



Caring for healthcare entrepreneurs – Towards successful entrepreneurial strategies for sustainable innovations in Dutch healthcare

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ABSTRACT

The sustainability of current healthcare systems is threatened by several societal developments, including an aging population, an increase of unmet medical needs and rising healthcare costs. A transition is needed in order to meet these threats and to achieve a proper balance between the demand for care and the capacity to supply it. Entrepreneurs play a crucial role in developing the required sustainable innovations for this structural change. They are able to develop innovations in close interaction within the healthcare context. This paper studies entrepreneurial strategies for the successful development of sustainable innovations in Dutch healthcare. Data comes from semi-structured interviews with healthcare entrepreneurs. Results show that entrepreneurs experience the interaction with the healthcare system context in various ways and act accordingly. Four types of sustainable healthcare entrepreneurs could be identified: isolated, innovative, evolutionary and revolutionary. These entrepreneurial types differ in terms of their beliefs as to whether and how individual entrepreneurs can contribute to achieving structural change in healthcare.

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1. Introduction into understanding sustainable healthcare entrepreneurs

Although the intensive growth of national economies has led to an enormous growth of welfare, we are increasingly confronted with the boundaries of what had seemed to be unlimited growth. As a consequence, society increasingly imposes demands on the direction of economic developments. These should be more sustainable in order to meet the needs of current generations without simultaneously compromising the ability of future generations to meet their own needs ([1] 'Brundtland report'). This specific requirement for sustainability seems especially important in healthcare, where societal trends jeopardize the sustainability of the sector. An aging population, with increasing prevalence of long-term and incurable illnesses,¹ an

increase in the number of people living unhealthily; an increase in unmet medical needs; increasing patient demands for quality and the availability of expensive new diagnostics and treatments will threaten the provision of healthcare for future generations [3,4]. In order to meet these threats and to achieve a more sustainable healthcare system in the future, a transition of the health sector is needed.² These transitions require far-reaching innovations, ranging from new products, services and technologies to systemic changes [8,10].

Such far-reaching innovations do not emerge in a vacuum, but rather in a dynamic and complex context, resulting from activities and interactions of different actors who are part of this context [6,15]. This 'system of innovation' approach describes innovation as an interactive phenomenon: i.e. a co-evolutionary process of structural reorientation. This view results in an integrated system-based model of innovation

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¹ By the year 2015, half of the population (15–85 years old) will suffer from a chronic disease [2].

² In literature transitions are described as major, complex, large-scale, long-term and structural transformations of an entire sectors which require structural reorientations at the micro- and macro-level of the economy that go beyond incremental change (see for example [5–10,3,11–14]).

that introduces potentially influential contextual factors for innovation processes. Studying innovation processes in terms of systems has developed into an established research tradition that studies structural elements, the actors involved and the institutions that guide and influence actor's perceptions and activities [6,10,16,17]. This paper follows Lundvall [17] indicating that the core of an innovation system is formed by the relation between micro-behavior of key actor groups and the wider system context in which they operate. This paper focuses on entrepreneurs as these are believed to be one of the key actor groups due to their ability to discover, develop and diffuse innovations (e.g. [17–19]).³ By focussing on the actions of entrepreneurs, contextual elements will be discussed when relevant. The innovation systems approach is often criticized for its lack of explanatory power caused by a wide focus on all actors, networks, organizations and institutions that influence the development, diffusion and implementation of a particular innovation (e.g. [6,17]). This research, however, describes the context based on experiences of entrepreneurs; consequently, only factors from the system context with an actual influence will be discussed. Furthermore, this research not only identifies contextual factors, but also analyzes how and why they matter for entrepreneurs.

According to many scholars (e.g. [20–22]), entrepreneurs play a crucial role in innovation processes that contribute to sustainability. Former studies into transitions have mainly focused on how entrepreneurs innovate (e.g. [23–26]) and on the identification of personal characteristics that determine which individuals become entrepreneurs (e.g. [27,28]). According to Edquist [16], innovation scholars started to recognize the importance of the system context for innovation processes from the 1990s onwards. Ever since, many scholars have devoted their work into explaining and describing the role of the context, which resulted in many studies into innovation systems and its elements: e.g. work into 'network interactions' of Carlsson & Jacobsson [29], Edquist [16] and Klein Woolthuis et al. [30]; 'guidance' of Ashford [5] and Hekkert et al. [10]; 'competition' of Sarasvathy [24]; Davidsson [25]; 'institutions' of North [32], Johnson & Gregersen [33], Olsen [34], Scott [35], Hahn & Scheermesser [36] and Rotmans [3]. However, within this literature about the system context of innovation, studies analyzing the influence of this context on entrepreneurs greatly outnumber those considering the influence of entrepreneurs on the context (e.g. [38,39,67]). Although these efforts are worthwhile, they illustrate that existing research fails to explain *how* entrepreneurs exert their potential influence on the system context, whereas such explanations would especially contribute to one important challenge in innovation theory as described by Lundvall [17]: linking entrepreneurship as a classical driver of innovation to

the concept of innovation systems. Hence, current innovation literature offers insufficient insights into *how* innovating entrepreneurs interact with the system context for their innovation. This gap in innovation literature is caused by insufficient knowledge on the characteristics, success and time-related dynamics of entrepreneurial strategies to interact with the wide variety of elements within the system context. An improved understanding of this *interaction*, especially for those entrepreneurs that contribute to the transition, could improve the understanding of innovation processes on a micro level and could be used to improve innovation policy. This research analyzes this interaction from the viewpoint of individual entrepreneurs in healthcare.

Contextual factors are, however, by definition sector-specific. Therefore a more detailed description of the sustainability challenge and innovation characteristics of the sector under study is required before the interaction itself can be analyzed. This paper focuses on Dutch healthcare, because of its high impact on the Dutch economy in terms of public expenses and employment numbers (e.g. [40]); its fundamental character of providing a public good according to well-known public values as quality, affordability and accessibility, and its strong sustainability threats like an aging population and increase of chronic illnesses. Until now, most studies into transitions have been applied to the energy and environmental sector (e.g. [13,14,41,42]). Applying an innovation systems and a transition approach to the healthcare sector is rather new, although the sustainability threats clearly emphasize the need for a transition towards sustainability in healthcare [4,34,43,44].

The main aim of this research is therefore to gain greater insights into the interaction between entrepreneurs and the system context in healthcare by simultaneously taking a wide scope (focusing on a wide variety of elements within the system context of innovation) and a narrow scope (focusing on the entrepreneurial perspective). This research will answer the following research question: *what are the successful entrepreneurial strategies to change the system context for the development and diffusion of sustainable innovations in Dutch healthcare?*

Fig. 1 gives an overview of the focus of this paper. Relation 1 illustrates that healthcare entrepreneurs develop certain innovations in interaction with the healthcare system context, which in turn contributes to the transition towards sustainable healthcare. Relations 2 and 3 represent the interaction between the healthcare system context and innovations by healthcare entrepreneurs: the influence of the system context on the entrepreneur (Relation 2) and the influence of an entrepreneur on the system context (Relation 3).

Section 2 presents the theoretical background for studying entrepreneurial strategies of sustainable healthcare innovations. Section 3 describes the research methodology: the research population, the data used, the measurements and the various methods of analysis. Section 4 presents the results. Section 5 provides the conclusions. Section 6 discusses the findings and gives recommendations for policy and further research.

