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# FROM BUSINESS IT VALUE TO PUBLIC IT VALUE – AN ACTION RESEARCH STUDY OF HEALTHCARE IN THE FAROE ISLANDS

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# FROM BUSINESS IT VALUE TO PUBLIC IT VALUE – AN ACTION RESEARCH STUDY OF HEALTHCARE IN THE FAROE ISLANDS

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## Abstract

*Obtaining business value from IT is a recurring theme that has diffused into healthcare information systems (HIS) where stakeholders often question the value of IT investments. Having finished the implementation of an integrated HIS, the Faroese Health Service (FHS) has started discussions about getting value from their IT investment, and how to reap those benefits is the subject of this paper. In order to fulfil this objective an action research project was started in the autumn of 2010 consisting of three cycles: (1) setting the stage for benefit realisation, (2) benefit realisation in a pilot area, and (3) diffusion of benefit realisation to other areas. This paper reports on the first two action cycles. Consideration of the first cycle reveals that it is not possible to distinguish between working processes and HIS, and the benefit realisation in health care (a public organisation) has a much broader perspective than just financial value. Considering the second action cycle, specific key performance indicators (KPIs) were identified, and a baseline established for a stroke process (pilot area). The outcome is that public value in this case can be measured by the KPIs, classified as: (1) professional quality, (2) organisational quality, (3) patient perceived quality, and finally (4) employee perceived quality. None of the KPIs is a financial value.*

*Keywords: Healthcare Information Systems, IT Value, Public Value, Action Research*

# 1 INTRODUCTION

The relationship between information technology (IT) and organisational performance has been a recurring theme in information systems (IS) research (Melville et al. 2004; Kohli and Grover 2008). Given the enormous investment in IT, the discussion on how to obtain proper value and payoff has become very important for both public and private organisations. Carr's (2003) provocative article titled; "IT doesn't matter," claimed that IT had been commoditised and had no strategic significance, and even worse; "*studies of corporate IT spending consistently show that greater expenditures rarely translate into superior financial results. In fact, the opposite is usually true*" (Carr 2003: 49). Carr's article has been rebutted by several authors (Smith and Fingar 2003b; Brynjolfsson and Saunders 2010). Smith and Fingar (2003b) argued that even though the technology has been standardised and commoditised, the business processes resulting from its use may turn out to be a source of competitive advantage. Furthermore, Brynjolfsson and Saunders (2010: 10) state that "*using technology effectively matters more now than ever before*" as IT is an important driver of innovation.

The IT value debate has also diffused into healthcare (Friedman and Wyatt 1997; Devaraj and Kohli 2000), and is closely related to a more general discussion about measuring the performance of healthcare systems (Murray and Frenk 2011; Reeves et al. 2011).

The general discussion about IT value and the broader discussion about measuring performance in healthcare motivated us to start an action research project in the Faroe Islands. The Faroese Health Service (FHS) has finished the implementation of an integrated healthcare information system (HIS) and it is time for them to consider reaping the benefits, which is the subject of this action research project. Thus, the aim of this paper is to lay down specific key performance indicators (KPIs) to support benefit realisation in health care settings. The empirical study reported in this paper covers the first two action cycles in the action research project, where we focus on the benefit realisation of HIS.

The paper proceeds as follows. Next section reviews the literature on IT value and public value. This is followed by a section on the methods of action research. Then we present the two action cycles with highlights from the process and learning outcome and we conclude with considerations about public value in HIS and its broader implications.

## 2 THEORY

This section reviews and presents literature on IT value and public values used later to guide the action research (AR) cycles and to analyse the observations during these cycles, which is the basis of the paper's overall argument. We open by an introduction to the concept of IT business value followed by a discussion on how this concept has been applied as Public Value Research.

### 2.1 IT business value

Traditionally the study of business value of IT has been tightly connected to studies on organisational change and transformation, but with a focus on net benefits to assess the actual measurement of the success of IT (Gregor et al. 2006). The concept of net benefits refers to; cost savings, expansion of markets, incremental additional sales, reduced search costs, and time savings, as results of the implementation and use of IT (Delone and McLean 2003: 23). These types of benefit can be further conceptualised into; informational (to provide information for decision making in the company), strategic (i.e., to change the nature of how a company competes), and transactional values (i.e., cost saving and support operational management) (Gregor et al. 2006).

