

Fragmented Transformation

Innovation is the Answer for Healthcare Services in the Baltic Sea Region

Introduction

Innovation is the key to understanding the process of transformation from one system regime to another. An innovation is often the cause of a disturbance that requires the system to adapt. Due to an innovation, the existing processes and structures do not suit the new reality and have to be adapted in a complex transformation process, often resulting in a crisis. Adapting and adopting the innovation or creating other innovations is the appropriate response and solution to enable the system to return to a new equilibrium and overcome the crisis. This transformation process has been extensively described for commodities,¹ but rarely for health innovations.²

The terms ›innovation‹ and ›innovative‹ are widely used buzzwords in many different fields, including healthcare. However, to date there is no comprehensive and generally accepted definition of innovation,³ and different disciplines apply slightly different concepts. Schumpeter was one of the first economists to recognise the importance of innovation for any economic system.⁴ He described innovation as any change in the mode of production, the manufacture of new products, the structure of the firm or the entry into a new market, and as the »creative destruction« that underlies all progress in a market system.⁵

It should be noted that innovation is not the same as invention. While invention describes the first appearance of a new idea or product, innovation

1 E.g., Rogers, E. M.: *Diffusion of innovations*, New York 2003; Hauschildt, J.: *Dimensionen der Innovation*. Berlin/Heidelberg 2015.

2 E.g., Flessa, S./Marschall, P.: *Individualized Medicine: From Potential to Macro-Innovation*, in: Fischer, T./Langanke, P./Marschall, P./ Michl, S. (eds.): *Individualized medicine: ethical, economical and historical perspectives*, Heidelberg/New York/Dordrecht/London: 2015, pp. 253–271.

3 Cf. Hauschildt, J./Salomo, S./Schultz, C./Kock, A.: *Innovationsmanagement*, München 2016.

4 Cf. Verspagen, B.: *Innovation and economic growth*, in: Fagerberg, J./Mowery, D. C./Nelson, R.R. (eds.): *The Oxford Handbook of Innovation*, Oxford 2005, pp. 487–513.

5 Cf. Schumpeter, J.: *Theorie der wirtschaftlichen Entwicklung*, Berlin 1934.

can be seen as the first commercial implementation of a new idea as well as the economic optimisation of knowledge use.⁶ Consequently, some authors define innovation as the successful introduction of a new product on a market,⁷ but this might be a somewhat limited approach regarding healthcare innovations.

Although invention and innovation can be distinguished, they cannot be completely separated, as a free market ensures that an invention has the opportunity to demonstrate its potential to become a new standard. However, this does not guarantee that it will ultimately succeed.⁸ It is possible to distinguish between invention as the development of ideas and the first technical realisation (e.g., a prototype),⁹ and innovation as a more comprehensive process that starts with new ideas and ends with successful acceptance by potential users.¹⁰ However, the two concepts are inextricably linked.

In healthcare, innovation is the source of every improvement in the quality of services and quality of life, but also a constant challenge to existing healthcare providers and systems.¹¹ Progress in medicine requires new technologies, procedures or organisational forms. Typical examples are new drugs, implants, equipment, surgical techniques or systems of care (such as palliative medicine as an innovative form of care). We are not overstating the fact that the tremendous increase in quality and length of life over the past 100 years can be attributed to innovations in healthcare, hygiene and nutrition. Innovations are revolutionising prevention,¹² diagnosis,¹³ therapy,¹⁴ rehabilita-

6 Cf. Vahs, D./Brem, A.: *Innovationsmanagement: Von der Idee zur erfolgreichen Vermarktung*, Stuttgart 2015.

7 Cf. Feldman, M. P.: *The geography of innovation*, Boston 1994.

8 Cf. Nelson, R. R.: *An evolutionary theory of economic change*, Boston 1985.

9 Cf. Corsten, H./Gössinger, R./Müller-Seitz, G./Schneider, H.: *Grundlagen des Technologie- und Innovationsmanagements*, München 2017.

10 Cf. Trott, P.: *Innovation management and new product development*, Harlow, Essex 2012.

11 Cf. Löschner, U./Fleßa, S.: (2022). *Essentials of Innovation Theory for Medical Devices*, in: Boccatto, C./Cerutti, S./Vienken, V. (eds.): *Medical Devices: Improving Health Care Through a Multidisciplinary Approach*, Berlin/Heidelberg 2022, pp. 35–51.

12 E.g., Mathieu, E./Ritchie, H./Rodés-Guirao, L./Appel, C./Gavrilov, D./Giattino, C./Hasell, J./Macdonald, B./Dattani, S./Beltekian, D./Ortiz-Ospina, E./Roser, M.: *COVID-19 Pandemic, 2022*, ourworldindata.org/coronavirus (03.01.2022).

13 E.g., Hosny, A./Parmar, C./Quackenbush, J./Schwartz, L. H./H. J. Aerts, H. J.: *Artificial intelligence in radiology*, in: *Nature Reviews Cancer* 18 (2018), No. 8, pp. 500–510.

14 E.g., Lu, D.-Y./Lu, T./Che, J./Yarla, N.: *Individualized cancer therapy, what is the next generation*, in: *EC Cancer* 2 (2018), No. 6, pp. 286–297.

tion¹⁵ and even palliative care¹⁶. For example, stem cell transplants enable us to cure previously fatal cancers,¹⁷ and gene therapeutic drugs target diseases which, as of recently, were considered a ›death sentence‹ (e.g., spinal muscular atrophy).¹⁸ Most citizens would agree that increasingly more innovation in healthcare is welcome to improve the quality of life and save the lives of patients suffering from diseases which we still cannot heal to this day.

At the same time, innovation challenges existing solutions and systems and therefore faces resistance within the established system. The high cost of innovation, the need to learn new techniques and change existing systems, in addition to the fear of anything new—all these factors act as barriers to innovation. The invention might seem fascinating to experts, but there is no guarantee that it will ever be successful and become a new standard solution. In reality, numerous promising ideas or products fail to succeed because they cannot overcome the obstacles in their way. In the best-case scenario, they might survive in a small niche with limited relevance, but in some cases great ideas, products or processes just disappear although they seem very promising. From an external perspective, it remains a ›miracle‹ why the adoption of innovations is frequently not smooth and rather fragmented.

In this chapter we want to model the innovation adoption process in order to identify the factors that influence the successful adoption of an innovation. Based on this model, we can analyse the conditions for a smooth and rapid diffusion of an innovation and the resulting transformation process. At the same time, the model highlights the barriers and bottlenecks that hinder the adoption process and lead to fragmented transformation when systems or individuals have different characteristics of innovativeness. The relevance of the model is then demonstrated using three case studies. The chapter

15 E.g., Yuan, F./Klavon, E./Liu, Z./Lopez, R. P./Zhao, X.: A systematic review of robotic rehabilitation for cognitive training, in: *Frontiers in Robotics and AI* 8 (2021), 605715.

16 E.g., Dunleavy, L./Preston, N./Bajwah, S./Bradshaw, A./Cripps, R./Fraser, L. K./Maddocks, M./Hocaoglu, M./Murtagh, F. E./Oluyase, A. O.: ›Necessity is the mother of invention‹: Specialist palliative care service innovation and practice change in response to COVID-19. Results from a multinational survey (CovPall), in: *Palliative Medicine* 35 (2021), No. 5, pp. 814–829.

17 Cf. Meehan, K. R./Areman, E. M./Ericson, S. G./Matias, C./Seifeldin, R./Schulman, K.: Mobilization, collection, and processing of autologous peripheral blood stem cells: development of a clinical process with associated costs, in: *Journal of hematotherapy & stem cell research* 9 (2000), No. 5, pp. 767–771.