2. Theoretical background

The contribution of this paper to innovation and sustainability literature is twofold. In addition to the emphasis on the important role of healthcare entrepreneurs in realizing a transition towards sustainability, this research delivers more

³ Two citations illustrate that entrepreneurs are believed to form a key actor group in innovation processes

- (1) "Sustainable entrepreneurs identify market opportunities for innovations concerning sustainability, successfully implement these innovations and create new products or services" [18:3].
- (2) "Innovation can be seen as 'new combinations'. It can be separated from invention that becomes an innovation only when the entrepreneur brings it to the market" [17:7].



Fig. 1. Conceptual relations between entrepreneur and system context.

detailed insights into the dynamics of transition processes. By analyzing the direct behavior of entrepreneurs in interaction with the healthcare system context, it delivers insights on the micro-level of such transitions.

2.1. The need for innovation

Transition management literature does not only emphasize the importance of innovations for transition processes; it assigns a crucial role to it. Innovation is the *critical factor* to realize radical change because it possesses the potential to contribute to fundamental changes towards sustainability [10,18,45]. Because of ongoing changes in the ideas on and the possibilities to sustainability, transitions need to be understood as ongoing change processes *towards* sustainability and not as the creation of a final sustainable system. Transitions are roadmaps or visions that indicate a direction for development and show which new competences are needed to get there [34,46]. This paper defines innovation as: “the successful development and application of knowledge and technology in the form of new technologies, products, processes, practices and services” [19]. This definition builds upon work of for example Ashford [5], Gerlach [18] and Hekkert et al. [10]. It describes the development of something new and, simultaneously, the reflection of that new knowledge and technology in something that is brought to the market. By ascribing such an important role to innovation in transition processes, this paper is in line with the innovation system approach (e.g. [15,16,39]) and the multi-level theoretical perspective (e.g. [6,7,47]). According to both theories innovation processes are able to contribute to transition processes (i.e. able to mitigate various societal challenges) by inducing structural change in a sector, in addition to the possible contribution of innovation to traditional economic factors [5,10,18,45,48,49]. Innovation contributes to a transition when it possesses the ability to change the sector structurally by causing the required far-reaching changes on the level of an entire system [49]. Innovations that only change the sustainability of a single firm, that are only applicable in very specific situations or that make individual product-life-cycles more sustainable, are therefore irrelevant from a transition perspective.

To conclude, from a transition management perspective, innovations are applications of knowledge and/or technology in the form of new products, processes and services that possess the *potential* to induce a structural system change and thus contribute to transition processes.

2.2. The need for entrepreneurs

This paper is in line with the work of Schumpeter [50], recognized as one of the first authors who related entrepreneurs

to the development of innovations. Ever since, many well-known scholars widely recognize and support the important role of entrepreneurs in innovation processes and their ability to develop and implement valuable innovations.⁴ This paper focuses especially on entrepreneurs that fulfill a crucial role within transitions processes in healthcare; it defines entrepreneurship as ‘the introduction of a new economic activity, which is expected to be economically viable (aimed at gaining some form of economic returns), and which leads to a change in the marketplace when introduced’ (based upon Gartner [52], Lumpkin & Dess [23], Sarasvathy [24], Saltman et al. [53] and Davidsson [25]). This definition allows the inclusion of a wide variety of healthcare entrepreneurs in this research, varying from new entrants to incumbent companies. As opposed to mainstream economic literature (e.g. [54]) this research does not overestimate the economic rationales of innovation; it does however acknowledge that entrepreneurs are, at least partly, driven by expectations of economic viability. Entrepreneurs potentially contribute to economic viability and sustainability at the same time. In addition to the contribution to sustainability the ‘more traditional’ goals of innovation (such as economic viability in terms of profit optimization, competitive advantage, market share, firm growth and/or an increased chance of survival) need not to be neglected [48,55,56]. This idea is in contrast with the traditional belief that every sustainable innovation is inherently associated to a trade-off in economic profitability [57]. This paper considers entrepreneurship as able to reconcile economic growth with transition efforts towards sustainability in healthcare.

2.3. Explaining entrepreneurial success

Explaining entrepreneurial success has been the aim of many theoretical approaches, including the opportunity recognition and the opportunity discovery view (e.g. [58,59]). This research, however, considers these approaches as insufficient to understand and explain entrepreneurial behavior and success, because they are both unable to explain the dynamics of innovation processes within transitions. The recognition view disregards the system context of innovation and the societal pressures coming from it by explaining entrepreneurial success from opportunities that would arise from market failures. This neglects the fact that entrepreneurs are risk-taking individuals who operate under high uncertainty and who are influenced by interdependencies with other stakeholders, policies, regulations

⁴ Various arguments for why innovative entrepreneurs are able to change the current system context around them and consequently force innovation processes into new directions are well-known in literature: entrepreneurs are not hampered by vested interests; may experiment on a small scale against low costs and are often venture some people that are willing to experiment (see for example: [24,51,25,6,10,19,26]).

and institutions (e.g. [18,57,60,61]). The opportunity discovery view on entrepreneurial opportunities explains entrepreneurial success in term of information asymmetry based opportunities. This is considered insufficient, and even confusing, as it suggests that opportunities are just 'out there', waiting to be exploited instead of recognizing the importance of actions, activities and strategies of individual entrepreneurs. In this research entrepreneurial opportunities are considered a direct result of individual entrepreneurial action (recognition, evaluation and implementation) in response to certain contextual factors and/or conditions (based on [50]). Turning an idea into entrepreneurial success is therefore the result of individual action that is based upon the entrepreneurs' perception, interpretation and understanding of factors from the system context [54]. This view on entrepreneurship aligns with the 'opportunity creation' view, because it assumes that entrepreneurs *create* market opportunities by applying certain strategies in interaction. Within this view, innovation processes are considered to be characterized by an intricate interplay between elements from the system context and the interpretation and strategies of individual actors. This would make it worthless to analyze innovation processes independently from the intense interaction between elements of the system context and the individual entrepreneur [28]. Innovation is a dynamic phenomenon and using the system approach helps to gain insights into the dynamics of innovation systems (e.g. [62]).

To sum up, entrepreneurs fulfill a crucial role in the transition towards sustainability, because they develop innovations that are economically viable and potentially induce valuable systemic changes within an interactive context. The adjective 'interactive' implies that entrepreneurs are not merely influenced by the system context; they also exert an influence on it. This paper increases the understanding of this interaction by analyzing *how* entrepreneurs innovate. To be more specific, new insights into *how* the system context influences entrepreneurs and *how* entrepreneurs influence the system context will lead to a more profound understanding of how macro-economic dynamics work out on micro-level of entrepreneurial innovation and vice versa.

3. Methodology

3.1. Research design & research population

The research design is exploratory and qualitative, due to the rather new focus on the interaction of entrepreneurs with the system context, and the current lack of available knowledge on this topic in the light of the sustainability challenge in healthcare. Inductively analyzing the data is most valuable for gaining new valuable insights for both innovation theory and practice [63]. This paper is based on data from 14 illustrative examples of healthcare innovations. To explore these examples, semi-structured, in-depth interviews with entrepreneurs have been carried out and relevant field documents have been analyzed. The research population consists of innovative healthcare entrepreneurs. All entrepreneurs must have developed healthcare innovations that were aimed at the delivery of certain health services. Fig. 2 defines the specific target population of entrepreneurs (SE = sustainable entrepreneurs).

