Electronic prescription system: do the professionals USE IT?

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Abstract: User-adoption of new IT-applications is the proof-of-the-pudding when it comes to IT-success in healthcare. As a consequence, many studies are made of the role of the users in the introduction of new IT in both theory and practice. User satisfaction is widely accepted as a criterion for IS success. However, to understand IS success or failure, it is necessary to recognise its social and technical causes.

The *USE IT* model has four determinants that have to be balanced in assessing the diffusion and use of information systems. *Resistance* is defined as the degree to which the surroundings and locality negatively influences the users of IT and the degree to which IT-users themselves are opposing or postponing the IT change. *Relevance* is the degree to which the user expects that the IT-system will solve his problems or help to realise his actually relevant goals. Micro-relevance is the degree to which IT-use helps to solve the here-and-now problem of the user in his working process. *Requirements* are defined as the degree to which the user needs are satisfied with the product quality of the innovation. *Resources* are defined as the degree to which material and immaterial goods are available to design, operate and maintain the information system. The USE IT model clearly makes the transition in the onion model of the book from change management (USE) to technological innovation (IT).

The empirical results of this qualitative study with 56 cases show that time and communication are the most important factors for General Practitioners for the diffusion and use of an Electronic Prescription System (*EPS*). The social aspects and technical aspects have to be balanced to get to real use of the information system. The (job) relevance of the EPS to the working process of the professional was, in all 56 cases, the most important determinant. The resistance of the professional that is often used as the main reason for plateaued diffusion was shown to be the cumulative effects of the other determinants. For instance a GP with limited resources (like a slow PC) will get annoyed by the waiting time and will resist the new system using a lot of processing time. At first the technical determinants, requirements and resources, seemed to be a prerequisite for the social determinants. Analysis of this presumption showed that a thorough check on resources is necessary and that a user – provider contract on requirements would help bridge the information gap.

Keywords: IT success; perceived usefulness; relevance; use of IT.

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Biographical notes: Ton Spil (1964) is area leader healthcare at the CTIT at the University of Twente. He is teaching in the area of Business Information Systems, mainly in project based education. In 1988 he finished his Masters in Computer Science and started his own company consulting big firms on strategic information systems planning. In 1996 he finished his PhD thesis on the effectiveness of these plans and after that he specialised in the application of area healthcare and professional organisations. In 2000 he was project manager on a big e-health research project on electronic prescription systems for general practitioners. He edited the book *Strategies for Healthcare Information Systems* published by the IDEA group in 2001 and chaired the healthcare track on several major conferences on information systems. He sits on the organising committee of the European Conference on Information Systems and on the programme committee of the American Conference of IS. The main subject of research in 2003 is the governance and inter-organisational aspects of information strategy and the User Satisfaction of IT in Healthcare (UseIT). He has published in international journals on both subjects.

The entire academic career of Roel Schuring has focused around the effective organisation and change of primary processes. This began in Geneva for the International Labour Office (1987) where he studied the effects of assembly automation on the occupational structure of assembly work. He later broadened his scope and included other dimensions of optimal organisation of assembly work (e.g. [1]). During the 1990s he worked mainly on the effective organisation and introduction of programmes for continuous improvement in organisation. Since 1998 he has worked for the Healthcare Management Department. The two areas of interest of his group are the effective organisation of healthcare processes and the effective introduction of new technologies in healthcare processes. These technologies include both information technologies and medical technologies. Dr Schuring works as a part time consultant for major industrial companies in the field of operations strategy.

After her graduation as a physician Margreet Michel-Verkerke spent 13 years teaching nurses and doctors' assistants. During this period she developed an interest in the application of information and communication technology in education. She studied Computer Science at the Open University. She gained her MSc in Business Information Technology from the University of Twente in 2003. From 1998 she worked as a project-manager in the area of E-learning in vocational education. She decided to switch to the application of ICT in healthcare in 2001, when she became a research assistant at the University of Twente. Her main fields of interest are the improvement of care processes by the enhancement of co-operation and co-ordination by the use of ICT, and the Electronic Patient Record.

1 Introduction

Successfully implementing information systems in healthcare organisations appears to be a difficult task [1]. Information Technology is seen as an enabler of change in healthcare organisations [2]. Southon *et al*. [3] suggest that (information) technology adoption decisions in healthcare are complex because of the uncertainty of benefits and the rate of change of technology [4].

Thornett [5] describes benefits as improved quality of care, disease prevention and disease management of chronic physical illnesses. Why then, do these systems not diffuse into the health organisations? The adoption of information technology in healthcare has increased which underlines the importance of user requirements [6]. In later work they link the adoption to the activities of the healthcare professionals [7]. Fleisner and Hofkircher [8] refer to the same problem when they conclude that relevant information will not be improved unless additional requirements are met.

A multiple case study amongst 56 general practitioners (GPs) on the influence of resistance, relevance, requirements and resources on the introduction of an Electronic Prescription System (EPS) demonstrates that the EPS is not used in at least 72% of the cases. Firstly, a broad background of the model is given. To explain the non-use of the system we combine the notions of information usage of DeLone and McLean [9] and Davis [10] and the notion of innovation from Rogers [11]. We use the semantic ladder from Stamper [12] and information levels from Shannon and Weaver [13] to straighten them out. To explain relevance we use the notions of Saracevic [14]. This will be described in the definition and framework section. Together these concepts build up an interview model that we used in all cases as described in the case study method just before the empirical results. Finally we make conclusions for every determinant of the model.

2 Background

We can use a wide range of sources that discuss user-perspectives in IT-introduction. This section gives a short overview of intriguing literature. The aim is to demonstrate that the four determinants explained separately in the next section should be handled as a whole dynamic interrelated set of quality criteria. One of the ultimate goals of our research project in this field is to propose a model that neatly balances the role of such factors.

First, such factors may be looked for in general literature on change and on the introduction of new technologies. For example, in the balance model of organisational change risks, Leavitt [15] introduced four domains in which these risks will occur: tasks, structure, technology and people. Offenbeek & Koopman [16] connect people with resistance potential because they can feel that the quality of their working life will be decreased. Mumford [17] observed that user participation contributes to effective organisational change. Wissema [18] defines resistance as a willingness to change and the difference between results and expectations.

When we focus on IT introduction more specifically, we again see a number of interesting literature sources. Thong and Yap [19] discuss the user-satisfaction approach to IT effectiveness. They mention the debatable operationalisation, poor theoretical construct and misapplication as critics to the approach. On the basis of their review, they conclude that attitude is the construct that lies at the root of user-satisfaction, and suggest ways to improve operationalisation and measurement of attitude. Paré and Elam [2] studied attitudes, expectations and skills in relation to physicians' acceptance of IT systems. Physicians with formal training on computers were more knowledgeable about informatics' concepts and reported that computers would be more beneficial to healthcare, although it is not clear whether the training causes this attitude. Also, it becomes clear that user-priorities regarding IT-innovations vary strongly.

The functional uncertainty is often described in information systems' literature. It occurs in the task domain of Leavitt. In each situation, the interpretation and the meaning can be different. Therefore, it is necessary to establish a functional specification with user and providers of the information systems. Henry and Stone [20] state this to be information quality. Larsen [21], p.413 notes however 'the quality of the IS/IT product is a necessary but not a sufficient prerequisite for IS innovation success. The *people* within the organisations determine the outcome.' Within the healthcare sector, Walley and Davies [22] conducted a study on the internal barriers to technological IT-advancement in the healthcare sector. The involvement of stakeholders is arguably one of the most distinctive characteristics of IT projects. There are instruments to identify user-needs, but they question whether they are actually used. Van der Pijl [23] shows that there is more to say about people than just resistance or user participation. Both users and providers of information systems have their own targets, not necessarily going hand-in-hand. A central question is whether the provider intention is the same as the user interpretation [24].

