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Evaluation as multi-actor trade-off – a challenge in introducing ICT innovations in the health sector

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Abstract

Information and Communication Technology (ICT) is valuable mainly as an enabler of improved work practices in society. Increasingly, healthcare builds on cooperation between several organisations and individuals. Their joint efforts will often need to be redesigned in order to reap the potential benefits of new technology. In performing such redesign, and also in proving to various stakeholders that adopting new technology is warranted, evaluation can play an important role. The investments required are likely to be distributed unevenly between stakeholders, as will costs and benefits. Therefore evaluation has to identify goals, consequences and incentives for each of them. – This article uses published reports of ICT applications in healthcare that involve several organisations to illustrate how such stakeholder analyses could be performed. The role and responsibility of the analyst is highlighted as important for future analysis, as he or she will have a crucial impact on the outcome of the analysis.

Keywords: *healthcare, information technology, stakeholders, economic evaluation, cooperation*

1. Introduction and aim

The value of Information and Communication Technology (ICT) lies mainly in its role as an enabler of improved work practices in society. ICT's contribution to productivity and profits in industry has been difficult to identify partly due to the time lags before organisations change and adopt new work procedures (Remenyi et al., 2000, Lucas 1999). When changed practices then become the normal state of affairs and a virtual necessity for all firms in an industry, it is difficult to identify their impact on productivity. They will often, however, have benefited customers through improved services or product quality (Brynjolfsson and Hitt 1993).

Changes in organisation and work practices usually affect the interplay between many actors in an industry, not just a single organisation. Outsourcing and 'virtual' organisations become more attractive. In health and social care, introducing new ICT will have effects on health-care institutions, municipal or private home assistance, and technical equipment in the homes, relatives, and of course care recipients themselves. The internet allows communication between healthcare teams regardless of geographical boundaries and reduces their need for physical coordination meetings. Patients will not have to visit a doctor just for routine checkups that can be performed and monitored at a distance over the internet. This in turn may make it possible – or natural – for home care personnel to participate more actively in the care process. They may even take over

some forms of routine medical testing, given that they acquire the new competences needed and legal clearance to perform these duties.

Large sums are now being invested in ICT for health applications, and many countries have adopted national programmes to build databases and test new ICT tools. Experience from other industries indicates that realizing their full potential is likely to require a redesign of work practices (Olve and Vimarlund 2005). In the present article, our aim is to test a simple format for such evaluations on some published case studies. We have searched the literature for descriptions of ICT applications in the area of healthcare for elderly and home healthcare that involve several actors (organisations or individuals). They are used here to discuss how economic evaluations may clarify the incidence of costs and benefits for the various actors. We believe such multi-actor evaluations are needed in order to understand the likely dynamics of adoption (or non-adoption) of ICT proposals in this area.

2. Method

The cases reviewed below come from fairly recent scientific literature and were selected to illustrate some commonly suggested uses of ICT. Our criteria for selection was: 1) the cases seem representative for each area; 2) they are not necessarily the first or the last published in a scientific journal, but one of several; 3) they were published during 2001– 2004; 4) they discuss or analyse consequences of the use and implementation of ICT in the area.

However, searching for the cases showed that few published cases make the multi-actor dimension clear or would qualify as "evaluations" (Vimarlund and Olve 2005). Because of this, a large number of publications had to be surveyed in order to identify this small set of cases.

Sources were then read carefully to extract information about what consequences were reported and in particular for whom. Below we simple specify positive and negative consequences reported in the case descriptions for Patients, Physicians (or in one case other Personnel), and Society in general. As discussed in Vimarlund and Olve (2005), identifying the stakeholders that should be specified is an important part of an evaluation design. Here our aim is simply to test this approach, so it would not have been possible or meaningful to go into greater detail. Nor should the consequences listed in each case be construed as an exhaustive analysis of effects that occur in cases like these. We use them here to illustrate the importance of a multi-actor approach to evaluation.

