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Evidence of Convergence in the Nordic Countries

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Article in proceedings (Post print version)

Uploaded to Research@CBS: November 2016

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Abstract

The implementation of Health Information Technology (HIT) can improve the provision of high-quality and efficient healthcare services; however, it has met with significant challenges in many cases. Despite the challenges occurring in many countries, prior research on HIT implementation success factors is, however, mainly from the USA. This research conducted a survey to IT managers in Nordic countries' healthcare organizations and compiled a list of the HIT implementation success factors that these managers considered important in each country. It was found that IT managers in Nordic countries agree highly with each other in their judgment of the importance of these success factors. While Nordic countries' healthcare systems and culture are relatively similar, the results suggest that an internationally applicable set of recommendations for the successful completion of HIT implementations could be within the realm of possibility.

1. Introduction

Many scholars have proposed ways to improve the success rate of Health Information Technology (HIT) implementation (e.g. [1], [2], [3], [4], [5], [6], [7]). One important facet that has been discussed is identifying the success factors (SFs) for HIT implementation. While a list of these SFs has been drawn by prior literature, not all studies have found the same SFs. For instance, Wen et al. [8] proposed a model to predict the success of an interactive health communication system (IHCS) which consists of organizational and tactical factors. Through a pilot Delphi method, Brender et al. [4] developed a list of 110 SFs for HIT implementation which comprises various success factors from twelve perspectives: (1) functional, (2) organizational, (3) behavioral, (4) cultural, (5) political, (6) management, (7) technical, (8) legal aspects, (9) strategy (10) economy, (11) education and (12) user acceptance. Rahimi et al. [9] used a qualitative meta-analysis to identify a list of 11 SFs associated with HIT implementation and analyzed the importance of these factors in different actions of implementation. Ash et al. [1] grouped related sub-factors to form 12 principles for a success of Computerized Physician Order Entry (CPOE) Implementation. Nguyen at al. [10] reviewed the existing literature and identified 16 SFs for HIT. They also suggested a taxonomy which shows the interactions of different stakeholders with implementers.

Different studies have reported different subsets of SFs rather than a comprehensive set of similar factors which are the key to success in HIT implementation. One plausible reason for this inconsistency in findings is the fact that different implementation projects have emphasized different elements for success. Other factors that could have had an effect on the result are differences in contexts with government regulations, economic environments, and organizational and national cultures.

In summary, the differences among the set of SFs for HIT implementation may be evident in two distinct levels of analysis, the organization and the country. According to Nguyen et al. [10], the study on SFs of HIT implementation is of global interest. The majority of previous studies were conducted in North America (69.45%), of those 61.11% and 8.34% were from the United States and Canada respectively. 19.45% of papers were from European countries (the Netherlands: 2, the United Kingdom: 2, Italy: 1,

Sweden: 1, and Spain: 1). The remainder was from Australia (1), Israel (1), and Mexico (1) [10]. Given that the current set of all HIT implementation SFs are mostly derived from North America, how would their relative importance be judged by European IT managers in the healthcare sector? Would these European IT managers evaluate their relevance equally, regardless of the country they come from? So far, little work has been done to systematically categorize the SFs for HIT implementation in this way, and to collect empirical evidence on their relative importance. To our knowledge, there are no prior studies on the country-level comparisons of these SFs. This would be the first step to isolate the hypothetical common set of SFs for any HIT implementation. Therefore, the aims of this study are: (1) to identify the success factor priorities through an empirical investigation; and (2) to compare the success factor priorities profile across countries.

The structure of this paper is as follows. Section 2 describes the research method. Section 3 focuses on answering the question of who are IT managers of healthcare organizations. The SF priorities and the comparison results are reported and discussed in Section 4 and 5. The final section suggests the implications and future research.

2. Research Method

2.1. Instrument Development

The guidelines of Straub and Carlson [59], and Straub et al. [60] about the content validity were used to design the research. First, a literature review [10], which extracted 15 success factors for HIT implementation, was used to create the questionnaire. Then, the questionnaire was pilot tested with four experts in information management, one IT project manager and one CIO. After considering their comments and suggestions the questionnaire was revised into a total of 25 success factors as shown in Appendix 1 [11]. The questionnaire was translated into Danish, Finnish, Norwegian and Swedish and a link to the questionnaire was sent to the respondents. The basic data portion asked the background information of IT managers such as the type of their organization, their experience and education and the position of their IT department. In the success factor part, the IT managers were asked to evaluate and show their degree of perceived importance for each factor in a 7-point Likert-type scale where the lower score corresponds to a more important factor. In the questionnaire, both the terms "Chief Information Officer (CIO)" and IT managers were used because

usage of the title varies considerably across organizations ([12], [13]).