In addition to these three more traditional benefits Gregor et al. (2003) introduces a *Transformational Benefit* and claims that this component is important in the overall IT Business Value of the IT systems implemented in an organisation. This value relates to changes in the organisational structure of a

company as a result of the implemented IT systems that provide a greater capacity for further future benefit realisation.

This is in line with Seddon et al. (2010) who elaborates on this by differentiating between short term and long term benefits. Short term benefits are seen as being connected to the project level and tied to how the realisation of an IT system: (1) functionally fits with the processes to be supported, and (2) basically helps people in the organisation get their job done.

Long term organisational benefits are connected to the (higher) organisational level (i.e., constituting the IT systems and processes used) and have three dimensions: (1) integration of processes, (2) optimisation of processes, and (3) overall improved access to information.

To realise the benefits above, change management, training and on-going major Enterprise Business improvements to overcome organisational inertia are crucial (Seddon et al. 2010).

Fingar and Smith (2003b) claim that until now the scope of IT has been to support business processes and undertake business process automation, whereas in the future it will focus on process management and how IT can act as a business enabler, and hence support how the business develops, delivers and maintains its market position.

The literature reviewed provides a shared belief that the business value of IT in a business context can be divided into two groups; the direct benefits that immediately affect the organisation, and the indirect benefits (transformational) that provides the organisation with a capacity to establish direct benefits in the future. The organisational changes are by nature, both a precondition for benefit realisation from, and a result of, the IT implementation projects.

## 2.2 IT Public Value (e.g. HIS)

Public Value Research (Moore 2000) identifies key-differences between governmental and for-profit organisations, which naturally leads to other means to evaluate the benefits of IT systems in this sector. The differences are summarised in Table 1 below.

	<b>For profit sector</b>	<b>Public sector (i.e. hospitals)</b>
Normative goal	To maximise shareholders wealth	Achieve social mission
Principal source of revenue	Sales of services and products	Tax appropriations
Measure of performance	Financial bottom line	Efficiency and effectiveness in achieving the mission
Key calculation of improvements	Find and exploit distinctive competence of firm by positioning it in product/service markets.	Find better way to achieve mission

Table 1: *Key-differences between governmental and for-profit organisations* Moore (2000).

Table 1 indicates that the nature of both normative goals, the measurement of performance and calculations of improvements are ‘softer’ (non-financial and somehow social constructed in a delimited context) in a public sector context. To explore and formulate these concepts in a concrete HIS setting the Action Research Study presented in the following section 3 “Method” was established and executed.

## 3 METHOD

This section introduces Action Research as applied in the present study; the setting of the project is presented and finally the research process and the variety of research method used are explained

### 3.1 Action Research

We have undertaken an action research study (AR) at the Faroe Island to fulfil the objective of reaping the benefits from the FHS's implementation of an HIS. AR involves close cooperation between practitioners and researchers to bring about change. The AR process can be defined as a number of learning cycles consisting of predefined stages. The AR cycle starts with diagnosing, which refers to the joint (practitioner and researcher) identification of problems and their possible underlying causes. Action planning specifies the anticipated actions that may improve or solve the problems and action taking refers to the implementation of those specified actions. Evaluating is the assessment of the intervention, and finally, learning is the reflection on the activities and outcomes (adapted from Myers 2009).

The AR project was initiated in the autumn of 2010 and is still on-going. The AR project consists of three action cycles: (1) setting the stage for benefit realisation of the HIS, (2) benefit realisation in a pilot area, and (3) diffusing benefit realisation to other areas. This paper reports from the action cycles; #1 and #2.

### 3.2 Project setting

The Faroe Islands are a self-governing territory within the Kingdom of Denmark with roughly 48,000 inhabitants. The FHS is a small organisation compared with healthcare services in other countries and consists of three hospitals and 27 general practitioners (GPs). In 2005, the FHS began the implementation of an integrated HIS covering both the hospitals and GPs. The project faced many problems during its first years, even to the point where discussions to halt the project materialised, particularly based on the experiences of high costs (financial as well as personal) and dubious benefit realisation (Schlichter 2010). The current situation in 2012 is that 530 healthcare professionals are using the HIS covering all areas of the hospitals and GPs. One of the authors has followed the implementation process and prepared an evaluation report based on the DeLone and McLean's (2003) success model. The report concludes that more needs to be done if the FHS is to obtain proper value and payoff from its HIS implementation. The users were satisfied with the solution and they got very good support from it in their clinical work, but no initiatives regarding harvesting the potential benefits had been planned or implemented (Andersen et al. 2010).