3. Optimizing health systems for home healthcare and elderly care

Increasingly, healthcare builds on cooperation between several actors (organisations and individuals). Their joint efforts may need to be redesigned in order to reap the potential benefits of new technology. This is especially true in the care of elderly and chronically ill people, who need not only medical support but also assistance with daily activities. An entire literature has sprung up around notions such as "integrated care" (cf. www.ijic.org etc). Leichsenring and Alaszewski (2004) describe how various European nations, which have a high proportion of elderly, currently struggle with making health and social services function together. One avenue is to organize "homecare", a combination of health support and daily assistance for elderly who live in their own homes. New ICT systems are viewed as important in enabling them to do so in spite of various health problems, leading to improved quality of life for care recipients and cost savings for society (Utbult 2004). The design of such arrangements needs careful analysis, just like industry's

experience with IT has been that it takes time to develop appropriate organisational interfaces and practices (Olve and Vimarlund 2005).

To decide how to use ICT best will require a discussion of the entire system of cooperating individuals and organisations. In this, economic evaluation will have a twofold role. One is to assist in weighing costs and benefits so the changes really are for the better (Vimarlund and Olve 2005). Another is to mediate between different actors in their transition to new ways of operating. Faced with limited resources, some of them will fear that the redesigned way of operating will increase their burden. Such fears may be justified and will sometimes necessitate a redesign also of payment arrangements. For instance, as elderly can live at home longer it is quite likely that municipal services will take over some tasks from health institutions that are financed by the county or the state.

The first role of evaluation, assessing the global effects of some proposed change, would be the only one in a centrally planned economy, where optimal methods to organize elderly care would be mandated by the state. To some extent this happens even in our democratic societies, as care is typically heavily financed through taxes, and there are rules and regulations for this. The second role – clarifying the incidence of costs and benefits to different actors – will however also be important when different actors sort out their cooperation. For instance, in our country a recent official study (Swedish Government 2004) located the responsibility for integrated "homecare" with the municipalities, but leaves it to the regions and municipalities to negotiate the economic compensation as the latter take over the responsibility for the healthcare part of homecare from the regions.

Evaluations must then take into account the multiplicity of actors typical of the introduction of new ICT in homecare: their goals, incentives, and the consequences from different alternatives for each of them. This should to be done in ways that are simple and easy to understand, as different actors need to be involved in discussing action designs and compensation needs.

4. An overview of concepts for evaluating IT applications in healthcare

The aim of economic evaluations is to support decision-making: choice between alternatives actions, including the search for new options. There may be several indicators favouring different alternatives. In healthcare evaluation some like Kazanjian and Green (2002 p.173) regard 'Economic concerns' as only one among several dimensions, the others being Population at risk, Population impact, Social context, and Technology assessment activity. For each they suggest that there should be a number of indicators and targets (goals). If evaluation is to be used by decision makers, however, the multidimensionality has to be reduced. Unless there is one dominant alternative that is superior in all respects, decision-makers have to make a trade-off between the different dimensions or interests. In the literature these are normally dealt with as a problem of distributional justice, invoking philosophical principles of equity in society. There may however also be dynamic aspects, where the consequences for some group can be expected to influence the system over time. For instance, increasing the burden of relatives is probably not just a disadvantage for this group, but may increase their own need for care at a later time, and therefore prove short-sighted (in addition to being perceived as unfair in the short run).

Evaluation of information systems in the area of medical and health informatics has been the subject of much research and many articles, particularly over the past 15 years by authors such as

Keen, Hirschheim, Smithson, Currie, Sherwood-Smith, Scriven, Symons, House, Walsham, Willcocks, Lester, Farbey and Remenyi. Nevertheless, researchers still seek clear answers and an overall theory. The literature is replete with innovative attempts to surmount the theoretical and practical problems of IT evaluation (Kaplan 1997a and 1997b, Masys 1997, Lorenzi and Riley 2000, William et al. 2002, Maj et al. 2003, Brailer 2003, Warren 2004, Olve and Vimarlund 2005 etc). Starting from qualitative analysis, adding sociotechnical perspectives to conventional financial and economic evaluation techniques, researchers have extended the range of tools to include productivity measures (Brynjolfsson, Hitt 1993), return on management (Strassmann 1997,Themin et al. 2003), information economics (Cardinali 1998), health economics (Agrell et al. 2000) or issues from health informatics (Ball et al. 1999). However, several researchers have found that, when pushed, decision makers, both individual and corporate, describe their decisions as being based to a greater or less extent on instinct. Indeed, the more complex the decision, the more likely this seems to be.

