HOW DO E-HEALTH DEVELOPMENTS IMPROVE THE PERFORMANCE OF HEALTH PROVISION NETWORKS?

A case study of Hungarian e-health developments

Introduction

Performance and performance-orientation have become key words during the last two decades in the public administration and public service management (see, for example, OECD, 2004). However, there is still no one and clear definition for "performance". Bouckaert and Halligan (2008) define **span and depth of performance** in the public sector, leading to the 4E model as well as to micro-meso-macro levels of public performance. What they define as new model of "performance governance", based on Osborne (2006), includes a network-based approach, with strong emphasis on meso-level performance. Governance is based on two concepts: (1) governmental processes and formal government structures, (2) networks of public and private interactions. Performance, according to this approach, extends to meso level, includes several levels of government as well as several sectors and actors from both the public and private sector.

According to Benson (1975, 1982) and Hudson (2004), **effective local network partnership** depends upon the factors that can be grouped into four dimensions: domain consensus (agreement regarding the appropriate role and scope of each agency), ideological consensus (agreement regarding the nature of the tasks faced), positive evaluation (or trust) towards other organizations, and work coordination (the alignment of working patterns and culture). **Contextual factors** that influence local level factors are as follows: the fulfilment of program requirements, the maintenance of a clear domain of high social importance, the maintenance of orderly, reliable patterns of resource flow, and application/defence of the organization's paradigm. The first four dimensions refer to the level of provider networks while the latter four to policy level.

Health service is one of the most complex public services. The model how health care services are organized, provided and financed are varying from country to country, making cross-country comparisons a challenging task and mutual learning and knowledge transfer more difficult. Still, it is a central question of interest in all the countries how this sector can provide better value for the money spent on it, or **how the performance of the health care sector can be improved**.

The performance of the health care sector is not only dependent on the performance of the individual actors (e.g. general practitioners, outpatient care facilities, and hospitals) – it does also matter how these actors coordinate their activities. Patients have various pathways in this system, and improving their health status requires efforts from every actor (e.g. there are referrals among physicians). The use of modern technology and the higher specialization of providers it comes with leads to a growing need for coordination among the actors. How health care services are organised will have an impact on how the actors coordinate their activities, and thus how the health care system as a whole may perform. Beyond the basic models of organising health care services (e.g. private health insurance, social health insurance, or state-centred models), there are lots of lower level elements effecting the

performance of the health care system: for example, who and how decides about the capacities of providers, what communication standards there are for institutions to follow, how patients are referred and corresponding information about their health status is forwarded among health care providers.

Improving network performance

From an analytical point of view, researchers seek for 'proxy variables' that describe various network characteristics influencing network performance in a positive or negative manner. In this sense, network management consists of activities that support the build-up of 'enhancers' and limit the effects of 'obstacles'. From a public policy viewpoint this 'game' is exactly the same: policy makers strive to set up rules that serve the build-up of 'enhancers' and prevail negative effects of 'obstacles'. Literature suggests that these enhancers can be, for example, the level of trust within the network, or the existence and use of communication channels—these factors can be considered as 'proxy variables' of network performance: if network members trust each other to a greater extent, network performance will be higher. In terms of institutional economics, researchers are seeking the factors that decrease transaction costs in the network. In terms of public policy making and implementation, these factors are central to the rule setting process since these are the ones that influence the behavior of public service providers—these are the factors that link policy networks and provider networks.

According to Benson (1975, 1982) and Hudson (2004), effective local network partnership depends upon the factors that can be grouped into four dimensions: *domain consensus* (agreement regarding the appropriate role and scope of each agency), *ideological consensus* (agreement regarding the nature of the tasks faced), *positive evaluation* (or trust) towards other organizations, and *work coordination* (the alignment of working patterns and culture). Regarding the terminology, local networks are equivalent to service provision networks. Internal and external contextual factors that influence local level factors are as follows: the fulfilment of program requirements, the maintenance of a clear domain of high social importance, the maintenance of orderly, reliable patterns of resource flow, and application/defence of the organization's paradigm. These contextual factors are often subject to policy level actions.

