# Seeing EMR Emergence through a Practice Lens: Implications for Smaller Healthcare Practices

*Completed Research Paper*

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## ABSTRACT

The development of national healthcare information infrastructures, specifically of shared electronic medical records, has received considerable attention by academics and practitioners for some time now. In reviewing information infrastructure development cases, a project management lens is typically applied which evaluates such cases in terms of success and failure and derives prescriptive conclusions accordingly. In this paper, we propose practice theory as an alternative lens and ask: How does evolution and design of information infrastructures look differently when the unit of analysis is broadened in both the scale and scope dimension? We apply this lens to interpret the cases of healthcare information infrastructure development in Finland and England and find that significantly different new action possibilities arise when seen from a practice theory perspective. We conclude that these possibilities are especially promising in the quest to involve smaller healthcare practices in the development of shared electronic medical record systems.

## Keywords

Information infrastructures, practice theory, evolution, healthcare IT, inter-organizational information systems

## INTRODUCTION

In a recent review of the results of an earlier study by the RAND Corporation (Hillestad *et al.*, 2005), Kellermann and Jones (2013) have argued that the failure to achieve the massive savings targets envisioned by Hillestad et al. for the healthcare sector through promoting the use of IT can be explained by deficiencies in four areas: lack of interoperability between systems storing medical records, slow uptake of IT, especially by smaller healthcare organizations, lack of ease of use of healthcare software, and failure to change work processes in provider organizations accordingly. This diagnosis seems to suggest straightforward remedies: improve interoperability, degree of IT diffusion, especially among smaller healthcare practices, ease of use of healthcare software, and change work processes accordingly. All these objectives are, in principle, attainable by policy makers, e.g. by providing incentives to increase adoption of healthcare IT which is certified to be interoperable and easy to use. Changing work practices may require more indirect measures such as changing the way healthcare providers are paid for their services which rewards efficiency over quantity of services delivered.

While we do not disagree with the analysis offered by Kellermann and Jones, we argue that they adopt a narrow materialistic perspective, by focusing on financial incentives and technical designs, which brackets crucial aspects of information infrastructure development. Moreover, we argue that such bracketing is typical for traditional IT project management and design approaches in general. One result of adopting this narrow focus is that outcomes of IT projects are evaluated in a similarly narrow manner which closes off the possibility that IT projects evolve in unexpected ways that may yield real benefits if seen from a different perspective. One finding from the study of inter-organizational information systems is that these systems persist over very long time spans and evolve in ways which may even contradict early visions (Reimers *et al.*, 2013a). Jackson and colleagues (Jackson *et al.*, 2007) have argued that, in order to more accurately evaluate the action possibilities and constraints offered up by emerging information infrastructures, a historical perspective is mandatory which takes into account the undesigned-for uses that locally bound projects encounter as scale and reach of a prospective information infrastructure increase. Consequently, there is a need to better understand the action possibilities and constraints

of actors involved in emerging information infrastructures that unfold over periods of time that significantly exceed the scale and time horizon of particular projects. To this end, we re-interpret two cases of information infrastructure development initiatives in healthcare, one generally perceived as a success story while the other is generally seen to have failed, by extending the scale and time dimension over which their development is analyzed. We will argue that attributions of success and failure, while valid from a narrow project management perspective, obscure broader patterns in information infrastructure emergence. These broader patterns offer distinct action possibilities and constraints that are hidden when information infrastructure development is seen from a project management and system design perspective which focuses on material aspects of infrastructure development processes assessed by concepts of success and failure. Our research question thus is: How does evolution and design of information infrastructure look differently when the unit of analysis is broadened in both the scale and time dimension?

