be aware of the problems of generalising from life-history narratives as these may be vitiated by systematic omissions or normative conceptions of 'the good life'. Nevertheless, it is the authors' belief that this method can add value to HRM research on inventors and innovation because of the longitudinal and explorative character of the approach. Especially in this chapter, where the objective is to understand the key actors in the innovation process, namely the innovative actors themselves, and to elucidate important relations between socio-cultural factors and innovation.

4. Empirical analysis

4.1 Bengt: a workshop inventor

Arguing for the importance of the educational setting for the development of social and human capitals, [5] defines workshop inventors as inventive actors with

no formal education except from elementary or high school. Bengt, a retired test engineer from southern Sweden is a great example of such an inventor. Working his whole life as a test engineer at one of the largest packaging manufacturing firms in Europe, all of Bengt's inventions has been developed related to his work. Therefore, Bengt considers himself more as a problem solver than an inventor. Bengt holds eleven patents.

Bengt describes his childhood as warm and safe. His father was a tinsmith with his own workshop; his mother was a homemaker without formal education. They lived under straitened economic circumstances, which he explains as being critical for the development of his innovative capacities: *"My father and my grandfather were both great craftsmen. My father had a workshop at home. He was genuinely a 'Mr. Fix It' who did almost everything by himself. In my childhood home, we always talked about how we could improve things, and we created many things ourselves. I must say that my father and my grandfather have been great inspirations for me".* This is in line with Henderson, Skytt-Larsen and Törnqvist who all found that actors who were raised with the opportunity to work with their parents or extended family on creative projects were encouraged in developing early inventive behaviour that proved invaluable in a later inventive career [4, 6, 12, 14]. In addition, echoing research on entrepreneurship [16–19], Skytt-Larsen also found that an intergenerational transmission of innovative values and behaviour was seminal for developing the anatomy of a workshop inventor [5].

Finishing elementary school, Bengt went to technical high school for three years, and thereafter he went to the army for one year where his knowledge about steel from his father's workshop came in handy as he was assigned to repair and test the machinery. These competences were key in starting his carrier as test engineer as he was also hired to test the machinery at the packaging firm.

Bengt describes the collegial environment at his workplace as critical for his inventive capacities: *"…we shared the same passion for our job, and often we worked after hours on inventive ideas to solve a problem we identified during working hours. When we finished sketching an idea we showed it to our manager – and if he liked the idea, which he often did, we were granted extra time to finish the idea and work out a patent application".* This is in line Skytt-Larsen who concludes that social networks of non-judgemental colleagues are seminal for this type of inventors [5].

In today's society, the workshop inventor is becoming an increasingly infrequent type of inventor, and hiring of labour is often associated with documented capabilities. Thus, with limited schooling and formal skills the chance to take on a position as a test-engineer is rather rare today. Hence, the clear workshop approach, stimulating curiosity, fixing sudden problems etc. will probably be less pronounced in the future landscape of inventors, but probably be present in a combination with more formal training as an important variable, and therefore understanding this type of inventor is still relevant for HRM research.

4.2 Daniel: an engineering inventor

According to Skytt-Larsen, engineering inventors are innovative actors with a technical university degree who work with engineering technologies in their everyday work life [5]. A great example of this type of inventor is Daniel, a thirty years old engineer working as a senior researcher in a large telecommunications company in Stockholm. He describes himself as "quite a decent inventor" with more than 10 accepted patents and about 150 filed patent applications related to telecom, all co-invented with a group of international colleagues.

Daniel was born and raised in Karlstad, West of Stockholm the capital of Sweden. His father was a technical trained network planner working in the

telecommunications industry, as did his uncle, while his mother worked as a medical secretary. As a child, his father and uncle's interests in their work instilled a great interest into technology for Daniel. His father also has five patents in connection to his work, and in the fifth grade, Daniel performed an internship at his uncle's workplace.

Even more important for the wakening of his interest into science, and thus for the development of his innovative capacity, Daniel stresses a specific event in high school:" *In high school we had a math test which showed I was the best in class. I didn't realize that before. Then I was chosen to be tutored by a retired professor of math and physics with a few other students. We were given other assignments than in class. This has been of great importance to me (...) this was when I decided to become an engineer.*" This corresponds well with [25] on the importance of investing in education for "*...a small number of exceptional people who can think creatively*".

Törnqvist claims, "*creative capital has better prospects of growing in an egalitarian than in a hierarchical organization*" [14]. This is substantiated by Skytt-Larsen arguing that a nice collegial environment, colleagues and managers with a non-judgmental approach to new ideas and an egalitarian structure in the workplace are seminal factors for engineering inventors [5]. In the same manner, Daniel argues that the Swedish work culture of low hierarchies is great for the development of innovative capacities: "*it is important for managers to trust in employees' own responsibilities and abilities and I believe that it is actually mandatory when innovation is the goal. At least that is my own experience*". This emphasizes that supplementing the institutional environment in the upbringing and during education; cultural norms and values at the workplace such as flat hierarchical structures play important roles for the development and enhancement of innovative capacities. Intra-firm structures are often based on the norms and values of a firm's place of origin, and therefore this finding demonstrates that places and the norms and values that places represent can also be vital in understanding innovative capabilities.

4.3 Eva: an academic inventor

Eva, a biomedical scientist with a PhD in clinical bacteriology is an exemplar of the academic inventor type [5]. She has established a probiotics research company in which she works as CEO and research manager, further she is affiliated with the local university where she acts as external lecturer and supervisor. Eva describes her inventive driving force as her continuous aim at helping other people out. She holds 12 patents related to medicine and biotech and considers herself more a researcher and entrepreneur than an inventor.

