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Disruptive Innovation in the Nordic Countries' Healthcare Systems

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The Nordic healthcare model is recognized to be one of the most innovative in the world. Here billions of USD are annually invested in developing new treatments, drugs, robots etc. to diagnose and cure diseases. Nevertheless, this study establishes that there is a fundamental shortcoming in the system that supports healthcare innovation: It is strongly biased towards micro-level innovation projects focusing on new products, alternative processes, and new financial solutions. The problem with this approach to support new projects is that the results are created as inventions within the system thus lacking holistic perspectives. This has consequently contributed with increasing costs that are out of proportion with existing budgets. Therefore this study seeks to analyze the current understanding of the Nordic healthcare system from a business model perspective. Here other aspects of the healthcare system are explored to determine if they could be redesigned to promote new types of innovation projects. The purpose of undertaking this task is to challenge the established patterns of the current healthcare innovation support practices. Here the vertical innovation process (VIP) framework, which is a systematic radical innovation model that seeks macro-level outcomes based on standalone inventions (see more below), is applied to analyze the current state-of-the-art in Nordic healthcare innovation projects. The results determine that very little attention is given to rethink and redesign the healthcare system at a macro-level, and it is discussed that stand-alone inventions ought to be rethought into the entire healthcare system to create a larger impact. Finally, it is argued that existing performance measures are inappropriate to foster projects that innovate the existing system: New measuring points should be developed to promote macro-level projects and to avoid the current rapid increase of costs in the Nordic healthcare system.

Keywords: disruptive innovation, radical innovation, healthcare innovation, business model innovation

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Introduction

The Nordic countries, represented by Denmark, Finland, Norway, Iceland, and Sweden as well as the three autonomous areas: the Faroe Islands, Greenland, and the Åland Islands, need fundamental changes in their healthcare systems to cope with increased societal demands. The need for change is evident: The healthcare spending per capita has increased drastically since 1998 and it has for years been above the average compared to other OECD countries (Norden, 2010; The Economist, 2011). For example, from year 2000 to 2012 Denmark had a 43 percent overall increase in healthcare spending. It is however the only Nordic country that has experienced a slight decline in healthcare costs since 2010, whereas the Norwegian healthcare system has had large cost overruns continuously every year (Norden, 2010). The Nordic healthcare model is based on social responsibility. It was created back in the 1890s as a unique system rooted in neighborly love. Here the state took care of its citizens without expectation of, or claim of refund. Although there are differences between the Nordic countries' healthcare systems, they are founded on the same societal basis which makes them comparable. Therefore, the individual Nordic systems are often referred to as the "Nordic welfare model" (Christiansen, Petersen, Edling, & Haave, 2006). The Nordic welfare model is not only limited to healthcare activities; it also involves education, pension, infrastructure, etc. for its citizens. Even though the model has been adjusted several times since the creation in 1890s, it has led to the world's highest tax rates and to the best governed countries in the world (The Economist, 2013).

The Drivers of Innovation in Healthcare

To respond to the increase in demand and to provide equal level of service for the region's 25 million inhabitants with the same or a less amount of resources spent, policy makers have in recent years increasingly invested public funds in healthcare innovation activities. The establishment of innovation centers has assisted private organizations in diffusing their inventions. Furthermore, science incubators and technology transfer offices have been created near university hospitals to support entrepreneurship and licensing activities of inventions to boost the level of innovation within the healthcare system (Norden, 2010). The problem with the current system to support healthcare innovation is that it focuses primarily on micro-level initiatives and no or very limited efforts are made to integrate these inventions into the total healthcare system (Danish Regions, 2012; Länsisalmi, Kivimäki, Aalto, & Ruoranen, 2006; Eggers, Baker, Golzales, & Vaughn, 2012). It is governed by a myopic "one problem, one solution" perspective. Seen from a macro perspective, the only focus that policy makers and legislators have on innovating the healthcare system is to develop new ways of financing the offers. For example, Eggers et al. (2012), Gillison, Horne, and Baeck (2010), and Bertelsen, Hyllegaard, Christensen, & Bennike (2013) draw attention to delivering more and/or better services for lower costs by focusing on radical efficiency. Here pilot projects are made to rethink the system and not only one element within the system (Danish Regions, 2012). The strict focus on cash-flow among the regional, municipal, and university hospitals (as well as the private hospitals) has promoted different payment methods in the Nordic model: private insurances complementing the public tax-paid insurance, Diagnosis-related Group (DRG) payments, and "fee-for-service" payments, but no research has yet demonstrated that one model is better than the other (Kjellberg, Soegaard, & Andreassen, 2009). Thus, focus is directed at moving cash around in the system in different ways. Also for immense work on the financial perspective, no savings have yet been found due to the efforts and standard indicators on hospital performance show no difference when comparing the different financial systems (Kjellberg et al., 2009). Simultaneously with the work on financing the