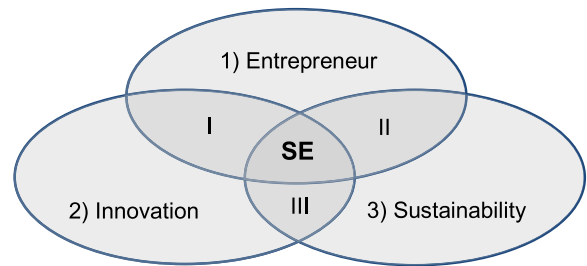


Fig. 2. Defining the population of entrepreneurs of interest (SE = sustainable entrepreneur).

The entrepreneurs were selected based on their compliance with three criteria:

1. 'Qualify as an entrepreneur': the entrepreneur developed and introduced a new viable economic activity into the market. This includes new entrants, start-ups, corporate ventures, spin-offs and even new innovative activities by (employees of) large firms.
2. 'Be innovative': the entrepreneur has developed an innovation in the market, which is a 'new combination' in the form of a sellable product, service or concept which (potentially) leads to a change in the market place after introduction.
3. 'Contribute to transition': the innovation should possess the ability to induce structural change in a sector while, at the same time, it needs to retain or improve economic returns for the individual entrepreneur.

Fig. 2 clearly distinguishes sustainable entrepreneurs (SE) from three other groups of entrepreneurs (I t/m III) for which only two out of three criteria apply. Although these other groups could develop valuable innovations as well, they do not contribute to the transition towards sustainability according to the theoretical logic and criteria formulated here. Group one (I) reflects non-sustainable innovative entrepreneurs, i.e. individuals or firms that introduce innovations that do not contribute to the sustainability challenge. For example, new daily practices within any particular healthcare organization may not be applicable to another organization, so that they cannot induce structural changes throughout the sector. Group two (II) consists of entrepreneurs that contribute to sustainability but not through innovation, such as entrepreneurs that start private non-innovative clinics for a specific target populations of which many already existed, or an individual that gets self-employed by starting a health consultancy firm. These entrepreneurs merely create new ventures without causing a real (innovative) change in the marketplace. Finally, group three (III) consists of persons that develop innovations that contribute to the sustainability challenge, but who do not qualify as an entrepreneur according to criterion one. For example, a company or person that develops an innovation platform that disseminates 'best practices' is not by definition entrepreneurial. Often these persons work for organizations that can be characterized as mission driven or not-for-profit. Although these endeavors may be valuable from a societal perspective, they are irrelevant for this research, because their

success is mainly dependent on others and their operations are not aimed at creating viable businesses [18,60]. This research analyzes entrepreneurs that comply with all three criteria and they are referred to as sustainable entrepreneurs (SE). The use of these three criteria makes 'success of the entrepreneur' inherent to its selection because all the interviewed entrepreneurs were at least successful in developing a particular healthcare innovation.

3.2. Data collection

After a thorough literature review on healthcare entrepreneurs and the Dutch healthcare system in international peer-reviewed journals and relevant field documents, data was collected by: (a) semi-structured, face-to-face interviews with innovative healthcare entrepreneurs ($N=14$) and (b) meetings with other researchers ($N=3$) to discuss our findings. Semi-structured qualitative interviews offered the best opportunity to contribute to an improved and thorough understanding of the interaction of individual entrepreneurs with the system context for innovation. In order to be able to elucidate commonalities within a diverging set of individual perspectives, multiple entrepreneurs were interviewed [63].

The semi-structured interviews allowed for gaining insights into the interaction of individual entrepreneurs with the system context for innovation. The influences, the applied strategies and the underlying argumentations and considerations were discussed in detail. For this purpose, the interviews consisted roughly of two parts: first, the influences the entrepreneurs experience from the system context were analyzed, after which the second part was dedicated to the identification and analysis of the implemented strategies aimed at inducing system change. During the second part of the interviews, the entrepreneurs were asked to relate the strategies to the earlier identified influences whenever possible. Questions about this relationship were asked to ensure that insight into the interaction was gained. The semi-structured interviews were also conducted to allow the interviewees to give underlying (argumentation and) motivations for their answers. To increase the reliability of the data, the interviews were recorded and transcribed. This offered the opportunity to analyze the data multiple times and by different researchers.

3.3. Methods of data analysis

The interviews delivered insights into the interaction of individual entrepreneurs with the system context. Since the interviews were open and semi-structured, they resulted in a large amount of qualitative data that needed to be analyzed in a comprehensive way to draw some general conclusions. The analysis of the qualitative data was conducted interactively, with the use of both theory and the data. First, raw data obtained from the interviews was transcribed and coded according to the process of 'open coding' (e.g. [64]). Because there was no theoretical framework with related labels to apply to the data, the labels came directly from the raw data, i.e. as they were mentioned in the descriptions of the interviewees. The next step in the analysis was structuring the data by excluding the overlap in the descriptions and by a continuous iterative comparison between theoretical insights and the raw data. This step in the analysis consisted of a

continuous development of a framework based on a comparison of the data to already developed labels and categories. For every piece of raw data it was determined whether it fitted with an already developed label; whether it required a change in the definitions of current labels or whether it legitimizes the creation of an entire new label.

Finally, the raw data was analyzed again, based on pattern-matching [63], to investigate whether the empirical data matched the developed framework. This final analysis needs to ensure that all the raw data, in terms of influences and strategies as mentioned by the entrepreneurs, could be assigned to one of the developed categories. In order to further increase the reliability, the details of the coding process and the results were discussed with colleague researchers. Source triangulation took place by using both field documents and exploratory interviews with entrepreneurs. In addition, close cooperation with other researchers took place during start-up, data-collection and data-analysis. So also investigator triangulation has been carried out as way to improve validity.

The process of iterative analysis results into a framework of categories of influences and thus represents the researchers' interpretation of the raw empirical data in the light of existing theory. It was the goal of this research to identify and clarify the interaction of factors from the system context and the strategy of healthcare entrepreneurs with regard to the transition towards sustainability. The rather explorative research design with iterative data analysis is considered suitable to deliver these insights, since it represents a first attempt to develop new models and theory about the behavior of sustainable entrepreneurs in interaction with the context. Since the interviewed entrepreneurs were selected randomly the results of this research are considered valid for the specific target population as described in Section 3.1. However, as the results will be very sector- and target population specific, additional research is needed before generalizations to other sectors and target populations can be made.

4. Results

The aim of this paper is to deliver detailed insights into the interaction of individual healthcare entrepreneurs with their system context. First, this study investigated what the term 'sustainable healthcare innovation' means. Next, a distinction has been made between influences from the system context on the entrepreneurs and, vice versa, the influence of entrepreneurial strategies on the system context. The results are structured according to this distinction.