Thus several questions remain to be answered when performing research on ICT value. Many researchers differ in their understanding of the concept, or on the issues to be defined and evaluated, or the specific purpose of the evaluation. In a widely cited paper, Brynjolfsson (1993 p 76) makes the following statement: "Productivity is the fundamental economic measure of a technology's contribution". Increases in productivity may however require changes in the entire system of suppliers, producers and consumers, and it is not at all clear who among them will gain financially – if indeed any of them will.

As a consequence, productivity effects from ICT have been hotly contested. Throughout the 1990s, there was talk of a 'productivity paradox' and one of the best-known public sceptics of IT value was able to describe the productivity gains of the computer age as "just a myth" (Financial Times, 13 August 1997). The phenomenon has also been commented on by Loveman (1994) who stated: "Despite years of technological improvements and investment there is not yet any evidence that information technology is improving productivity or other measures of business performance on a large scale - or, more importantly, significantly enhancing US economic performance." More recently, there has been evidence of such effects at least in industry (Dedrick et al. 2003), but we believe there still remain many sceptics among practitioners in the health sector. Brynjolfsson and other researchers have pointed to the (self-evident) fact that ICT applications will not by themselves have any positive effects, while their costs are apparent. The hoped-for benefits result from changed work processes, and these will not happen automatically even if the new tools were appropriate and function (Pedroja 1999).

In spite of the problems in evaluating, achieving, and proving the hoped-for benefits from new technology, organisations have continued to invest vast sums in it. One reason may be that IT is valued in more complex and subtle ways. Kaplan (1997a) suggested that in the area of medical and health informatics a more qualitative view of IT value is more rational, because qualitative approaches place much more emphasis on the human and sociological values of information systems. They use a wider definition of benefits, placing value in a broader context than accounting and economics, taking into account both hard and soft or intangible benefits. We agree that investment decisions are based on human perceptions of value and aim to contribute to an organisation in different forms. Economic evaluations should encompass not only financial consequences, and money may be used as a metric for combining also other factors, many of which will be non-monetary in origin.

But even calculating health effect per dollar or euro is not enough. Evaluation must include how a change affects different members of society. There is of course an entire philosophical literature

on this, and a long-standing debate among practitioners of evaluation in the health sector. However, we have not been able to find any published evaluations with an explicit focus on interorganisational relations in healthcare in general. Evaluations in the area of medical informatics are often directed to assess the value of electronic healthcare information exchange and the interoperability (HIEI) between providers (hospitals and medical group practices) and independent laboratories, radiology centres, pharmacies, payers, public health departments, and other providers using principles from a cost-benefit model (Walker et al. 2005) and being considered "very optimistic and could produce estimates that are not achievable" (Barker 2005). As for elderly healthcare in particular, we have found no economic evaluations at all that expressly elucidate the consequences for different stakeholders or financers involved in the introduction of new ICT (cf. Vimarlund and Olve 2005).

5. Recommended: multi-actor evaluations

There are several reasons to pay explicit attention to the incidence of costs and benefits to different organisations and (groups of) individuals:

- Ideas of justice and societal equity, as already indicated.

- Studies indicate that most people's utility is influenced by what they see happen to others in society (Becker and Murphy 2002). The impact this has on their own perceived happiness is complex: people value not only what happens to people they know, like relatives. Large inequalities are valued negatively, and many seem to evaluate their own welfare relative to others in society, reporting less satisfaction even though their own standards have improved if this increase does not keep up with that of others. This is probably true also when we act in a professional capacity, as part of one of the organisations interacting in a care system.

- Some organisation or group of citizens may be in a position to block change, so that independent of views on equity it is pragmatically necessary to find ways of convincing them. (As we write this, *The Economist* summarize a story (21 July 2005) about a new information system for the NHS in the UK: "The world's biggest government IT project is working rather well-but the biggest obstacle is convincing doctors to use it").

- Consequences for the organisations involved in a care system may have an effect on their future development, and on the survival and growth of entire industries. Such dynamics also should be observed in choosing one system of care rather than another.

In describing various decision alternatives, this means there are good reasons to be as specific as possible about which actors are to be involved. Only when the outcomes for different groups have been specified in sufficient detail is it possible to discuss likely dynamic effects from an alternative, opposition, notions of justice, and possible compensatory schemes if some group of actors seems mistreated or need to be "bribed" into accepting.