healthcare system, attention has been given to performance contracting initiatives to reduce costs in the Nordic model. Here collective procurement is emphasized to strengthen bargaining power and reduce overall prices in the context of public tendering, but mainly oriented towards conducting optimized procurement procedures defined as public-private innovation. Although a smart initiative, it is not innovation, it is simple business acumen camouflaged as innovation. Although significant resources are allocated to promote standalone inventions in healthcare, the main reason for a 12 percent productivity improvement from 2007-2011 in Denmark was the establishment of new super-hospitals. However, the 12 percent saving has not led to any significant productivity improvement when comparing it to the society's increased demands for healthcare: The public expenses for healthcare increased more than 12 percent during the same period. What has been affected positively is the improvement of curing rates and thus the contribution to overall better public health by introducing new therapies, new drugs, etc. (Norden, 2010; Danish Regions, 2012).

Purpose and Goal of the Study

We claim that this strict focus on single variables (standalone inventions) in the Nordic healthcare system often is a barrier to the creation of disruptive and/or radical innovation in practice. This is a fundamental issue in all aspects of new public management and the Nordic model is no different (Gillison et al., 2010; Bertelsen et al., 2013; Eggers et al., 2012). Therefore, instead of promoting the current "one problem, one solution" innovation system, it is stressed that rethinking the Nordic healthcare system into a business model framework could provide researchers and practitioners with new inspiration. To some extent, this is what is done when the new super-hospitals are projected and established: All established patterns are rethought. This study consequently seeks to describe the current understanding of the Nordic healthcare system from a business model perspective. The purpose of doing this is to challenge the current healthcare innovation support practices in the Nordic model. This is done by analyzing the Nordic healthcare system in the vertical innovation process (VIP) framework (Brix & Jakobsen, in press), which is a systematic radical innovation model that seeks macro-level outcomes based on standalone inventions (see more below). The goal of the study is therefore to disrupt the existing support system of healthcare innovation and to develop new propositions that can: (1) generate greater impact with same public expenditure; (2) inspire policymakers for radical changes; and (3) guide future research.

Current Understanding

The current practice of developing innovations in the Nordic healthcare system is divided into two large silos: private companies and public organizations.

Private Companies in Healthcare

The Nordic countries, especially around southern Sweden and Denmark, have a very large and extensive biotechnological and technical medical device industry¹ specialized in insulin, asthma medicine, pills, stoma, blood purification equipment, hearing aids, scanners, etc.. Invention activities of these companies are focused on their core business areas and there is a historic extensive cooperation between industry and universities. Two thirds of the healthcare companies in Denmark have less than 50 employees, and these small businesses account for 25 percent of the industry's turnover. The companies typically act on a narrow and focused technology and/or business, often based on an earlier invention which has been gradually improved, modified etc.. Companies like these contribute greatly with new inventions, new products, and new services.

¹ Retrieved from <http://www.mva.org/about-mva>.