### 3.3 Research Process

We have had a high degree of interaction with the FHS and used a variety of research methods in the two action cycles executed so far. This is specified in Table 1 below (adapted from Lindgren and Henfridsson 2004: 444-446):

Action Cycle #1 (Fall 2010 – Spring 2011) Setting the stage for benefit realisation	Action Cycle #2 (Spring 2011 – on going) Benefit realisation in pilot area
<b>Diagnosing</b>	
<p>HIS was operational for 530 health professionals in autumn 2010</p> <p>However, senior management wanted to get more value and payoff from the HIS implementation</p> <p>FHS has not formulated a specific strategy which could direct the benefit realisation, so the first part of the AR project was explorative to identify potential benefit areas for different stakeholders</p>	<p>There was an on-going discussion during the first quarter of 2011 in order to define the scope for the pilot area and organise the project. Care for stroke (apoplexy) patients was selected as the pilot area and the action cycle #2 began in <i>spring 2011</i></p> <p>The diagnosing phase for cycle #2 has thus mainly been a decision process for FHS to decide where to do the pilot</p>

Action Cycle #1 (Fall 2010 – Spring 2011) Setting the stage for benefit realisation	Action Cycle #2 (Spring 2011 – on going) Benefit realisation in pilot area
<b>Action planning</b>	
<p>The planning phase implied activities such as preparing a semi-structured interview guide which was formulated from IS value literature (e.g. Seddon et al. 1999; Smith and Fingar 2003a; Melville et al. 2004)</p> <p>A pilot interview was conducted with the former project manager of the HIS implementation project (<i>November 2010</i>), which brought about several changes to the interview guide such as framing and focusing questions for health professionals</p> <p>The former project manager also helped us to shape the first cycle for the medical ward at the national hospital because they had the most mature implementation of HIS (operational since 2009). Interviewees were selected and interviews planned</p>	<p>The planning was done in <i>May 2011</i>. Cycle 1 has mainly been driven by the researchers as a research activity, but cycle 2 has to be driven by FHS as an ordinary project in order to succeed. An FHS project manager was appointed</p> <p>Several workshops and a steering committee meeting were held in May 2011 in order to initiate the project. The main areas covered were:</p> <ul style="list-style-type: none"> <li>• Project Management: Goals, scope, organisation, plan, workshop process and risks were discussed (Larson and Gray 2011)</li> <li>• Process modelling: Description of the care for stroke patients process using swim lane diagrams (Harmon 2007)</li> </ul>
<b>Action taking</b>	
<p>Seven interviews with health professionals (doctors, nurses, administrators and a secretary) at management level were conducted in <i>December 2011</i></p> <p>We presented a preliminary table with action areas from the interviews at a management meeting immediately after the seven interviews were conducted</p> <p>Two action areas were selected as possible candidates for the benefit realisation pilot, i.e., the medical process and patient care for stroke patients</p>	<p><i>June 2011</i>: Further process modelling and a draft specification key performance indicator's (KPIs) were prepared and linked to the process model. The project was named "The good stroke care course"</p> <p><i>September 2011</i>: A questionnaire was completed by 37 health professionals and seven were interviewed. The questionnaire and interviews were about health professional's view on the stroke care course. This will be used as a baseline onwards</p> <p><i>September 2011 to November 2011</i>: The questionnaire and interviews were analysed. The process model and KPIs were revised</p> <p><i>November 2011</i>: The process model and KPIs were again discussed. Two pilot stroke patient interviews were held. All 40 patient records related to stroke in 2011 were reviewed.</p> <p><i>February 2012</i>: The configuration of HIS to support the stroke process model and KPIs were discussed</p>
<b>Evaluation &amp; Learning</b>	
<p><b>Data sources</b></p> <p>Documents, seven interviews and focus group meeting</p> <p><b>Data analysis</b></p> <p>The interviews were taped, transcribed verbatim and coded in NVivo (Bazeley 2007). This resulted in 103 codes of which 38 codes were related to KPIs such as; medication use and errors, and length of stay at hospital.</p>	<p><b>Data sources</b></p> <p>Documents, process model with KPIs, questionnaire, nine interviews and a number of workshops, and review of 40 patient records</p> <p><b>Data analysis</b></p> <p>The interviews has been transcribed and briefly coded. The questionnaire was analysed by descriptive statistics. The workshops were the intervention area to produce process model and KPIs. The review of 40 patient records to establish baseline for several KPIs</p>

