

# The Challenge of the Installed Base in Creating a National E-Health Infrastructure

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## Abstract

In this study, we look at how the installed base affects the process of developing a national eHealth infrastructure. National eHealth solutions enable patients to get access to information and services while also allowing for more efficient and cost-effective care delivery. We trace the design of services between people and their GPs in the context of the Norwegian eHealth site, based on a two-year case study. Our research is based on the installed base idea from Information Infrastructure studies, which allows us to focus on the link between needs, capabilities, and technological components already in place. In particular, we adopt a relational approach to the installed base and examine three key decisions that shape the infrastructure's design.

## Perspective

Healthcare more accessible to people by enabling more efficient and cost-effective ways of delivering treatment. However, a recent European research on eHealth indicated that the problems of achieving national consensus on eHealth policies, implementing them, and completing the accompanying management and organisational duties have been greatly underestimated. All industrialised countries' healthcare systems face the issue of enhancing the quality, efficiency, and safety of patient treatment. To solve this problem, health care is shifting away from organization-centered treatment and toward process-based care. This trend toward person-centered structures in health care will continue in the future. This system change is paired with enhanced communication and cooperation, which is supported and facilitated by suitable Information and Communication Technologies (ICT), also referred to as e-health. The resulting solutions must be reliable. Inter-organizational information systems, notably e-prescription and governmental patient-oriented eHealth platforms, are the focus of the empirical instances. These systems cut across organisational boundaries and include both local and shared system components. Different approaches of conceptualising such linked networks of systems exist. Concepts like "system-of-systems" (Maier 1998), "ultra-large scale systems" and "coalitions of systems" are used in software engineering to highlight the unique qualities and problems that such systems provide.

These linked, dispersed groups of systems are referred to as "information infrastructures" by us. This viewpoint comes from a distinct, multidisciplinary background. It is derived from Information Systems, Science, Technology, and Society, and Innovation studies, all of which are disciplinary fields with a dual focus on technology and human/societal factors. This broad perspective is presented in the next section. We then focus on one of the information's primary concepts. The focus of this study is on one of the services, eDialogue. The eDialogue project is the first to build unique eHealth services in the framework of the national portal since its introduction, which is why we chose it. This meant that the project was included in the decision-making process not only for the implementation of

the conversation services, but also for the architectural design of the national eHealth portal. Three significant architectural considerations are discussed in our examination. These choices reveal the effort of building an infrastructure in terms of how current technologies are chosen and configured, as well as how new requirements are recognised. Our findings provide light on the sociotechnical challenges that come with establishing a national eHealth infrastructure.

## Information Infrastructure Study and 'Installed Base'

The dynamics of large-scale systems are studied in information infrastructure research. The study on how the internet has evolved into a worldwide infrastructure is an excellent example of this type of research. Others have addressed the issues that business infrastructures face. IIs are often made up of a diverse set of technologies, components, protocols, and applications that are used to serve a variety of application domains and uses through time and over geographical distances. Because of this complication, regulating an II's slow evolution is better regarded as a cultivation rather than a control act. The established basis on which IIs are developed is a key idea to grasping the evolution of II. An installed base, the current "set of ICT capabilities and associated users, operations, and design communities," but it also includes existing institutional and organisational components. The conflict between the fact that IIs are difficult to modify and the fact that they are continually changing, often known as the tension between innovation and conservation, has been conceptualised by II research. As a result, an installed base is considered to enable as well as limit infrastructure evolution. An established basis, says Lanzara, "may be a resource for creative design and innovation or a trap from which it is impossible to escape". Hanseth and Aanestad, for example, explore 'bootstrapping' as a technique for accelerating the expansion of the installed base of networked technology users. In this situation, the infrastructure's installed base of users has enabled it to develop by drawing more and more consumers. Other researchers, on the other hand, talk about the irreversibility of the installed base, such as when standards expand and disperse. In this work, we use a relational approach to the installed base in order to better understand why certain architectural decisions are made throughout the infrastructure design phase. A relational perspective is founded on practice theory, and it emphasizes the sense-making processes that users and stakeholders utilize to enjoy technology. Star, for example, considers infrastructures relational since they have various meanings for different individuals, i.e., they only acquire specific attributes in connection to structured actions. Similarly, determining the installed base is an empirical matter that is contingent on the circumstances of each instance and the actors' sense-making abilities. The decisions made to build components in the basic architecture of a national infrastructure are the topic of this article.

Existing, or defined advanced solutions are presented and contrasted after briefly introducing meanwhile widely recognised architectural paradigms for applications, mechanisms, and infrastructures offering security services. In this regard, the Electronic Health Record has been given special consideration as an e-health core application. The security services required are summarised and rated based on published work as well as investigated options. The advantages and disadvantages of the researched cases are gathered and analysed. In that regard, the German health telematics framework architecture and security infrastructure, as well as the associated implementable solutions, have been extensively reviewed, as has the US Veterans Health Administration's approach to security.