18 Cf. Ogbonmide, T./Rathore, R./Rangrej, S. B./Hutchinson, S./Lewis, M./Ojilere, S./Carvalho, V./Kelly, I.: Gene therapy for spinal muscular atrophy (SMA): A review of current challenges and safety considerations for onasemnogene abeparvovec (Zolgensma), in: *Cureus* 15 (2023), No. 3, <https://doi.org/10.7759/cureus.36197>.

concludes with some reflections on the underlying factors that influence the fragmentation of transformation.

Modelling the Adoption of Innovations

In this section we present an innovation adoption model that can be used to describe monotonous, erratic and fragmented transformation processes in healthcare to understand how transformation processes depend on economic, cultural and individual characteristics. Innovation theory provides the main framework for understanding transformation processes.¹⁹

Transformation

Any change requires energy and creates uncertainty. Consequently, an open system has an inclination to return to its steady state equilibrium and avoid change, i.e., open systems are usually homeostatic and averse to transformation.²⁰ Only when the differences between the goals and outcomes of the system increase to a level that the structures cannot be maintained and the fundamental targets cannot be achieved will the system react and adjust its structure. Otherwise, homeostasis will lead to the extinction of the system. Under the assumption that the environment changes frequently, systems are under constant pressure to change although they would prefer to stabilise. Under the pressure of change, they will only survive if they can expand beyond their original structures and processes. Figure 1 to Figure 3 display potential transformation processes.

The system is originally in a stable equilibrium. It fulfils its function within its environment and can absorb minor internal or external disturbances (synchronous system regime). However, if these disturbances (perturbations) become so strong that they cannot be absorbed within the existing structures, the system can shift smoothly into a new regime. If this transition occurs

19 The innovation adoption model was originally developed to analyse the adoption process of primary healthcare innovation (cf. Fleßa, S.: *Gesundheitsreformen in Entwicklungsländern: eine kritische Analyse aus Sicht der kirchlichen Entwicklungshilfe*, Frankfurt am Main 2002). It was amended and applied to other innovations, e.g., Flessa, S./Huebner, C.: *Innovations in Health Care—A Conceptual Framework*, in: *International Journal of Environmental Research and Public Health* 18 (2021), No. 19, 10026.

20 Cf. Ritter, W.: *Allgemeine Wirtschaftsgeographie. Eine systemtheoretisch orientierte Einführung*. München 2001.

gradually through a series of incremental changes without major crises, it is referred to as a monotonous transformation (see Figure 1). In reality, however, the system often cannot transform smoothly. Instead, it fluctuates until it reaches a bifurcation point, at which it becomes clear that the system will never be the same again. Often, the system will find a new equilibrium adapted to the new environment, which is usually set at a higher energy level. Due to the unpredictable and oscillating nature of this development, it can be termed an erratic transformation (see Figure 2).

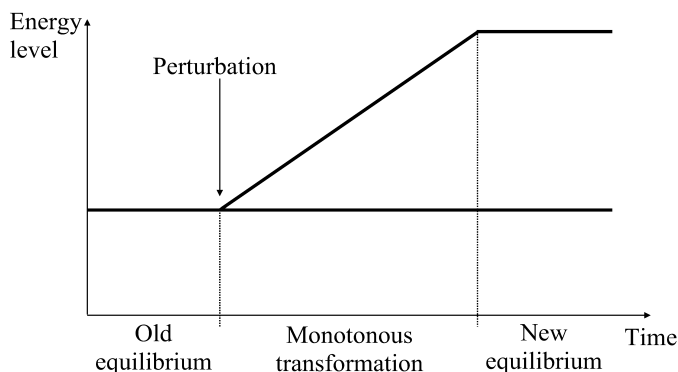


Figure 1: Monotonous transformation²¹

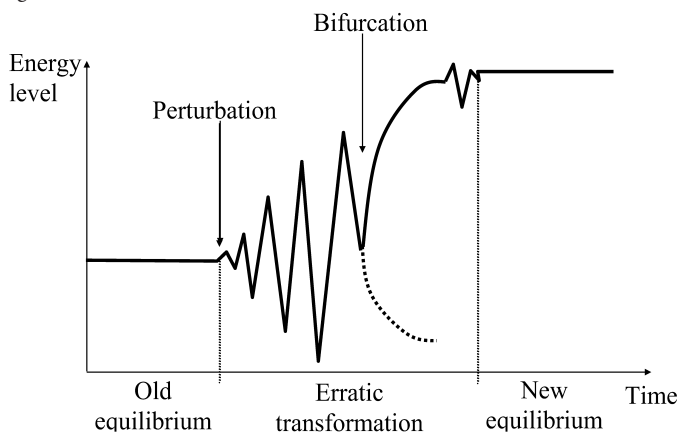


Figure 2: Erratic transformation²²

21 Source own, based on Ritter: Allgemeine Wirtschaftsgeographie.

22 Source own, based on ibid.

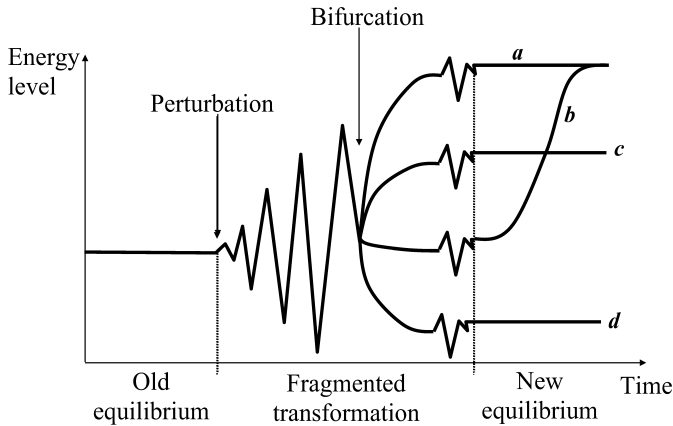


Figure 3: Fragmented transformation²³

At the bifurcation point, the system requires a new solution, i.e., an innovation. Nevertheless, different settings may not have the same ability and willingness to adopt this innovation. Some systems will adopt the innovation rapidly leading to an early and high penetration of the old system regime by the innovation and a new equilibrium on a high energy level (see course of curve »a« in Figure 3). Other systems will finally reach the same high energy level, but it takes longer (see course of curve »b« in Figure 3), while the innovation adoption might face barriers resulting in a limited adoption either at a higher (see course of curve »c« in Figure 3) or even at a lower energy level than the old system regime (see course of curve »d« in Figure 3). In reality, some may be faster or stronger in adoption of an innovation. This leads to uneven developments in different settings, regions or niches which can be referred to as fragmented transformation, leading to different levels of innovation and energy in different environments.

One reason for fragmented transformation is the diverging strength of the micro- and meso-structure of a system. Changes in the environment are initially absorbed by the microstructure (e.g., personnel, patients etc.). The meso-structure gets involved if the *disturbances* become so strong that the micro-structure are unable to manage them. And only if the meso-structure cannot absorb the fluctuations will they be passed on to the macro-structure, i.e., the economic or political system. For instance, if a problem cannot be

²³ Source own, based on ibid.

solved by the interaction between a patient and his doctor, a hospital or the entire healthcare system have to respond. If that approach seems to be ineffective, the legislation and other sectors will have get involved in solving the problem. A stable meso-structure can withstand quite a lot of pressure, but if the necessary changes are blocked by the macro-structure, the meso-structure may become inflexible or even fragile.