While the authors originally used the term of 'super-structure' for the local network level, and 'sub-structure' for the contextual level (reflecting the fact that the super-structure is the one which actually provides services and sub-structure is essentially the environment for these networks), it is worth redefining these two levels as **service provision network and policy network**, based on the fact how the dimensions at each level refer to relationships at service provision and policy levels. This change also decreases the confusion the authors' original terminology could cause since it is directly opposite to the one defined by Mintzberg (1996) and widely used by scholars.

The model incorporates network dynamics as well. Networks reach a certain level of equilibrium in each dimension (for illustration, Benson uses low, moderate, and high level), resulting in balanced systems where each dimension is at the same level (e.g. high-high-high-high), or imbalanced systems (e.g. high-moderate-low-high). The dynamics is brought into to model by stating that a system, left on its own (without network management efforts), will move into the direction of becoming balanced. It follows that managerial interventions must be directed at all dimensions because lower level dimensions might decrease network

performance by influencing higher level dimensions in an unfavourable way (e.g. lack of trust might inhibit integration of work processes). Figure 1 gives an overview of the model.

(Local) service provision network: Operational relationships

Degree of domain consensus (= to what extent the roles and responsibilities of different network members are clear)	**Degree of ideological consensus** (= to what extent network members agree on problem definition and problem resolution)
Degree of positive evaluation (= to what extent the workers of network members trust in each other)	**Degree of work coordination** (= to what extent working patterns and cultures are aligned in a network)

Policy network: Contextual influences

Fulfilment of program requirements (= to what extent provider networks undertake tasks which are consistent with present policy requirements)	**Maintenance of a domain of high social importance** (= to what extent the agenda has public legitimacy and support)
Maintenance of resource flows (= to what extent the resource flow is predictable and reliable)	**Application/defence of the organizational paradigm** (= to what extent participants are committed to the agency's way of doing)

Figure 1. A framework for analysing factors driving network performance
(based on Benson, 1975 and Hudson, 2004)

According to Benson and Hudson, the performance of a local service provision network will be better if the equilibrium reached in the four dimensions of the local level is at a higher level. A local network performs better if:

- the network members reach a consensus about the distribution of responsibilities for certain tasks, goals and objectives followed by the members are consistent with each other, and the unnecessary duplication of resources can be avoided (for example, in a health provision network the distribution of tasks between primary care and secondary care is clarified)—as described by the **degree of domain consensus**;
- the network members have a consent about the 'nature' of the problems they face as well as possible ways of solution (for example, in the case of health provision, the

main goal is to improve the overall health status of the whole population—the task is not to manage hospitals and other institutions, or to treat diseases, but to focus on patients' health and relevant data, to improve health instead of treating disease episodes, and to take prevention activities into consideration as well)—described by **ideological consensus**;

- the network members trust each other, and relevant information is shared, the relationships between members is shaped by rather commitment toward common goals than differences in negotiating power (for example, joint development projects are initiated where asset specific investments are also made, or physicians trust in each other's diagnoses to a greater extent when an adequate quality assurance framework is in place)—described by **positive evaluation**;
- interorganizational processes are well coordinated (for example, treatment protocols that meet local requirements and possibilities are put in place, and the flow of both physical material and information is well-organized in a field where physicians traditionally have high autonomy and authority)—described by the degree of **work coordination**.

Performance levels of all the local service provision networks in a certain policy area (e.g. all the health districts) will be influenced by the aggregate of performance levels achieved by the whole 'community' of provision networks. It will be also influenced by the performance of the network administrative or supervisory bodies (how they succeed with managing the network). The reasoning behind is that the macro-level success of the whole public policy program will be decided upon whether expectations are met in service provision or not. All the local service provision networks *may* perform better if:

- public policy program requirements are fulfilled in a higher number of local provision networks, or to a greater extent (for example, it can be demonstrated that health care services work well in several regions and investments made towards the health care will have a social return);
- social legitimacy concerning a policy program is higher, that is the program is known and its importance is acknowledged wider in the public (for example, health care is notorious in need for a reform, however, what tools reformers may choose is dependent on what the society accepts better);
- financial and other resources are secured for the continuity of operations in a transparent manner, which encourages long term thinking (for example, how health care services are financed is transparent and calculable in the long term, given the need for investing in fixed assets to a great extent, for example, in the case of hospitals);
- local provision members 'use the same language' to describe problems and solutions as policy makers and the supervisory bodies do (for example, health providers do accept policy goals and provide support in communicating the need for reform towards local stakeholders; in Hungary the majority of health care providers never publicly accepted the newly introduced co-payment in 2007, leading to a referendum annulling it).