2.2. Survey Administration

As no comprehensive source of information was available on IT managers in the healthcare organizations of these Nordic countries, the list of research subjects was created manually. We used two methods to find the respondents. The first focus group comprises people who were found directly by the researchers. Because not all potential respondents could be found directly, the second focus group was composed of people who were contact persons in the target organizations. In this case, the contact persons were asked to forward the questionnaire to "the individual who is responsible for the automated information systems in your hospital". After adjustment for non-working email addresses and additional references from the contact persons, the final list of potential respondents who received the instrument included 309 persons (Denmark 85, Finland 109, Norway 69 and Sweden 46). The survey duration was two months and a total of 94 responses was received which equals to a 30.42% response rate.

Since the questionnaire was sent via two different channels, it is necessary to ensure that the respondents were, in fact, in the correct target group, that is IT managers who have clear responsibilities for HIT implementation in their organizations. The criteria for screening respondents were based on background data from the respondents such as their titles and their known departmental functions (see [14] for similar criteria). The screening was made by two of the researchers working together. After screening, all respondents from Norway and Denmark were included. In Finland, of the 34 responses, two were screened out since one was an expert doctor in a temporary position and the other was a security chief and thus excluded from the IT management function of the organization. In Sweden of the 21 responses, one was screened out since he/she was a human resources manager and had not implemented any HIT projects. Thus, a total of 91 responses (i.e. 14 from Denmark, 32 from Finland, 25 from Norway and 20 from Sweden) were included in the study reported here. The portion of the data gathered from Finland has previously been used in a separate article (see [11]).

Table 1: Profile of respondents by countries

Countries	Number of respondents	%
Denmark	14	15.38

Finland	32	35.16
Norway	25	27.47
Sweden	20	21.98
Total	91	100.00

3. Who are IT Managers?

The average age of the respondents is 50.42 years old and thus they had extensive experience in the field. Almost 60% of respondents had a previous job in management positions prior to becoming IT managers (see Table 2 below).

Table 2: Previous management experience

Countries	Previous Management Positions	Total	%
Denmark	8	14	57.14
Finland	16	32	50.00
Norway	19	25	76.00
Sweden	11	20	55.00
Total	54	91	59.34

The proportion of female IT managers overall is around 36%. There is an even number of female and male IT managers in Finland and Sweden. However, 92% of Norwegian IT managers who participated in this survey are male.

The most popular education background of respondents is technical (over 40% in three countries: Denmark, Finland and Norway). IT managers with nursing background are common in Finland (i.e. 18.75%), while they are relatively few in Denmark, Norway and Sweden (i.e. 7.14%, 4.17% and 5.00% respectively). Except for Denmark (14.29%) and Sweden (5.00), there were no IT managers with a clinical background in Finland and Norway.

Table 3: The recruitment method

Countries	External (%)	Internal (%)
Denmark	63.64	36.36
Finland	46.88	53.13
Norway	33.33	66.67
Sweden	55.00	45.00
Total	49.41	50.59

Both the internal (i.e. promotion or transfer) and external recruitment methods are used to appoint IT managers in healthcare organizations in Nordic countries. The data from the survey shows that IT managers are recruited equally often from internal and external sources at average of around 50%. Norway has the highest number of IT managers recruited from internal sources (67%) while Denmark has the highest number of externally recruited managers (64%) as shown in Table 3 above.

The ICT sector has relatively large shares of the young employees who are below 35 years old [15]. Since respondents in this survey are IT managers it is reflected in a quite high average age (around 51 years old). In general, the Nordic countries have relatively large shares of women on the labor market and based on the report of "The ICT Sector in Nordic countries 1995-2000" [15], the share of females employed in the ICT services was around 30% and more or less identical among the Nordic countries. For this survey, 36% of respondents were female IT managers. Regarding education background of CIOs/IT managers, Gottschalk [12] reported that the majority (58%) of Norwegian CIOs responding to a survey had completed either a Master's or Bachelor's degree. Earlier research by Stephens et al. [14] noted that 60% and 59%, respectively, of responding U.S. CIOs having a "business-related" degree. IT managers in healthcare organizations in the Nordic countries also have high education level reflecting the knowledge-intensive character of this sector. The major background is technical (38.53%), followed by business school (14.35%) and medical science (13.59%).