Eva grew up on a farm in northern Sweden, her father had a degree in veterinary science, but worked full time as a farmer while her mother worked part time at the farm and part time as a teacher in the local business school. Reflecting upon how her formative background and upbringing influenced her innovative capacities, Eva says, "Growing up on a big farm taught me a lot about driving a business, which I think has been helpful in starting up my own company. Moreover, and even more important for the formation of my innovative skills, I think, I have always been very competitive and my parents were always supportive in that and encouraged me to go to university and fulfil my dreams of becoming a doctor". Eva's reflections correspond well with Johannisson's reflections on how an upbringing in an entrepreneurial environment has a positive impact on oneself becoming an entrepreneur [13], as well as Ejermo and Hansen's conclusions on the positive impacts of academic backgrounds on future inventors [15].

Eva's competitive spirit and industriousness were also critical during her time at university where she felt that being a woman necessitated that she had to work twice as hard for her aptitudes to be recognized by her male co-students. However,

her PhD supervisor kept on encouraging her and invited her to conferences where she started networking with international peers; specifically she stresses a specific conference: "there I met some amazing researchers that made me realize that I was doing the right kind of research, that it was cutting edge, and that I should continue what I was doing". This echoes Törnqvist who, when discussing the importance of educational institutions in the development of Nobel laureates' creative capacities, argues "*…it is not the actual institutions themselves that are of interest, but rather a few individuals who are or have been active at those places*" [11].

Finally, Eva stresses her role in different boards, her wide international network in both academia and business as well as her wide personal network as critical for the continuous improvement of her innovative capacities.

4.4 Critical factors for innovative capacities

The life-histories of Bengt, Daniel and Eva all show that regardless which inventor typology they subscribe to, upbringing is critical in the development of innovative capacities behaviour, and that the intergenerational transmission of knowledge and skills is important regardless of socio-economic position. This conclusion sustains former findings on both inventors [4–6, 12, 14, 15] and entrepreneurs [13, 16–19], who all found that an open-minded and supportive childhood was an important base for actors' future capacities.

For Bengt, as a workshop inventor, parental artisan skills were stressed as an important factor, while the educational background of the parents played a critical role for both Daniel and Eva, representing engineering and academic inventors respectively. Daniel stressed that the education and career paths of his father and uncle have been an important source of influence over his innovative capacity. This finding is not so surprising given that many previous studies have pointed to the connection between the educational background of the parents and the choice of education of the individual of interest; see for example [5, 6, 12, 14, 15].

Both Bengt and Daniel stress egalitarian organizational structures and open-minded colleagues in their workplaces as critical factors for the development and expansion of their innovative capacities. This reflects the work of both Törnqvist, Chadwich and Dabu, and Shipton et al. showing that creativity and innovation-oriented performance thrives better in egalitarian organizations with empowering structures than in organizations characterized by hierarchical structures [12, 14, 26, 27]. However, Eva stresses the importance of taking part in various international and local networks as critical for innovative capacities. This is in line with Skytt-Larsen who shows that actors with high endowments of human capital, as Eva as an academic inventor represents, often use their social networks to access wider sources of knowledge that benefit their innovative capacity [6].

5. Conclusions

Based on interviews with twenty-three patent-taking inventors in Sweden, this chapter analyses how life-history research can help us to understand critical socio-cultural factors motivating and triggering actors to become innovative. Hitherto, most research has focused on understanding and documenting how institutional arrangements create innovative organizations and regions. Such a perspective is highly relevant for understanding the how HRM can foster innovative outcomes, but to fully understand how innovative thinking is facilitated and nursed, we also need knowledge about the socio-cultural factors that stimulate and motivate actors to become innovative in the first place.

This chapter presents the life-histories of three different types of inventors and analyses these to understand key socio-cultural factors for their development into patent-taking inventors. Although being innovative within different sectors and using different approaches and strategies in their innovative processes, the three individual inventors all highlight intergenerational transmission of skills and curiosity from parents and grandparents as some of the most critical single factors for the development of their innovative capacities.

Moreover, inspiring and encouraging support during education and on the workplace is of pivotal importance. Here an egalitarian structure and empowering employment culture in the workplace can be of outmost importance as it allows employees to be open-minded, curious, to think'out of the box'and share their ideas and knowledge with colleagues both within and between organizations. Our research shows, however, that the importance of workplace structure varies according to the age of the inventors, showing that it is more important in the early phase of a career compared to later when the inventor has had successful experiences and become more self-confident.

Thus, although the inventors represent different inventor typologies, they stress many common socio-cultural factors as crucial for stimulating their innovative capacity, namely families and institutions that spur and embolden curiosity from the early childhood and encourage actors to follow their ideas no matter how controversial they might seem. This is also the case later in life where tapping into stimulating, motivating and supporting networks in workplaces is stressed as being of key importance.

This chapter informs important future directions in HRM research. Until now, HRM research has primarily relied on top-down approaches when exploring innovation. However, this study clearly illustrate that understanding the inventive actors are an important first step if we are to understand innovation. This is because innovation is also a social process in which the key actors are inventive actors themselves. Moreover, life-history research provides a new starting point for empirical HRM research as it provides a rich quantity of narratives and recorded experiences that can serve as a springboard for more comprehensive understandings of the actors, networks and events that influence innovative capacities.

Summing up, this chapter is of relevance to managers seeking to improve rates of innovation in their organizations. The study shows that different types of inventors stress different socio-cultural factors through their life paths as critical in developing and enhancing their innovative capacities. However, social inheritance, acknowledging teachers and supervisors, and egalitarian structures and a non-judgmental collegial environment in workplaces are important factors that cannot be ignored if we are to make successful inventors and thereby successful innovative organizations in the future.

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