The framework describes well the **interrelatedness of policy level and service provision level**, and the performance of *one* policy program and *its* connected provision networks. In order to utilize the synergic opportunities between various networks, objectives set at various policies and at organizational strategies should be consistent with each other. The most obvious clash of consistency can be observed in the relation of local/regional networks and sectoral policies (e.g. country-wide network of education, or health provision). What is

rationalization from one aspect might mean destabilization from the other. It should also be noted that elements of the model are significantly affected by the **cultural context**. For example, more individualistic societies will have more difficulties in building up trust, thus reaching higher degree of positive evaluation in the respective quadrant of the model. **Education** plays a role in forming the cultural context of the health care sector as well: whether university education emphasises team work, will also have an effect on how physicians will cooperate when they work.

The more inconsistencies exist between these objectives, the less synergic opportunities can be utilized between and within networks. This way, the consistency of goals and objectives of public policy programs and public service provision networks is an important influencing factor of network performance. It should be noted, however, that it would be illusionary to think that 'total consistency' can be reached in a sphere where politics and political actions are continuously bringing imbalance into the system.

Except for the case of the smallest counties, almost all of the public services is organised in a more or less decentralised manner (the vertical dimension of public performance was earlier defined as the depth of performance). Decentralisation (or (re)centralisation) is always a "reform question" in the case of public services. Having overviewed the role of the network manager and the possibilities for various network management strategies, this multi-level nature of how public services are organised must be taken into consideration in further analysis. It is very much a tradition in federal states. As Isett et al. (2011:i167) noted, "networks can be found within and across the federal, state, and local levels." Agranoff and McGuire (2003, cited by McGuire, 2006:34) added that "[A]merican federalism, for example, is perhaps the most enduring model of collaborative problem resolution."

Higher levels (for example, health policy and regulation at country level) set the context for middle levels, by assigning tasks and responsibilities to meso-level organisations and their managers (thus, providing a maneuvering space for them). Managers at meso-level organisations, in turn, set the context for individual public service organisations. Policy level managers not only have to face with the problem of how to steer the network of meso-level organisations themselves but also with the issue of what regulations and tools should be implemented to make the tasks of meso-level network managers easier in improving the performance of their regional (or local) networks. Sometimes there are also central policies implemented aimed at encouraging collaborative problem solving of autonomous groups of organisations. This issue could be named as **multi-level network management**. (It should be noted that this issue somewhat resembles the phenomenon of multi-level governance, however, it was originally and is primarily attributed to European Union and integration; see, for example, Kohler-Koch–Rittberger, 2007).

Meso-level networks in the health care system may take various forms: federal states, regions (either administrative or health-sector related), insurance funds, or other bodies with planning and financing roles. What is important that health care providers must work in a coordinated way. Inter-organisational coordination of the individual health care provider may also play a role (see, for example, Gittel–Weiss, 2004) but the principle of collaborative management must be applied to the health care sector at a higher level as well. There is no clear answer for it but it seems that the solution must move beyond markets and hierarchies, as it was stated by Mintzberg and Glouberman (2001), naming collaborative networks as one of the possible answers. In their book about the US health care, Porter and Teisberg (2006) emphasised that the competition, with corresponding performance measurement, should be placed on

outcomes and results centred on patients, and not on costs and efficiencies of single health care providers. Performance measurement has been a long tradition in the NHS, too (Smith, 2005), where health regions as well as GP and hospital trusts are often used as units of analysis. In a growing complexity and deeper specialisation in health care services it is an essential question who and how coordinates (parts of) the system, and how the performance of (these parts of) the system can be measured.