4. Results

4.1. Success Factor Priorities

The average rating of SFs for all four countries are counted and used to rank SFs. The ten most important SFs are: (1) commitment and support of leaders, (2) system quality, (3) end-user participant, (4) information and service quality, (5) infrastructure, (6) department cooperation, (7) resources, (8) staff training, (9) co-development of the system and workflow, and (10) vendor cooperation. These top

ten SFs from the four Nordic countries are the same as identified in the prior study using only Finnish data [11] only the relative positions of some of SFs within the top ten are slightly different. Furthermore, these top ten SFs are also almost identical for the three other Nordic countries.

4.2. Cross-country Comparison

To investigate differences in the perception of IT managers from different countries, the ranking of the success factors in the four countries were compared. Even though the country proportion is different (i.e. Denmark: 15.38%; Finland: 35.16%; Norway: 27.47%; Sweden: 21.98% in Table 1), four diagrams have almost a similar pattern as is shown in Chart 1. Thus, it is likely that despite being in different countries and contexts, IT managers have similar evaluation to certain success factors of HIT implementation.
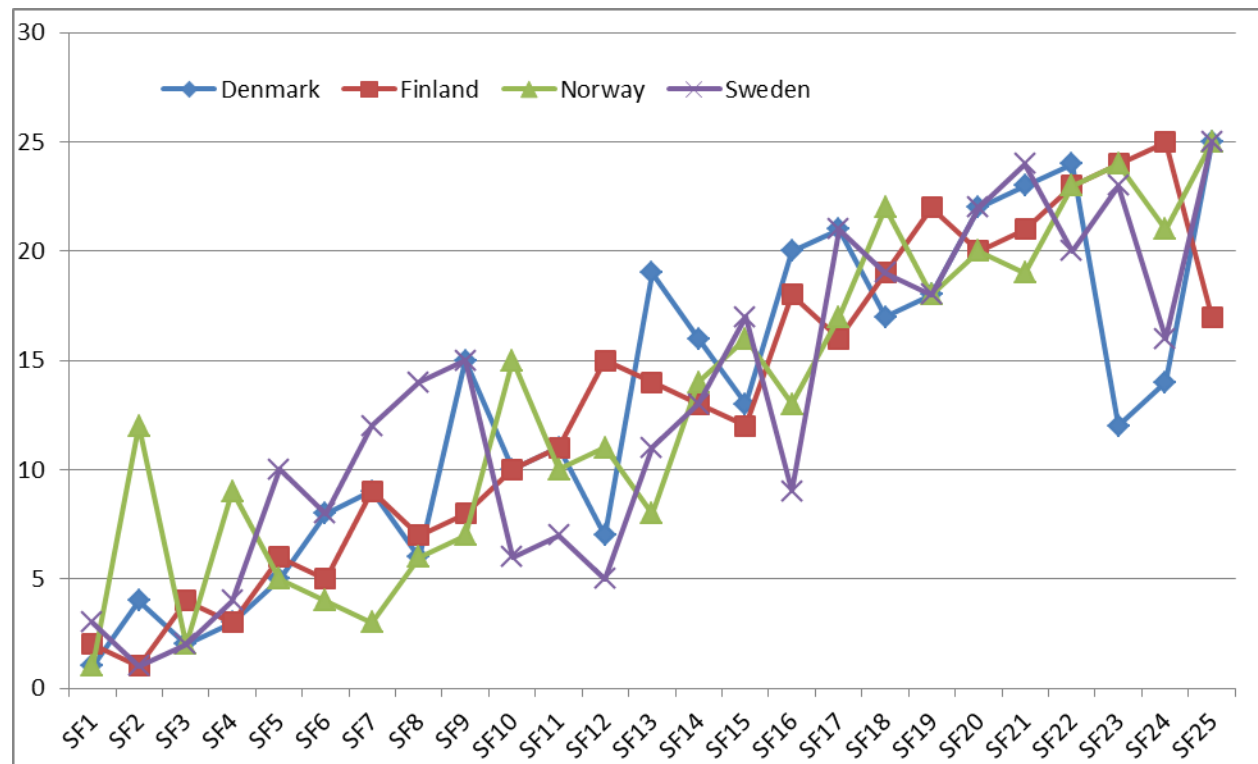
Chart 1: Success factor priorities comparison

Despite similarities, as can be seen from Chart 1, some differences exist. For example, "system quality (SF2), organization openness (SF16), regulation (SF23), incentives (SF24) and influence of external environment (SF25)" vary between these countries. Particularly, the Danish IT managers might consider the role of incentives and regulation in promoting HIT more important than other countries particularly in comparison with the view of Finnish IT managers. On the other hand, Finnish IT managers emphasized the influence of external environment at 17th position while the rest valued it at the 25th position. Swedish IT managers might be quite different from the others regarding the role of organization openness to change and innovation (SF16). Finally, in Norway, the system quality is not in the top ten (12th position) while IT managers of three other countries viewed this factor as extremely important (ranked 1 in Finland, (2 in Sweden and 3 in Denmark).