Finally resources (human, physical and monetary components [25]) are needed to implement the new information system into the organisation. The human resources can be insufficient in both time and experience (risk of technology). Insufficient material resources [16] will have a limiting influence on the other three risk domains.

In this chapter, we will focus on all four determinants of user-adoption of IT in healthcare, i.e. resistance, relevance, requirements and resources. It is most important to elaborate the construction of a framework that brings these factors together. Saarinen and Sääksjärvi [26] point out that different factors act as critical success factors under different circumstances and make a distinction in process factors and product factors. This will also apply when a framework of success factors is limited to user-related factors. Table 1 gives an overview of the USE IT model.

Table 1 USE IT model

USE IT model	*User domain*	*Information technology domain*
Product	Relevance	Requirements
Process	Resistance	Resources

3 USE IT: definition and framework

3.1 Resistance

The tendency of human beings to resist and fear new and unknown things and the willingness to stick to the familiar procedures has been widely studied. (e.g. [27–29]). Attributing the rejection of innovations only to anxiety and fear of change, however, is an oversimplified view of the process of technology transfer [30].

Carey [31] finds a correlation between acceptance of change and variables such as previous use (experience), education, and current usage of a new system. She also reports that commitment, exposure to change, and preparation for change are important for successful implementation of new technologies and systems. So a much broader view on the subject of resistance is appropriate.

We start with the first known published reference to research on resistance to change in organisations by Coch and French [32]. They were early explorers in the world of resistance when they concluded that 'by preventing or greatly modifying group resistance to change, this concomitant to change may well be greatly reduced'. Besides taking notion of resistance influencing successful change they state that it can be different on group and individual level. Later change management literature categorises into the individual, group and organisational (structure) levels.

On the group level, Lewin [29] refers to 'group standards' when looking for reasons for resistance to change. He concludes that the more individuals take the group standards of their environment, the greater will be the resistance to change of an individual group member. Lewin further continues that group standards with social values are often referred to as 'social habits'. The mean for reducing the level of resistance may thus be either to diminish the strength of the value of the group standard or to change social habits themselves.

Both Lawrence [33] and Zuboff [34] conclude that resistance is not simply an irrational phenomenon to be overcome [35]. Zuboff sees positive and negative aspects to resistance. This healing effect of resistance is described by more authors [36–38]. Insightful and well-intended debate, criticism or disagreement do not necessarily equate to negative resistance, but rather may be intended to produce better understanding as well as additional options and solutions.

Kotter and Schlesinger [39] diagnose resistance from the negative viewpoint as:

- parochial self interest (fear of losing something worthwhile [18])
- misunderstanding and lack of trust
- different assessments (believe that change is worthless [18])
- low tolerance for change.

Fuller [40] also discovers different levels of concern regarding resistance. Self concern can be seen in awareness, personal commitment and personal consequences. Task concern is related to controlling the change and co-operation concern sees both concerns in collaboration and reengineering. Schmidt [41] whose study was a mirror of control for this study refers to Zmud [42] who adds a fourth environmental category. Lapointe [43] applies these categories in explaining the dynamics of IT adoption in healthcare. She based her theory on the theory of reasoned action where ìindividual behaviour is directly determined by one variable-intention which, in turn, is determined by two variables: attitude and subjective normsî. In line with Scott [44], Prasad and Prasa [45] make the distinction between formal and informal (routine) resistance. Strebel [46] already described this as personal compact, formally a job description and appraisal but informally psychological (mutual expectations) and socially (cultural values).This brings us back to the notion that change is intensely personal [47] and therefore our empirical material is gathered very close to professional coping with the change.

Kotter and Schlesinger are mainly interested in the self concern. Mittelstaedt [48] adds the inability of either individual or group to cope with the change. Also the situation can call for postponement. The situational factors we see as mainly emerging on an organisational level.

- not for them (reject)
- unwilling or unable (accept)
- postpone (time and situation) (accept).

Gatignon and Robertson [49] and Szmigin and Foxall [50] use like distinctions, the latter introduce opposition instead of unwilling or unable. Ram and Sheth [51] call this habit resistance and also relate to Rogers [11] when they state that often an initial resistance has to be overcome. Please note that most of the literature in this paragraph is based on resistance of consumers. It might not always apply in a healthcare environment.

Offenbeek and Koopman [16] introduce the resistance potential and make a distinction between change-ability of the problem system and desired change. This potential of resistance would be people-determined resistance according to Markus [52]. System-determined resistance is handled in the technical determinant of IS success but the interaction-determined resistance which is mainly political (inter)organisational resistance can only be seen within the reasons to postpone of Mittelstaedt [48].

Other publications on the subject of resistance challenge or enhance the 'accepted' concepts [53]. Piderit [37] suggests that resistance to change is a complex, multidimensional response with emotional, cognitive, and intentional components. For example no participation or not enough communication, may result in an emotionally resistant attitude to the changes, even though the changes make good business sense (cognitive). Alternatively, initially enthusiastic (emotional) and clearly seeing the need for change (cognitive), people give up (i.e. our intentions change) because they are not given the support they expect and think they'll need in order to make the changes happen. It is rare that employees are all negative or all positive across the three dimensions. It is important to remember that resistance to change is normal and frequently functional.

'Moving too quickly toward congruent positive attitudes toward a proposed change might cut off the discussion and improvisation that may be necessary for revising the initial change proposal in an adaptive manner.' In other words, discussion, disagreement and experimentation can consistently lead to more successful change, whereas effective communication and participation are powerful tools for overcoming and avoiding misunderstandings [38].

Zaltman and Duncan's [54] resistance framework discusses four categories of barriers, 'cultural, social, organisational, and psychological' that can obstruct change. These categories are in turn broken down into a total of 18 resistance factors, which disrupt change efforts and distort adopter perceptions of innovations.

This framework can be useful because it explores change from the opposite perspective to most other models. By focusing attention on factors that erect barriers to change, Zaltman and Duncan help to recognise such obstacles as they arise or even to identify and address their underlying issues before they arise. It is important to note that a given individual can harbour intense pro-change and pro-resistance sentiments simultaneously.

Though detailed in its 18 factors, this framework is not suitable for the goal of this study. More appropriate is a model with its roots in change management, educational and training literature, structuring resistance and affection into three categories; Ability, Attitude and Opportunity. Metselaar [55] describes this used in training against (negative) and with (positive) resistance based on a concept from social psychology [56]. Lanning [28] comes with the same result in an empirical study for a planned change approach. We adopt these findings into our 'framework for resistance to IT change' where we should

reckon that the main focus of these shifts from (inter)organisational, to group, to individual. In line with the USE IT model [57,58] this subdivision is made into macro – and micro relevance.

3.1.1 Attitude (Will) to change

People who are expected to participate in the change project must have personal motivation and a sincere will to engage themselves in the development. Comprehension and acceptance of the basic idea in the project is an important condition. Will does not occur unless real effort at developing the organisation can be perceived.

3.1.2 Ability to change

The level of knowledge and skills of those who are involved in a 'change' project needs to be high enough to be able to contribute to the project. Job specific skills enabling people to use new tools and technology and to act according to new procedures and tasks must be adequate. But ability also means comprehension of project vision and understanding one's own role in implementing the new technology. The user experience also adds up to his ability to change.

3.1.3 Opportunity to change

Organisational systems (surrounding people and structures) to support the development process and implementation of the new technology. Sufficient resources, top management support and commitment are essential to give everybody the feeling that change and development can be achieved.