Balancing the claims of different stakeholders is of course in itself a field of enquiry with pragmatic and moral dimensions, which no analyst or decision-maker can avoid who has to select one alternative in preference to another. We can here just remind readers about some of the directions where views on it may be sought. Assuming that an evaluation identifies multidimensional consequences of a decision alternative for a variety of stakeholders or actors, how can this be handled? Here are some examples of approaches:

Multicriteria Decision Making. How a single decision-maker establishes a preference order between alternatives with multiple characteristics became a topic for research in the late 1960s, as computers became available to model people's choices. Research along similar lines has continued in the field of artificial intelligence. It seems, however, to have had very little effect on published evaluations, where additive weighting of criteria still is a common method. This obviously ignores possible nonlinearities and interaction between criteria.

Theories of distributionary justice. When there are consequences for several individuals or groups of individuals, and some courses of action would benefit some among these more than others, there are also political and philosophical issues to deal with. Pareto, Rawls and Nozick are some of the names most commonly referred to here. If analysts who perform evaluations take their ideas into account they will be careful *not* to hide distributionary effects by merging groups into averages, and sometimes to research possibilities to compensate some disfavoured group.

Agency theory. In health system change, individuals and organisations are not just objects of the change, but themselves part of producing change. The consequences they experience will depend on their actions. Distributionary justice – already hard to define – may not be enough. We have to be aware of the incentives that different decision alternatives provide for the individual, organisations and decision makers, and how these may lead to dynamic effects over time. For instance, in developing new ways to organize home healthcare for the elderly, health and social care that belong to entirely different organisations may need to cooperate. To utilize their abilities to the best effect, they need to take into account differences in access to information and risk attitudes. Principal-agent theory is a branch of studies concerned with the analysis of these, and it might be useful in this regard.

Critical social theory. Some researchers prefer to address the kind of change discussed here by emphasizing the involvement of the people concerned, starting participative processes rather than providing well-informed expert solutions. An example is Waring and Wainwright (2002), who describe an ICT implementation in UK hospitals based on ideas from Habermas and critical social theory.

In this article we will not enter into a discussion about the relative merits of these very different approaches. However, we believe that for all of them it is necessary to trace the consequences of different decision alternatives on each among the more important (groups of) individuals and organisations who are impacted by change. We will call this the *incidence* of the consequences of for instance a new ICT or IT application.

6. Illustrations

To illustrate how applications of new technology may impact different organisations and their actors, we have searched for case studies from published sources. Most published cases proved less useful for this purpose, as they concern applications that impact a very small part of one organisation, like one process for a particular profession. Our emphasis has been on finding relatively simple cases, in the sense that specialized medical knowledge is not required to imagine the consequences of an application. The technical change will be described briefly, followed by an account of the advantages and disadvantages for different actors. It should be noted that the analysis was made by us and not by the original authors, and it aims only to illustrate our

suggestion for such studies. It could however be used as an inspiration for further studies of the organisational context for each of these applications of ICT.

In the cases below, we have chosen to differentiate between only three groups of actors. This is because our analysis here is at a superficial level, only serving to illustrate how an analysis can be performed. Also, working from secondary sources, it would probably not be possible or make sense to go into more details.

Telemedicine – saving travel-related costs

Travelling may be avoided through the use of ICT. Patients can be linked to a specialist through technology handled by a nurse at a local health centre. The example selected here (Agha et al. 2002) is just one among several in the literature, and we will comment briefly on some other below. In the reported case, there are no changes in quality of life or mortality risk – cost savings and convenience only motivate the application. Instead of travelling to the specialist, patients communicate through video conferencing with integrated equipment for monitoring heart rate etc. The nurse needs special training for handling the technology.

It seems apparent already through our very limited analysis that here it is the physicians who might be difficult to convince about the new practices. They may be convinced by the convenience of patients, or believe that a possible greater number of investigations may benefit their professional interests. Otherwise, they may remain sceptical and oppose the changes.