Public Support for Healthcare Innovation

The innovation activities in the Nordic healthcare system are, on the other hand, primarily limited to four types of organized entities that are engaged in the cure of ailments and diseases:

- **University hospitals:** University hospitals have experienced rapid growth in both size and numbers in the past decades. These units have changed the overall understanding of the Nordic models for healthcare, as the creation of these units has involved a lot of new procedures, technologies, working routines etc.. Moreover, there are more than 10,000 Ph.D. students in the Nordic countries connected to the hospitals as researchers mainly inventing new ways of handling diseases;
- **Public hospitals:** Public hospitals have been reduced in numbers in recent years. For example, in 2012 there were 53 hospitals in Denmark which represents a reduction of 50 percent compared to 1990. However, eight new super-hospitals have been established during the same period;
- **Private hospitals:** Private hospitals are mainly financed through private insurances or health insurances bought by companies for their employees. Often private hospitals operate in specific and detailed treatment segments, and private hospitals and clinics are less important for the entire healthcare system in the Nordic countries. The value of private healthcare production in Denmark is estimated at one billion Euros, equivalent to 2.2 percent of the total disease treatment budget in Denmark;
- **Military hospitals:** In many countries military hospitals play a significant role in the healthcare system. It is however inferior in the Nordic countries healthcare system.

The Fall of Nordic Healthcare System

It is argued that even though much attention is given to develop new healthcare products and work processes, the activities and not least the investments do not live up to their full potential. The shortcoming is due to no incentives and only very limited funding to explore meso- or macro-level perspectives of new inventions, and there is hence no incentive to change the overall systems based on these inventions (Rasmussen & Obel, 2012). Also for the taxpayers in the Nordic countries no disruptions have been created (Christensen, Anthony, & Roth, 2004) to facilitate a more efficient or innovative system for healthcare (Ratten, 2012). It is thus safe to say that the Nordic healthcare system fails to live up to the late Schumpeterian criteria (Schumpeter, 1943) requiring the creation of innovation even though a vast amount of public funds are invested.

To make our point clear: Some of the most significant inventions incorporated in the general healthcare sector over the last 25 years are: e.g., CT/MR scanners (for diagnosis), ACE-inhibitors (medicine), and Angioplasty (surgery). Fundamentally, the significant impact of these inventions and discoveries in the healthcare system are not only based on the individual idea itself, but just as much on the way the invention is thought into an innovation system as a vertical integrated activity (see Appendix A). CT scanning was granted patent in 1975, but it was not based on a new discovery. As early as 1895 the German physicist Wilhelm Röntgen invented X-ray technology, but the method did not become a central part of the complete diagnosis system before 1971 where the British engineer Godfrey Hausfield and South Africa-born physicist Allan Cormack used the technology to create 3d diagnosis of patients called CAT scanning. Even the CAT scanning technology improved the X-ray technology in several ways, and even the complimentary technology f-MRI scanning in 1977 again improved the possibility to make precise images of the body—a technology also based upon an old discovery done by the Hungarian-born inventor Nikola Tesla in 1882. Therefore, the scanning technology is not limited to a single invention, but have become a mainstay for diagnosing somatic diseases,

new education to handle the machinery was created (radiographer), new practices and work routines were established, new software support systems to analysis the pictures were developed, doctors and nurses learned to analyze pictures across the somatic disciplines, etc.. Hence, what we consider to be a state-of-the-art invention is therefore not limited to the invention itself, when referring to innovation in the healthcare sector—other more radical approaches in the vertical process need to be made to let an invention become a disruptive activity to the healthcare system.

Based on the limited funding that exists, there are projects and initiatives at meso-level that are starting to sprout. For example, Danish Regions's (2012) initiatives seek to increase collaboration, both at administrative and medical level, between the regional and the municipal healthcare systems in Denmark. Another example of the concrete striving for radical innovation at the meso-level is the emergency medical care, which is undergoing the largest reorganization in decades. Here new emergency departments are being established and the number of acute hospitals is reduced from more than 40 to 21 in Denmark².