These sub-dimensions of resistance fit underneath the user satisfaction research model of Mahmood [59] as they call it user background and organisational support. The perceived benefits that complete user satisfaction are in the USE IT model situated under the relevance determinant [57,58] and are described in the next section.

3.2 Relevance

Saracevic [14] defines relevance as a measure of the effectiveness of a contact between a source and a destination in a communication process. This is a somewhat abstract wording of what we would call the degree to which the user expects that the IT-system will solve his problems or actually help to realise his relevant goals. There are three dimensions that are kept implicit in Saracevic's definition that we wish to stress. Firstly, we use the word 'expects' since we want to stress that relevance is a factor that is important in the course of the adoption process, not only in evaluation. Secondly, instead of effectiveness we use 'solve problems and goals'. By doing so, we imply that effectiveness has two dimensions: to take away existing negative consequences (problems) and, to reward with positive consequences (reach goals). Thirdly, the word *actual* is crucial in our view of relevance. Relevance is not to be confused with the degree to which the user considers outcomes as being positive. The set of outcome-dimensions that someone considers 'positive' is larger than the set of outcome-dimensions that are relevant. Imagine a physician, who basically considers IT-outcomes of a computer decision support system, such as, assistance in diagnosis, disease prevention or more appropriate dosing of drugs [5], as 'positive'. This does not automatically imply that IT-adoption is relevant to him. It is only relevant if these dimensions are high on his goal agenda. That is why we use the word 'actual'. Again, this is a more explicit wording of a dimension that is implicitly included where Saracevic' uses

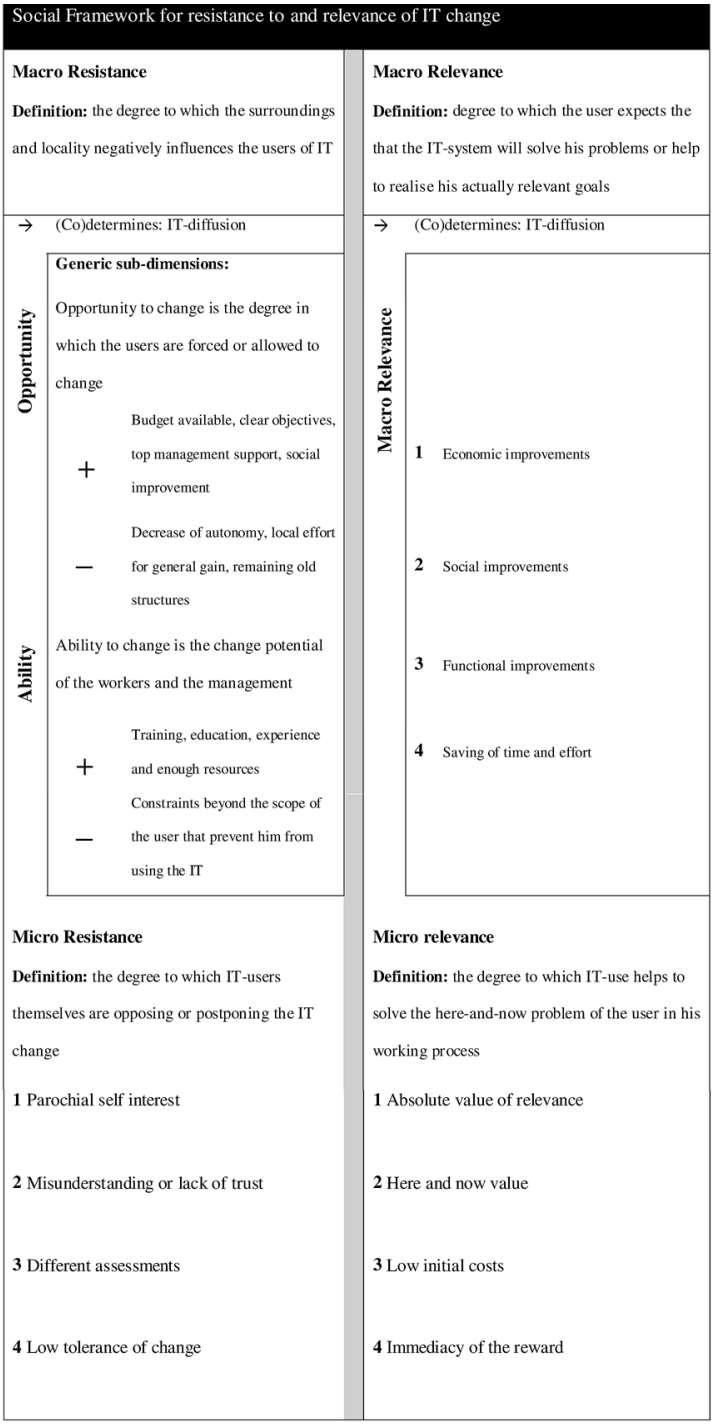
the word effectiveness in his definition. The actually relevant goals may be a mix of short-term and long-term goals. If, for example, smooth communication with hospitals or pharmacy is his prime actual problem or goal, he will only consider the IT-innovation as relevant when it actually helps to improve that communication, notwithstanding the fact that he might have a positive attitude towards that innovation as long as the innovation helps to solve other problems or other goals that are on the lower positions in his agenda-ranking. We discovered in our case-studies that it is not sufficient for an innovation to effect a positive attitude amongst users. The IT-innovation should be relevant.

Micro-relevance is a related concept that can be used to describe a similar phenomenon once the new IT is installed. Micro-relevance is defined as 'the degree to which IT-use helps to solve the here-and-now problem of the user in his working process'. The use of new equipment or new IT-procedures is a conscious activity. In every conscious activity that is goal-orientated to a specific goal, there is a reason why that course of action is being chosen. Similar to what was discussed above on 'relevance', not every course of action that a user basically considers as 'positive' is 'micro-relevant'. Again, let us illustrate this with an example. Imagine a patient with a virus infection visits a physician. The physician might notice the similarity to a number of other patients he has met that week and decide on diagnosis and treatment fairly quickly. To this doctor, the use of a decision support system to determine diagnosis is not micro-relevant. However, a colleague of his may not feel so confident and thus use the system. We discovered that micro-relevance is a key factor in explaining IT-use in our case-studies. Figure 1 gives an overview of relevance as we propose to use it.

Relevance and micro-relevance are notable refinements of the way the role of the user is being discussed in the existing literature [5] implicitly refers to relevance and micro-relevance when he discusses limited adoption and use of DSS by primary physicians where 'consultation time is lengthened by their use and there is no appreciable impact on patient satisfaction'. It is an example where other outcomes that are basically considered as positive (as mentioned above: better diagnosis, more appropriate dosing of drugs, and other) are overruled by limited relevance and micro-relevance.

Saracevic [14] provides an historic positioning of relevance. The roots lie in the 1930s and 1940s where the distinction between information and relevant information is made by Bradford [14; p.324). In order to make the distinction between relevant and non-relevant information, he discusses the nature of communication. By doing so, he recognises that relevance to a subject depends on specific dimensions, like for example, the subject's knowledge, representation and values. He discusses a number of (philosophical) approaches to relevance. The elaboration we propose above builds on the radical pragmatism-perspective or, more specifically, Cooper's [60] utility function 'Relevance is simply a cover term of whatever the user finds to be of value about the system output, whatever its usefulness, its entertainment, or aesthetic value, or anything else'. Wilson [61] adds to this that relevance is situational. Ballantine *et al*. [62] put it in the following way: 'Depending on the type of task, the information generated by the system may be more or less appropriate, which will affect its success or failure'. Saracevic [14] distinguishes various other approaches to relevance, of which a number focus on the basic source of relevance, like logical relevance, the nature of interference and the pertinence view of relevance. We are very much aware of the fact that our elaboration of relevance does not, in full, retain the differences between those points of view. It is merely a practical elaboration that we use to predict user-adoption.