Table 1. Incidence of costs and benefits in Agha et al. (2002)

Patients	Physicians	Society
+ Saved travel costs	– Less control: tele-medicine equipment may be handled wrongly, but the responsibility remains with the doctor	+ Reduced production loss
+ Saved time (work or leisure)	– Increased demand for knowledge	+ Option to use equipment for other treatments in the future
– No direct contact with medical specialist	– Difficult to talk openly with the nurse as patient may listen	– Investment costs

In Table 1, it was assumed that Society owns the telemedicine equipment. Obviously, in a system where healthcare is organized in other ways this will have to me modified. For instance, the local

health centre where the patient and the nurse are may not be owned and operated by the same entity as the hospital where the doctor is.
There are many other reports from similar applications: Demartines et al. (2000), Nicogossian et al. (2001), Field (1996), Reid (1996), Hebert 2001), Gardiner (1997), Poloudi (1999), Wooton (1996, 1999), Whitten (2000), Agrell et al. (2000), Tachakra (2000), Dansky et al (2001). Most of these group the effects in ways that are similar to Table 1. Vimarlund et al. (2001) in their stakeholder analysis for real-time interactive video consultations report effects in addition to those included in Table 1 which we have listed in Table 2.

Table 2. Effects from telemedicine, in addition to those in Table 1, in Vimarlund et al. (2001)

Patients	Physicians	Society
+ Reducing follow-up appointments to the hospital.	+ Putting specialists and generalists together in joint consultations	+ Major integration of healthcare units
+ Support from Primary healthcare is possible due his/her participation in consultations with experts or specialists	+ Possibility to interact with other specialists	+ Stimulates inter-organizational collaboration
	+ Information is now accessible to all actors participating in telemedicine consultations	+ Improved quality of diagnosis due to joint participation of all actors
	+ Sharing of knowledge leads to improvement of knowledge	+ Cost effective consultations
		± Demands new work routines
		± Changes organizational boundaries

”Smart cards in the medical sector”

Aubert and Hamel (2003) deal with the introduction of so-called smart cards into Canadian healthcare. Patients carry a card with information on earlier treatments. In the reported experiment, storing information was voluntary, with possibility to add information at a later time if patients change their mind.

The objective is to simplify for all kinds of personnel rapidly to get a complete picture of a patient’s condition, as all information is in one place and follows the patient. The card holds

personal identification data, blood group, data on vaccinations and medicines, and medical history. Ambulance personnel, physicians, nurses and pharmacists who are equipped with special readers for the cards can use data. These groups have different rights to access information. Patients themselves can see their information and get printouts when visiting their care provider.

Table 3. Incidence of costs and benefits in Aubert and Hamel (2003)

Patients	Physicians	Society
+ No need to give same information again when visiting another care provider	+ Rapid and complete access to information saves time and reduces risk of mistakes	– Efficiency gains require general use, which (according to the article) is not possible with current information protection legislation
+ Possibility of future use with other government authorities	– As long as the system is voluntary, doubts may exist if information is complete	
– If cards are made obligatory, patients need to have them available in order to visit care provider (and possibly carry them at all times)		

The article makes some points of direct relevance for our focus here, multi-actor evaluation: Even if everyone recognizes the value of the Health Card, there has to be some individual advantage to motivate adoption. This has to be true for professionals and clients. Usage is conditional on adoption by both groups. The study described in this paper looks at the critical factors that would lead to adoption of the system.

Aubert used statistical tools to rank order the factors that would make an introduction of smart cards successful. Some such factors come from the government and professional organisations, and so these might be considered for inclusion in a multi-actor evaluation: These groups would assess the consequent modifications to their practices, their relative power, and their hierarchical position before recommending adoption.

This case also illustrates in an interesting way that the systemic character of ICT often makes wholesale adoption of new practices a virtual necessity for success (general use and satisfaction as well as economic success). This may be linked to the discussion in Shapiro and Varian (1999) about the role of standards in adopting systems like ICT tools. For instance, it may be necessary

for competitors in an industry to collaborate in establishing a shared standard and thus a market for their products, before they then can compete for market share.

Decision support systems for physicians

Short et al. (2004) describe a system which provides physicians with advice on treatments and risks for stroke patients. Doctors enter data on the patient and the system is meant to improve their diagnoses, supporting the doctor with previous experience that he or she may lack, and thus reducing uncertainty.