The development of new structures and functions of systems requires a steady flow of energy. Social systems are based on the energy source of human creativity to adapt the systems. It is through creativity that people develop innovations to respond to and survive changes in the environment. Thus, innovations are the basis for the survival of open systems, and their evolution is the condition for survival. However, innovations are also the cause of disturbances. In a dynamic economy, an innovation will flourish the innovative company, but challenge other organisations based on the old standard technology, i.e., innovation usually means »creative destruction«.²⁴ One organisation solves its challenges by innovating, and others are driven into crisis by that very innovation. Thus, the crisis-affected organisation requires further creativity and innovation to respond to the crisis and develop another innovation, which then becomes the new standard and causes another crisis for other organisations.

Innovation Adoption

While a monotonous transformation is rather unlikely, the capability and willingness to adopt an innovation determines whether the transformation is erratic or fragmented. Figure 4 exhibits a model of the adoption of a healthcare innovation. It assumes that a new idea, paradigm, product, service, or technology was invented elsewhere and has evolved to the point where an organisation or any other system could adopt and implement it. The model answers the question of what has to happen in order for this innovation from outside to become an accepted innovation from inside the organisation.

Promoters are the core of the model. They can be called key persons or champions who determine whether an innovation will be supported, accepted, hindered or destroyed.²⁵ Frequently, an innovation requires four

24 Schumpeter: Theorie der wirtschaftlichen Entwicklung.

25 Cf. Witte, E.: Organisation für Innovationsentscheidungen: Das Promotoren-Modell, Göttingen 1973.

different types of promoters in order to become a new standard. Firstly, expert promoters contribute to overcoming the barrier of lacking know-how.²⁶ They know ›how things work‹, they understand the innovation and see its perspectives.²⁷ Secondly, the power promoter helps to overcome the barrier of unwillingness. They decide to introduce the innovation into the organisation and to allocate sufficient resources to the adaption and development process.²⁸ Their role also includes breaking resistance within the organisation due to their position of power.

Thirdly, the administrative promotor overcomes the administrative hurdles.²⁹ It can happen, that a power promotor supports the innovation, but routines, data protection laws and insufficient resources prohibit the implementation. Fourthly, some authors call for a relationship promoter constantly looking for innovation seedlings from outside that might be relevant for the organisation³⁰ in order to overcome obstacles caused by inadequate or misguided communication between the organisation, customers and other stakeholders.³¹

Promoters are only able and willing to support the adoption of an innovation if they perceive system deficiencies. There is no need to risk an innovation if everybody is satisfied with the current solution. Only if the existing system solution is dysfunctional, promoters will dare to incur the costs of an alternative. However, the normal reaction to a dysfunctional system is not to change it completely, but to improve the old standard. Thus, potential promoters will first attempt to ›repair‹ the existing solution instead of adopting a completely new alternative. They search for compensation mechanisms, such as improving the design, reducing the factor costs, or simply reducing their own expectations. Managers tend to keep the existing solution, even

26 Cf. Gemünden, H. G./Salomo, S./Hölzle, K.: Role models for radical innovations in times of open innovation, in: *Creativity and innovation management* 16 (2007), No. 4, pp. 408–421.

27 Cf. Goduscheit, R. C.: Innovation promoters—A multiple case study, in: *Industrial Marketing Management* 43 (2014), No. 3, pp. 525–534.

28 Cf. Hauschildt/Salomo/Schultz/Kock: *Innovationsmanagement*.

29 Cf. Hausschildt, J./Chakrabati, A.: Arbeitsteilung im Innovationsmanagement—Forschungsergebnisse, Kriterien und Modelle, in: *Zeitschrift Führung+Organisation* 57 (1988), pp. 378–388.

30 Cf. Hauschildt, J./Schewe, G.: Gatekeeper and process promotor: key persons in agile and innovative organizations, in: *International Journal of Agile Management Systems* 2 (2000), No. 2, pp. 96–103; Gemünden/Salomo/Hölzle: Role models for radical innovations in times of open innovation.

31 Cf. Walter, A.: *Der Beziehungspromotor: Ein personaler Gestaltungsansatz für erfolgreiches Relationship Marketing*, Wiesbaden 1998.

32 Source: own, based on Fleßa: *Gesundheitsreformen in Entwicklungsländern*.

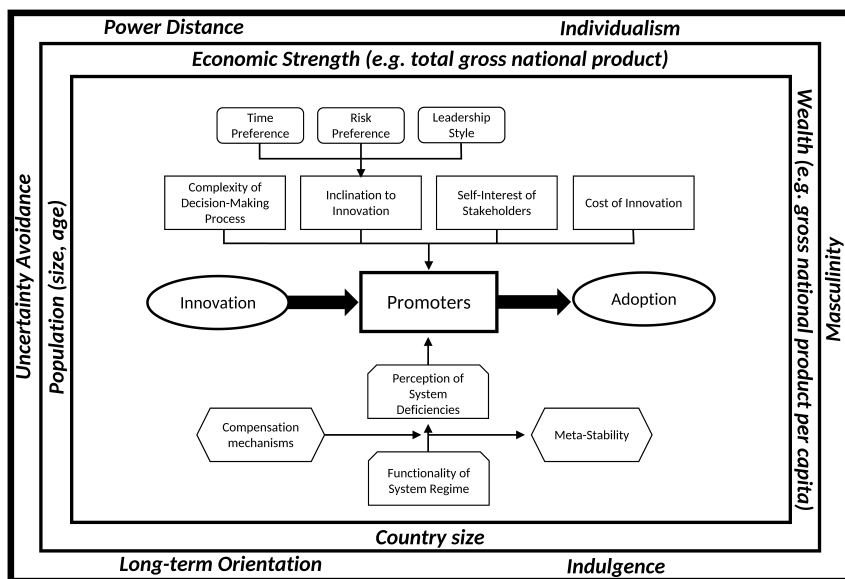


Figure 4: Model of adoption of a healthcare innovation³²

if this requires financial and temporal resources. The consequence is an artificially stabilised solution, which can only exist as long as the managers are willing to protect it. However, the stability of the system is artificial, it is meta-stable.³³ Unless managers shield the old solution from the pressures of dysfunction, it will collapse. Consequently, the adoption process is frequently not monotonous, but revolutionary or erratic. For an extended period of time, there may be no noticeable changes. Then suddenly the organisation accepts an innovation like a leap to a higher level. Consequently, the transformation is rarely monotonous but erratic or fragmented.

In addition, complexity, cost, innovation inclination and self-interest of promoters determine the willingness and ability of the manager to adopt an innovation. The more complex an innovation is, the less likely and rapidly it will be adopted. Hence, an innovation that involves many subsystems and processes will require more explanation. In addition, the costs of the innovation are crucial for the likelihood and speed of adopting it. It is important to note that term cost covers much more than only financial expenditure, but also includes the costs of reduced productivity during the transformation

33 Cf. Ritter: Allgemeine Wirtschaftsgeographie.

of the old to the new system, the negative consequences of the limited intellectual performance of managers who concentrate on the new methodology, and the political costs in the sense of resistance against the innovation (even co-workers going on strike against it).³⁴

Furthermore, inclination of promoters and other stakeholders towards innovation determines likelihood and speed of adoption. This inclination is shaped by three factors, i.e., time preference, risk preference and the leadership style within the organisations. The time preference is an expression of the value of future.³⁵ The risk preference expresses the perception of risks by the decision-maker (averse, neutral, and seeking). The leadership style is also relevant for the adoption process. The more the style is based on obedience and strict task fulfilment, the smaller is the space for innovation. Consequently, a person with a low time preference and a low-risk adversity, who works in an organisation with a coaching and fostering leadership style, has a high likelihood of becoming promoter.³⁶

Finally, stakeholders will reject innovations that challenge their own self-interest.³⁷ We need solutions that bring a win-win situation without leaving important stakeholders as losers of the transformation process. Otherwise, they will reject or slow-down the adoption of the innovation.