Table 2. Summary of action research

## 4 FIRST ACTION RESEARCH CYCLE “SETTING THE STAGE FOR BENEFIT REALISATION OF HIS”

The first action cycle (AC1) was about setting the stage for benefit realisation, e.g. to identify and formulate the first set of indicators. The FHS had not formulated a specific strategy that could direct the benefit realisation, so this first part of the AR project was explorative to identify the potential benefit areas from different stakeholders.

We carried out seven interviews and one way to understand and interpret the “voice of the health professionals” (the stakeholders) was to analyse which topics were most often raised in the interviews. The results are illustrated in figure 2 showing the 10 codes out of 103 that were most frequently highlighted, hereafter denoted as topics.

The topics varied in terms of abstraction levels whereby e.g., “working procedures and descriptions” is high level, whereas “KPI number of beds and length of stay at hospital” is much more specific and ready for immediate use as a KPI. Figure 1 can only give an indication of the topics discussed and thereby what the interviewees focussed on when the subject was benefit realisation.

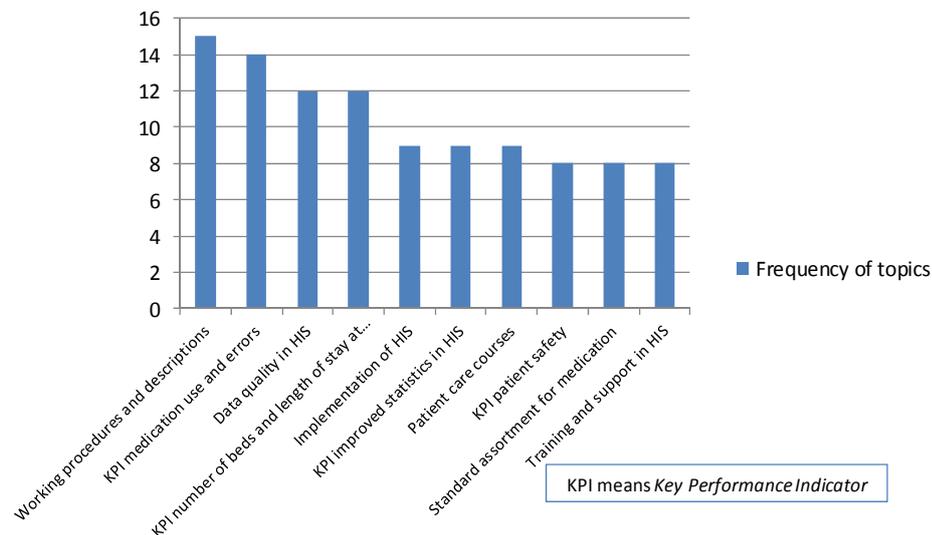


Figure 1. Most frequent topics discussed in interviews

Two quotations are included here to illustrate what lay behind the topics:

Working procedures and descriptions: “So in some way I could well imagine that there was a person who was locally responsible for [HIS], a person who has worked with it and maybe walked around the wards to constantly keep people in, and helped developing processes to enhance quality. I think this will be good, where maybe we have our own [HIS] team down in the hospital and not just the top of the administration” (interviewee # 1).

The number of beds and length of stay at hospital (A KPI): “We have proved that we can close a whole ward when we focus on efficiency at the conferences and in the outpatient clinic of course. The young doctors are dressed very carefully, especially at the conferences, which can reduce the length of stay considerably. As soon as we open a ward more, what happens is that we lean slightly back, never mind, but if we really drove it tight so we can say that [HIS] is an excellent tool for streamlining admissions and planning study” (interviewee # 2).