To support such analysis theoretically, we choose a practice lens for our re-interpretation. Practice theory is especially suited to the analysis of system evolution over long time periods for two reasons. On the one hand, its basic unit of analysis, practices, has a much longer potential existence than other possible units such as projects, organizations, initiatives, or actor constellations. On the other hand, a practice lens suggests to define information infrastructures as constellations of practices rather than as technical structures to which social aspects such as human agency and institutions have to be added post hoc. We show that, against a practice theoretical background, the evaluation of the two cases, set in Finland and England, becomes much less clear than is typically portrayed. In both cases the information infrastructure continued to evolve beyond initial time schedules and project objectives. Moreover, the evolution of these systems can only be understood when, in addition to considering the material dimension, one also pays attention to how beliefs regarding the effects of IT and norms about its proper use evolve. By adopting a practice lens, we: (1) broaden the unit of analysis to include these dimensions, which we call the ideational and the normative dimensions, in addition to the material aspect of information infrastructure; and (2) open the time horizon by studying the development process beyond the duration of individual projects. These moves allow us to reveal new action possibilities for 'gestalting' information infrastructures: we treat ideational and normative structures as integral components of information infrastructure in addition to its material manifestations; and we allow evolution to occur in all three dimensions. We conclude that, by doing so, the chances of including and involving smaller healthcare practices in the development of healthcare information infrastructures can be significantly increased.

## THEORETICAL FRAMEWORK

Practice theory is increasingly used in the information systems field as well in general organization theory (Nicolini, 2013). As described by Nicoloni (ibid.), there is a plurality of approaches that share significant common ground while there are also considerable differences between them. Our particular lens is derived from the works of Lave and Wenger (Lave and Wenger, 1991; Wenger, 2002) and Reckwitz (2002). We have developed our approach more fully elsewhere (Reimers *et al.*, 2010; Reimers *et al.*, 2012) and summarize it here only to the extent that is necessary to support our interpretation of the two selected cases.

The fundamental change of perspective that practice theory implies results from a novel unit of analysis that it proposes: practices. Practices are not seen as resulting from individual action through a process of aggregation but, in contrast, as being primordially social phenomena which make individual action possible. This means that practices do not have to, nor can they, be analyzed into constitutive instances of individual action as the fundamental unit of analysis but are themselves already the basic unit of analysis. Individuals are enrolled into practices through a process of social learning. In this process, individuals come to understand what it means to be a competent member of the practice and acquire the skills that allow them to act competently. These skills do not consist of knowledge of action rules. Rather, rules are only seen as didactical devices that will ultimately become obsolete when the skill is acquired (Dreyfus and Dreyfus, 2005). Knowledge and skills are thus passed on from competent members to novice members and reproduced in everyday practice. In these processes of reproduction and learning, knowledge and skills are not only maintained but also and simultaneously changed.

Practices potentially have a long duration, exceeding that of other forms of social organization such as firms, government agencies, or other hierarchically structured organizations. In contrast to formal organizations, they also do not have clearly delimited boundaries. This is due to the possibility of being peripherally enrolled into a practice. One can, for example, be a doctor but also work occasionally in administration, thus becoming peripherally enrolled in the practice of hospital administration. This allows for practices to overlap or, rather, to segue into one another. Practices are also nested. One can be a healthcare professional and as such share certain normative orientations and argumentative skills with other healthcare professionals. Within that broader practice, one is typically enrolled into more specialized practices such as those of a GP, a pharmacist, or a nurse. Likewise, practices may vary across regions. For example, while pharmacists in China and Australia may share broad normative orientations, they are likely to display significant difference with regard to, for example, the understanding of their role in the whole medication process.

Practices may be analyzed into durable (structural) and ephemeral aspects for didactical or analytical purposes. The structural aspect refers to rules and explicit knowledge that a competent practitioner may formulate in order to instruct a novice or that may be solicited in an interview situation. The ephemeral aspect refers to empirically noticeable patterns of behaviour which a novice may use to infer underlying rules or which she may try to imitate. For analytical purposes the structural aspect of practices may be further divided in various ways, dictated by the analytical purpose. In our studies, we found it helpful to distinguish three dimensions which we call material, normative, and ideational. The material dimension refers to constraints and affordances experienced bodily. This includes, among others, technical devices, architectural arrangements, as well as material incentives such as money. While material structures are experienced bodily, they still require bodily skills to be effective, for example in the case of handling a technical tool. Normative structures refer to the 'moral sense' which informs about right and wrong ways to respond to a situation. Normative structures are also learned and are usually not considered in the IS field. Finally, ideational structures refer to beliefs about relevant causal relationships. They help people to rationalize their actions, if asked to, and orient them when their bodily skills do not suggest an 'automatic' response to a given situation. Through this conceptualization, we treat technology *as* a social structure exactly like norms and ideas are viewed as social structures. This is in contrast to the socio-technical approach which views systems as consisting of social *and* technical elements. Our treatment of technology is very similar to the concept of sociomateriality (Orlikowski and Scott, 2008) who suggest that technology is inseparably implicated in social practice.