Consequently, the adoption of an innovation into an organisation and into a complete system is a highly complex process that involves a broad set of stakeholders and influence factors. Promoters of different settings (such as enterprises, branches, countries) will have different personalities and diverging characteristics leading to different speed and rigor of adopting the innovation. The consequence is a different adoption speed with pioneers (high speed) and laggards (low speed). At the same time, the penetration will be different. While some will accept the innovation completely, others will keep the old standard solution and employ the innovation only for certain niches. As a result, speed and penetration define the fragmentation of the adoption and the transformation process.

Based on this model we can conclude that excellent ideas, technologies or products do not necessarily find supporters. Main barriers are a missing

34 Cf. Fleßa, S.: Grundzüge der Krankenhausbetriebslehre, München 2014.

35 Cf. Rogers: Diffusion of innovations.

36 Cf. Fleßa: Grundzüge der Krankenhausbetriebslehre; Vahs/Brem: Innovationsmanagement; Hauschildt/Salomo/Schultz/Kock: Innovationsmanagement.

37 Cf. Heyen, N. B./Reiß, T.: Das Gesundheitswesen aus Innovationssystemperspektive: Acht Thesen und Handlungsmöglichkeiten: Teil 1, in: Sozialer Fortschritt 63 (2014), pp. 245–252.

perception of the dysfunctionality of the existing system, a compensation mechanism so that deficiencies within the existing solution can be partially remedied, high costs of the conversion, harm to a powerful influence group or simply a lack of promoters. In these cases, the innovation might only be adopted in a small niche. Here it can mature and get rid of ›teething troubles‹ so that it becomes a potential³⁸ or an innovation seedling³⁹ which might be of relevance when the old standard solution becomes more and more obsolete. Then, the seedling is ready for complete takeover, and under the increasing pressure on the dysfunctional old solution, the likelihood increases that the new solution becomes the new standard.⁴⁰

Figure 4 shows that the model centres on this adoption process. The Figure sets this adoption process in a framework of two layers that determine the influencing factors and thus drive the speed and penetration depth of innovation adoption. The first layer are the traditional variables of economics, such as gross national product (NGP), NGP per capita (p.c.), size of the country as well as demography (size and age structure of the population). Beyond these economic statistics, the outer level shows the cultural dimensions which might have an influence on the diffusion of innovations. Based on the six dimensions of national culture of Hofstede,⁴¹ Figure 4 shows that the adoption process depends on these dimensions of national culture, i.e., power distance, individualism, masculinity (today sometimes described as the motivation towards achievement and success), uncertainty avoidance, long-term orientation and indulgence versus restraints.⁴² It is essential to recognise that these variables influence the innovation adoption, but they are not the result of economic processes but cultural values of a society or nation beyond the scope of traditional economics. As these values might differ from culture to culture (or nation to nation), innovation adoption might be fragmentary.

Overall, transformation unfolds over a diachronic phase. Due to the erratic nature of the adoption process, the respective transformation of the system in

38 Cf. Dopfer, K.: *Elemente einer Evolutionsökonomik: Prozess, Struktur und Phasenübergänge*, Berlin 1990.

39 Cf. Ritter: *Allgemeine Wirtschaftsgeographie*.

40 Cf. Auffermann, S./Staudt, E.: *Der Innovationsprozess im Unternehmen—eine erste Analyse des derzeitigen Stands der Forschung*, Bochum 1999.

41 Cf. Hofstede, G.: *Culture and organizations*, in: *International Studies of Management & Organization* 10 (1980), No. 4, pp. 15–41, <https://doi.org/10.1080/00208825.1980.11656300>; id.: *Culture's Recent Consequences: Using Dimension Scores in Theory and Research*, in: *International Journal of Cross Cultural Management* 1 (2001), No. 1, pp. 11–30.

42 Cf. Hofstede, G./Hofstede, G. J./Minkov, M.: *Cultures and organizations: Software of the mind*, New York 2005.

a new system regime is rarely monotonous. Instead, the system oscillates, and older innovation seedlings might give the direction of transformation. The speed and rigour of adoption of the innovation will differ between settings leading to fragmented transformation. The more the adoption depends on public financing and national regulations, the more national borders determine the speed and penetration. In addition, dimensions of national culture might play a major role in the explanation of fragmented transformation and different speed and level of adoption.

In healthcare, one would expect that life-saving and quality-of-life-producing innovations would be adopted everywhere and in high speed. This would theoretically result in a homogenous healthcare space. However, in reality healthcare innovations are not equally implemented worldwide. It is obvious that financial capabilities will make a difference. But even between countries of similar economic development, we perceive great differences. The model of Figure 4 might help to determine the underlying causes of this fragmented transformation.

Case Studies

Digital Health

In this section, we analyse the factors determining the implementation of digital health in different countries. Unfortunately, a Digital-Health-Index has not been calculated for all countries of the Baltic Sea region so that we have to include other countries in this analysis. The main question is whether the factors shown in Figure 4 determine the digital health index.

Digital health is the deployment of information and communication technologies in the healthcare sector.⁴³ The technology and concepts can be easily imported into any country, so that one would expect that digital health had diffused to all countries at least within the European Union or the Baltic Sea region to a similar extend. However, this is not actually the case. In 2018, the Bertelsmann Foundation published a Digital-Health-Index that includes different dimensions of digital health, i.e., infrastructure (e.g., nationwide patient identification number, technical data infrastructure), legal framework (e.g., data protection regulation, data security), institutionalisation (e.g., national

43 Cf. European Commission: eHealth: Digital health and care, 2021, ec.europa.eu/health/ehealth/home_en (01.07.2021).

digital health organisation, standards, financing) and specific applications (e.g., digital patient records, e-prescription, video consultations, health information, health research).⁴⁴ Table 1 exhibits the Digital-Health-Index (DHI) of 13 selected OECD-countries for which the DHI as well as the dimensions of national culture of Hofstede exist. Although these countries are roughly on the same development level, they have quite different indices. This calls for an explanation.

Table 1: Digital-Health-Index, economic variables and Hofstede dimensions of national culture⁴⁵

Country Name	DHI	GNI p.c. PPP (current int. \$)	GNI, PPP (million current int.\$)	Population density (people/km ²)	Population, total	Land area (km ²)	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation	Indulgence
Denmark	72.47	79,390	472,114	146.4	5,946,952	40,000	18	74	16	23	35	70
Estonia	81.92	47,350	64,686	31.1	1,366,188	42,750	40	60	30	80	82	16
Germany	30.02	72,110	6,092,387	238.1	84,482,267	349,390	35	67	66	65	83	40
Poland	28.52	47,380	1,738,300	123.3	36,685,849	306,100	68	60	64	93	38	29
Sweden	68.26	72,990	769,090	25.6	10,536,632	407,284	31	71	5	29	53	78
Australia	57.31	66,260	1,764,943	3.3	26,638,544	7,692,020	38	90	61	51	21	71
Belgium	54.67	71,990	851,159	382.6	11,822,592	30,280	65	75	54	94	882	52
France	31.61	62,130	4,235,079	123.8	68,170,228	547,557	68	71	43	86	63	48
Italy	55.81	58,650	3,446,469	200.0	58,761,146	295,717	50	76	70	75	61	30
Netherlands	66.05	77,750	1,390,099	520.7	17,879,488	33,670	38	80	14	53	67	68
Portugal	67.19	47,850	503,638	113.1	10,525,347	91,606	63	27	31	99	28	33
Spain	71.36	52,420	2,535,604	94.9	48,373,336	499,733	57	51	42	86	48	44
United Kingdom	69.98	58,140	3,974,003	277.0	68,350,000	241,930	35	89	66	35	51	69
Correlation	-0.012	-0.61	-0.08	-0.60	-0.05	-0.46	-0.06	-0.54	-0.36	-0.07	0.21	
p-value	0.95	0.03	0.79	0.03	0.86	0.11	0.85	0.06	0.23	0.83	0.49	

It is obvious that the adoption of the Digital Health innovation is very different in these countries. The DHI of Poland is 28.52 while the respective index of Estonia is 81.92. Table 1 shows that the economic, demographic and cultural

44 Cf. Bertelsmann Stiftung: #SmartHealthSystems, 2021, www.bertelsmann-stiftung.de/de/unsere-projekte/der-digitale-patient/projektthemen/smarthealthsystems#c1203567 (01.07.2021).