Figure 1 Social framework for resistance and relevance



The pragmatic perspective of relevance that we choose resembles the notion of 'relative advantage' as discussed in the Innovation Diffusion literature by Rogers. Rogers [11,63] reserves a central role for 'relative advantage', which is the user's view of 'the degree to which an innovation is better than the idea it supersedes'. Relative advantage can be economic or social. Rogers: 'The nature of the innovation largely determines what specific type of relative advantage is important to adopters, although the characteristics of the potential adopter also affect which dimensions of relative advantage are most important'. Based on a review of hundreds of empirical studies, Rogers concludes that relative advantage explains 49% of the rate of adoption of innovations.

It is most notable that the organisational factors are not explicitly included in our user-relevance framework. It should be kept in mind that a user's agenda of problems and goals depends on his role in society [64]. The influence of the organisation on this agenda depends on many aspects, including the involvement with other organisations on time and on place. As a consequence, our framework reflects the actual impact that organisational goals and preferences have on the user, and thus, on organisational behaviour.

3.3 Requirements

At the semantic level [9,12,13] we are concerned with how pattern-types relate to what happens in the world. On this level we deal with the meaning of the system but this term brings along a lot of different meanings about its definition [65]. The meaning of a sign relates to the response the sign elicits in a given social setting [66]. It is situational in nature since we have a range of pattern-types that signify a certain meaning and a user (group) that interprets the expression [67]. It is therefore necessary to establish requirements as thoroughly as possible.

Wieringa [68] defines requirements as *desired properties needed to achieve the desired composite system properties*. Pressman [69] makes a distinction between normal requirements, expected requirements and exiting requirements. Before defining requirements ourselves we want to study the problem at a deeper level.

'Many system designers do not appear to realise that with their present approach they are designing only partial systems' [17]. She argues that all the needs of the end users should be identified. The notion of variance emerged from some early socio-technical work design experiments in Norway [17]. A variance is defined as *a tendency for a system or subsystem to deviate from some desired or expected norm or standard*. Key variances are the deviations on goals and functions, operational variances stem from the organisational problems. Together they get close to the main problem that we are addressing, the information gap between designer and user.

Iivari and Koskela [70] include three quality constructs on a semantic level which they call the input/output requirements: informativeness, accessibility and adaptability. Informativeness describes the potentiality of the information systems, accessibility the quality of the user-IS interaction and adaptability points to the ability of the systems to change.

DeLone and McLean [9] enumerate the criteria from nine earlier studies. They declare that there is not 'one' measure of IS success but many dependent variables. They call their taxonomy on the semantic level information quality. Usefulness or relevance is mentioned eight times in the nine studies. Schuring and Spil [57,58] have studied the importance

of relevance and made it a separate determinant on the pragmatic level. Timeliness is empirically used five times and adopted in our model. We keep using the term accessibility as a broader term including convenience of access. Accuracy is studied four times and adopted under informativeness. We do not understand why there is no notion of adaptibility or ability to integrate in the DeLone and McLean study. We adopt 'ability to integrate' as the degree that the new system is imbedded in the organisation.

Brender and McNair [71] use the ISO 900x structure and use the strategic, tactical and operational level to perform their user requirements specification. Larsen [21] also makes this distinction. The strategic level is concerned with the problem definition, including objectives and global task description. The tactical level is interpreted as a preferred approach and the operational level includes a set of functional, performance and capacity criteria.

Requirements are defined as *the degree to which the user needs are satisfied with the product quality of the innovation*. We divide the requirements into macro and micro requirements (see Figure 2):

- strategic general requirements and tactical approach is the degree to which the users agree with the objectives and methods used.
- functional requirements and performance requirements specify what the content of the innovation should be. In this study we chose timeliness (accessibility), accuracy (informativeness), ability to integrate and content as the main quality criteria, but we acknowledge that this is more of a framework than a complete list.

3.4 Resources

Under the semantic level most researchers situate the syntactical level [70]. They give efficiency criteria to measure the quality of the information system on this level (design costs, operations costs and maintenance costs). Shannon and Weaver [13] call it level A, the technical problem and Stamper [12] divides it into three levels (syntactic, empirical and physical). The main quality criteria on these levels are formal specification, reliability and costs.

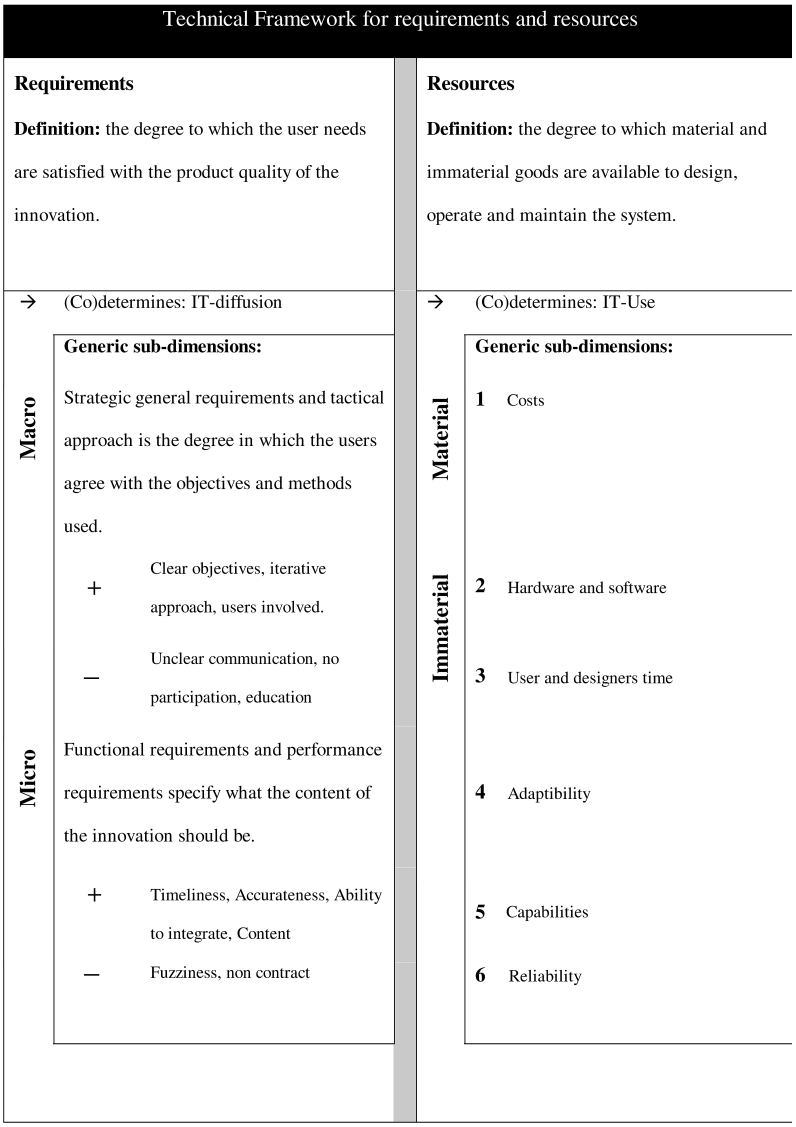
Resources are defined as *the degree to which material and immaterial goods are available to design, operate and maintain the information system*.

The design costs can mainly be seen as time and capability of users and designers [72] but the size of the project and the complexity of the problem could also be measured to assess the risk of the innovation design. Also hardware and software costs fall under this heading. Formal specification on a syntactic level can be checked on the semantic level with the quality criterion accuracy (data, system and information).

The operations costs are mainly human resources but the abnormal costs can be derived from the reliability of the system [70].