The case of e-health

Improving performance of local (regional) health provision networks

E-health has been an issue for European countries for more than a decade. It made its wider scale appearance in an EU-level action plan in 2004. It was defined as "the application of information and communications technologies across the whole range of functions that affect the health sector." (EC, 2004:6) As for its effects on heath care performance, the action plan noted that "eHealth systems and services can reduce costs and improve productivity" (ibid:6-7). While there were several advancements after 2004, the action plan was only partially carried out, and common (EU-wide) elements were especially lacking. In the latest action plan, dated in 2012, the definition of e-health became more elaborated and included a more complex approach to performance expectations: "eHealth is the use of ICT in health products, services and processes combined with organisational change in healthcare systems and new skills, in order to improve health of citizens, **efficiency** and **productivity** in healthcare delivery, and the **economic and social value of health**. eHealth covers the interaction between patients and health-service providers, institution-to-institution transmission of data, or peer-to-peer communication between patients and/or health professionals." (EC, 2012:3) Reference to productivity, efficiency, economic and social values might be interpreted as elements of the 4E of public performance.

Regional level may play an important role in e-health development. For example, Denmark, where health care services are organised on regional level, is considered as a pioneering country in e-health advancements. After having several HER projects carried out at county-level, and facing the problems of incompatibility between these systems, regions took a bigger role in implementation projects. (Bernstein et al., 2005) Between 2004 and 2008 integrated inter-organisational IT networks have been developed in three Hungarian regions in the framework of the development program financed by EU structural funds (Lukács, 2007). Burton et al. (2004) also called for "regional governance structures to encourage the exchange of clinical data". WHO recommendations about e-health strategy put emphasis on the regional level as well: "While eHealth strategies are primarily developed to deliver health benefits for countries, they can also be an important mechanism for **facilitating cooperation at the regional level** and driving investment in ICT infrastructure, research and development." (WHO, 2012:31)

This section of the paper examines the effect of (potential) e-health developments on the "network performance enhancers" as defined by Benson (1975, 1982) and Hudson (2004). Figure 2 summarises how the elements of e-health might improve the performance of local health provision networks via improving domain consensus, ideological consensus, positive evaluation, and work coordination among network members. The most important contextual factors at higher (policy) levels are also listed.
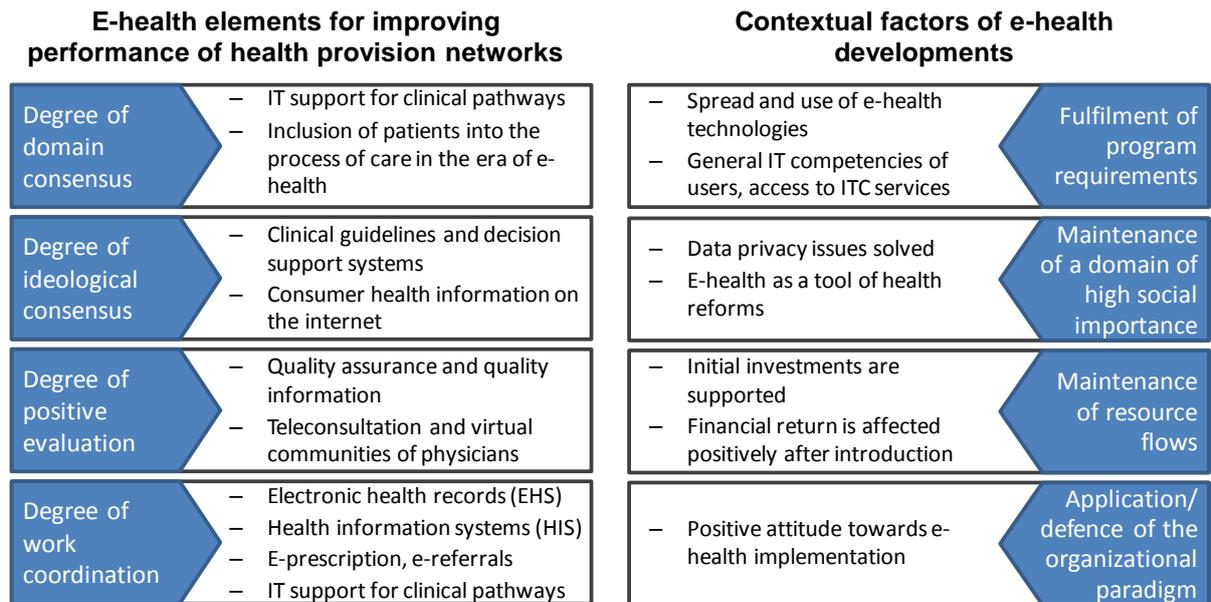
E-health elements for improving performance of health provision networks		Contextual factors of e-health developments	
Degree of domain consensus	− IT support for clinical pathways − Inclusion of patients into the process of care in the era of e-health	− Spread and use of e-health technologies − General IT competencies of users, access to ITC services	**Fulfilment of program requirements**
Degree of ideological consensus	− Clinical guidelines and decision support systems − Consumer health information on the internet	− Data privacy issues solved − E-health as a tool of health reforms	**Maintenance of a domain of high social importance**
Degree of positive evaluation	− Quality assurance and quality information − Teleconsultation and virtual communities of physicians	− Initial investments are supported − Financial return is affected positively after introduction	**Maintenance of resource flows**
Degree of work coordination	− Electronic health records (EHS) − Health information systems (HIS) − E-prescription, e-referrals − IT support for clinical pathways	− Positive attitude towards e-health implementation	**Application/ defence of the organizational paradigm**