Table 4. Incidence of costs and benefits in Short et al. (2004)

Patients	Physicians	Society
+ Possibly an improved diagnosis	+ Knowledge support	– Cost
– May be hard to understand and reduce confidence in doctor	– Fears of reduced authority	
	– Perceived as time-consuming	
	– Need to learn about the system	

In this case like in the previous ones, it is obvious that additional data would need to be collected on the factors mentioned in the table. Unlike in the previous case, there is no need for wide-spread adoption, although acceptance will grow if the tool becomes more common. (Burkle 2003). Decision support systems in medical informatics have been considered as a tool to transfer information between healthcare personnel at different levels, and as a possibility to improve care. However, despite obvious potential benefits only a handful of organisations have successfully implemented clinical decision support systems. A number of barriers may explain this, one of the greatest being the need for an extensive electronic medical record system infrastructure and the necessity to continuously update the system (Bates 2005).

Medical monitoring in the home

Pollard et al. (2002) studied medical monitoring in the home. Developments in wireless networks (PAN, Personal Area Network), advanced sensors, and improved distributed systems have made it possible to install sensors on a person's body or in her home to monitor continuously and directly muscle use, heart rate, toilet visits etc. Computers can also be used to react on these data and adapt for instance room temperature. Monitoring may enable patients to live in their own homes longer. This has the potential to increase life quality but also reduce costs compared to traditional homecare.

To guarantee the integrity of information the system uses encryption of medical data and patient identity, avoiding unwanted access to data. Different professional groups have differing access rights to information.

Table 5. Incidence of costs and benefits in Pollard et al. (2002)

Patients	Care personnel	Society
+ Can stay at home	– Need for new competences	± Cost
– Reduced direct contact with care providers, and negative attitude to surveillance	– Risk of technical breakdown	– Legal worries
– Worries that sensors will malfunction		

As indicated, we cannot be certain whether society's net cost for adopting the system is positive or negative. Most likely, it will differ between different cases, and also depend on the total number of patients' homes that can are monitored. Patients usually appreciate the possibility to live in their own homes, but as we can see there are also negative aspects which will be evaluated differently depending on the gravity of one's condition, personal attitudes and on the possibility to active participate in the care process (Burdea 2002). As in the previous cases, these will need further studies.

Readiness for catastrophes and telemedicine networks

Emergencies such as terrorist attacks lead to breakdowns of telephone networks due to excessive use. In the US, there already exist telemedicine networks which could be used by catastrophe teams if they were equipped with new ICT tools. Care centres with telemedicine equipment would then be able to make a valuable contribution through tele-diagnoses and tele-monitoring. Where medical staff is not present at the site of an accident, web cameras and the internet could be used for rapid diagnoses. Sensors could warn for high concentrations of gas, fires etc.

According to Simmons et al. (2003), in addition to equipment there is a need for interoperability of systems and for rules for how hospitals will collaborate. Hospitals may need government compensation for their investments in making their systems more open and modern, and for the extra workload. Procedures also have to be worked out for the cooperation with police, fire departments, ambulance trusts, and voluntary organisations that might be affected.

Table 6. Incidence of costs and benefits in Simmons et al. (2003)

Patients	Hospital	Society
+ More rapid treatment + Possible prevention of additional damage	+ Possibility to contribute on a national level – Need to invest – Necessity to submit to large system, reducing independence	– Cost for networks – Difficult resource allocation discussions

The case is an interesting example of a system that could be designed ("optimised") on a more or less large scale. Before an analysis is attempted, we need to think hard about who and which issues should be included in the analysis, and how we should deal with the uncertainty inherent in the exceptional character of catastrophes, terrorist attacks, and the challenges that such a system will have to meet. There are of course many approaches in decision theory to such issues.

A comparison of the illustrations

The examples presented illustrate how ICT, in all its forms, is used with a wide range of aims and with different effects (Vimarlund 2003). They also show that even a simple stakeholder analysis may help to understand and predict the reactions of important actors when a new system is proposed.

For instance, in our first example Telemedicine the initial impression may be that negative effects dominate for one key stakeholder group: the physicians (Table 1), but there are claims (Table 2) that they may also benefit from the system. In fact, several of our examples contain legitimate concerns that physicians may have about the proposed systems. For instance, in Table 4 knowledge support is the only positive effect among three negative ones.