The maintenance costs can be shown with the quality criteria adaptability and portability that also link to the ability to integrate on a higher level.

Figure 2 Framework for requirements and resources determinants



4 Multiple case studies results

4.1 Case study method

Nykänen [73] distinguishes four major evaluation perspectives: goal-orientated, standardised, effectiveness-based and stakeholder-based perspective. In a goal-orientated evaluation the emphasis is on rationality: measurement criteria and the means to achieve the goal can be derived from the goal itself. This is possible if there the criteria are

clear and there are no conflicts of interests among the stakeholders. The downside of goal-orientated perspective is the inability to see other than the anticipated consequences of actions. In standardised (or normative) evaluation, causes and consequences are not in the scope of interest, but compliance with rules, agreements, budgets and principles is monitored (e.g. quality systems). From an effectiveness-based view point the input/output ratio of actions is economically evaluated. The problem with this perspective is in expressing intangibles (e.g. health) in monetary terms. According to the stakeholder-based perspective, all actions are not always rational, aiming at one mutual goal, and therefore the criteria should be collected from several stakeholders' points of view. The perspective has a lot of qualitative characteristics and it can be quite a laborious framework for a study design [74].

This study used the stakeholder-based perspective and was set up both to assess the situation regarding the electronic prescription system 'EVS' in the Netherlands and the theory described above, set up to provide an instrument that could be used to unravel the diffusion situation of the prescription system. This resulted in a case-study protocol that covers all the topics mentioned in the framework in open-ended questions. In line with the case-study approach by Yin [75] we discerned different case-situations on the basis of our theoretical framework. In particular, the network situation (individual, group practice, healthcare centre) of general practitioners and the degree of adoption of previous ideas (laggard (no computer) to innovator (using ICPC codes and electronic patient record)) served as a basis to make categories of general practitioners. A total of 56 case-studies was conducted. Each general practitioner was visited in his/her own working situation and interviewed for over an hour. We agree with Brender [76] that the kernel point of assessment is that of understanding the process. We had data available on the size of each category, which enabled us to quantify the qualitative data that we gathered.

4.2 Empirical results GP electronic prescription system

4.2.1 Empirical resistance of GP

The main problem formulation for this study was to find the obstacles of implementation of the EPS system. Under the header resistance of the GP, questions were asked about problems or wishes that the GP experienced as important at the moment of asking, during implementation of the Electronic Prescription System. Table 1 gives an overview of all the situational resistance factors mentioned. Here we will summarise the results of the main five:

- time (55%)
- user interface 33%
- free choice 30%
- ICPC 27%
- unwilling 20%.

Fifty five percent of the case population were said to be under immense time pressure. We think that this made the EPS less relevant to the GPs [57,58] but it also levered the resistance because the GPs thought they would need more time for a consult using the EPS instead of less time. These statements are confirmed by British research [77].

Thirty three percent of the GPs had problems with the quality of the software. Main problems were not related to the new EPS but more to the old GP – IS that was not able to give a good user interface. The EPS we described in [78] as 'spoilers on a T-ford'.

Thirty percent of the GPs say they do not want to be constrained by a new system and want to maintain their free choice in prescribing drugs to their patients. Some say the advice is too conservative, others say they want to be able to try out new ideas. All of them say they want the freedom of choice.

Twenty seven percent of the GPs thought that ICPC, the international primary code, was a problem when using the EPS system. Some stated that it was rather difficult to find a ICPC related to the diagnosed disease. Other state that it is not necessary to use ICPC for general diseases like flu' because it costs time and does not help the process.

Twenty percent of the GPs are unwilling to use the EPS in principle. That means that they have not looked at it and will not look at it just because they do not like the change.

4.2.2 Empirical relevance to the GP

Under the heading relevance for the GP, questions were asked about problems or wishes that the GP experienced as important at the moment of asking, during implementation of the Electronic Prescription System. Table 1 gives an overview of all the situational relevance factors mentioned. Here we will summarise the results of the main seven:

- communication
- time
- money
- software
- free choice
- International Code Primary Care (ICPC)
- formulary.

In more than half of the cases that improvements have to be made to communication with colleagues, pharmacists and hospitals. They state that a standard way of working is very important to reach such a communication. The EPS system does not deliver these features. Saarinen and Sääksjärvi [26] measured the improved internal communication and improved inter-organisational communication under the heading 'Impact of the IS on the organization'. None of these success factors was satisfied in our cases.

In 55% of the cases and independently of each other (the term was not mentioned by the interviewee) the GPs stated that there should be a diminishing of the time pressure. In the description of the EPS, as in international literature, it is assumed that EPS will not diminish the consult time [5,77].

Forty five percent of the case studies reported that the GP expected a fee in return for going through the trouble of implementing and using EPS. At the moment of interviewing it was not clear what financial profit the new system would deliver for the GP. What was known was that it would deliver the government great savings on the costs of medicine.

In about 20 case studies lack of trust in the existing software and in the software supplier were mentioned as a barrier for (wanting to) use the new EPS. They said that first things had to change in the GP – IS market and in the GP – IS itself before EPS could be a success.

About the same amount of GPs want to retain freedom of choice for medication of the patient. Although this seems to be a resistance matter it is also a relevance matter because the EPS does not comprehend new ideas and new treatments which are already known in general practice.

Although the use of ICPC seems useful to many GPs (in structuring and communicating) the time that it will cost to find the right code and the omissions of some codes will create a barrier to EPS use.

Twenty percent of the GPs make use of a personal or regional formulary. The EPS makes use of a formulary of the Dutch Council for GPs and often cannot keep their own formulary when an update of the software is installed.

Finally, once the computer system was installed, use of the system was mostly sparse. The way of working was relatively complicated and added relatively little value in most patient – doctor contacts.

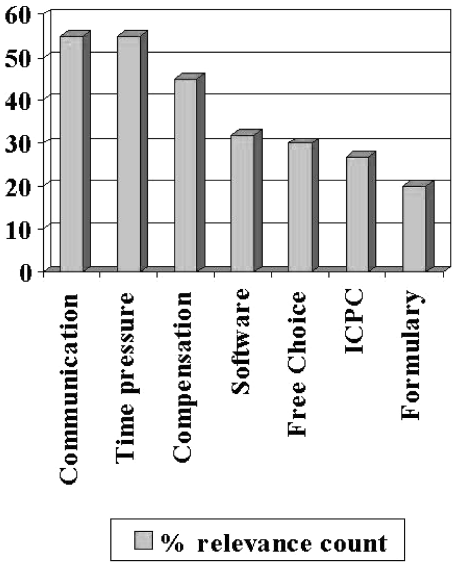
4.2.3 Empirical requirements to the GP

The objectives for this innovation were mainly money driven. The system should decrease prescription costs with 150 million euro yearly. To the GPs we interviewed, the goals were not clear.

4.2.3.1 Content

The functionality of the system can be divided into administrative functionality and medical functionality. We observed that the administrative use of the system has the overhand. Only 15 GPs (27.3%) made use of the SOAP (subjective, objective, assessment, plan) module in the systems which is a prerequisite for the use of the electronic prescription system.

Figure 3 Case study results on relevance



Communication with other GPs, hospitals and pharmacists is a requirement that is high on the agenda of the GP (55%). Still, the new EPS does not support the communication at all.

4.2.3.2 Timeliness

The time pressure is one of the most important problems of the GP today. Timeliness of the system is therefore an important performance criterion. Due to a bad user interface the GPs are not able to work several records parallel and therefore lose time in opening and closing the patient's record.