4.1. Sustainable healthcare innovations

'Healthcare sustainability' refers to the balance between the demand for care and the capacity to deliver it. A sustainable healthcare system can be described as financially robust, economically viable, accessible to everyone and valuable in improving the health status of the individual (according to [3]). Sustainable healthcare systems thus need the long-term capacity to mobilize and allocate sufficient resources (such as manpower, technology, information and finance) to activities that meet individual or public health needs [34]. Ensuring a sustainable healthcare in terms of quality, affordability and

accessibility is therefore dependent on the ability to find appropriate responses to sustainability threats. These threats are already identified and described in earlier research efforts (e.g. [2]). On the demand side, we need to come to terms with: an increasingly aging population, an increasing prevalence of long-term and incurable illnesses; an increase in the number of people with unhealthy life styles (e.g. obesity); an increase in patient demands for quality; and the availability of new, expensive diagnostics and treatments [4]. A threat to the supply side of healthcare could be a possible shortage of capacity, which may be the result of higher expenditures on healthcare, limited growth of productivity (e.g. innovation deficit in drug development pipelines) and an increasing lack of qualified personnel⁵ [3,4]. In addition to these threats, also long development times, rigid patent laws, strict safety regulations and complex ethical issues characterize healthcare. Together these threats and characteristics make the need for a transition evident. Healthcare needs to develop into a more sustainable healthcare system, i.e. one that is capable of providing affordable, safe, effective and innovative care now and in the future. A wide range of (non)-technological innovations is needed for this purpose [44].

Healthcare is thus sustainable when healthcare demand and the capacity to deliver it (supply) are in balance, now and in the (near) future. Even innovations that are not fully sustainable at the time of introduction are valuable from this perspective if they contribute to sustainability by inducing long-term systemic changes. Criteria for determining whether innovations have the potential to contribute to healthcare sustainability [65] are listed in Table 1.

4.2. Influences from the system context on entrepreneurial strategy

A total of 23 influences from the system context were identified during the initial round of interviews. All exerted an influence on the innovation processes of the entrepreneurs. A detailed analysis of the data resulted in a comprehensive overview, in which all influences were assigned to one of five inductively developed categories⁶ of influences: 'network interactions', 'infrastructure', 'institutions', 'technology' and 'external factors'.⁷

The category of *network interactions* describes cooperative and competitive relations between different organizations within and outside the healthcare sector. Although the entrepreneurs acknowledged the importance of competition for determining their strategies, they did not consider it as a threat for their success. It was often argued that when an innovation adds real value to potential customers, all competition becomes irrelevant. Other entrepreneurs considered competition as the most important driving force for their success because it forced

them to keep performing well. Sometimes, the influence of competition on entrepreneurial strategy was evaluated from a general healthcare perspective, as is evident in the following illustrative quote (Personal communication, February 2009):

"The more added value for healthcare the better. That's why we share lessons learned freely and without pre-conditions with 'competitors'...[...]That's what we want right, spreading valuable ideas".

In addition to competition, the existence of either too strong or too weak interactions was referred to as another important aspect of network interactions. The entrepreneurs indicated that those too strong relations – often between health professionals, patients and technology providers – make money flows, rather than social and societal values, dominant when new developments were evaluated. Too strong relations, described as being intensive, rigid and long lasting, may form a problem when they lead to a certain level of myopia within healthcare organizations. Examples of this myopia are general practitioners that always send patients to the same specialist without any obvious reason; or medical professionals that are hesitant to work with new technologies or methods, even when the added value for patients is clearly present. Too strong relations may therefore result in a fear to innovate, which in turn threatens the room for experiments and innovation. This is especially the case for outsiders who cannot build upon existing relations with partners when they develop an innovation. According to the entrepreneurs, also too weak interactions were an important aspect of network interactions that influenced them negatively. They may hamper learning and consequently the development of shared visions and/or interests. These too weak interactions make that the healthcare sector is often characterized as highly fragmented in terms of responsibilities. This may be problematic for entrepreneurs because it makes it very hard to develop new and/or integrated healthcare concepts. An illustrative example is the case of an entrepreneur that developed a new care concept for disabled people. The concept consisted of more than merely delivering care since it also comprised educational/training and financial elements. Confronted with the fragmentary nature of healthcare, it was totally unclear for the entrepreneur to decide who to approach when he/she desired to start implementation. Too weak interactions may also lead to a lack of shared vision of what sustainable healthcare is and of which promising developments are potentially valuable in that perspective. This is often addressed as an important reason for the disappointing implementation of promising innovations in practice. Too weak interactions may lead to organizational isolation which makes it almost impossible to look beyond the boundaries of the individual organization for potentially valuable innovations. The final result may be that professionals are not aware of new developments and that promising initiatives are not implemented on a larger scale. Finally, the fragmentation also results in a lack of guidance. There is no clear description of what society expects from innovation or which developments are considered desirable. Such a description could really support the creation of legitimacy of the entrepreneurial innovation and its societal acceptance. A vision on the long-term future of healthcare

⁵ It is estimated that 1 out of 5 people will have to work in care by the year 2030 in order to sustain the current system of healthcare [2].

⁶ Subdividing the influences in categories instead of failures (e.g. [30]) is done to ensure that they comprise both drivers and barriers.

⁷ As explained in Section 3, the categories are based upon an iterative analysis of raw data and theory. The following theoretical contributions were used in the analysis: 'network interactions' follows from Klein Woolthuis et al. [30]; 'infrastructure' from Smith [31]; 'institutions' from Edquist [16]; 'technology' as systemic component comes from Suurs & Hekkert [13] and the category of 'external factors' was added because some influences wouldn't fit the other categories.

Table 1

Description of criteria of sustainable healthcare innovation (based upon [65]).

An innovation contributes to the transition in healthcare if it complies with (one of) the following criteria	
It focuses on the interest of the patient with a demand for care	It integrates different valuable aspects from the supply chain of care
It includes intensive cooperation with services from other sectors	It recombines health, prevention, cure and care in a more valuable way
It mobilizes valuable resources from sectors outside of care	It creates support and care from a distance to reduce the demand for care
It increases the learning and innovative potential of care	It offers opportunity to increase the productivity of healthcare substantially
It redefines the demand for care (in the future) by for example focus on prevention	It is not restricted to a particular location, that it is suitable to be scaled-up
It encompasses social support systems that reduce the demand for care	

rather than a continuous focus on short term interests, e.g. a certain technology or the discussion of any particular merger between providers, would be able to provide this legitimacy in the important and crucial implementation phase. In the view of the entrepreneurs a strong guidance, based on a strong and stable vision on the future of healthcare, could ensure that society profits from the promising initiatives of entrepreneurs, as is clearly illustrated by the following quote from one of the entrepreneurs (Personal communication, February 2009):

“They don't need to tell me how to innovate. What we do need is a proper vision and a government that acts accordingly”.

Three *infrastructural elements* that influence the entrepreneurs were identified during the interviews: the labor market, the education system and the financial infrastructure. In general it was stated that a proper functioning of these three structural elements were important because they provide the required resources for entrepreneurs to develop their innovation. An example is the availability of personnel that is crucial because many entrepreneurs emphasize that the value of the innovation often lies in the employees that work with it. Attracting the right personnel is therefore crucial and easier

when the labor market functions properly. The labor market is also strongly related to the educational infrastructure which needs to ensure that a sufficient amount of well-trained professionals is educated. To phrase it differently, a proper functioning of the education system increases the number of possible employees. Contrary to what is often assumed, the influence from the financial infrastructure didn't concern the limited availability of funds. The main problem with financing their innovation came from a non-proper functioning of this system, given the available funds. Often entrepreneurs think it is problematic that investors do not reap the profits from the investments in an innovation. An example of a technological innovation in home care illustrates this. A new technological innovation in e-health was very promising from a sustainability perspective but the one that profits from it was not the entrepreneurial firm that invested in its development but the insurance company of the potential clients.