An important implication of adopting a practice lens is that these structures are always seen as evolving. More precisely, practice theory always urges the analyst to keep in mind that the concept of structure is only applicable as a methodological tool which requires that a practice is momentarily frozen, for example through recording and transcribing an interview. The way that practices are reproduced and novices are enrolled into practices makes it likely that significant elements of a practice are transported over time with only few changes. However, change is always possible and can happen with various degrees of magnitude. Consequently, practice theory calls for attention to the way that practices change over time. Based on our model, we will pay special attention to how evolution has occurred across the three dimensions described above. Specifically, we will attempt to record traces of material, normative, and ideational structures as they change and persist over time. In contrast to other accounts, e.g. those based on the concept of path dependency, we treat structures in all three dimensions as malleable. Moreover, our three dimensions are only deployed as analytical devices which, to a practitioner, are experienced holistically. Finally, practice theory treats structures and their changes only as methodological devices to empirically trace evolving practices which, in their day-to-day reproduction, normally do not reify structures.

## METHOD

To explore our research question -- How does evolution and design of information infrastructure look differently when the unit of analysis is broadened in both the scale and time dimension? -- we recount the development of the national information infrastructure for electronic medical records (EMR) in Finland and England. EMR (we use the term synonymously with the term electronic patient records, EPR) are essential components of a nation's healthcare information infrastructure.

To construct our case narratives, we draw on both primary and secondary data as described in Table 1. Primary data for the Finish case have been collected through interviews in 2010 and 2012. Secondary data were collected by one of the authors during his half year sabbatical in England. During this time, he has also personally experienced the English healthcare system which provided helpful in contextualizing and interpreting the published data.

In our narrative, we draw on all these resources. To facilitate a smooth reading flow, we do not reference them again except in cases where potentially contested claims are made, for example in the evaluation of project outcomes.

| Case | Type of data | Data source |
|---|---|---|
| Finland | Interview data, recorded and transcribed | About 56 interviews with the Ministry of Social Affairs and Health, the National Institute for Health and Welfare, the national insurance company of Finland, pilot programme coordinators, manufacturers, wholesalers, service companies, software developers, the pharmacies' association, the pharmaceutical industry association, physicians in secondary and primary health care, managers of hospitals and primary health centres, hospital district deputies, pharmacists, and external observers |
| | Published academic articles | Korpela, 1998; Niskanen, 2002; Reponen, 2004; Häyrinen and Saranto, 2005; Hyppönen et al., 2005; Ruotsalainen et al., 2007; Harno et al., 2008; Harno et al., 2009; Hämäläinen et al., 2009, Doupi et al., 2010 |

| Case | Type of data | Data source |
|------|--------------|-------------|
| England | Governmental reports | Major Projects Authority, 2011; Department of Health et al., 2011; Department of Health, 2012 |
| | Websites | www.pifonline.org.uk (Patient Information Forum), www.patient.co.uk, www.patientsknowbest.com |
| | Published academic articles | Currie and Guah, 2007; Hibberd et al., 2012; Currie, 2012 |
| | Articles from newspapers and specialized news services | Health Service Journal, Guardian, Daily Mail |

**Table 1: Data sources for our two case narratives**

## TWO STORIES OF HEALTHCARE INFORMATION INFRASTRUCTURE EVOLUTION

### Finland: Gradual materialization of an early vision

The evolution of electronic medical records in Finland was shaped, on the one hand, by relentless government action and, on the other hand, by continuous local experimentation. It can be characterized as a steady move towards ever more centralized technical and administrative structures while their complexity, as seen from a user perspective, grew simultaneously.

Government action took on two main forms. On the one hand, the administrative structure of the healthcare system was repeatedly changed, always in the direction of more consolidation and centralization. On the other hand, government initiated subsequent rounds of national e-health programmes aimed at creating an integrated national information infrastructure with electronic patient records at its core. These programmes involved research-oriented activities, including numerous pilot projects, as well as the passing of dedicated laws to underpin and harden government intentions.