4.2.3.3 Accuracy

The accuracy of the system is good and might be too good. The system was rigidly designed to avoid failures and therefore has many signal functions. For instance, when prescribing medicines for influenza, the GP gets a lot of alternatives and warnings where he or she already exactly knows what to prescribe.

Also the accuracy of input is a problem because 30% of the GPs think it is unnecessary and sometimes difficult to generate a code for all 'vague' diseases like stomach ache, headache and so forth.

4.2.3.4 Ability to integrate

The electronic prescription system is delivered on CD-ROM as a stand alone system. This means that it is not integrated in the GP information system and also not in the communication configuration of the GP. The GP therefore has to start the programme for each patient and cannot work parallel even more because the system is not window based.

4.2.4 Empirical resources to the GP

4.2.4.1 Costs

For the GPs there are no costs involved in getting the system but they need to time to install and operate the system. In general 30 million euro was spend in designing and implementing the system. Strangely all system suppliers said they did not get money to change their GP information system. The operating and maintenance costs are not seen as a problem by the GP. The reward for using the system is seen a problem. Extra office support was promised by the government but in practice not given and not clear.

4.2.4.2 Hardware and software

The GPs have no faith in the suppliers of GP information systems. Caused by fusions and take-overs, the suppliers and GPs are in a deadlock situation where maintenance seems to be the only thing that happens. Thirty percent of the GPs call the quality of the GP information system an obstacle to using the new EPS. We described it as 'spoilers on a T-Ford'.

4.2.4.3 User's and designer's time

From our questions to the GPs it is very difficult to analyse the time spend in designing the system. In operating the system the GP loses time because he or she has to put more information in the computer and uses some time in consulting the system. With an average time of six minutes per consult this will a big problem.

4.2.4.4 Adaptability

From maintenance point of view, the system is very adaptable since a new version just has to be distributed without having to change the rest of the GP systems. Nevertheless we advised that the GP system itself had to be updated with the EPS as an integrative communicative subsystem within.

4.2.4.5 Capabilities

One of our final conclusions in the main report [79] is that we think it is crucial in the continuance of the project that the average GP is addressed instead of the innovative GP. In designing the system GPs were involved but only voluntary GPs that are bound to be pro bias focused.

We also found big differences in IT capabilities. Some GPs still used the 'green card' and no computer and some GPs did all their activities on the computer. Different introduction scenarios therefore are needed to diffuse the system into all GP practices.

4.2.4.6 Reliability

According to the General Practitioners, the system is reliable. Breakdown of the systems seldom occurs. The maintenance is reasonable although one GP states: 'We have to be at a patient's house in ten minutes and they can stay away for ten days'.

5 Conclusions

Resistance of GPs is not *the* determinant of the use of the EPS (only 27%). Resistance is the cumulative consequence of effects of the other determinants and therefore it looks as if resistance is the most important determinant. This means that many studies work on the effect and not on the cause of the lack of IT use.

Relevance has long since been a central notion to IT-theory. The elaborated approach that we proposed in this paper was used in 56 case studies. These cases provided us with enough evidence that for this particular (electronic prescription) system in this particular (healthcare) branch, relevance was the most important determinant for failure of diffusion and use of the system.

Although in many studies the social criteria of success are mentioned as more important than the technical criteria we cannot confirm this for these 56 cases. In most cases the resources were not sufficient to use the new electronic prescription system. On top of that the requirements of the users were not sufficiently met by the system. We like to draw the following conclusion for the healthcare organisations: before starting a new project to build or buy a new information system in healthcare organisations it is necessary to explicitly measure the resources available. Next step is to make a contract containing functional and performance requirements both agreed upon by a broad (laggards and innovators alike) group of end users and the responsible designers of the system.

Finally, we can conclude that assessing the IT diffusion and IT use of the electronic prescription system with the USE IT model was a multiple case study balancing the socio-technical determinants. The model has been used in two other healthcare situations and is now being used in a telecare project for stroke patients and a diffusion project of an electronic patient record in a hospital. We stimulate other researchers to work with the model in other environments (also outside healthcare). The interview schedule can be found in the Appendix.

References

1 Berg, M. (2001) 'Implementing information systems in healthcare organizations: myths and challenges' *International Journal of Medical Informatics*, Vol. 64, pp.143–156.

2 Pare, G. and Elam, J.J. (1999) 'Physicians' acceptance of clinical information systems: an empirical look at attitudes expectations and skills', *International Journal of Healthcare Technology and Management*, Vol. 1, No. 1, pp.46–61.

3 Southon, G., Sauer, C. and Dampney, K. (1999) 'Lessons from a failed is iniative:issues for complex organisations', *Medical Informatics*, Vol. 55, pp.33–46.

4 Walley, P. and Davies, C. (2001) 'Implementation IT in NHS Hospitals – internal barriers to Technological Advancement', paper presented on the 1st Hospital of the Future Conference, Enschede, The Netherlands.

5 Thornett, A.M. (2001) 'Computer decision support systems in general practice', *International Journal of Information Management*, Vol. 21, pp.39–47.

6 Beuscart-Zephir, M.C., Brender, J., Beuscart, R. and Menager-Depriester, I. (1997) 'Cognitive evaluation:how to assess the usability of information technology in healthcare', *Computer Methods and Programs in Biomedicine*, Vol. 54, pp.19–28.

7 Beuscart-Zephir, M.C., Anceaux, F., Crinquette, V. and Renard, J.M. (2001) 'Integrating users' activity modeling in the design and assessment of hospital electronic patient records: the example of anesthesia', *International Journal of Medical Informatics*, Vol. 4, pp.157–171.

8 Fleisner, P. and Hofkircher, W. (1998) 'The making of the information society: driving forces, 'Leitbilder' and the imperative of survival', *Biosystems*, Vol. 46, pp.201–207.

9 DeLone, W.H. and McLean (1992) 'Information systems success: the quest for the dependent variable', *Information Systems Research*, Vol. 3, No. 1, pp.60–95.

10 Davis, F.D. (1989) 'Perceived usefulness, perceived ease of use, and user acceptance of Information Technology', *MIS Quarterly*, September.

11 Rogers, E.M. (1983) *Diffusion of Innovations*, The Free Press, New York.

12 Stamper, R.K. (1973) *Information in Business and Administrative Systems*, John Wiley & Sons, New York.

13 Shannon, C.E. and Weaver, W. (1949) *The Mathemathecial Theory of Communication*, University of Illinois Press, Chicago, IL.

14 Saracevic, T. (1975). 'Relevance: a review of and framework for the thinking on the notion in information science', *Journal of the American Society for Information Science*, Vol. 26, No. 6, pp.321–343.

15 Leavitt, H.J. (1965) 'Applied organisational change in industry: structural technological and humanistic approaches', in March J.G. (Ed.) *Handbook of Organisations*, Chigaco, IL, Rand-McNally, pp.1144–1170.

16 Offenbeek, M. van and Koopman, P. (1996) 'Interaction and decision making in project teams', In West, M.A. Ed. *Handbook of Work Group Psychology*, John Wiley & Sons Ltd.

17 Mumford, E. (1995) *Effective Systems Design and Requirements Analysis*, MacMillan, London.

18 Wissema, J.G. (1987) *Angst om te Veranderen? Een Mythe!* Assen, Van Gorcum.

19 Thong, J.Y.L. and Yap, C.S. (1995) 'CEO characteristics, organizational characteristics and IT adoption in small businesses', *Omega*, Vol. 23, No. 4, pp.429–442.

20 Henry, J.W. and Stone, R.W. (1999) 'End user perception of the impacts of computer self-efficacy and outcome expectancy on job performance and patient care when using a medical information system', *IJHTM, Special issue on advances in the management of technology in Healthcare*, Vol. 1, Nos. 1/2, pp.103–124.