Another category of identified influences from the system context consists of *institutions*. These are subdivided into three forms. Regulative institutions are the formal rules of the game and their enforcement including legal, political and economic arrangements [66]. Normative institutions are both values and norms and cognitive institutions are cultural institutions, taken for granted assumptions that have developed into routines like common beliefs, mutually developed

Table 2

Overview of some normative and cognitive institutions that influence healthcare entrepreneurs.

Influences upon individual entrepreneurs	Influences upon healthcare
Preventative care should be accepted more as a new form of valuable care.	Professionals do not render an account to society. They do not critically reflect on their own position.
Norms are too conservative, too reserved and based on too much hierarchy; together this decreases the acceptance of entrepreneurial activities.	Taboos may hamper entrepreneurs to a large extent; e.g. the black box attitude towards medical errors decreases the acceptance of innovations that contribute to safety.
A too strong focus on quality may hamper innovation and quality on the longer term. Innovation/experimentation should be accepted as equally important values.	Government is ruled by a fear to innovate since it is believed that it may damage the quality of care. This results in reservations towards investments of time and money.
Management should change: it is focused on problems rather than opportunities; on the past instead of the future; on avoiding problems instead of creating promising solutions. Healthcare would benefit from the opposite.	Reward structures are too rigid since they aren't related to results. Increasing the relation between results and profits for a professional would increase the quality of care. This should be done without hampering experimentation.
Healthcare is ruled by a certain fear for personal investment and change because of high bureaucracy and high degree of narcissism. This makes health professionals afraid of losing reputation and experimentation.	There is a too strong focus on an 'evidence based dogma' that does not align with the nature of innovation. A new innovation based dogma should take its place to replace traditional values like accessibility, affordability and quality by a new one: 'optimal care'.
Professionals are ruled by envy towards valuable innovations from entrepreneurs outside of healthcare. It is thought that real value can only come from people within the sector, which in turn decreases the acceptance of valuable innovations from outsiders.	It has become common behavior for large research institutes to take advantage of SME's, only to obtain access to subsidies. These SME's often form the link with business practice that is often required, SME's do seldom profit from these contacts.
As a changing norm, it needs to be accepted that people will pay for health services from their private budgets. This shift from public to private funding has already taken place in other sectors, such as home security.	Healthcare is characterized by lack of openness about quality/costs, while efficient markets need openness. "Transparency should shed a light in the black box healthcare still is".

mental models and shared logic, habits, behaviors, cultural practices and indirect agreements about how things should be done accordingly (see Dimaggio & Powell [37], Scott [35], Geels [6] and Lepoutre [68]). Many different opinions exist about the details of the influences of institutions; Table 2 presents a short overview. This table makes a subdivision between institutions that exert an influence on individual entrepreneurs and the ones that influence healthcare in general.

The influences of *technology* on entrepreneurs was sometimes referred to as somewhat paradoxical since it was stressed that a certain level of technical knowledge is needed to prevent the technology-push model of becoming too dominant. In general it seemed as if the availability of new knowledge was seldom the problem in healthcare practice. The application sometimes was (Personal communication, February 2009):

“Especially in healthcare there is a vast range of valuable and useful knowledge and research insights present; it is the biggest challenge to apply it in such a way that the entire healthcare system can profit from it”.

Finally entrepreneurs indicated that certain *external factors* had a large influence on their innovation processes. These influences were termed external factors since they couldn't be ascribed to a certain category there was no, easily identifiable, common factor. Examples of identified external influences were the worldwide credit crisis, the emergence of a spontaneous hype surrounding a certain innovation, the need for positive news, the increasing and changing demand for care and finally pure luck (Personal communication, February 2009):

“Sometimes it happens that everything fits together; it would be rather arrogant to ascribe that to something else than pure luck!”

Although many of the described influences were stated during the exploratory interviews, one observation seems valid for almost every one of them: innovations often emerge out of certain dissatisfaction with the current situation. An underlying degree of dissatisfaction with the current functioning of the healthcare system was, at the same time, the definition of the added value of that particular innovation. The existence of a certain problem is what makes the innovation valuable if it offers a solution for it. For example, the fact that currently the communication between healthcare professionals and patients is complicated and inefficient adds value to an ICT innovation that tries to improve that communication.

Up to this point, influences from the system context on entrepreneurs were discussed; the next section discusses the entrepreneurial strategies that were applied with the aim to influence that system context.

4.3. Strategies of entrepreneurs

A majority of the entrepreneurs acknowledged that the current healthcare system, with its actors and relations, is probably hampering the development of radical innovations or is at least not supportive for radical innovation. Therefore,

most entrepreneurs acknowledge that healthcare would profit not only from innovations, but also from changes in the system. This section will further explain the interaction between an entrepreneur and the system context by providing an overview of applied strategies aimed at improving the success of the innovations and influencing the system context.

During interviews it appeared that the entrepreneurs often relate the application of a certain strategy to certain influences from the system context. It seemed as if all influences from the healthcare system context were reacted upon by applying a certain strategy. Still, the strategies are described independent from the influences defined earlier, because the specific argumentation of applying a certain strategy differed across the interviewed entrepreneurs. Furthermore, the aim of this paper was to describe the entrepreneurial interaction with the system context in general terms. Table 3 provides an overview of the identified strategies and describes a particular application of that strategy within the context of healthcare.

After this overview of entrepreneurial strategies, three more general remarks about the results need to be made. First, the overview shows that the entrepreneurs use many different strategies to get their innovation more widely accepted and beyond the stage of experimentation and small scale application. At least part of the population of entrepreneurs believes that valuable innovations (from the perspective of its users) will be easily accepted and that they will spread easily (Personal communication, February 2009):

“It is remarkable that with every innovation process, no matter how radical it is, there are always some early adopters and some laggards. The real challenge is to get the first group to follow you because the laggards will always follow.

The strategies are all developed to eventually cause a real effect in the widespread diffusion and application of the innovation. Second, the analysis of the interviews indicated that the strategies were applied by individual entrepreneurs only and not in (close) cooperation. None of the innovative healthcare entrepreneurs participated in any form of collective entrepreneurial action aimed at changing system conditions and/or the healthcare system context, although it is known that these could be very useful in changing conditions such as institutional arrangements (e.g. Van de Ven [69]). Third, by describing their strategies in detail the entrepreneurs acknowledged that they are able to change current structures around them and consequently force innovation processes into new directions. Although many entrepreneurs experienced some difficulties in their innovation processes, they consider themselves capable of making change happen.⁸ The strategic reactions of entrepreneurs on influences from the system context consist of strategies that deal with certain influences and active strategies aimed at changing them. The next section describes the underlying argumentation of entrepreneurs in applying certain strategies, which also relates the influences and strategic reactions of entrepreneurs in more detail.

⁸ Moreover, most of the entrepreneurs explicitly state that they do not only strive for businesslike successes. They also strive, although in different degrees, for broader and more general societal changes and improvements in particular aspects of healthcare.