Figure 2. E-health developments as network performance enhancers and their context

Degree of domain consensus was defined as to what extent the roles and responsibilities of different network members are clear. It can be improved by:

- **Providing IT support for clinical pathways:** it was demonstrated that clinical pathway conformance can be improved by the use of IT (see, for example, Lenz et. al., 2007). Clinical pathways are implementations of guidelines in a specific setting, and they "consider available resources like staff, level of education, available equipment, and hospital topology" (ibid:S397). Clinical pathways are thus essential in setting the roles and responsibilities of local health provision network members in order to improve performance of care. (Clinical pathways are also serving the purpose of better work coordination.)
- **Better inclusion of patients into the process of care:** modern technology provides better opportunities for home care by, for example, using telemonitoring, or might improve adherence of patients (WHO, 2003). These developments change how the roles and responsibilities are shared between the physician and the patient. Physicians must not only accept this "shift of power" but support them in the future.

Degree of ideological consensus was defined as to what extent network members agree on problem definition and problem resolution. It can be improved by:

- **Clinical guidelines and decision support systems:** clinical guidelines summarise the experience about clinical outcomes from a very wide range of cases thus essentially representing the most important knowledge management tool for clinical decisions. Clinical decision-support systems "can formulate treatment suggestions based upon treatment guidelines" (Jaspers, 2011:327). Although the authors in their literature review conclude that few studies have demonstrated positive effects on patient outcomes so far, however, advancements in IT technology and AI will likely lead to significant improvements in this field.
- **Consumer health information on the internet:** patients have been significantly empowered since the appearance of medical information on the internet. Patients, professionals, companies, or government agencies create and share huge loads of information. Web 2.0 turns the internet into a communication tool in the field of

medicine as well. It is promoted that health care personnel adapt to these changes and actively participating in information sharing (Meskó–Dubecz, 2007).

Degree of positive evaluation was defined as to what extent the workers of network members trust in each other. It can be improved by:

- **Quality assurance and quality information:** availability of information about the performance of providers may improve trust in both physicians and patients. Information gathering, processing and publication can be supported by e-health solutions. Quality information might be restricted to internal use of clinicians (for example, clinical audits), used by reimbursement (for example, pay-for-performance schemes use quality information as well), or available for public use. In the case of public information there are two pathways of performance improvement (Shekelle, 2009): patients prefer choosing better quality providers ("selection pathway"), or providers are able to identify weak points in their care processes and react ("change pathway"). There are several examples of quality information publication in Europe or in the US. Demonstrating quality of care contributes to trust in service providers.
- **Teleconsultation and virtual communities of physicians:** more frequent communication is usually considered as a "trust builder" element. While making relationships less personal is a risk of telemedicine applications, this is only true in cases when it replaces traditional face-to-face meetings. Teleconsultation services among physicians might add further opportunities to discuss patient results or care issues compared to when they communicate only in writing. Virtual communities can also contribute to positive evaluation.