21 Larsen, T.J. (1998) 'Information Systems Innovation: A Framework for Research and Practice' In Tor J. Larsen and Eugene McGuire (1998). *Information Systems Innovation and Diffusion*. Idea Group Publishing. Hershey, USA.

22 Walley, P. and Davies, C. (2001) 'Implementation IT in NHS Hospitals – internal barriers to Technological Advancement' paper presented on the 1st Hospital of the Future Conference, Enschede, The Netherlands.

23 Pijl, G.J. van der (1994) 'Measuring the strategic dimensions of the quality of information', *Journal of Strategic Information Systems*, Vol. 3, No. 3, pp.179–190.

24 Sperber, D. and Wilson, D. (1986) *Relevance, Communication and Cognition*, Basil Blackwell, Oxford.

25 Ansoff, I. (1965) *Corporate Strategy*, McGraw Hill, New York.

26 Saarinen, T. and Saaksjarvi (1992) 'Process and product success in information system development', *Journal of Strategic Information Systems*, Vol. 1, No. 5, pp.266–277.

27 Goodstein, L.D. and Burke, W.W. (1997) Creating successful organizational change. In Carnal C.A. (Ed.) *Strategic Change*. Oxford, Butterworth-Heineman, pp.159–173.

28 Lanning, H. (2001) Planning and Implementing Change in Organisations – a Construct for Managing Change Projects. Dissertation, Helsinki University of Technology (Espoo, Finland).

29 Lewin, K. (1952), 'Group decision and social change', in *Readings in Social Psychology*, eds. Swanson, G. Newcomb, T. and Hartley, E. New York; Henry Holt, pp.459–473.

30 Raghavan, S.A. and Chand, D.R. (1989) 'Diffusing Software Engineering Methods' IEEE Software, July, pp.81–90.

31 Carey, J.M., (Ed.) (1988) *Human Factors in Management Information Systems*. New Jersey; ABLEX Publishing Corporation.

32 Coch, L. and French, J.R.P. Jr. (1947) 'Overcoming resistance to change', *Human relations; studies towards the integration of social sciences*, Vol. 1, No. 2, pp.512–532.

33 Lawrence, P.A. (1954) 'How to deal with resistance to change', *Harvard Business Review*, May–June.

34 Zuboff, S. (1982) 'New worlds of computer-mediated work', *Harvard Business Review*, March–April pp.142–153.

35 Malinconico, S.M. (1983) 'Hearing the resistance', *Library Journal*, Vol. 108, No. 2, pp.111–113.

36 Folger, R. and Skarlicki, D. (1999). 'Unfairness and resistance to change: hardship as mistreatment', *Journal of Organizational Change Management*, pp.35–50.

37 Piderit, S.K. (2000) 'Rethinking resistance and recognizing ambivalence: a multidimensional view of attitudes toward an organizational change', *The Academy of Management Review*, Vol. 25, No. 4, pp.783–794.

38 Binney, G. and Williams, C. (1995) *Leaning into the Future. Changing the Way People Change Organizations*, London, N. Brealey Publishing.

39 Kotter, J.P. and Schlesinger, L.A. (1979) 'Choosing strategies for change', *Harvard Business Review*, March–April, pp.106–113.

40 Fuller, F.F. (1969) 'Concerns of teachers', *American Educational Research Journal*, Garrity, & Sanders, (1999) Information Systems Success Measurement, Idea Group Publishing.

41 Schmidt, R., Lyytinen, K., Keil, M. and Cule, P. (2001), 'Identifying software project risks: an international Delphi study', *Journal of Management Information Systems*, Spring, Vol. 17, No. 4, pp.5–36.

42 Zmud, R.W. (1979) 'Individual differences and MIS success; a review of empirical literature', *Management Science*, Vol 25, No. 10, October, pp.966–979.

43 Lapointe, L., Lamothe, L. and Fortin, J.P. (2002) 'The dynamics of IT adoption in a major change process in healthcare delivery', *Proceedings of the 35th HICSS Conference*, Big Island, Hawaii.

44 Scott, J. (1985) *Weapons of the Weak: Everyday Forms of Peasant Resistance*, Yale University Press, New Haven, CT.

45 Prasad, P. and Prasa, A. (2000) 'Stretching the iron cage: the constitution and implications of routine workplace resistance', *Organizational Science*, Vol. 11, No. 4, July–August, pp.387–403.

46 Strebel, P. (1996) 'Why do employees resist change?', *Harvard Business Review* May–June, pp.86–92.

47 Duck, J.D. (1993) 'Managing change: the art of balancing', *Harvard Business Review*, November–December, pp.109–118.

48 Mittelstaedt, R.A., Grossbart, S.L., Curtis, W.W. and Devere, S.P. (1976) 'Optimal stimulation level and the adoption decision process', *Journal of Consumer Research*, Vol. 3, pp.84–94.

49 Gatignon, H. and Robertson, T.S. (1989) 'Technology diffusion: an empirical test of competitive effects', *Journal of Marketing*, Vol. 53, pp.35–49.

50 Szmigin, I. and Foxal, G. (1998) 'Three forms of innovation resistance: the case of retail payment methods', *Technovation*, Vol. 18, Nos. 6/7, pp.459–468.

51 Ram, S. and Sheth, J.N. (1989) 'Consumer resistance to innovations: the marketing problem and its solutions'. *Journal of Consumer Marketing*, Vol. 6, No. 2, pp.5–14.

52 Markus, M.L. (1983) 'Power, politics and MIS implementation', *Communications of the ACM*, Vol. 26, No. 6, pp.430–444

53 Dent, E.B. and Goldberg, S.G. (1999) 'Challenging resistance to change', *Journal of Applied Behavioral Science*, Vol. 35, No. 1, pp.25–41.

54 Zaltman, G. and Duncan, R. (1977). *Strategies for Planned Change*, New York, NY: John Wiley and Sons.

55 Metselaar, E.E., Kolk, J.M. van der and Wortelboer, F.Q.C. (1996) 'Werken aan veran-deringsbereidheid' (in Dutch), *Handboek effectief opleiden*, Vol. 9, pp.135–158.

56 Ajzen, I. and Madden, T.J. (1986) 'The prediction of goal directed behavior: attitudes, intentions and perceived behavioral control', *Journal of Experimental Psychology*, Vol. 22, pp.453–474.

57 Schuring, R.W. and Spil, T.A.M. (2002A) 'Assessing relevance and micro-relevance to the professional's working process as a determinant of IT-diffusion and IT-use in healthcare', Proceedings of International Information Resource Management Association Conference, Seattle, WA.

58 Schuring, R.W. and Spil, T.A.M. (2002B) 'Explaining plateaued diffusion by combining the user-IT-success factors (USeIT) and adopter categories: the case of electronic prescription systems for general practitioners', accepted at *International Journal of Healthcare Technology & Management*, Vol. 44, No. 3, pp.303–318.

59 Mahmood, M.A., Burn, J.M., Gemoets, L.A. and Jacquez, C. (2000) 'Variables affecting IT end-user satisfaction: a meta-analysis of the empirical literature', *Int. J. Human-Computer Studies*, Vol. 52, pp.751–771.

60 Cooper, W.S. (1971) 'A definition of relevance for information retrieval', *Information Storage and Retrieval*, Vol. 7, No. 1, pp.19–37.

61 Wilson, P. (1973) 'Situational relevance', *Information Storage and Retrieval*, Vol. 9, No. 8, pp.457–471.

62 Ballantine, J., Bonner, M., Levy, M., Martin, A., Munro, I. and Powell, P.L. (1998) 'Developing a 3D model of IS success', In Garrity, & Sanders, (1999) *Information Systems Success Measurement*, Idea Group Publishing.