45 Source: Bertelsmann Stiftung: #SmartHealthSystems; Hofstede Insights: Compare Countries, 2024, hi.hofstede-insights.com (29.05.2024); World Bank: World Development Indicators, 2024, databank.worldbank.org/source/world-development-indicators (30.05.2024).

variables cannot satisfactorily explain the differences in DHI. One would expect that high-income countries (expressed in terms of gross national income per capita) would have more resources to invest in digital health and thus, would be faster to adopt the innovation. However, this is not the case. Instead, the correlation between DHI and the absolute GNI is negative, i.e., wealthier countries perform poorly in digital health, and this correlation is significant.

Surprisingly, population density also has no impact on the DHI. We could expect that countries with a lower population density would benefit more quickly from the advantages of digital health (and in particular telemedicine). Instead, there is a negative correlation between DHI and the population as a whole, i.e., digital health seems to be more evident in countries with smaller populations, suggesting that smaller countries (in population) are more innovative or willing to adopt innovations.

Among the cultural dimensions, power distance and masculinity have a measurable impact on the adoption of digital health technologies. It might be a surprise that a high motivation towards achievement and success (masculinity) has a negative significant ($p = 0.06$) impact on the DHI. High-scorers on DHI (such as Estonia, Netherlands, Denmark) have quite low scores on masculinity, i.e., individual success and aggressive assertiveness are seen as inappropriate while social orientation and teaming are of high esteem. High power distance and low masculinity together could indicate that a participatory leadership style with low hierarchy, free discussion and openness to different arguments as well as the will to be successful as a team, sector or nation are prerequisites for Digital Health. This might be the ›secret‹ of Estonia with a very low power distance and masculinity resulting in an exceptional DHI. However, these variables alone cannot explain why some countries perform well in adopting digital health innovations while others lag behind. In addition, some variables (e.g., size, population, income) cannot be influenced easily and do not provide insights into what the leadership can do to improve the innovation adoption. There must be other variables that grease the adoption process beyond the traditional realm of economics and management. This will be considered in the following section.

Pre-Clinical Emergency Medicine

Emergency medicine is a crucial, pre-institutional phase of the chain of care. It usually starts with an emergency (accident, life-threatening health event) resulting in alerting emergency services. In most cases, they see the patient

in the location of the emergency, make first interventions to stabilise the patient and transport them for further treatment to a healthcare centre and/or hospital.⁴⁶ Emergency medicine will continue in the healthcare institution, but here we would like to focus on the pre-clinical emergency services.

The pre-clinical emergency systems of the countries of the Baltic Sea region are quite diverse. Typical differences are:

Profession and education: Some countries (e.g., Germany) come from a tradition of volunteers working in the emergency field,⁴⁷ while other countries have seen emergency paramedics as a profession for a long time, e.g., Finland. Even Germany with its long tradition of Red Cross, Malteser and Johanniter with a strong focus on volunteers has moved towards the professionalisation of emergency care. This includes a three-year education, but it started much later than, for instance, in Finland. In some countries (e.g., Poland), emergency paramedics have a bachelor's degree specifically for that field, while in other countries (e.g., Germany) the training is still technical (three years after general school leaving certificate).⁴⁸

Authorisation: As a consequence of different professional traditions, the authorisation of paramedical emergency specialists differs. While some countries give almost the same authority to emergency paramedics as to emergency doctors (e.g., endotracheal intubation, pain therapy), other countries limit their rights and require an approbated physician to permit these interventions.⁴⁹

Rescue Concept: Some countries emphasise that the patient should be treated as far as possible at the scene of the emergency to ensure that they arrive at hospital in a stable condition-(»Treat in Street«). Other countries see the main purpose of the emergency unit in transporting the patient as fast as possible to the hospital (»Scoop and Run«).⁵⁰ The consequence is also that no professional emergency physicians are needed to transport the patient, while stabilising the patient before is usually beyond the capability of paramedics.

Role of first responders: The time between the emergency event and the first contact with the medical professionals can be crucial for the patient's survival and potential disability, especially in cases of stroke and heart attack. Some countries invest in

46 Cf. Wankhade, P./Murphy, P.: *Emergency Services Management: A Research Overview*, London 2023.

47 Cf. Seeger, I.: *Ambulante Notfallversorgung in Deutschland: verloren zwischen den Sektoren*, Universität Oldenburg 2019.

48 Cf. Dúason, S./Ericsson, C./Jónsdóttir, H. L./Andersen, J. V./Andersen, T. L.: *European paramedic curriculum—a call for unity in paramedic education on a European level*, in: *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 29 (2021), No. 1, 72, <https://doi.org/10.1186/s13049-021-00889-z>.

49 Cf. Tjelmeland, I. B./Masterson, S./Herlitz, J./Wnent, J./Bossart, L./Rosell-Ortiz, F./Alm-Kruse, K./Bein, B./Lilja, G./Gräsner, J.-T.: *Description of Emergency Medical Services, treatment of cardiac arrest patients and cardiac arrest registries in Europe*, in: *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 28 (2020), pp. 1–16.

50 Cf. Smith, R. M./Conn, A. K.: *Prehospital care—Scoop and run or stay and play?*, in: *Injury* 40 (2009), 4, pp. S23–S26.

the training of first responders who are able to provide first aid (incl. reanimation) while other countries seem to put less emphasis on their training.⁵¹

Role of airborne rescue: Helicopters are the fastest means of transport for emergency teams, but also the most expensive ones.⁵² In some countries, helicopters are widely used, in other countries this is a rare exception.⁵³ In some countries, emergency helicopters are equipped like intensive care units in order to start treatment while the patient is transported in the helicopter. Other helicopters are simply transport devices for the emergency team or for the patient.⁵⁴

Financing: Countries with a national health service (e.g., Scandinavian countries) usually provide a tax-based line-item budget for the emergency service, while countries with a Social Health Insurance provide the freedom of negotiations between emergency service providers and health insurances. In Germany, for instance, different emergency services compete with each other, and a number of for-profit providers are on the market, while Scandinavian countries usually have state-owned providers as an element for the public administration.⁵⁵

While the differences in the current systems of emergency care are quite relevant for research, this chapter will focus on emergency care innovations in order to analyse whether these innovations are diffusing smoothly and rapidly in the emergency system. As these innovations will almost always have a direct impact on the quality of life of patients and frequently on their survival, one would expect that all countries would adopt these innovations alike.

Unfortunately, very little is documented in the literature about the adoption of pre-clinical emergency innovations in the Baltic Sea region. Consequently, we organised a workshop bringing together emergency experts from all Baltic Sea region countries in Greifswald in March 2023. We provided

51 Cf. Oving, I./Masterson, S./Tjelmeland, I. B./Jonsson, M./Semeraro, F./Ringh, M./Truhlar, A./Cimpoesu, D./Folke, F./Beesems, S. G.: First-response treatment after out-of-hospital cardiac arrest: a survey of current practices across 29 countries in Europe, in: *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 27 (2019), pp. 1–20, <https://doi.org/10.1186/s13049-019-0689-0>.