The first administrative reform within this period took place in the early 1970s when so-called primary health centres for delivering primary care were established through legislation. Trough this act, the provisioning of primary care services became the responsibility of municipalities. In 1989, again through legal act, that responsibility was extended to also provide specialized, i.e. secondary and tertiary healthcare service. For this purpose, hospital districts were defined which were governed jointly by several municipalities. Both municipalities and hospital districts were further merged to consolidate primary health centres and administrative structures.

Along with such administrative integration and consolidation patient data systems were created and regionally integrated. When primary health centres were established, some began to build integrated systems for primary care, including medical records, partly based on software developed in the US at MIT. These efforts responded to an increasing need for administrative information for political decision making following the administrative reform but were also aimed at supporting medical decision making and easier handling of patient data. Throughout the 1980s, such systems were increasingly adapted and used by primary health centres. Also, interfaces were built to exchange patient data with hospitals which were generally lagging primary health centres with respect to computerization due to their more complex administrative structures and broader scope. When municipalities were assigned responsibility for providing secondary healthcare services, a first network was established to support referral of patients between the primary and the secondary care sectors. In addition, work commenced to define common data elements and codes to facilitate the exchange of patient data between the primary and the secondary care sectors. When hospital districts were consolidated through merger, for example in the Helsinki area, the EPR systems existing in the primary, secondary, and tertiary sectors were linked through a regional gateway system so that health professionals could access patient data that existed in their district while a centralized system storing patient data was not yet envisaged. Such regional networks were also increasingly established in other regions so that 20 of the 21 hospital districts had access to such data exchange systems in 2005.

While these efforts at regional consolidation were driven in a bottom-up fashion but took place in a context of increasing administrative consolidation, government also intervened directly in shaping the national information infrastructure. The first such action came as a national strategy to implement IT in the healthcare sector, published in 1996, which was updated two years later to call for the use of electronic patient records in all areas of healthcare and measures to ensure their

interoperability, i.e. ability to be shared and exchanged. Similar to the bottom-up consolidation process described above, implementation of this plan set out by establishing regional information networks that would integrate the primary and secondary healthcare sectors through a gateway through which patient records held locally in other institutions could be accessed by healthcare professionals. While the implementation of regional networks, pursued through a number of pilot projects, was largely successful, the intended increase in interoperability of patient records was not achieved (Häyrinen and Saranto, 2005). A renewed effort was undertaken in 2002 when government announced a plan to establish a nationally standardized EPR system by 2007. To this end, a core set of semantic and syntactic standards was to be defined and a national server installed through which common codes would be made available for integration in local EPR systems. This initiative was underpinned by corresponding legislation and extensive funding. A further initiative, announced in 2007, then called for establishing a nationally centralized database holding summary patient records until 2011. While healthcare providers would still maintain local EPRs, copies of these would be routed, through the regional networks, to be stored in that national system, viewed as an archive. These copies would have to adhere to the previously defined syntactic and semantic standards. Again supported through a series of legal acts and extensive funding, that system was implemented but its completion has been postponed to 2014/15. At the beginning of 2012, records held in the central database were not standardized as envisioned, supposedly due to unclear legal specifications, so that data about patients were actually spread across multiple records, one for each provider organization and time of treatment. Health workers had thus to use a search function to put together all available patient data for a given patient.

### England: Punctuation of material manifestation

The healthcare system of the UK is centrally structured in each of its four nations, Scotland, Northern Ireland, Wales, and England. In England, the system is administered by the UK government whereas in the other three nations the respective national governments are responsible. The term 'National Health Service" (NHS) refers to each of these four administrative systems respectively. Here, we report on the development in England. The development of electronic medical records can be characterized by a process of rapid local adoption and an intermittent episode of a large-scale government initiative to establish a national (England-wide) EPR system which is generally considered to have failed (Currie, 2012). This programme was preceded by several smaller programmes which are also perceived as having failed (Hibberd *et al.*, 2012).

The "National Programme for Information Technology" (NPfIT) followed in the wake of two smaller programmes to introduce large scale systems in the NHS begun in 1992 and 1998 respectively. The NPfIT has been described as the "largest civil IT programme" (Currie and Guah, 2007) and comprised four elements, an electronic booking system for appointments, the electronic transmission of digital images, an electronic prescription system, and the national EPR system which is at the focus of this paper. The project commenced in 2002 and was discontinued in 2011, following an evaluation by a governmental authority.