The two quotations very briefly illustrate the discussions at the interviews.

The topics discussed were classified into several action areas for benefit realisation such as: (1) diabetes outpatient clinic processes (including telemedicine), (2) medication process (prescription, usage and errors), (3) overview through HIS at doctors' conferences, and (4) care for stroke patients and several other possible action areas. As noted above, care for stroke patients was selected.

A final, but important, part of AR is to identify the lessons learned (Myers 2009). *First*, we cannot distinguish between the information systems (HIS) and the associated working processes; they are like Siamese twins (Alter 2002) as regards benefit realisation. *Second*, benefit realisation in healthcare has a much broader perspective than just financial value (Kohli and Grover 2008) and can be divided into three main areas: (1) professional quality (e.g., mortality rate after six months), (2) organisational quality (e.g., length of stay at hospital), and (3) patient-perceived quality (e.g., level of information about course of disease). *Finally*, the AR approach has mobilised health professionals towards working with benefit realisation and paved the way for further collaborative practice research (Mathiassen 2002).

## **5 SECOND ACTION RESEARCH CYCLE “BENEFIT REALISATION IN PILOT AREA”**

During the second action cycle (AC2) three main areas for benefit realisation in an HIS setting were identified. The intention of AC2 was to refine and provide a structure for realising some of the benefits focussing on the process ‘care for stroke patients’ in a well-defined and limited clinical setting. The improvement initiative was named “The good stroke care course”. Below we present AC2 by analysing the specific activities such as; the workshops that were held, the review of patient journals, and the pilot interviews with patients. For each of these activities the contributions to the stroke process baseline, and to the further process of improving the capability of the stroke process was identified.

### **5.1 Workshops**

During the workshops the present stroke process was discussed taking into consideration the newly implemented HIS, and suggestions for improvement were identified. At the first workshops an understanding of the need to document the present stroke process in detail emerged among the healthcare professionals. A first suggestion was developed by one of the researchers and then presented, discussed and refined during the next workshops. During the very detailed discussions of the process, several key performance indicators (KPIs) were identified, for the purpose of identifying a baseline for measurement of future improvements. The search for the KPIs was qualified by: 1) the Danish Healthcare Quality Model (Danish Regions 2009), 2) the participants’ professional pre-recognition of where improvements (especially based on the new HIS) could be implemented, and 3) Health Technology Assessment projects completed with stroke patients all around the World. An interesting observation was that the new HIS made it much easier to collect and calculate KPIs, thus making the measurement of improvements possible. Many KPI candidates emerged during the analysis; the ones presented below (and used in the following improvement process) are among the most important and the ones that are feasible to construct.

AC1 identified three benefit dimensions: professional quality (the clinical treatment as such, about diseases and cure - effectiveness), organisational quality (the optimal use of resources – efficiency) and patient perceived quality (the customers/patient satisfaction). AC2 revealed the lack of consideration to the ‘voice of’ the employees. The healthcare professionals (nurses, doctors, therapists and secretaries) showed an understanding of quality not expressed in the three dimensions above. E.g.: *“Instructions earlier provided to the patient are not relayed to B6 [new ward]. The information provided to the new ward is accidental and only given because somebody asks”* (Nurse, B6). We therefore suggest the inclusion of ‘Employee Perceived Quality’ (the satisfaction of the employees, i.e., do they believe that the process is well taken care of) as a fourth dimension.

The workshops contributed to: a) the baseline with a detailed documentation of the stroke-process and hence, the present capacity of the HIS process and the inclusion of an additional quality dimension: “Employee perceived quality”, and b) to the process by identifying problems and places for improvement, i.e., “*Simplify the process: The apoplexy patient will be sent to a dedicated medicine ward only taking care of apoplexy patients. Before that the patients could be sent to three different wards*” (Nurse, member of the project group).