4.3. Success Factors and Organization Types

The survey sample was divided into two groups: the large hospitals (e.g. university and regional hospitals) which accounts for around 41.76% of the sample and the small organizations which includes all other types of healthcare organizations. The success factor priorities between the big and small healthcare organizations were compared. It is found that the

ranking list of the group of big healthcare organizations is almost the same as the group of the small healthcare organizations. However, the perception differences in the staff training (SF8) and the co-development of the system and workflow (SF9) are relatively large (6 and 5 positions difference respectively).

5. Discussion

The questionnaire used in this study was based on the literature review where most studies came from North America. However, the similarity in HIT implementation success factor priorities in the empirical data from the Nordic countries suggests that these success factor priorities profiles can be applicable in several countries. In addition, previous literature reviews of Enterprise Resource Planning (ERP) related SFs (e.g. [16], [17]) also found that there is a set of factors such as top management support, excellent project management that are fundamental to successful implementation of ERP and common to most ERP adopting organizations. This study accommodates their argument but in the context of HIT implementation. This could imply that some success factors in IS implementation share the same characteristics. While country-level similarities were identified in the IT manager –reported HIT implementation success factors in this research, we also noted that there were certain differences between the countries that could be due to a number of reasons, for example organizational and government policies.

Regarding success factors and organization types, the research of Saini et al. [18] found insignificant differences in success factors of ERP at Indian SMEs compared with Indian large organizations. Our research is conducted in the area of HIT implementation but shows similar results. The size of organizations seems unimportant in relation to their IT managers' evaluations of SFs except for the co-development of the system and workflow, and staff raining. For these factors, IT managers in small healthcare organizations might perceive the "co-development of the system and workflow or business process re-engineering as less important than their colleagues in the big organizations. Instead, they might emphasize more the role of staff training. One of the reasons could be in the small clinics the business re-engineering process might not be as difficult as in big clinics, while they might need to increase more IT knowledge for their staff.

6. Implications and Conclusions

Several prior studies have focused on the success factors of HIT implementations. Literature reviews have identified a set of HIT implementation success factors that are derived from many stakeholder groups in various countries. There have thus far, however, been few attempts to empirically examine the importance of these success factors across contexts. To our knowledge, this is the first study that collected this empirical data from several countries and also contrasted the view of IT managers across these countries. As the profile of HIT implementation success factor priorities from the four surveyed countries are relatively similar, this study suggests that a common set of critical success factors for HIT implementation may be derived and used in a range of countries. If this would be the case, recommendations for HIT implementations throughout the world can be made on a much more solid footing. If certain similarities are consistent across the countries, it may be possible to derive the list of fundamental success factors with little variances across countries. This would lead to establish a set of some management standards which IT managers can base on to promote the international cooperation and celebration. It would also diminish the contextually oriented view regarding the differences in national culture, management style, organizational forms, and policy structures.

For example, this research suggests that lessons learned by top IT experts in HIT implementation can be applicable internationally, and that seminars, workshops, and conferences that introduce foreign cases can contribute with interesting findings derived locally. Human resources transfer between countries regarding HIT development and implementation can also bring more benefits to organizations than thought thus far. In particular, the projects that would benefit most would be those that take place in countries with relatively low capabilities for HIT implementation or few local experiences. Future research should attempt to confirm whether the list of priorities for HIT implementation success factors is applicable also for other parts of the world.

This study also indicates that Nordic IT managers may have certain differences in perceptions. While organizational types seem not appear to play a role, these differences may result from subtle variations in the healthcare system or organizational features, for instance, and therefore, future research is needed to account for these contextual issues. There is also a possibility that these differences are due to methodological issues. Another possibility is that a situation exists whereby certain SFs are consistently

similar among the countries whereas others vary. This could be object for further study.

One limitation of this research relates to the difficulty of identifying the relevant respondents since there is no clear official information source which provides information about IT managers and the complex IT healthcare structure in the Nordic countries. In addition, this study reflects the views of surveyed IT managers which may be different from those of other stakeholders such as end-users. If the results of this study can be compared to a similar survey of the other stakeholders, it would be more informative. Finally, as the Nordic countries have rather similarities in culture and healthcare systems, further verification for the results of this study would be desirable.