Table 3

Description of strategies applied by healthcare entrepreneurs to influence the system context.

Entrepreneurial strategy	Description of application in healthcare
Networking	In order to gain access to new resources the aim is to create a network of stable and valuable relations. The network must have a certain focus; however, for its quality it is important that it contains a wide variety of organizations including patient-organizations, medical professionals and policy makers. One entrepreneur emphasized the importance of having governmental actors in the network: "To emphasize the need for system change, e.g. in regulation, it is of the utmost importance that I have direct contact with the decision makers. Convincing them may in turn lead to new valuable regulation".
Finding supporters, ambassadors or promoters	The commitment of people who are really enthusiastic about the innovation helps in creating legitimacy, acceptance and in turn success; especially if those people have some status, credibility and influence in the sector. For example, well-known professors and/or large groups of satisfied patients could fulfill the role of valuable supporters, who in turn create legitimacy for it.
Creating awareness and/or commitment	Creating awareness and commitment is important because it contributes to the innovative success by breaking resistance, creating acceptance and convincing policy makers and potential customers of its value. This will get people to support the innovation and will diminish the impact of taboos that hamper it. Examples are the creation of mutual dependency between users and an innovation or increasing the awareness of an underlying problem. The essence is that creating awareness and commitment requires action; it will not come in itself.
Timing	Properly timing the introduction of an innovation is crucial because often certain time-frames, often termed 'windows of opportunity', exist in which innovations are accepted more easily. Sometimes societal trends cause the momentum to be good, although the innovation itself may stimulate the trend as well. Timing the introduction may help to improve long-term success. Even though the timing of the introduction is difficult, and success can only be easily determined afterwards, timing the introduction needs to be a deliberate strategic decision. For example; one entrepreneur stated that his efficiency improving innovation was a success because of the trend of ever increasing healthcare expenditures. Timing the introduction when this trend was heavily discussed had increased the acceptance of the innovation.
Taking time	It is important to not always aim for rapid growth, especially when certain developments need time to prove their value. Sometimes, trying to accelerate the development and introduction may be harmful for long-term success. Building legitimacy in a complex and delicate sector as healthcare sometimes asks for patience. Additionally, taking time allows the individual entrepreneur to stay in control of its own development.
Cooperation	Cooperation is of crucial importance given that innovations often emerge out of collective actions. Vertical-, horizontal- and diagonal cooperation agreements were created to correct for lack of power, to increase legitimacy and to get access to additional resources. Cooperation may also help to deal with the fragmentary nature of the sector. Additionally, collective actions are more likely to succeed in breaking through system barriers because they have for example more power to put problems on the public or political agenda.
Finding coaches	Finding a coach that supports not only the innovation but also and especially the entrepreneur, is important, even when the entrepreneur has ample experience. Every entrepreneur lacks certain relevant skills or knowledge and coaches are often an easily available tool to fill this gap. In this research, entrepreneurs consulted coaches for assisting the entrepreneurs during the entire innovation process.
Demonstration projects	Demonstration projects may be used to build legitimacy based upon early results. In this way potential value can be shown as a proof of principle, also when no large scale projects and/or results are available. These projects may not only deliver useful insights for potential customers (value) but for the entrepreneurs as well (potential benefits and risks). In this way these projects may be very helpful in building and creating support, visibility, safety, awareness, interest and acceptance of the innovation. If the innovation consists of unique projects, every successful project can be used as a demonstration project.
Non-conformity	Being non-conforming to existing practices may be a very successful strategy to increase the success of the innovation, especially when those innovations offer solutions to not yet existing problems. Real innovation asks for changes in behavior of customers and entrepreneurs. Non-conformistic entrepreneurial behavior may consist of: naïve persistence, acting according to yet-to-be-developed-standards; asking awkward questions at places where it is normally not accepted, accepting new and odd business models, or by just feeling inviolable for criticism.
Defining model and position of the organization	Defining the exact business model and position of the entrepreneur and/or firm is essential for future reputation. Selecting a business model, such as a traditional healthcare organization, a franchise organization or an external service-provider, determines the probability of success and the possibilities to achieve it. For example, the service provider

	model could be valuable due to its ability to make change happen without losing independency from traditional actors. Defining a position is especially important for integrated health concepts; it needs to be clear what does and what does not belong to it.
Free-publicity	Although, publications and lectures are more important than mass media in healthcare and although market niches are always small, publicity needs to be a main element of any entrepreneurial business strategy. In modern times, the media is very important for creating (and destroying) reputations. Deliberately thinking of opportunities to talk about the innovation may create legitimacy for the innovation among insiders and outsiders who may become important new customers.
Dealing with competition	The large influence of competition on entrepreneurial success makes it very important to determine how to deal with it. Examples of aggressive approaches to competition can be found in aggressive PR-strategies, in attempts to hinder competition by influencing policy makers, in trying to get the innovation patented or in building strong consortia. However, some entrepreneurs actually did quite the opposite: "By actively assisting competitors we work in the advantage of the entire system; improving health asks for openness and joint efforts. Because of that no rights are patented." Independent of the details, choices related to competition need to be made.
Multiple roles	Although all entrepreneurs tried to develop innovations to create added value, it is wise to be flexible in the role one plays. Healthcare innovation is often considered to consist of a trade-off between the interest of an individual and of an entire patient population. Therefore, entrepreneurs should find a proper balance between different roles; including that of a specialist, therapist, scientist or an entrepreneur; the right choice is context dependent.
Personal attitude	Thinking of personal attitude as a strategic choice may improve the success of the innovation. Often innovative success is determined by personal contacts and always making a good impression. Therefore, even with technological innovation, the person behind the innovation matters. Being benevolent, positive, ambitious but realistic, having a focus on realization instead of exploitation and being open to learning and mistakes are ways to increase the acceptance of the person and the innovation.
Flexible financing	The success of an innovation often depends on financing possibilities; therefore it could be valuable to make finances flexible. Financial flexibility exists in different forms: (1) not being dependent on a single form of financing; (2) splitting the innovation in two different services (e.g. care and housing) in order to gain access to different financial streams; (3) just take time to build a strong business case; (4) try to attract financial means especially for financing diffusion and, finally, (5) gaining access to privately owned money.
Standardization	The effect of standardization on innovative success is twofold. First, sometimes the innovation itself sets a new standard if it allows professionals to improve their work. This may lead to new evidence that stimulates inspectorates to accept the innovation as a new standard. Second, it can also be important that an innovation just fits within current standards, or that it is open for future improvements when new standards are developed. The development of an open ICT platform for delivering specialized care on demand is an example of this second form of standardization. Exact details may differ, however the entrepreneurs agreed upon the importance of thinking strategically about the relation between the innovation and the current standards in healthcare.
Ex ante investment ex post justification	Sometimes it seems advisable to start with an innovative development before the official approval of management authorities is acquired. Although this is a risky strategy, it enables the entrepreneurs to use real realized value to attract new investors or customers instead of being dependent on the persuasiveness of individuals. Initial results may now be used afterwards to create the legitimacy needed for further implementation. The introduction of an ICT-innovation, that had already proven its value in other countries, is a successful example of applying this strategy. The entrepreneur implemented the innovation despite severe initial resistance: "Now that the innovation is running people see the value and continue using it. The lack of approval at time of introduction is not discussed".
Building and using status	Using status of a firm or of its owners as a resource may be helpful in building legitimacy for the firm. This could attract new potential clients and in turn improve the innovative success. Especially small scale entrepreneurs, who are often new entrants on already existing markets, emphasize the importance of status. Examples are efforts to convince a reputable hospital to join a partnership around a medical innovation. Although most entrepreneurs agreed upon the importance of status, some stated that "real innovation doesn't care about reputation or status".
Link with other societal functions	Some entrepreneurs deliberately tried to link their innovative concept to other social and societal functions such as education, social support or even leisure activities. According to the entrepreneurs these interactions and relations are able to increase the societal value by getting the innovation socially embedded. Linking the innovation to a broader concept makes it an integral aspect of something that is already or more easily accepted (like a site for leisure activities). In turn this could decrease initial resistance.