Unfortunately, the only current tendency on macro-level initiatives is, as mentioned in the introduction, directed at the way healthcare is financed by proposing different cash flow systems and evaluating pro's and con's for these. Complementing this finance perspective, the Nordic system now invests heavily in performance contracting. Here focus is on cutting costs (collective procurement) to make the systems within the healthcare system both more efficient and more effective. Moreover, areas such as efficiency and sustainability are claimed to be revolutionized by focusing on an increased use of (1) ICT-systems in healthcare, e.g., "Telehealth", "E-health records", and "E-prescriptions"; (2) New technologies, e.g., surgical tools, rehabilitation robotics, diagnostic technologies as well as waste-management technologies to reduce CO₂ emissions from the hospitals (LCB-Healthcare, 2012).

Hence, current innovation initiatives are camouflaged as meso- or macro-level projects while focus still remains on single-variable initiatives. We claim that these innovation activities are not radical enough to rethink and create disruptions in the macro-level healthcare system. Therefore, most innovation activities still act as treatment of a symptom instead of treatment of a cause in the expensive Nordic healthcare model. It is this bias—or rather "skilled incompetence" within the system, we seek to disrupt by analyzing and proposing a new direction for the Nordic model in this paper.

Research Method

Based on Zott, Amit, and Massa's (2011) review and critique of contemporary research on business modelling, the VIP framework (Brix & Jakobsen, in press) demonstrated in Figure 1 was chosen to analyse the Nordic healthcare system as a single case study (Yin, 2009; Eisenhardt, 1991). This deliberate choice was made because the VIP framework focuses on the creation of concept modelling which can lead to business model innovation. Other business model frameworks, e.g., Johnson, Christensen, and Kagermann's (2007) "Innosight model" and Osterwalder and Pigneur's (2010) "Business Model Canvas" focus on business model commercialization, which is not the purpose of this exploratory study. Especially because the healthcare system in the Nordic countries does not need perspectives of commercialization: There are already "too many" customers, and the number is increasing rapidly. The purpose of utilizing the VIP method to analyze the Nordic model is to demonstrate that the shortcoming of the current invention-biased innovation system reduces the full

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Retrieved from <http://icoa.au.dk/news/single/artikel/big-data-and-organization-design-can-create-effective-emergency-departments-at-hospitals/>

potential of creating radical change and thus improves service with e.g., lower costs for tax payers. The goal is to develop propositions that can guide legislators to move (at least some of) the current incentives from invention-based activities towards innovation-based activities.

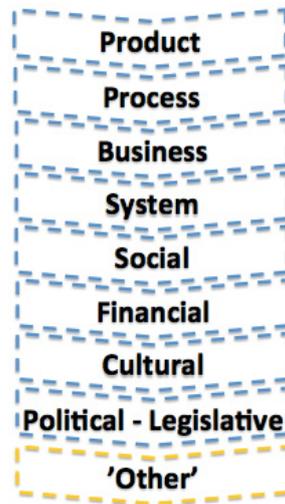


Figure 1. The VIP framework.

The content that must be found and developed for each of the nine levels of inquiry in the VIP is explained in Table 1. The relevancy of utilizing the VIP framework to analyze the Nordic healthcare system is that the framework goes beyond product, process, and financial perspectives, where areas of inquiry such as politics, business, social, cultural, and system are developed to seek potential of the invention in a larger perspective and to strengthen the acceptance of the new invention amongst the users (social), the patients (business), and society/community (culture).

Table 1

The Content of the VIP Framework

Area of inquiry	Explanation of content
Product	How technologies, techniques, and design approaches are to be used in the construction of the product
Process	How to produce the product and/or to provide the service including the buying or selling rights
Business	How to meet/interact with the customers and/or users; including branding, creation of needs, and relationship building
System	How “the subject” interacts with other products, services, and systems, both internally and externally to the organization
Social	How to get acceptance of “the subject” by users and partners and their motivation to use the product, service, and/or system
Financial	How to finance the system, how the cash/flow will be conducted and how the cash/flow is financed
Cultural	How to adapt to the habits in the target group(s), the communities, the branch and society, including written and unwritten rules/customs
Political-Legislative	How decisions are reached and made including addressing barriers (opportunities) such as laws, legislation, and competitive tendering in the context of the new idea
“Other”	What might also be affected beside the eight areas of inquiry above

Note. Source: Brix and Jakobsen (in press).