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Appendix 1: Summary of literature review on success factors of HIT implementation

ID	Success Factors	Description	References
SF1	Commitment and support of leaders	Providing support for the project team to overcome the obstacles to implement the systems successfully	[19]; [20]; [21]; [22]
SF2	System quality	Level of quality characteristics set for the technical system, such as reliability, response time and flexibility of the system	[27]; [37]; [44]; [48]; [49]; [50]
SF3	End-user participation and involvement	Involving the end-users in various stages of the project, including requirements definition, planning, development, and testing	[21]; [23]; [28]; [29]; [31]; [35]; [37]; [38]; [42]; [43]; [44]; [45]
SF4	Service and information quality	Level of quality characteristics set for the service and information quality, such as accuracy, timeliness and responsiveness	[27]; [37]; [44]; [48]; [49]; [50]
SF5	Infrastructure Quality	Telecommunications capability, rigorous security, interoperability, standardization, and connectivity of clinical information systems	[21]; [29]; [30]; [32]; [33]; [43]; [51]
SF6	Cooperation among administration, IT, and clinical functions	A collaborative relationship between physicians, researchers, hospital administrators, IT specialists, end-users, and external stakeholders	[22]; [38]; [39]; [40]; [41]
SF7	Sufficient resources	Resources from the healthcare organization or other sources which ensure the sustainability of the implementation project	[22]; [32]; [40]; [51]
SF8	Staff training	Training provided to the end-users which is sufficient in quantity and quality to increase end-user acceptance of the system	[1]; [21]; [23]; [28]; [32]; [33]; [34]; [43]; [52]; [51]; [53]; [54]
SF9	Co-development of the system and the workflow	Concurrent design and development of the technical system and the work process it is to support	[21]; [28]; [30]; [32]; [35]; [37]; [38]; [42]; [43]
SF10	Collaboration with the vendors	A collaborative relationship between the healthcare organizations and IT vendors which helps to inform the organization of new IT and its potential	[19]; [32]; [35]
SF11	Project management	Activities define the scope, schedule and budget of the project and include methods to identify, evaluate and avoid problems	[19]; [21]; [26]; [27]; [29]; [32]; [33]; [34]; [35]
SF13	Multi-disciplinary teamwork	The project group includes representatives from different units such as the IT, administration and clinical departments	[21]; [31]; [33]; [34]; [36]; [37]
SF14	Performance of project	The degree to which the project team is able to	[21]; [31]; [33]; [36];

		obtain the objectives set to the project, such as keep within the budget and schedule	[37]
SF12	Meeting the need of end-users	Understanding the needs of users in several levels, and then meeting these needs	[30]; [42]; [46]; [47]
SF15	Technical Support	Support provided to the end-users in trouble-shooting situations which helps them to overcome the problem and foster organizational learning regarding the technology	[1]; [21]; [23]; [28]; [32]; [33]; [34]; [43]; [51]; [52]; [53]; [54]
SF16	Organization openness change and innovation	Organizational culture that encourages use of systems, and the presence of individuals and opinion leaders who are keen to adopt systems	[20]; [26]; [28]; [46]; [51]
SF17	Meeting the need of management	Understanding key organizational objectives and management needs, and then meeting these objectives and needs	[8]; [31]; [46]
SF18	Organization Strategy	Planned activities which aim at achieving certain organizational goals	[36]; [55]; [56]; [57]
SF19	Experience in change and innovation	A history of organizational changes and in using health information systems that can spur the adoption of new systems	[20]; [26]; [28]; [46]; [51]
SF20	Information Communication Technology (ICT) Strategy	Defining how ICT can be used within an organization as part of achieving goals and objectives of the organization	[8]; [42]
SF21	Meeting the need of external stakeholders	Understanding and meeting the needs specified by governments and other third parties, e.g. in the dimensions of patient safety, quality improvement, and patient rights	[42]; [46]; [58]
SF22	Project champions	Persons, typically executive managers, who help to coordinate implementation and encourage overall acceptance of the new applications by their peers	[20]; [22]; [23]; [24]; [25]; [26]; [27]; [28]; [29]; [30]; [31]
SF23	Regulation	Administrative policies which mandate the use of systems, and may include punishment for non-use	[1]; [24]; [32]; [48]; [49]
SF24	Incentives	Encouragement policies that reward the use of the system, such as financial rewards	[1]; [24]; [32]; [48]; [49]
SF25	Influence of external environment	Regulatory, legislative, and economic context which can influence the development of systems	[27]; [40]; [42]; [46]; [58]