4.4. Towards a new typology of sustainable entrepreneurs

It appeared that for some interviewed entrepreneurs, the influences and strategies were directly related. In such cases, a strategy was applied as a strategic reaction to a certain influence. Only rarely strategies were applied independently.

Since all the interviewed entrepreneurs developed and introduced sustainable innovations in healthcare they all contributed to the transition towards sustainability. They all qualified as an entrepreneur; all had innovated something and all had developed innovations that *potentially* induce system changes (see the criteria in Fig. 2). The fulfillment of these criteria however does not imply that all the entrepreneurs recognized their contribution, let alone that it is their desire to reach such an effect. It does not give a clue about the specific intentions of the entrepreneurs when applying certain strategies. During the interviews it appeared that the entrepreneurs sometimes apply the same strategies with different intentions. This is due to a difference in underlying argumentation and beliefs about their role in the transition and the expected effectiveness of their actions (see Relations 2 and 3 in Fig. 1). Accordingly, in order to understand innovation processes on the micro-level of individual entrepreneurs, detailed insight is needed into actors' beliefs and practices. This may clarify and explain entrepreneurial behavior in terms of interactions with the system context and will help to improve the understanding of entrepreneurial behavior.

This study indicated that entrepreneurs apply their strategies, either as a reaction to certain influences or not, with four different aims: (1) improving the innovation itself; (2) generally improving the success of the entrepreneurial

firm or entire company; (3) creating or improving market conditions; and finally, (4) changing or improving the system context in general (and thus without a direct relation to any particular innovation). The applied selection criteria ensured that all interviewed entrepreneurs contributed to the transition, however, they do not always recognize the role of innovations in transitions. The fact that four different aims came up during the analysis illustrated that the theoretical logic presented in section two is not consciously acknowledged by the entrepreneurs: creating an innovation is, according to the entrepreneurs, not the same as changing the system context for innovation. The application of entrepreneurial strategies is therefore not always an attempt to change the system context directly.

Summarizing, entrepreneurs apply different strategies with different aims and only some are directly aimed at inducing system change. Although this is a valuable result in itself, it remains an unanswered question why entrepreneurs set different aims and consequently apply different strategies. It appeared that the entrepreneurs differed in their beliefs about their role in realizing the transition. This observation lead to the formulation of the following hypothesis: different interpretations of the role of entrepreneurs in realizing the transition could lead to differences in interaction between the system context and the entrepreneur, because these opinions have an effect on aims and the actual application of their strategies. In order to gain some understanding of the validity of this hypothesis, the interviewees were asked whether they believed that it was their role to induce system change by developing innovations and if so, what they thought would be their effectiveness. It appeared that there are four types

Table 4
Typology of sustainable healthcare entrepreneurs.

#	Name	Description of beliefs about entrepreneurial role
1	Revolutionary entrepreneurs <i>"I can directly and successfully induce system change"</i>	Individual entrepreneurs may be successful in inducing system change besides developing a sustainable innovation. Although it may be difficult, it is considered a realistic and legitimate aim to try to structurally change the healthcare system. Therefore, these entrepreneurs apply strategies aimed at inducing system change directly. The idea that individual entrepreneurs are able to cause structural change legitimizes the term 'revolutionary' entrepreneurs.
2	Evolutionary entrepreneurs <i>"I can induce system change through my innovation"</i>	Entrepreneurs can only be partly effective in changing the healthcare system context because of the close interaction between structural change and innovative success. This interaction makes it very difficult to predict the long-term effectiveness of strategies aimed at changing the system. The success of the innovation itself is considered as the best indicator for determining the effectiveness of strategies that were aimed at changing the system. As a result, these entrepreneurs apply both strategies that are aimed at the innovation and at the system context. The emphasis on the interdependency between the development of an innovation and changes in the system context legitimizes the name 'evolutionary entrepreneurs'.
3	Innovative entrepreneurs <i>"Entrepreneurs cannot induce system change"</i>	Entrepreneurs are only able to contribute to the transition by developing successful sustainable innovations. They do not have the possibility to cause structural changes. Strategies are therefore always aimed at increasing the innovative success. The innovation itself is at the center of focus, which legitimizes this entrepreneurial type's name. Three different lines of argumentation were used to defend this position: <ul style="list-style-type: none"> • Entrepreneurial variety is needed because individual influence is strongly limited. Structural change may only be the overall result of activities of many entrepreneurs. • Attempts to influence the system context have no short-term effect on the success of an innovation. This makes these attempts of secondary importance, especially when they could conflict with short-term business goals. • It is impossible to change the system context as an individual entrepreneur, either if they want to or not. Entrepreneurs may profit from structural changes, however, this desire becomes irrelevant due to the inability.
4	Isolated entrepreneurs <i>"System context is irrelevant for my innovation"</i>	Entrepreneurs believe the system context is absolutely irrelevant for the success of their innovation. They consider all attempts to structurally influence the system therefore as worthless. It is of no use to them to think of effectiveness of those attempts. Because there is no relation with the broader system context the term 'isolated' is used to describe this type.

of entrepreneurs that differ in their thoughts about the influence an individual entrepreneur can exert on the system context. These types are presented in a fourfold typology in Table 4.

This fourfold typology illustrates the different ways in which entrepreneurs think about their contribution to the transition. The typology also illustrates that it is not as straightforward as it seems to evaluate the success of an entrepreneur. Both from the perspective of an individual entrepreneur as from the viewpoint of other stakeholders, it depends on the ideas about the role of an entrepreneur to decide whether one is successful or not. Although all the entrepreneurs were at least successful in developing an innovation; it is plausible that isolated entrepreneurs apply other criteria to determine or measure their success than revolutionary entrepreneurs. Also other actors will expect certain outcomes based on the specific categorization of the entrepreneurs. The typology, therefore, seems to offer some initial insights into the underlying argumentation of determining success by emphasizing the role of expectations and different logic about the role of entrepreneurs.

The same reasoning goes for determining which type of entrepreneur is most valuable for the transition. In order to value entrepreneurial activities with respect to the transition, a distinction needs to be made between (1) the intention of an entrepreneur, (2) the actual behavior in interaction with the system context and (3) the short- and long-term effects of that behavior. Moreover, determining which of these three is most important for the transition is complex and difficult, and actually also partly a political question. The typology developed in this paper is a first attempt to contribute to this challenge by classifying entrepreneurs according to their beliefs about their role in realizing a transition.