The purpose of analyzing the Nordic model in the VIP framework is to demonstrate that the inventions that create disruptions are the ones that affect more than one level of analysis in the healthcare system. By doing this the VIP framework can assist in determining that the myopic product, process, or financial focus

must be broadened when new inventions or measurement points are developed and introduced in healthcare systems to deliver value beyond single variables. Appendix A shows how the VIP is used to describe an innovation instead of a single invention by systematic search and creations of disruptions.

The Nordic Healthcare System: Presenting the Case

The current state-of-the-art in healthcare innovation projects is systematically presented as an overview in the VIP framework (Brix & Jakobsen, in press) below. The content has been found and integrated based on close collaboration with medical experts, regional and national healthcare professionals, GPs, and healthcare consultants who have guided our literature search. Table 2 shows that, as seen from the Nordic Countries, a majority of single area activities, where activity related products (inventions), process (new logistically optimized hospitals), and mainly financial activities (contracting performance) represent the majority of the innovation activities.

Table 2

Overview of Common Healthcare Innovation Projects

Level	Content	Reference
Product	ICT for healthcare (electronic health records, prescriptions, telehealth, etc.); Innovative materials and devices (smart fabrics and interactive textiles; in vitro fertilization (IVF); artificial pacemaker); Technologies to improve procedures (Novel surgical tools, rehabilitation robotics, new diagnostic systems; self-diagnostic systems; blood pressure monitor; insulin pump; pregnancy tests; fMRI scanner; endoscopy; DNA tests; IBM Watson for oncology); Technologies to improve operational procedures (Infection control and cleaning solutions); Technologies to reduce environmental impact (low carbon energy solutions, water, and waste management)	EcoQUIP (2013); MedTech Europe (2012); The Economist (2011)
Process	Proactive communication and collaborative approach between suppliers, customer and value chain, and between customer stakeholders; early engagement in supply-chain, outcome-based specifications on contracts; whole-life costing; support wider market development; be creative and flexible; integrated care improves patient outcomes and reduces costs; multi-chronic diseases are more expensive to cure than single diseases (multiple systems are engaged); "cancer package" (Denmark); design and establish new hospitals based on ideal processes	OECD (2011); WHO (2009); Danish Regions (2012); Norden (2010); Bertelsen et al. (2013); Eggers et al. (2012)
System	"Touch points"; doctor to patient (D2P) communication; doctor to doctor communication (D2D); Patient Recorded Outcomes Measures (PROMs)—patient evaluation of doctor's intervention; electronic patient records; interactive healthcare websites; health clubs (fitness, etc.)	Bechmann (2012); The Economist (2011); EcoQUIP (2013); Bertelsen et al. (2013); Kjellberg et al. (2009)
Business	Prevention campaigns/programs; higher demands from informed patients and larger demand for technology that cure one problem is expensive; user-driven dialogues; health promotion	WHO (2009); Danish Regions (2012); Norden (2010); Gillison et al. (2010)
Social	Satisfaction with current routines in the hospitals; job-functions are clearly marked; skills gap; reduce costs of daily operations; good work environment leads to less re-admissions	EcoQUIP (2013); Hildebrandt (2000); McHugh and Chenjuan (2013);
Financial	Healthcare systems that rely on government funding will not see significant cash infusion to meet growing cost pressure; block budgets; fee-for-service payment; diagnosis-related groups (DRGs); pay-for-performance (P4P); using case-mix payments; capitation funding; bundling payments to doctors and hospitals; prospectively or reimbursed treatments; Accountable Care Organization (ACO), performance contracting; government funded or private insurance?; activity-based funding; integrated care model/managed care model; articulate value for payers, patients, policy makers, hospitals, health professionals, and society; private health insurance in Denmark (even though everyone is publically secured)	Wagner (1998); Coleman et al. (2009); Kodner and Spreeuwenberg (2002); Glickman and Peterson (2009); Charlesworth, Davies, and Nixon (2012); O'Reilly et al. (2012)