The establishment of a national EPR system was the main aim of the NPfIT initiative. Following a vision formulated in an earlier governmental document, a dedicated administrative body was charged with defining and implementing a national EPR system which contained core medical data about every patient living in England. This body was headed by the Director General of the NHS IT division and an advisory group composed of many healthcare organisations. A crucial distinction was made between summary patient records maintained centrally and detailed patient records held locally. Every healthcare professional should have access to the summary record to improve decision making and reduce medical errors particularly in emergency situations. However, in the governmental report reviewing the programme published in 2011, it was concluded that, although important infrastructural elements have been successfully built, most notably a communication network and supplementary services such as the appointment booking system, the programme has not achieved its original goals and recommended the discontinuation of the programme (Major Projects Authority, 2011).

In the wake of the decision to discontinue the NPfIT, a change of strategic direction emerged. Rather than aiming for a central data repository holding all patient data, the NHS now emphasized the possibility of accessing patient data through improved inter-operability of local systems in GP practices. A new slogan capturing that new strategic focus emerged: "fit for sharing." To support this new vision, the NHS now emphasized measures to ensure compatibility between local systems rather than compliance with a central data repository. Moreover, it appears that the discourse on electronic patient records is now nuanced slightly differently. Whereas the earlier vision, encapsulated in NPfIT, highlighted the need for efficient and seamless patient service, the NHS now emphasises the patients' right to control access to 'their' data. The Department of Health as the executive of the NHS has proclaimed its new strategy as pursuing "... a change in culture and mindset, so that our health and care professionals, organisations and systems recognise that the information in each of our own care records is fundamentally about us -- and so that it becomes routine for us to be able to access our own records online." (Department of Health, 2012, p. 16).

Even though NPfIT was discontinued, the compilation of summary records continues. Summary records are now available for about a third of the English population. Moreover, the NHS has started a public information campaign through which all citizens are educated about the national EPR system and specifically about their right to opt out of the programme, which resonates with the new emphasis on patient rights. 44m citizens (of about 50m) have been reached so far of which 1.34% have chosen to opt out. The issue of patient rights and privacy has been highlighted in the public debate when it was reported that the NHS has lost track of 1.8m patient records. Advocacy groups have emerged which call for a change in information culture and practices, including a change of language such that information is no longer 'about' patients but 'for' patients. A company, Patients Know Best, aims to build tools that help patients to control who has and has not (or no longer) access to their data.

**Interpreting the cases**

While, from a traditional project management perspective, the Finish case seems to be a success story whereas the English case may be viewed as one of the largest failed IT projects, our practice lens highlights a number of commonalities between the two projects and points to differences which are difficult to frame in terms of success and failure. Specifically, when considering the ideational and normative dimensions in addition to the material dimension as integral to information infrastructure, the continuity of the evolution of each infrastructure development becomes apparent. Moreover, including the ideational and normative dimensions as integral conceptual components of information infrastructure allows evolution in these dimensions as well which may create the precondition for ongoing development in the material manifestation by suggesting new development possibilities.

The *material manifestation* of the two evolutionary processes is rather similar. At the time of writing, in both cases, centralized systems existed for electronic patient records. These systems are operational and used by a significant fraction of healthcare professionals. This finding may seem surprising in view of the differential evaluation of the two cases when seen from an outcome (i.e. success/failure) perspective.

Regarding the *ideational dimension*, we observe both commonalities and differences. Both processes were initially driven simultaneously by the ideas of centralization and standardization. However, in Finland, the idea of centralization was pursued more vigorously while efforts to standardize core elements of patient data were generally revitalized only after problems of exchanging patient data became apparent. It might be said that the idea of standardization 'trailed' that of centralization and, to some extent, was subordinated to that idea as standardization would facilitate data integration on a centralized server. In contrast, in England, these two ideas were increasingly seen as alternatives. The about-turn that followed the decision to discontinue NPfIT can be characterized as abandoning the centralization idea in favour of increased standardization such that a national data repository would either become obsolete or at least would be drastically reduced in importance because patient data would be accessible through horizontal sharing among health professionals. Thus, the way that these two ideas evolved in the two cases contributed to two entirely different development paths for the material manifestation of the emerging information infrastructure, even though they earlier both supported a centralized architecture.

