

# Infrastructural expansion under time pressure: an empirical case

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**Abstract.** This paper presents an empirical study of the on-going expansion of the Greek healthcare information infrastructure. Specifically, we investigate the introduction of three new web-based applications that facilitate healthcare provider – national administration coordination. The new applications were introduced to the everyday work of thousands of practitioners in “crude” format and are being continuously shaped, reconfigured and extended while in use. We explore the effect of this strategy for the swift design and deployment of new components in complex pre-existing infrastructural arrangements.

## Introduction

Information infrastructures are “shared, open, heterogeneous and evolving” (Hanseth & Lyytinen, 2010). They contain technological components that are in most cases relatively rigid particles nested within relatively supple conventions for action (practices, routines). Building such components necessitates deciding and forming novel affordances and constraints for action that are technologically possible, serve specific purposes and also have some level of congruence with existing infrastructural arrangements. As existing healthcare information infrastructures are particularly complex arrangements, the “proper way” to proceed with infrastructural extensions of global impact has been proposed to be through the engaged participation of diverse groups in “a forum where multiple perspectives are considered and where the timeless tensions between local and general, between short term and long term are addressed” (Bowker et al., 2010).

When there is no immediate ambition for global impact, extensions from the periphery via cultivation strategies of “local interference and support” (Ciborra et al., 2000) have been identified and suggested in the literature (Aanestad & Jensen, 2011; Hanseth & Lundberg, 2001; Oliver, 1997). In the cases that we study in this paper, none of the two strategies has been followed. Instead, a strategy of “global interference” with initial makeshift solutions is being attempted. The cases under study (applications for e-prescribing, e-referring and e-reimbursing) are new components of the overall Greek healthcare information infrastructure: they are embedded in an intricate web of technologies, practices, routines, to which they relate in specific ways and in specific situations of use (Star, 1999). These new components have been introduced to use in “crude” formats and are being continuously shaped, reconfigured and extended while in use. Part of the strategy is to leverage web technologies that are easily reconfigured in order to resolve mismatches with work practices after they are experienced. This “rushed” information technology implementation is driven by the expectation to reap financial benefits to address the Greek economy’s public debt crisis.<sup>1</sup>

## Cases Overview

Healthcare delivery in Greece is based on both public and private providers (mainly in primary care, diagnostic technologies and pharmaceuticals) and healthcare services are paid by social insurance funds (although the government also contributes by subsidizing public healthcare services and patients also pay directly out-of-pocket). Key health indexes for the Greek population are good and aggregate public spending is moderate compared to the EU and OECD averages, but despite its overall good standing, there exist significant pockets of inefficiency that fuel the expectations for cost savings especially related to pharmaceutical expenditure and diagnostic tests.<sup>2</sup> Aiming to enhance control, the Greek government decided to implement a version of the “information panopticon”, rendering key actions of healthcare providers visible, expecting that this new visibility will warrant appropriate conduct or what is termed as “anticipatory conformity” (Zuboff 1988). Table I summarises key information.

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<sup>1</sup> The Greek government agreed with the International Monetary Fund (IMF) and European Institutions to pursue cost reduction by accelerating healthcare reforms and introducing new electronic tools (e.g. e-prescription was part of the “Memorandum of Economic and Financial Policies” with the IMF).

<sup>2</sup> Greece ranks above average in most health status indexes including life expectancy and healthy life years, infant mortality, and adults’ self-reported health status, while total public health spending (as a share of GDP and in terms of Purchasing Power Parity) is below average (OECD, 2012). Although the Greek system is overall effective, there are significant opportunities for efficiency improvement evidenced by some peculiar statistics (OECD, 2011, 2012): Greece has the highest penetration of new medical diagnostic technologies (about twice the EU average), the highest antibiotics consumption (39 daily doses per thousand population per day, practically double the EU average of 20) and, the highest expenditure on pharmaceuticals per capita and as a GDP share (about 40% more than the EU average).