(Table 2 continued)

Level	Content	Reference
Cultural	Highly coordinated healthcare system (environmental issues, prevention, monitoring public health, and warnings in case of emergencies) workforce shortage; reduce burden on hospitals; prevention rather than treatment; work loss due to illness; lifestyle choice and chronic diseases	EcoQUIP (2013); DICE (2002); The Economist (2011)
Political–legislative	Union jurisdiction demark job functions between doctors and nurses; different demands to regional vs. municipal hospitals; super hospitals; new healthcare centers; healthcare reforms; new super-hospitals disrupt old routines	Danish Regions (2012); Norden (2010)

Note. Source: Authors' elaboration.

Results and Propositions

Table 2 demonstrates strong tendencies, which support the authors' introductory claims: Current innovation activities in the Nordic healthcare system are based upon single-variable initiatives with a strong biased focus on strengthening/maintaining the “old and traditional” expensive Nordic model. For example, the strong focus on products and technology to support surgical procedures adds costs to the healthcare system and not necessary a financial return on investment. Innovation projects as the ones described in the product and process areas of inquiry have not been rethought into the system; they have served with improvements to the treatment of illnesses. This is good, naturally. However, when relating to the increase in expenditure and the costs to the taxpayers, this approach has led politicians to focus on the financial aspect of the healthcare system, since they are responsible for the significant cost overrun and budget increases. As a response, the national states, in order to fully or only partly to pay the expensive bill, have attempted with financial control systems based upon performance contracting (take “financial” area of inquiry for example).

Based on these insights it is therefore possible to develop the first three propositions all based on the premise that “you get what you measure” (Jakobsen, Gertsen, Goudsheit, & Rebsdorf, 2008):

Proposition 1: Innovation projects in the Nordic healthcare sector are biased towards new products. The large number of Ph.D. students and researchers are assessed on the basis of the numbers and quality of published articles and not in terms of innovation results in healthcare.

Proposition 2: Innovation projects in the Nordic healthcare sector are biased towards new processes as logistic optimization systems. A large number of newly built super hospitals are listed with clearly defined benchmarks on logistics and streamlined processes;

Proposition 3: Innovation projects in the Nordic healthcare sector are biased towards financial solutions managed through performance contracting. Performance targets are typically based on, e.g., number of beds, duration of hospitalization, etc. to measure and ensure improved performances.

The first propositions provide continuously increased costs at a rate, which the optimized process systems and related measures (defined by proposition 2 and 3) cannot meet. The introduction of new therapies will only continue to rise to spiraling costs unless they are understood as a fundamental vertical function for healthcare; as a system not limited to a treatment system, that is. This is argued, because the integration of, e.g., the business (interaction with the patient), social (new way of processing, internal change), and/or cultural part (changing habits amongst patients) of the vertical process is not considered in the current innovation practices. As an example: The self-diagnosis of patients with high blood pressure, which is controlled and monitored at home will have to be repeated (again) when consulting the GP—even though the technology, culture, and system have provided new possibilities to eliminate this unnecessary double checking.

The fourth, fifth, and sixth propositions therefore suggest:

Proposition 4: There is no or limited coherence between the different vertical steps, as new innovation activities are based on pushing for single breakthroughs with sub-optimized measurement points.

Proposition 5: Disruptive and radical innovation activities are almost completely within the domain of the construction of new modern hospitals with a biased focus on process innovation; e.g., optimized routines, procedures, and logistics.

Proposition 6: Disruptive innovation occurs when all levels in the vertical innovation approach are integrated.