Degree of work coordination was defined as to what extent working patterns and cultures are aligned in a network. Since e-health solutions are mainly targeted at electronisation of processes in a complex environment, most e-health tools will contribute to better coordination of operational processes of providers. Degree of work coordination can be improved by:

- **Electronic health records (EHS):** "[h]ealth information technology (HIT) has the potential to improve coordination by making information electronically available at the point of care […]", as noted by O'Malley et al. (2010:177). They carried out a qualitative survey which showed that there is still "a gap between policy-makers' expectation of current EMRs' [= electronic medical records'] role in the coordination of care and clinicians' real-world experience with them." (ibid:183) They also found that within-office coordination works better than coordination between clinicians and settings. Surveys show that the use of EHR is lagging behind (for example, Jha et al., 2010). We might also consider EHS as the "base infrastructure" of collaboration and coordination among health care providers.
- **Health information systems, e-prescriptions, e-referrals:** while EHS is the basic infrastructural element for e-health, several applications build these pieces of information into workflows of providers and clinical decisions of physicians as well as into standard messages among various providers. Hospital systems or GP systems are examples for provider-level applications, facilitating coordination among organisational members while e-referrals and e-prescriptions are the most frequently used examples of standard messages among physicians or between physicians and pharmacists. These systems might incorporate support for clinical pathways, decision support system modules, telemedicine applications, or virtually any kind of tools that connect the actors. This way, better coordination might lead to better performance in the other dimensions of the model as well.

As for the **contextual factors** of the performance model, they might enhance or limit how well local networks perform (definitions for contextual factors are not repeated here). If spread and use of e-health technologies is quicker and higher in at least a few of local or regional networks, it may prove that the nationwide e-health policy is viable. It might make sense for the policy maker to initiate pilot projects and focus on areas where "quick wins" are easier to get. How providers undertake tasks required by the new applications will depend on several factors. On the one hand, general IT competencies of users (physicians, other professionals as well as patients), and access to ITC services are decisive contextual factors (hence there is a role for education). On the other hand, main purposes of system introductions will also determine how supportive health care providers will be: a positive attitude is very much needed, and it will be more likely granted if the system is perceived as a supportive one instead of a controlling one. E-health might also be seen as an element of health care reforms: if there is a higher level of public support for health care reforms, e-health projects are more likely to be welcomed (and financed). Since personal medical data is very sensitive, e-health projects will be more successful if the rules are unambiguous and transparent and data privacy issues are solved in advance. Costs associated with introduction are usually high. If initial investments (and pioneering organisations) are supported, it is easier to get to the point where the network effect can be utilised. In the beginning financial returns on introductions can be poor so that supportive financial schemes or other financial motivators are needed.

Experiences from the Hungarian regional EHR development projects

Between 2004 and 2008 health information system development projects were carried out in three Hungarian regions (there are seven geographic regions in Hungary). Three regional projects were defined with the participation of 39 hospitals and outpatient care facilities as well as 259 general practitioners (this way, only a part of these regions was covered). The projects were supported from EU structural funds, total amount of financial support was about 16 million euros. The project included the introduction of electronic health records in participating organisations as well as an intra-organisational communication system component with functionalities as follows: access to medical data in all the participating organisations, e-referrals and e-consultations, telemedicine in some areas, patient authorisation. (Lukács, 2006) There were no national communication standards for intra-organisational networks at that time so specifications were elaborated as part of the projects. The three consortia joined up for this, and commissioned this task from the same vendor.

The health care providers of the consortia successfully modernised their IT infrastructure: as compared to the original project plans, 3243 new workstations were purchased instead of the expected 750 (while additional 1800 workstations were planned to upgrade, and in the end only 95 upgrades were made). The majority of the financial support was used for renewing organisational-level IT systems; the intra-organisational component gained less attention. A survey among patients was carried out as part of the evaluation of the project: it showed that only 15% of patients were asked to give authorisation for physicians to access their medical history, and only 2% had the experience of a physician accessing medical data from an other provider in the region. (Megakom, 2008)

Subsequent expert evaluations could not show progress either: while the major HIS suppliers adopted the intra-organisational communication elements into their systems, no steps towards a nationwide introduction has been made so far. Király (2010, 2011) identified the main limiting factors as follows:

- Lack of financing of additional costs of operations: running the system requires additional resources from the participants while benefits are lower, especially in the beginning. It must be also noted that lots of benefits are external to providers, and social cost savings are not shared with them. A more beneficial cost/benefit sharing would require central coordination; a regional project was not able to provide this type of coordination. (Király, 2010)
- Communication protocols should be standardised and issues of liabilities should be regulated centrally. (Király, 2010)
- Use of the system will not "spread" to new actors on its own, given the lack of financial support. (Király, 2011) Only a small part of GPs and around 82-85% of hospitals joined the consortia. (Megakom, 2008:165)

It can also be added that the three pilot projects were carried out in three of the four least developed regions of Hungary; the use of ICT services is correlated with the level of regional development. From the point of view of "quick wins", the least developed regions might not have been the best places for pilot projects. Based on the experience, recommendations for "task sharing" between regional network managers and central policy making can be summarised as shown on Figure 3.