When this kind of analysis is viewed as an evaluation, the normal way to proceed would be to weight negative and positive effects, including how much importance should be given to various stakeholders. In this, uncertainties such as legal worries and the risk of choosing systems that later turn out to be incompatible with future standards will have to be considered. Timing of outcomes also will be important, as several among the effects mentioned concern the introduction of a new system rather than its long-term use. Obviously, as in all investment evaluations it is necessary to balance short-term costs against long-term gains. However, it would probably be wrong to attempt an evaluation based on the enumeration of effects in our examples. Instead, tables like these should be viewed as a challenge for redesigning the proposals. Working together with stakeholders to change work processes, modify ICT systems, and influence legislation and industry patterns might eliminate most of the minuses in our tables.

Healthcare organisations still seem to prefer localized adaptations and implement new applications of ICT mainly for administrative and personnel issues, such as storing and accessing information. When ICT is used to rethink procedures it mainly concerns forms or standard formats, which are used to electronically place orders and receive confirmations, eg administrative electronic data processing systems (EDP) or smart cards. Thus the capital investments are made mainly to reduce costly time-consuming errors from manual data entry, to increase the usability of existing systems, and the primary motivation is to improve the organization's budget. In other words, organizations look for short-term returns via the direct effects of IT investments. When processes are indeed changed as a result of new ICT, such as distance consultations or joint consultations with actors at different levels of the healthcare system, our impression is that such changes are mainly motivated through efficiency gains due to the joint use of information and a decrease in transaction costs.

The major benefits from adopting IT for medical monitoring at home may instead be through developing less hierarchical ways of organizing work internally. New structures for interacting and new types of services are developed through internal (horizontal) integration, eg the decentralization of the organization and/or active use of IT for communication. New possibilities to bridge distances and communicate both synchronously and asynchronously open up new ways to transfer information and/or knowledge both between healthcare and administrative personnel and for monitoring patients at home. IT is used to change work processes: the horizontal dimension of the organisation. As incentives grow and the use of IT increases, co-ordination throughout the workplace becomes easier due to the fact that all involved actors can use IT-applications actively.

More complex systems such as terrorism prevention, biomedicine or catastrophe medicine demand a flexible healthcare organization that works actively with the total design of organizational structure, and at the same time design their information management. In these circumstances, IT plays the same role that general-purpose technology (telephone, telegraph) has played before to enable complementary innovations, such as geographically dispersed enterprises, and encourage new business models. The paradox in this case is that the benefits of IT become easier to appreciate, even though its use becomes more powerful and complex. Furthermore, the acquisition of such systems may accompany considerable changes in the structure and behaviour of workplaces, as for instance the possibility to use IT actively at a distance, the possibility to integrate and share databases, and the construction of dynamic social networks of teams.

7. Concluding thoughts

Possible extensions of our analysis

To evaluate and further improve proposed systems like the above, it would seem attractive to take inspiration from agency theory and critical theory (cf. above) and involve actors in a discussion about information and risk. Who should for instance judge patients' condition and needs for practical assistance: care personnel who meet them daily or doctors who see them only infrequently? How should we handle the fact that such decisions may have an impact on costs for someone else – not only the organisation for which the person making the decision is working? Do we always need to align incentives so that the person who is able to judge the situation (the "agent") is sensitive to the wishes of the organisation, which is paying (the "principal").

A first step towards a discussion of such issues is to add a few more rows in the illustrations above, describing the information or knowledge available to each actor, their risk attitude, and the

expected alignment between his or her preferences and those of other actors in the system who will have to pay. Obviously we also need to decide what actors to focus, ie the identity of our columns. Only after this should we attempt to quantify the outcomes, and then discuss tradeoffs.

Role of the analysis – and the analyst

We have here discussed how multi-actor evaluations are needed in health economics. Their design should match the purposes for which they are intended. As hinted earlier, we can imagine a variety of uses, ranging from high-level authoritarian decisions on what policies should be adopted to "emancipating" and "democratic" discussions among stakeholders and actors themselves.

Even in the later case the analyst (i.e. the designer of the evaluation) will play an important part, even though she may not be willing to admit this. The selection of characteristics, how they are expressed, for what groups of subjects or actors consequences are evaluated, etc – all of these will have their impact, and ethical questions arise about the actions of the analyst/researcher. Churchman (1971) pointed out the need for a 'guarantor' in systems analysis. One response to this may be the existence of established procedures or theories for the researcher to follow, another extensive openness about how the analysis is made (and what alternative ways of performing it has been discarded). Ultimately there is no simple answer to this problem. But it does reinforce our conviction that it is important that healthcare evaluations should take into account multi-actor consequences.

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