It is seldom that technology transfer and licensed inventions lead to innovation that revolutionizes the healthcare sector, although it may contribute to improved earnings for the innovating enterprise. As stated before, this mainly contributes with new additional costs reasoned in new diagnostic methods or new treatments. This is evident, even though the projecting and construction of new super-hospitals have provided a 12 percent improvement. However, the myopic focus on new therapies, new robots, and the improvement of productivity in the Nordic healthcare model cannot keep up with the increased cost that healthcare is facing due to an aging population. It is not the new buildings per se that makes the difference. What then makes the difference? It is the social acceptance of the critical questioning of the (1) existing patterns; (2) the skilled incompetence's; and (3) myopic routines that remove assumptions and taken-for-granted attitudes towards what a reasonable and functional system is (Brix, 2014; Brix & Jakobsen, 2013).

Implications

Researchers, policymakers, and legislators in the Nordic Countries must revise and challenge the assumptions that are made on existing performance measures in the healthcare system. The practice of clearly defined and very narrow metrics promotes inventions and more incremental innovations, but the Nordic health sector requires a much more radical approach as well as broader defined and vertically anchored measurement points. The key message of present study is clear: The existing model to measure the healthcare system is defined by measurement points that are inadequate, because they do not provide sufficient disturbance in the system. For example, it contributes to increased or decreased waiting times instead of cheaper treatments.

Disruptions in the health sector are therefore not only based on inventions, but also in the way new inventions, new treatments, and new cures are implemented in hospitals and subsequent rehabilitation centers. New inventions have to be vertically integrated to ensure that the healthcare system can cope with the increased cost new possibilities provide, even though they provide perfect treatment or diagnosis.

Policy-level

More focuses should be directed towards meso- and macro-level projects from a legislative point of view to improve the effect of the resources that are invested in innovation activities in the Nordic model. Tendencies are starting to emerge within the new EU Horizon 2020 program, and therefore national and regional support and incentives should also be given for projects of this type, rather than the current linear model for product/service innovation. The performance-contracting model used today is based on specific measurement points that pose major challenges to what is seen as measurement points. The strong focus on large university hospitals with affiliated research contributes to highly academic environments, and highly specialised research activities. Also for the habitants in the Nordic countries very little, if any, academic meriting is given in the medical society to study systems innovation.

Organizational Level

A large effort is done worldwide to cure diseases and in most countries the average age of populations increases rapidly. Therefore, there is an increasing pressure on the healthcare system as well as new options for cure, which will increase the economic pressures on healthcare budgets. At the moment organizational changes in the Nordic healthcare system are mainly seen in connection with the construction of new hospitals. The large changes that many industries have experienced in recent years with new and different ways to meeting its customers, different ways of organizing the work, new ways of financing activities etc. have not yet had a significant impact on the Nordic healthcare system. The healthcare sector's sharp focus on highly specialised diagnostics, medicine, and surgery distract attention from vertical innovation of the system and mega factors and innovations become too incremental (focus on procurement, number of beds, etc.) despite new options as self-diagnosis, communication methods, etc. creating new disruptive opportunities.

Research

Innovation activities in the Nordic health sector are based on measurement points primary related to three activities: (1) cure of diseases (usually measured in percent); (2) price (usually measured in number or time duration); or (3) routines (lean systems and logistics, etc.). A research agenda with a holistic approach understanding healthcare systems as innovation systems does not exist at the moment and with this explorative paper a new research agenda is sought to be established. The first direction for further research is based on the developed propositions: Here the clear "one product, one solution" approach to generating and implementing new innovations must be overcome to create a turning point to the increasing healthcare costs for taxpayers. As a first step, it is recommended that researchers and legislators start to work, experiment with and demonstrate new measurement points that relate more to all areas of inquiry in the VIP framework as an innovative healthcare system, and not as a way to cure diseases only. To put it simply: Stop asking "are we doing things right?", and start asking "are we doing the right things?" (Argyris, 1999), when it comes to healthcare innovation.

Discussion

Innovation activities have the last couple of decades led to increased costs in the healthcare system, where the income through the tax system does not correspond to the expenses of delivering healthcare services. To curb this, the focus of contracts between the state and healthcare delivery and payment for services are defined via the described metrics, e.g., time (duration of hospitalization) and number (e.g., number of beds, number of admissions and re-admissions).