	<b>Introduced by</b>	<b>Status</b>	<b>Users</b>	<b>Functionality</b>
e-prescribing	Greek e-Government Centre for Social Security  Launched in January 2011	Pilot status, but, obligatory use for all users Tender process under way for the fully fledged permanent solution.	<ul style="list-style-type: none"> <li>• General practitioners and specialist doctors in primary care and hospitals in private and public sector</li> <li>• Pharmacists</li> <li>• Funds' administrators</li> </ul>	Circulation of pharmaceuticals' prescription information between doctors, pharmacies and reimbursing funds
e-reimbursing	One specific social insurance fund (IKA) <sup>3</sup>  Launched in September 2011	Continuous launching of new versions (currently in version 3.5), obligatory use major extensions to functionality underway	<ul style="list-style-type: none"> <li>• Private healthcare providers (including microbiologists, radiologists, rehabilitation and physiotherapy centres)</li> <li>• Fund administrators</li> </ul>	Capture and transfer information on performed tests and treatments from private healthcare providers to reimbursing fund
e-referring	Greek e-Government Centre for Social Security  Launched in February 2012	Pilot status, but, obligatory use for all users Gradually merged with e-prescribing	<ul style="list-style-type: none"> <li>• General practitioners and specialist doctors in primary care and hospitals in private and public sector</li> <li>• Funds' administrators</li> </ul>	Capture and transfer information on ordered tests and treatments from healthcare providers to reimbursing funds

We have conducted an empirical study to investigate the impact of the new applications to everyday work of healthcare practitioners (doctors and pharmacists) that included observations, semi-structured interviews and review of available documentation. We have reported on healthcare practitioners' coping strategies elsewhere (Vassilakopoulou et al., 2012a, 2012b). During the study we identified that all three applications are fluid. Numerous usability, security and interoperability issues are continuously being addressed since their introduction and none of the three is stabilised yet. Key issues that remain to be resolved are related to: a) the complexity of medical practices e.g.: normalization of drugs dosage and summaries of medical diagnoses are still open issues, b) the gaps in the underlying pre-existing infrastructural arrangement e.g.: there are significant problems posed by the lack of a single personal identifier for all Greek residents up till recently (the obligatory social security number was only introduced in October 2009) and the lack of a secure network (the secure network "Syzefxis" that will connect all public healthcare is still under development and has only achieved partial coverage) and c) early architectural decisions (e.g. data are not exchanged between e-referring and e-reimbursing). Nevertheless, all three web applications are currently used by thousands of users, are perceived as a major success by the national administration and measurable cost reductions have been attributed to them.

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<sup>3</sup> Up till, recently, 35 different funds (for compulsory insurance) covered 97% of the Greek population, IKA specifically, covered about 45% of the population. The funds are currently in a process of consolidation: on March 2011, the funds covering farmers, freelance non-professional workers and public servants were merged with IKA and together formed a new fund (EOPYY) which is gradually absorbing the other funds and is currently the "owner" of e-reimbursing.

## Discussion

The cases reported here present infrastructural expansion achieved by introducing crude technological solutions to practice that are subsequently subject to a continuous reconfiguration process to address issues identified in use. This continuous reconfiguration is not unproblematic: trust to the new technological solutions is undermined by continuous alterations and learning processes are challenged as users have to come to terms with a fluid functionality. Comparing the approach adopted to the design rules for dynamic complexity proposed by Hanseth and Lyytinen (Hanseth & Lyytinen, 2010) can inform the analysis of pragmatic merits and problems ensued. Furthermore, these specific cases can be further analysed to identify possible generative mechanisms for their evolution. It is possible that the key mechanisms at play here are quite different to the ones identified by Henfridsson and Bygstad (innovation, adoption, scaling (Henfridsson & Bygstad, 2013)) and relate more to fitting, dependencies' building and entrenching.

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