63 Rogers, E.M. and Scott, K.L. (1997) 'The Diffusion of Innovations Model and Outreach from the National Network of Libraries of Medicine to Native American Communities', http://www.nnlm.nlm.nih.gov/pnr/eval/rogers.html

64 Barnard, C.I. (1938) *The Functions of the Executive*, Harvard University Press, Cambridge, MA.

65 Cohen, L.J. (1962) *The Diversity of Meaning*, Methuen, London.

66 Liu, K. (1993) Semiotics applied to information systems development, PhD thesis, University of Twente, Enschede.

67 Spil, T.A.M. (1993) The evaluation of SISP; From a quality undergrowth to a semiotic clearing, proceedings of the first ECITE conference, Henley on Thames, UK.

68 Wieringa, R.J. (2001) *Requirements Engineering: Frameworks for Understanding*, John Wiley & Sons, Chichester, UK.

69 Pressman, R.S. (1982) *Software Engineering, a Practitioner's Approach*, McGraw-Hill.

70 Iivari, J. and Koskela, E. (1987) 'The PIOCO model for IS design', *MIS Quarterly*, September, pp.400–417.

71 Brender, J. and McNair, P. (2001) 'User requirements specifications: a hierarchical structure covering strategical, tactical and operational requirements', *International journal of Medical Informatics*, Vol. 64, pp.83–98.

72 Salmela, H. (1997) 'From information systems quality to sustainable business quality', *Information and Software Technology*, Vol. 39, pp.819–825.

73 Nykänen, P. (2000) Decision support systems from a health informatics perspective. Academic dissertation. Department of Computer and Information Sciences, University of Tampere, Tampere, Finland.

74 Hakkinen, H., Turunen, P. and Spil, T.A.M. (2003) 'Information in healthcare process – evaluation toolkit development', *Proceedings of HICSS 36*, http://www.hicss.hawaii.edu/diglib.htm

75 Yin, R.K. (1984) *Case Study Research, Design and Methods*, Sage Publications, London.

76 Brender, J. (1999) 'Methodology for constructive assessment of IT-based systems in an organisational context', *International Journal of Medical Informatics*, Vol. 56, pp.67–86.

77 Mitchell, E. and Sullivan, F. (2001) 'A descriptive feast but an evaluative famine: systematic review of published articles on primary care computing during 1980–97', *British Medical Journal*, Vol. 322, pp.279–282.

78 Lagendijk, P.J.B., Schuring, R.W. and Spil, A.A.M. (2001) 'Het Elektronisch Voorschrijf Systeem, van kwaal to medicijn', Universiteit Twente, Enschede.

Appendix

Interview-protocol Care Provider USE IT version 14.0

Date interview:

Name interviewer:

Name interviewee:

Job interviewee:

Organisation:

P *Primary process*

P1 What care do you provide?

Most care providers contribute to different care processes.
In our research we make the following distinction:

- Diagnosis %
- Investigations outside the consulting room %
- Treatment %
- Nursing %
- Acute incidents occur: the whole day through / several times a day / several times a week
- Acute incidents dominate my work very much / somehow / a little / not

The categorisation may be adjusted to the investigated care process as long as it is clear to what % of patients or tasks the innovations applies (see Rel. 7).

How do you act at each of the above-mentioned tasks?

- Do you follow a fixed pattern?
- How long does a patient contact take?
- Do you use equipment?
- Do you use (human) support? If so, for whom else does this supporter work?
- Where do you perform your tasks? Could they be performed elsewhere?
- Do you always sit or stand in the same position towards the patient? (Make a sketch)
- Do you have to look up or ask after things?
- Do you have to prepare anything?

P 2 What other tasks do you have apart from providing care?

How much time or energy do these tasks take from you?

time % energy %

P 3 What exceptions or disturbances make that this kind of care or the coordination of this care fails?

P 4 Do you use a care protocol or medical guideline for the care you provide?

- Do you comply with this protocol entirely or partially?
- What parts do you use, what parts don't you use?
- Does using the protocol fit with your way of working?

P 5 Who refers patients to you?

P 6 To whom do you refer patients?

P 7 What other care providers or institutions are simultaneously involved with the care for your patients?

- Do you work together?
- Or do you work 'in parallel'?

P 8 How do you experience the cooperation with other care providers in respect to the providing of the care?

P 9 With what care providers should you cooperate (more)?

- Why?
- With whom should you exchange more information?
- What information?

P 10 What do you find important in the contact with other care providers?

REQ Requirements

I 1 What information about the patient do you need to perform your job properly? (Distinguish according to the separate tasks, mentioned in P 1 and P 2)

What information do you receive from

- The patient?
- The patient's surrounding?
- Other care providers?
- With what purpose?
- In what frequency?

What form does this information have?

- Letter (sent by post or handed over personally)
- Fax
- E-mail
- In paper record
- In electronic record

I 2 Does this information suffice?

- Do you experience problems?
- Do you miss information?

I 3 What information do you generate yourself when providing care?

What information do you give to:

- The patient?
- The patient's surrounding?
- Other care providers?
- Managers?
- External parties (e.g. insurance company, government)?

What form does this information have?

- Letter (sent by post or handed over personally)
- Fax
- E-mail
- In paper record
- In electronic record
- Record only used for this patient group or this type of care
- Record only used by your own discipline
- Record only used in your institution

I 4 How do you appreciate the quality of the proposed (or implemented) innovation? Regarding the:

- Content
- Objectives
- Method
- Possibility to integrate it in the present situation
- Timeliness
- Correctness

I 5 Where the right end-users involved with making or selecting this innovation?

REL Relevance

R 1 What do you experience, *for you personally*, as important in your daily work when you look at the care you provide?

R 2 What aspects in the ability to provide care, do you experience as a bottleneck or problem?

- Concerning the providing of care
- Other aspects

Are there any specific actions in the previously discussed processes that cause bottlenecks or problems?

R 3 Do you know proposals for improvement, concerning these patients, for which you would do your utmost?

R 4 How important are these proposed improvements in the chain of care in relation to other possibilities to improve aspects of your job?

- Can you name other proposals for improvement, which are more important?
- Can you name other proposals for improvement, which are less important?

R 5 In what way could the use of ICT matter to you?

- What application are you thinking of?
- For what purpose or for what situation?

R 6 What aspect of your job would you miss, if it would be removed?

R 7 How important are your tasks for these patients, *for you*, in comparison with your tasks for other patients?

- Why are these patients so important or of so little importance for you?

Res Resistance

A 1 To what extent are you convinced that the use of ICT is necessary to improve the providing of care?

- What experience do you have with ICT?
- How much time are you prepared to spend?
- Do you use ICT to communicate?
- How often do you use the Internet?
- How often do you use specific systems yourself?

A 2 Do you experience obstacles when implementing innovations?

- Workload
- Management support
- ICT support
- Money
- Your skills

A 3 How much time and energy do you think you can find to implement the changes that will occur when introducing innovations and ICT in this kind of care?

A 4 Do your colleagues or managers stimulate you to participate in changes?

A 5 Can you name other innovation-projects this organisation is working on?

- Are these projects equally important (or more or less important)?

Res Resources

M 1 What ICT-facilities do you have at your disposal at your workplace?

- Hardware
- Software
- For communication
- Data

M 2 What of these ICT-facilities do you use when providing care?

- Hardware
- Software
- For communication
- Data

M 3 Is the technical support sufficient to guarantee the quality of the system?

- Reliability
- Availability
- Security
- Privacy

M 4 Do you think you will have support to implement changes?

- Time
- Money
- Training
- Management support

C Concluding questions

C 1 Is there anything you would like to add?

C 2 May we contact you to think with us in the development of a ICT-application?