Within this expanded public-private innovation, activities are established actually to deal with optimized procurement procedures. Finally, partially completed and ongoing activities with the establishment of new super-hospitals have had tremendous impact on optimization and rationalization of business processes and logistics. New innovation activities in the Nordic health sectors have been dominated by single step activities such as the public-private innovations activities in the Nordic healthcare sector, which in the same way as any other single activity does not contribute to the necessary disruptions in the healthcare system to cope with increased costs in the future. In this article it is stressed that the normally practiced single solution innovation model based on simple measurement methods is insufficient to achieve the required reductions in the healthcare budgets of tomorrow. Completely different vertically disruptive solutions must be explored and implemented to

ensure both efficient hospital system and effective treatments—but not necessarily at the same time and not necessarily integrated.

Basically, to quote the great Danish physicist, Niels Bohr and his colleague Albert Einstein discussions in the 1930s about measurability of real objects, it is concluded: “you get what you measure” (Jakobsen, Gertsen, Goudscheit, & Rebsdorf, 2008). Therefore we must be much more focused on both what we measure, and how we measure healthcare innovation in the Nordic model to achieve both improved treatments for the benefit of the citizens and at the same time a better economy for the overall society.

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Appendix A: From Invention to Innovation—The Case of Edison's Light Bulb

Thomas Edison is undoubtedly best known as the inventor of the light bulb. But the bulb was actually not invented by Edison and it was not the invention of the bulb, which was the primary part of Edison's work and success. None of the principles in Edison's works were especially new, but Edison managed to put each element of his work into a larger context. Here he created new innovations by rethinking the entire system: as new business models. Here Edison's work is demonstrated by using the VIP model as method for analysis.

Table A1

From Invention to Innovation: Edison's Light Bulb Story

Area of inquiry	Example based on Edison
Product	Edison made a bulb in 1878, but the bulb was already invented in Britain by Humphry Davy in 1810, and the first tests were done by the German Heinrich Göbel in 1854. Several others have also patents before Edison, but Edison created a bamboo based filament able to burn in 1200 h.
Process	The bulb was difficult to produce, and Edison found with his good friend Henry Ford a process by which he could produce 10,000 and more on one machine. Also he made a cable solution by decreasing the consumption of copper with 1/8
Business	Salesmen went from door to door—offering to do all the installation, with electricity and promised that it was cheaper and better than the normal kerosene solutions. Each person who joined were provided with 12 bulbs for free
System	The bulb was the small part: Edison made also the power plants with generators to produce DC, he dug up the streets of all Manhattan and he put the new invented copper wires in the ground. He even made the installations in each house from gas supply to DC electricity
Social	Edison was facing a lot of criticism, and his idea was called castles in the air. Edison published his new cotton bulb and invited people to come and see a demonstration in his lab at Menlo Park. First time 3,000 arrived and became impressed
Financial	Many of the millionaires from New York pre-paid a lot of money to be the first with private electric light as it was a status symbol. The richest person in USA, William H. Vanderbilt, was the first in 1882 to turn on the electrical light
Cultural	Edison got a journalist from the newspaper "The Sun" to write about how he would be lightning up all of Manhattan, and how his inventions would provide power, heat, and cooking facilities. Even satire drawings became an important tool in the process of changing culture from gas and kerosene to DC
Political – Legislative	Edison invited the corrupted politicians to his facilities in Menlo Park for demonstration followed by a dinner with lots of wine, champagne, food from an exclusive restaurant and presents, which made the responsible politicians to argue: "Gas is dangerous" and Edison was allowed to dig up all Manhattan and implement his system
"Other"	Edison denied stubbornly AC, and this stubbornness was his driving force

Edison started his project as 31 years old in 1878. The bamboo bulb was created in a few days, but he did the final test of the complete installed system in 1882, and in these four years the color of his hair changed from dark to grey.