We also notice that the material and ideational dimensions occasionally seem to evolve in a contradictory manner. For example, even though standardization is proclaimed as an essential part of the centralized EPR system in Finland, patient records are not (yet) standardized at all, partly because of contradictory legal requirements. Rather, patient records exist as 'narratives' separately for each healthcare practice and patient visit. Standardization is envisioned to be enforced in the future through technical means as only those records will be forwarded to the national archive that comply with syntactic and semantic rules. In England, work to build the national data repository continues even after the NPfIT was discontinued and a change in strategic direction was proclaimed. GPs still prepare summary records and copy them to the national archive and the NHS has started its information campaign, now emphasizing citizens' right to opt out of the scheme but, factually, strengthening the system through this measure as only a small fraction of the population makes use of that possibility. One possible interpretation of this finding is that rationales evolve on multiple levels while our data only brought to the fore those which were visible most prominently. Evolution in the ideational dimension on other levels may contradict those of policy makers and continue to support practices that are not endorsed by official ideologies. Some such instances of conflicting logics have been reported in Currie and Guah (2007). Conflicting ideational structures may also account for continued evolution in cases which would have to be seen as closed from a success/failure perspective.

Lastly, we observe a significant change in *normative orientation* in England which coincides with the shift in strategic direction from centralization towards horizontal sharing of EPRs. Specifically, the NHS began to appeal to patient rights rather than to the need for efficiency which can be seen to imply another norm, namely the maxim of economical use of taxpayers' money. Moreover, that changed normative stance was visible in civic society more generally as advocacy groups and private firms called for the right of patients to control access to information stored about them in electronic patient

records. That stance also came to the fore in a different language which suggested that patient records are not only *about* patients but *belong to* patients. This interpretation is in line with Currie and Guah (2007) who observed a change from a 'private sector ethos' to a 'patient-centred ethos' which, according to these authors, took place around 1998. This suggests that changes in shared norms may underpin or even lead changes in the other dimensions.

## DISCUSSION AND CONCLUSION

We propose that adopting a practice perspective has a number of advantages when compared to traditional perspectives and holds great potential especially for developing information infrastructures involving small organizations.

The main difference with traditional approaches lies in the treatment of the normative and ideational dimensions as integral to the concept of information infrastructure. In contrast, traditional perspectives privilege the material dimension in evaluating development processes; specifically, questions are asked such as: Does or will the technology work as intended? Was or will the technology be implemented on time/in budget? (see, for example, Currie, 2009, and Maughan, 2010).

The ideational dimension is not absent in these accounts but is given externally, in the form of original project goals or external criteria of efficiency and thus is viewed as constant. The normative dimension is usually not considered. In contrast, by allowing evolution in the ideational and normative dimensions as well and treating these as integral parts of the phenomenon at hand, the development process is conceptually opened up in two novel ways. First, by not having to evaluate a given development status in terms of success/failure, participants in the development process -- health professionals, politicians, designers, managers, etc. -- avoid possibly premature changes in practices. For example, evaluating a project as a failure may lead project managers to conclude that they should alter their project management practices and engineers may alter their designs. As a case in point, Aanestand and Jensen (2011), comparing a failed and a successful initiative for building national EPR systems in Denmark, recommended a modular approach and advised against efforts to standardize syntactic and semantic components of electronic patient records ex ante. From our two cases, one might be tempted to compare project management techniques and/or design choices between Finland and England and then recommend those that proved relatively more successful in Finland. Second, changes in normative stances regarding and beliefs about effects of information technology may reveal novel uses of technical components that were previously installed with different intentions and normative orientations. For example, recounting the development processes in England from a practice perspective showed that change in ideational and normative structures opened up new development possibilities that would have been hidden from a traditional project management perspective. Important elements of the material infrastructure implemented under the NPfIT, which initially was planned as a highly centralized system, later became integral components of a much more decentralized architecture.