52 Cf. Röper, J./Krohn, M./Fleßa, S./Thies, K.-C.: Costing of helicopter emergency services—a strategic simulation based on the example of a German rural region, in: *Health Economics Review* 10 (2020), pp. 1–15.

53 Cf. Kurola, J./Wangel, M./Uusaro, A./Ruokonen, E.: Paramedic helicopter emergency service in rural Finland—do benefits justify the cost?, in: *Acta anaesthesiologica scandinavica* 46 (2002), No. 7, pp. 779–784.

54 Cf. Jones, A./Donald, M. J./Jansen, J. O.: Evaluation of the provision of helicopter emergency medical services in Europe, in: *Emergency Medicine Journal* 35 (2018), No. 12, pp. 720–725.

55 Cf. World Health Organization. Regional Office for Europe & European Union: Emergency medical services systems in the European Union: report of an assessment project co-ordinated by the World Health Organization, WHO Regional Office for Europe 2008, iris.who.int/handle/10665/107916.

them with innovations in emergency medicine and asked them whether these emergency technologies were

0: not used at all

1: early innovation, not broadly used

2: diffusing innovation, used by many

3: new standard used everywhere and by everybody

In addition, they were given the chance to list additional innovations which were used in their countries. The respective items were taken from the literature and can be seen in Table 2. The majority of innovations seems to be in a rather early stage of development. Merely Finland, Norway, Denmark and Sweden have emergency innovations that have already been adopted to an extent that they have become a new standard. In particular the tele-emergency physician, the electronic prehospital medical record and the mobile stroke unit have been fully established while other countries are not yet familiar with them or have only just begun a few projects.

Table 2: Innovations in Pre-Clinical Emergency Medicine (Source: own).

	Innovation	Germany	Denmark	Poland	Norway	Sweden	Finland	Estonia	Latvia	Lithuania
before emergency treatment	AI for forecasting emergency demand	1	1	1	1	1	0	0	0	0
	AI for recognising cardiac arrest	1	2	1	1	1	0	0	0	0
	Virtual Reality Simulation Training	1	2	1	1	1	1	2	1	0
	First Responder System	2	3	1	2	0	2	2	0	1
during emergency treatment	Tele-Emergency Physician	2	2	1	3	3	3	1	1	1
	Medical Drones	1	1	1	3	0	0	0	0	1
	Electronic Prehospital Medical Record	2	3	1	2	3	3	1	1	0
	Mobile Stroke Unit	1	0	1	3	0	3	1	0	0
additional innovations by countries	Telemonitoring of COPD Patients at home	0	2	0	0	0	0	0	0	0
	Ambulance Data – Mapping Traffic Accidents	0	1	0	0	0	0	0	0	0
	Single IT System for Emergency Ambulances	0	0	0	0	0	0	0	2	0
	Simulation Training Emergency Teams	0	0	0	0	0	0	0	0	2
	Mobile Nurse-Unit	0	0	0	0	0	2	0	0	0
	Drones for search after missing persons	0	0	0	1	0	0	0	0	0
	Pre-Hospital Triage system	0	0	0	2	0	0	0	2	0
	Tele-emergency consultation	0	0	0	3	0	0	0	1	0
	Integrated patient and hospital record	2	0	0	0	0	0	0	1	0
	Digitally Supported QM	2	0	0	0	0	0	0	0	0

Table 3 calculates an EMS-Score for the innovativeness by adding the columns of Table 2. It is obvious that this score is not validated and the results must be interpreted with caution. However, the table shows that the adoption of EMS innovations depends on the wealth of a nation expressed by the GNI p.c. The higher the income per person, the more likely these innovations of emergency will be adopted and become a standard. It seems that the wealth of a nation determines the likelihood of survival in case of emergency. However, all other economic variables do not explain the differences significantly.

From the cultural dimensions, only individualism and indulgence seem to have a significant influence on the adoption of emergency medicine innovations. Individualism (versus collectivism) according to Hofstede describes how much individual behaviour is controlled by the respective group. Entrepreneurs and innovators frequently have to stand alone and fight their innovation to succeed. This might be the reason why a higher score of individualism leads to a better innovation adoption. Indulgence points in a similar direction. It is the degree of freedom which an individual can enjoy to live their own dreams and enjoy life and have fun. The more freedom is granted to entrepreneurs to promote their innovation and the more they can harvest the fruits of this success, the more likely a system will be innovative.

It is noteworthy that the results of Digital Health and Emergency Innovations are not identical. Estonia, for instance, is a ›super star‹ of digital health, but it has not yet translated this championship in the field of emergency medicine. This might be due to the fact that these EMS-innovations are quite resource-intensive. Countries like Estonia may not see it as a priority to invest their comparatively scarce resources in emergency innovations. Beyond the wealth of a nation, it is again likely that there are variables that influence diffusion of the innovation that go beyond the cultural dimensions and traditional economic factors.

Table 3: EMS-Score, economic variables and Hofstede dimensions of national culture.⁵⁶

Country Name		EMS-Score	GNI p. c. PPP (current Int. \$)	GNI, PPP (million current Int. \$)	Population density (people/km ²)	Population, total	Land area (sq. km)	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation	Indulgence
Denmark	17	79,390	472,113	146.4	5,946,952	40,000	18	74	16	23	35	70	
Estonia	7	47,350	64,686	31.1	1,366,188	42,750	40	60	30	80	82	16	
Finland	14	64940	362,669	18.2	5,584,264	303,948	33	75	26	59	63	57	
Germany	15	72,110	6,092,387	238.1	84,482,267	349,390	35	67	66	65	83	40	
Latvia	9	41420	77938	30.3	1,881,750	62,230	44	70	9	63	69	13	
Lithuania	5	50100	143,871	44.7	2,871,897	62,610	42	55	19	65	49	16	
Norway	22	108790	600,502	14.8	5,519,594	364,270	31	81	8	50	55	55	
Poland	8	47,380	1,738,300	123.3	36,685,849	306,100	68	60	64	93	38	29	
Sweden	9	72,990	769,090	25.6	10,536,632	407,284	31	71	5	29	53	78	
Correlation	1	0.89	0.22	0.19	0.14	0.38	-0.57	0.86	-0.11	-0.46	-0.07	0.58	
p-value		0.001	0.57	0.63	0.71	0.31	0.11	0.003	0.77	0.21	0.85	0.099	

Vaccination against SARS-Cov-2

The COVID-19 pandemic affected all countries in the Baltic Sea region, but the governments did not respond in the same way. Hence, the pandemic waves caused a difference in incidence and prevalence as well as mortality due to SARS-Cov-2. Figure 5 shows the excess mortality of the target countries between January 2020 and July 2024 (Sweden does not provide data for 2024). The excess mortality refers to the number of deaths from all causes compared to average over previous years (2015–2019).

⁵⁶ Source: Hofstede Insights: Compare Countries; World Bank: World Development Indicators.