## 5.2 Audit of patient journals.

A spot test of a few journals initiated a more comprehensive audit (review) of journals of stroke patients. By using the diagnosis code on ‘stroke’ 40 cases from 2011 showed up. The audit was complicated by the fact that many registrations were done in the form of unstructured text rather than using a structured formal data-model. The audit was structured after the observation done during the analysis of the present stroke care process. The audit of stroke journals contributed to: a) the baseline, by the identification and valuation of KPIs; e.g., “Early examination with CT/MRI scan”, “Assessment by physiotherapist”, “Mortality”, “Length of stay at hospital”, and b) to the process, by showing that timestamps of incidents show an inconsistent way of registration of events in the HIS, and that a more well-defined registration process could be beneficial and be the basis of an automated generation of KPIs by the business intelligence module of the HIS, e.g. by standard reports.

## 5.3 Interview of stroke patients.

The interviews revealed that, despite the problematic evaluation of the process by the healthcare professionals, the patients were quite happy with their experiences. One patient said: “*I have received good information and I am very satisfied with the stay, I have to admit that...*” (patient 1, 60 years old male on his fifth months of hospitalisation), and “*We are not that used to the hospital, but we have been satisfied with it at is has been*”, (patient 2, 91 year old male, one month after his discharge).

Interviewing stroke patients contributed to: a) the baseline, with the finding that patients seem very satisfied with the process, and b) to the process, by showing that it is possible to get information from the patients. However, questions arise as to whether the remarks of the patients are too positive.

## 5.4 Excerpt of key performance indicators specified in AC2

The outcomes from AC2 are mainly; the addition of the dimension “Employee perceived quality”, the specification of KPIs (see Table 3), and the establishment of a baseline of the present stroke-process.

Quality Dimension	Indicator (KPI)	Present Value	Target value (Goal)	Source
Professional	Early examination/diagnostics with CT/MRI scan: Proportion of patients who undergo a CT/MRI scan on the first day of hospitalisation	79%	Higher or equal to 80% **	Journal audit, among 40 patients
	Assessment by physiotherapist Proportion of patients assessed by a physiotherapist no later than the 2 <sup>nd</sup> day of hospitalisation	61%	Higher or equal to 90% **	
	Mortality Proportion of patients who die within 30 days of admission for acute stroke	18%	Less or equal to 15% **	From HIS business intelligence reports
Organisational	Length of stay at the hospital	No valid data	Not yet defined	
Patient perceived	“I believe that I have received the necessary information in relation to the treatment”	6,5*	Not yet defined	Pilot survey among 2 patients
	“The experience of the whole process	6,5*	Not yet defined	

Quality Dimension	Indicator (KPI)	Present Value	Target value (Goal)	Source
	was good”			
Employee perceived	“The experience of the whole treatment process as well-organised and coordinated “	3,3*	Not yet defined	Survey among 37 health professionals
	“I always felt to be in a position where I could give the patient good information about the treatment”	4,1*	Not yet defined	

Table 3. Examples of key-indicators, present values and goals identified

\* On a 7 point Likert Scale, where ‘7’ is “I strongly agree”

\*\* Target values are Danish Standard Numbers as defined by (Danish Regions 2009).

One specific observation that puzzled the authors is the very high degree of satisfaction of the patients, which somehow contradicts the opinions of the healthcare professionals. This could be a cultural issue interesting to research further.

## 6 CONCLUSION

The aim of this paper was to identify and specify specific KPIs for the support of benefit realisation in a health care setting.. The KPIs was identified and their related Target Values (goals) partly specified during two action cycles. The outcome is that public value in this case can be measured by KPIs, classified in four Quality Dimensions: (1) professional quality, (2) organisational quality, (3) patient perceived quality, and finally (4) employee perceived quality. We go from business IT value to public IT value since none of the KPIs are of the type ‘financial value’. This is a broader understanding of value than typically discussed in the IS context.

During the next phase of the present research project we will explore how benefits actually can be realised and then enter the third AC (Action Cycle) where the research will change focus into diffusion of benefit realisation into other health care processes.

Although this paper reports from a specific case we will argue that both the conceptual understanding of IT Public Value and the AR approach to generate the KPI’s might be relevant in other settings such as public organisations and non-profit organisations more generally. This also opens up for future research for cases in other organizations and cross-case studies in different kind of non-profit organizations. The limitation is that the AR project is done in a small health care setting and we have only carried it out in a pilot area (care for stroke patients). We do thus not know how this will scale up and how higher organisational complexity will impact the process.

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