Our approach shows significant similarity with the concept of 'drift' in information infrastructure development as set out by Ciborra and colleagues (Ciborra *et al.*, 2000). However, we also note that the concept of drift still emphasises the material dimension through its notion of installed base that is seen as constraining action. Yet, the similarity between our approach and that of drift shows up in discussing the question of boundedness. Ciborra (2000) demonstrates that a practice lens calls for giving up the concept of system boundaries which distinguishes his approach from traditional project management techniques. We add that one also has to give up the idea of project closure, that is boundedness in time, when seeing information systems and infrastructures as evolving rather than as managed.

There are a number of prescriptive implications of our proposed change of perspective. So far, we have argued that traditional (prescriptive) approaches have disadvantages in that they may yield unproductive feedback to project management and system design and that they may be blind to real positive change. Along with Ciborra (2000) we propose that the practice lens offers a solid basis for a prescriptive theory which Ciborra has circumscribed through the concepts of hospitality, care, and cultivation. More specifically, our theoretical framework calls for simultaneous consideration of innovation possibilities in the ideational and normative dimensions. Such possibilities are clearly evident in the case of England and just have to be recognized as real opportunities that managers, users, politicians and others have in shaping the evolution of an information infrastructure. These options may be especially helpful when considering smaller organizations which, when seen against the material dimension only, often seem to be powerless and exposed.

While the degree of computerization in England and Finland in smaller health practices is high, the use of electronic medical records still poses significant problems which relate to the network character of such data. Electronically maintained records may yield some advantages when used in isolation; but many practitioners may find that these advantages do not compensate for the convenience and familiarity that paper-based records offer. The transformational potential of electronically maintained medical records will come to the fore only when these are shared among health professionals who offer care to the same patients (Hillestad *et al.*, 2005). The two case stories recounted here demonstrate the significant problems that come with attempting to realize this potential. Moreover, it is unlikely that these difficulties can be overcome by providing monetary

incentives to small healthcare practices to adopt information technology, a measure that tends to be favoured in the US (Taylor *et al.*, 2005), also and especially when discussing IT adoption with regard to smaller healthcare practices (Lee *et al.*, 2005). As has been shown by Currie and Guah (Currie and Guah, 2007; Currie, 2012), professional ethics and logics, norms and rationales in terms of our model, did play a significant role in adopting and using electronic medical records in England. By addressing these dimensions and, more importantly, by allowing norms and rationales to evolve to accommodate the needs of local practices as well as regional and national practices, significant steps towards realizing the potential of shared electronic medical records may be realized more easily than through heavy subsidy and legal force, both of which are measures that exist in the material dimension only. This approach would go beyond current proposals to promote IT use in smaller healthcare practices that focus on traditional project and change management techniques (e.g. Poon *et al.*, 2006), in addition to financial incentives just discussed. Specifically, the way that planners and politicians, who are enrolled in their own practices, envisage electronic medical records be used in smaller healthcare practices may not resonate with the views of healthcare professionals or may violate existing professional norms. Such feelings and thinking, however, is not easily solicited. Healthcare professionals may not be able to articulate their practices in a way that would make these dissonances apparent because such knowledge is embodied; they may also experience conflicts between various rationales, only some of which are officially sanctioned while others are valid too. By allowing rationales and norms to evolve, novel and undesigned-for uses may become manifest that shape the evolution of EMR infrastructures in beneficial albeit unanticipated ways.

The limitations of our research lie in the post hoc nature of our analysis. We have relied on data which are either publicly available or which have been collected through traditional interview techniques. Both sources of data are not well suited to a practice theoretical analysis since they are biased towards soliciting material structures and explicable knowledge. From a practice theoretical perspective, data collection poses novel problems (Nicolini, 2013; Reimers *et al.*, 2013b) and we are currently experimenting with novel data collection techniques to address them. With regard to the present analysis, this means that we have captured only a small fraction of relevant data regarding the evolution of EMR information infrastructures. However, our intention was to show the potential that lies in a practice theoretical approach with regard to devising policies and prescriptive stances. We encourage further research that builds on systematic data collection appropriate for a practice theoretical account to better understand evolutionary mechanisms and the possibilities and constraints that decision makers and practitioners have in shaping the evolution of information infrastructures in desired directions. The purpose of the present research was to show that such possibilities are likely to exist beyond the traditional arsenal of project management and financial incentives-based programs.

## ACKNOWLEDGMENTS

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