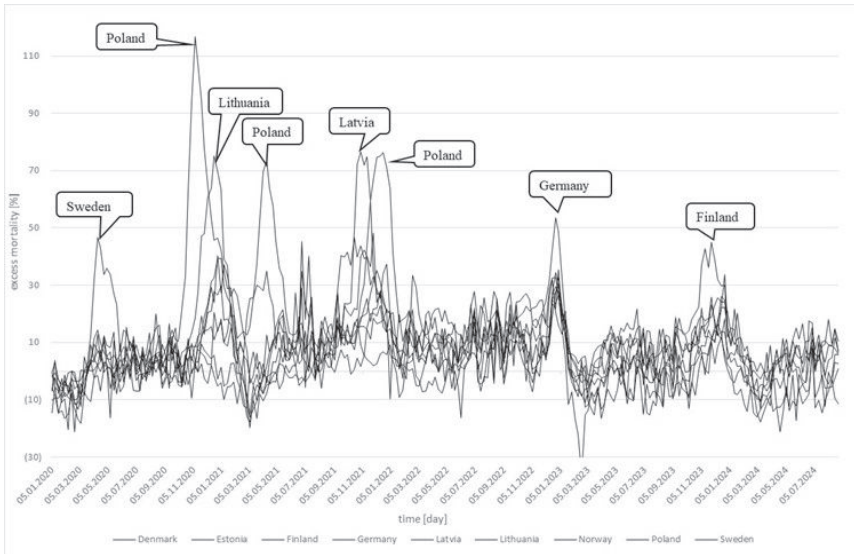


Figure 5: Excess Mortality due to SARS-Cov-2.⁵⁷

Figure 5 shows that all countries had an excess mortality during this period, but some countries had peaks of exceptional mortality in comparison to former years. In the first wave, Sweden attempted a herd immunity strategy and could not protect the elderly resulting in exceptional deaths. In the second wave in winter 2020 and 2021, Poland, Latvia and Lithuania had even higher rates indicating that this wave did not meet adequate public health interventions. Countries that initially performed quite well during the first waves (e.g., Germany and Finland) subsequently relaxed the prevention efforts too early, leading to increased mortality in 2023. Norway and Estonia, on the other hand, maintained a much better situation throughout the period.

⁵⁷ Source: own, based on Our World in Data: Excess Mortality: Deaths from all causes compared to average over previous years, 2024, ourworldindata.org/grapher/excess-mortality-y-p-scores-average-baseline?showSelectionOnlyInTable=1&country=DEU~POL~LTU~LV~A~EST~FIN~SWE~NOR~DNK (16.10.2024).

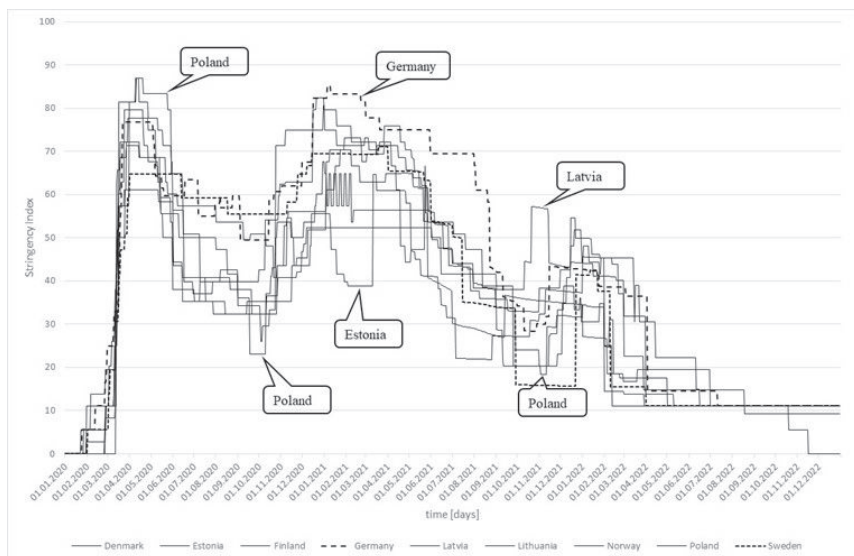


Figure 6: COVID-19 Stringency Index.⁵⁸

Figure 6 shows the Stringency Index which indicates how strictly a government responded to the Corona crisis. It is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans. An index of 0 refers to »no restrictions«, an index of 100 to »all possible restrictions«. It is obvious that the restrictions followed the infection waves, i.e., higher incidences induced higher stringency with a time-gap of one to two months. Countries with a high stringency usually have a lower excess mortality, but several countries that performed quite well during the first or second wave became too lax during the other waves. The rumour that Sweden did not react at all to the Corona threat is untrue, as the maximum stringency index of the countries are rather similar. Sweden had a maximum of 71.13, Latvia of 67.59. Poland reached a maximum of 87.04 during the first wave, Germany of 85.19 (05.01.2021).

One can understand anti-Corona measures as innovation. However, we would like to focus more on the vaccination rates and see vaccinations as the innovation to be adopted. Table 4 and Table 5 exhibit the vaccination

⁵⁸ Source: own, based on Our World in Data: COVID-19: Stringency Index, 2023, ourworldindata.org/explorers/covid?Metric=Stringency+Index&Interval=Daily&Relative+to+population=false (16.10.2024).

rates (vaccine doses administered per 100 inhabitants) at 31.12.2021. This date was selected as vaccines were available on the European market in sufficient quantity, i.e., differences are likely to be the consequence of different adoption rates of the vaccine innovation.

Table 4: Vaccination Rates.⁵⁹

Country Name	Vaccination Rate
Denmark	201.3
Estonia	133.6
Finland	171.4
Germany	182.5
Latvia	135.5
Lithuania	145.8
Norway	179.1
Poland	122.3
Sweden	168.0

Table 5: Determinants of Vaccination Rate (Source: own).

Country Name	GNI p.c. PPP (current int. \$)	GNI. PPP (million current int.\$)	Population density (people/km ²)	Population. total	Land area (sq. km)	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation	Indulgence
Correlation	0.79	0.26	0.32	0.15	0.24	-0.87	0.68	-0.21	-0.80	-0.12	0.78
p-value	0.01	0.49	0.40	0.69	0.21	0.002	0.04	0.58	0.01	0.75	0.01

It is obvious that wealthier countries have a higher vaccination rate (cf. Table 5). This is surprising as it was the goal of the European Union that national wealth would not determine the armamentarium against Covid. No other traditional economic variables have an influence on the vaccination rates. Instead, four cultural values determine the rate. The higher the power dis-

59 Source: Mathieu, E./Ritchie, H./Rodés-Guirao, L./Appel, C./Gavrilov, D./Giattino, C./Hasell, J./Macdonald, B./Dattani, S./Beltekian, D./Ortiz-Ospina, E./Rosier, M.: Coronavirus (COVID-19) Vaccinations, 2024, ourworldindata.org/covid-vaccinations (16.10.2024).

tance, the lower is the vaccination rate. One would expect that a high-power distance would result in obedience to the government and thus a higher vaccination rate, but the opposite is true. Among the countries in the Baltic Sea region, in those where higher organisational or political levels commit to working with and persuading the levels below them, the vaccination rate is higher. In addition, individualism determines the vaccination rate. The higher the individualism, the more people will be vaccinated. Furthermore, uncertainty avoidance determines the rate. If people are afraid of the risk of the vaccination and try to avoid this uncertainty, they are less likely to accept the vaccination innovation. Estonia and Poland in particular have very high uncertainty avoidance and rather poor vaccination rates. Finally, indulgence is positively correlated. Denmark is a country where enjoyment and pleasure are embraced, and it has a high vaccination rate.

Even though more factors correlate significantly with the introduction of innovation than in digital health and emergency medicine it is still difficult to explain the innovation process solely on the basis of these economic and cultural parameters. It seems that there is at least one other factor that affects the adoption process. This underlying other factor might be the existence of certain champions of the adoption process—individuals, groups of people or institutions which are pioneers of change or change agencies.