5. Conclusion

This paper investigated the interactions between entrepreneurial strategies and the system context for innovations in healthcare by considering the following main research question: *What are the successful entrepreneurial strategies to change the system context for the development and diffusion of sustainable innovations in Dutch healthcare?*

Thirteen (out of fourteen) entrepreneurs recognized that they developed innovations in an interactive system context; only one entrepreneur thought the system context was irrelevant for his innovative activities. These entrepreneurs were aware of the broader societal impact they could have if their innovation would be accepted throughout healthcare practice. This research focused on the interaction of entrepreneurs, more specific on the influences that entrepreneurs experience and react upon within the interactive system context. This findings are in line with what Giddens called the 'duality of structure', which describes the essence of interaction in slightly different words: 'structures are both the product and medium of action' [(from Giddens in Geels [6]). Entrepreneurs, as actors in an innovation system, operate within the constraints and opportunities of existing structures while at the same time restructure that same system. This means that the system may be changed by deliberate strategies of entrepreneurs but the same system also forms a context for their actions [6]. Most of the entrepreneurs acknowledge that there is, given the system

context, some room for intelligent interpretation and strategic maneuvering. This research has therefore confirmed the existence of interaction between structural elements from the system context and strategic behavior of individual entrepreneurs.

To be more specific, in reaction to five categories of influences – i.e. network interactions, infrastructure, institutions, technology and external factors – this study showed that the entrepreneurs applied 19 different strategies in order to deal with, change or adjust the influences coming from the system context (Table 3). The categories of influences were discovered inductively so they are different from already known classifications from for example Geels [6] and Lundvall [17]. Despite the slight differences in descriptions, the entrepreneurs acknowledged that they operate in interaction with a dynamic system context. They do not only recognize the existence of influences from certain contextual factors but also agree upon the possibility of influencing these factors themselves. These findings therefore support the view of Geels [6] who stated that factors from the system context are more than explanatory factors for stability and inertia. By deliberately emphasizing the ambition and possibility to influence factors such as institutions and network interactions, the entrepreneurs acknowledge that institutions are dynamic instead of static.

The entrepreneurs do however differ in their interpretation of the influences and in their description of the usefulness and goals of applying the 19 different strategies. How the entrepreneurs decided to act was dependent on their ideas about the effectiveness of the strategies to develop and introduce sustainable innovations. A more detailed analysis of the underlying argumentation offered new insights into possible explanations of the observed differences. As a result of this analysis, a fourfold typology of healthcare entrepreneurs was developed, consisting of 'isolated', 'innovative', 'evolutionary' and 'revolutionary' entrepreneurs. This typology implies that entrepreneurs only seldom aim their strategies at changing the healthcare system structurally, because they think in various ways about the relevance of the system context for their innovation and about their own interest in and potential to change it. Most entrepreneurs do not relate changes in the system context directly to their innovation. Developing an innovation and improving the healthcare system are considered as independent goals of applying a specific strategy. Only the 'revolutionary entrepreneurs' consider inducing system change directly (i.e. without directly intending to innovate) as a possibility and thus as a legitimate reason to apply a certain strategy. These different opinions about their role in the transition also makes that entrepreneurs evaluate and value their own success differently.

By focusing on beliefs rather than actions, the typology seems to provide a deeper understanding of innovation processes by clarifying differences in interaction between individual entrepreneurs and the broader system context. The typology therefore deepens our understanding of the straightforward interaction between entrepreneurs and the system context (Relations 2 and 3 in Fig. 1) by showing the types of entrepreneurs each interpret the interaction differently and act accordingly. In light of these findings, it is questionable whether it can be assumed that the development of a (radical)

innovation and system changes emerge simultaneously. At least, these findings indicate that entrepreneurs are not always aware of this mutual relation. Therefore, the developed typology of isolated, innovative, evolutionary and revolutionary entrepreneurs seems to form an underlying explanation for the actual interactions between entrepreneurs and the system context.

6. Discussion

Although the status of the 'Systems of Innovation' approach as a theory is often debated, it has shown to be of value for the aim of this paper. It delivered more insight into the interaction of entrepreneurs with the system context, even while this research focused on the micro-level within a system, i.e. the level of individual entrepreneurs. Analyses on macro-level, i.e. system or policy level, should therefore be considered as valuable complementary research strategies instead of as alternatives.

This research has demonstrated that certain healthcare entrepreneurs are able to combine economic goals with a contribution to the transition towards sustainability in healthcare. This justifies further analysis of the underlying argumentation of entrepreneurs in order to obtain an improved understanding of their behavior. Further research into this topic could be useful for improving policymaking for the transition in healthcare. Because of the importance of the perspective of the entrepreneurs in this research, rather open and explorative research methods were used. Although these were considered suitable with respect to the aim of this paper, the results should be interpreted with caution. The dataset was quite limited in size, although it consisted of rich and in-depth information. Possibilities to gain more detailed insights into entrepreneurial behavior range from planning new interviews and increasing the research population to testing the typology in a quantitative study with a larger dataset and/or with entrepreneurs within other sectors. Several authors have written about the specific characteristics of healthcare that influence the details of the observed interaction⁹ which makes this comparison worthwhile. This research has shown that it is valuable to analyze the underlying argumentation of entrepreneurs to gain more insights into the dynamics of innovation processes. Additional quantitative research with larger datasets could reject, confirm or adjust the identified fourfold typology of entrepreneurs and consequently further clarify whether and how assigning an entrepreneur to a certain type does determine the experienced influences and the applied strategies. Further research could compare our classification of entrepreneurs with earlier classifications, for example Mitroff's classification of system entrepreneurs by Meyers–Briggs personality scores (see for more information e.g. Mason and Mitroff [70]). Our research has refined the insights into the interaction of individual entrepreneurs with the system context in healthcare (Relations 2 and 3 in Fig. 1). Further research may generate more detailed insights by delivering

generally valid results about innovation processes on the micro-level of an innovation system and innovative entrepreneurial behavior.

Innovation policy could profit from the results of this research because insights are useful for policy makers to develop more refined preconditions for sustainable healthcare innovation. At first, the central government should recognize that it is an important actor in the innovation system. Its role goes beyond merely exerting the legitimate power to develop new regulation. This research illustrated that central government is also mentioned as having an influence on the creation of weak and strong (network) ties, in increasing the general awareness of the need for transition and in guaranteeing guidance for the direction of development. This means that policy-making could be improved by reconsidering the role the central government plays in the functioning of the system. Second, policy makers should realize that traditional and old-fashioned beliefs about intentions, goals and actions of entrepreneurship characterize healthcare. Commercial healthcare does not always strive for maximized profits; some entrepreneurs are able and willing to combine an economic interest with a contribution to the transition within certain circumstances. The trade-off between economy and sustainability does not always exist; therefore, developments and innovations should be judged on actual effects instead of assumptions about underlying intentions. This trade-off between different value orientations is an interesting topic both for innovation research and policy. Finally, policy makers should benefit from the practical knowledge of entrepreneurs to improve policy making for innovation. Examples of that knowledge from this research include the stimulation of preventative care; making money flows less dominant in decision making; allow investors to profit from their investments (financially); improving the subsidiary system and finally, focus more on translation and diffusion of innovations instead of their initial development. If policy makers are willing to take up their responsibility they can be more active in 'caring for entrepreneurs' and doing so bringing the transition towards sustainable healthcare one step closer.

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