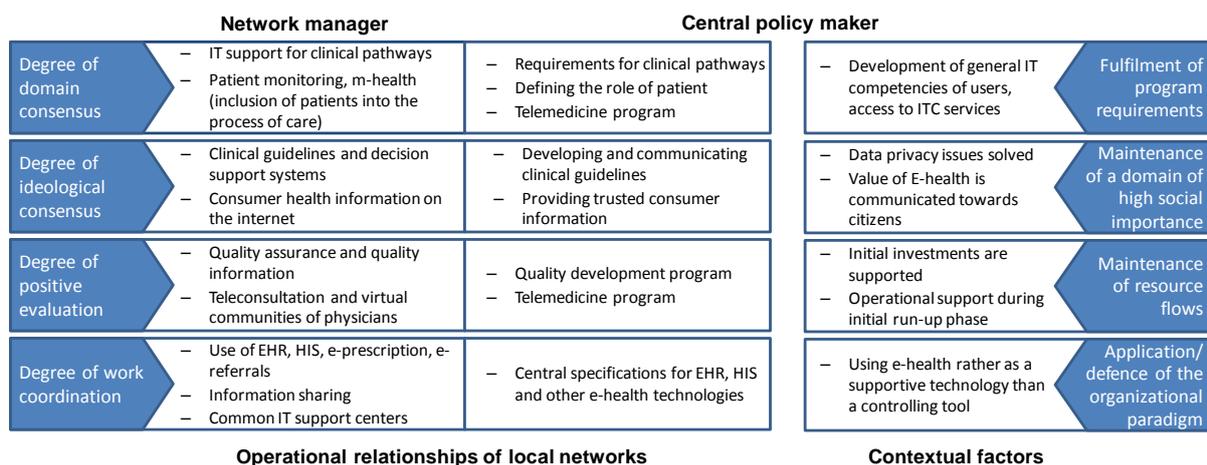| Network manager		Central policy maker	
Degree of domain consensus	– IT support for clinical pathways – Patient monitoring, m-health (inclusion of patients into the process of care)	– Requirements for clinical pathways – Defining the role of patient – Telemedicine program	– Development of general IT competencies of users, access to ITC services	**Fulfilment of program requirements**
Degree of ideological consensus	– Clinical guidelines and decision support systems – Consumer health information on the internet	– Developing and communicating clinical guidelines – Providing trusted consumer information	– Data privacy issues solved – Value of E-health is communicated towards citizens	**Maintenance of a domain of high social importance**
Degree of positive evaluation	– Quality assurance and quality information – Teleconsultation and virtual communities of physicians	– Quality development program – Telemedicine program	– Initial investments are supported – Operational support during initial run-up phase	**Maintenance of resource flows**
Degree of work coordination	– Use of EHR, HIS, e-prescription, e-referrals – Information sharing – Common IT support centers	– Central specifications for EHR, HIS and other e-health technologies	– Using e-health rather as a supportive technology than a controlling tool	**Application/ defence of the organizational paradigm**
Operational relationships of local networks		**Contextual factors**	

Figure 3. E-health developments as network performance enhancers and their context

Summary

The case study has shown how various e-health tools might improve the performance of local (regional) health provision networks by changing network characteristics in the four domains as listed above. The role of contextual factors were also reviewed. Based on the case of the Hungarian regional development projects, introducing electronic health records and intra-organisational communication protocols, the role of central policy makers in e-health developments were discussed. While regions play an important role in carrying out e-health projects (this role is also supported by the fact that regions play an important role in organising health care services in several countries), central policy makers have to play a supportive role as regards to standard setting as well as providing financial motivators.

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