Pioneers of Change and Change Agencies

It is feasible that random events can have a major impact on the innovation adoption. In particular, the ›early adopters‹ may be countries in which the right person occupies the right position at the right time, whereas the laggards may be those in which the wrong person holds the wrong position at the wrong time. The pioneering position of Estonia in the field of digitalisation might be an example for the role of these change agents.

Back in the early 1990s, the then Prime Minister Mart Laar (1992–1994, 1999–2002) coined the slogan ›E-Estonia—the coolest digital society‹, which was subsequently adopted by all his successors. Estonia was already working digitally in many areas of administration before the turn of the millennium and became a role model for other governments and countries. The health-care sector consistently followed from 2004 at the latest.

Figure 7 shows important milestones in the development of this pioneering country.⁶⁰ As early as 2004, the government took the lead by formulating a vision, guidelines and an implementation plan, which was supported by the establishment of an ›Estonian e-health foundation‹. Important digital health instruments (e-prescription, digital health record, communication systems, national patient portal) were implemented consistently and with clear political leadership. Today, almost all citizens have access to digital patient records, e-prescriptions and individualised digital services.

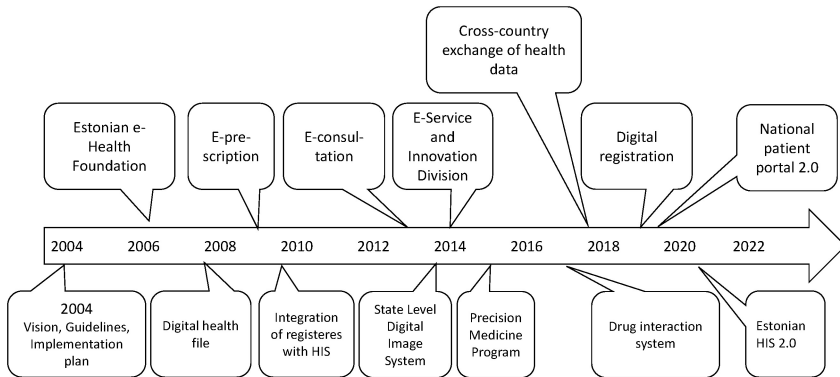


Figure 7: Development of Digital Health in Estonia.⁶¹

In early 2007, Estonia experienced a crisis that did not lead to suspicion of digitalisation, but rather increased efforts.⁶² Following digital attacks on government, parliamentary, media and banking websites (cyberterrorism),

60 Cf. Bittroff, M./Mittelstaedt, G. von: Digitalisierung im Gesundheitswesen: Was wir von Estland lernen können, in: kma—Klinik Management aktuell 24 (2019), No. 9, pp. 54f.; Georgiev, A. A./Shtereva-Tzouni, D.: Development of e-Health in Austria, Bulgaria, Croatia, Estonia and Slovakia, in: Archives of Business Review 8 (2020), No. 4, pp. 155–162, <https://doi.org/10.14738/abr.84.8114>.

61 Source: Thiel, R./Deimel, L./Schmidtman, D./Piesche, K./Hüsing, T./Rennoch, J./Stroetmann, V./Stroetmann, K.: #SmartHealthSystems. Digitalisierungsstrategien im internationalen Vergleich, Bertelsmann Stiftung 2018; Bittroff/Mittelstaedt: Digitalisierung im Gesundheitswesen.

62 Cf. Metsallik, J./Ross, P./Draheim, D./Piho, G.: Ten years of the e-health system in Estonia, CEUR Workshop Proceedings, 2018.

vulnerabilities in the system at the time were analysed in detail and countermeasures were taken. Digital security was even declared a dimension of national defence. It became particularly important that data management was consistently switched to block chain so that data could be better protected.⁶³ Overall, the population's trust in e-Estonia and digital health even increased.⁶⁴ This means that Estonia not only introduced digital health innovations much earlier than other countries, but also achieved a higher level of penetration, with the electronic patient record (EPR) playing a major role. As we have shown in the previous section, Estonia is a small country with a low population density and comparable low national income per capita, but it has the highest Bertelsmann DHI. It has rather high values of power distance and uncertainty avoidance, but otherwise the traditional variables do not detect anything exceptional. It is likely that the right people took the initiative at the right time, developed momentum and made digitalisation ›their baby‹. Thus, the transformation process might depend on these champions who pioneer the innovation adoption. One reason why Germany is a laggard in the field of digital health is that no politician or other opinion leader has ever championed it. The introduction of digital health in Germany is a technocratic process, rather than a matter of personal commitment. As these champions are not available everywhere at the same time, the result is a fragmented transformation process.

However, the existence of champions is insufficient to explain why innovations are adopted earlier in some systems. Firstly, these champions must be given the right to make decisions and influence the entire system, i.e., we need not only expert, but also power promoters in strong institutions. Thus, we require not only change agents, but change agencies. The controversial approach of the Corona policy in Sweden with strong resistance against lockdowns, travel restrictions and face masks for general use is an example.

It was the powerful and rather independent position of the Public Health Agency of Sweden that allowed Nils Anders Tegnell as the state epidemiologist

63 Cf. Aaviksoo, A.: Building blockchain powered trusted digital health services. Estonia, in: *Telehealth and Medicine Today* 5 (2020), No. 1, <https://telehealthandmedicinetoday.com/index.php/journal/article/view/167/219>.

64 Cf. Białczyk, A./Leśniak, G./Nadolny, F./Mrowiec, J./Otałęga, A.: Exploring digital health horizons: a narrative review of e-health innovations in Poland, Spain, Romania and Estonia, in: *Prospects in Pharmaceutical Sciences* 22 (2024), No. 1, pp. 32–37.

to influence the country politics to an extraordinary extent.⁶⁵ The idea of achieving a herd immunity as soon as possible by a strong wave of infections instead of flattening the curve (as most other countries did) was not unique in Sweden. Other scientists and politicians had the same intention (e.g., in Great Britain), but they did not have the power which Tegnell had. Therefore, the role and power of institutions and authorities within a country determine the speed and consistency with which innovations are adopted—for better or for worse.

Secondly, fragmentation will be strong in a situation where the diffusion of an innovation strongly depends on the willingness of the government to permit and finance it. Private innovations (e.g., mobile phone technology) do not depend on national regulation or borders, while healthcare innovations are financed publicly and are subject to many laws. Consequently, the government influence is much higher and the likelihood of fragmented transformation as well.

Thirdly, fragmentation cannot only appear between countries, but also within a country. Federalism has many advantages, but it might also lead to a situation where an innovation is adopted by one state and rejected, delayed or reduced in another state of the same country. German federalism, for instance, might be one reason why some innovations which are readily adopted in one state do not find promoters in another state. The well-known phenomenon of »Not invented here« can reduce the inclination of adopting a well-functional system from another federal state, such as the tele-medicine physician.⁶⁶

In summary, we can conclude that transformation processes depend on economic, cultural and personal characteristics. An analysis that concentrates on economic or cultural values alone might be insufficient to explain the fragmentation in the adoption and transformation processes. Instead, we should emphasise the role of pioneers of change and change agencies as the core of the adoption model. These promoters have grossly been neglected in the field of healthcare innovations. Incorporating them stronger into the theory of dynamic innovation systems might open the floor for fruitful future research.

65 Cf. Jonung, L.: The Constitutional Basis for Sweden's Exceptional Covid-19 Policy, 2020, https://www.martenscentre.eu/wp-content/uploads/2020/09/sweden_final_tl_edit_0.pdf (16.10.2024).

66 Cf. Antons, D.: Das »Not-Invented-Here-Syndrom« in der Forschung und Entwicklung: eine Untersuchung aus Sicht von Innovationsmanagement und Sozialpsychologie, Hamburg 2013.

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