



Exploring health information  
technology implementation success  
factors – a comparative  
investigation in Nordic countries

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# Research Problems

- The computerized technologies that collect, store and display patient information across the whole range of functions which may affect the health of citizens and patients are called Health Information Technology (HIT) (Brender et al. 2006).
- health information systems which store and retrieve information to support patient care activities;
- administration information systems which assist in carrying out financial and administrative support activities, such as payroll, patient accounting, materials management, and office automation;
- and executive decision support systems which provide information and analytical tools to support managerial decision-making in health services organizations.



# Research Problems

- An ongoing debate on how to achieve greater success in implementing Health Information Technology (HIT).
- Many scholars have attempted to improve the success rate of HIT implementation by identifying success factors (SFs)
  - key elements that influence the ability to achieve intended objectives or goals.



# Research Problems

- A number of overlapping SFs and their inter-relationships should be explored
- Brender et al. (2006) developed a list of 110 SFs into 12 perspectives.
- Ash et al. (2003b) grouped related sub-themes to form 12 principles that can be categorized into four groups.
- Both Brender et al. (2006) and Ash et al. (2003b) shared some common SFs, such as technical or organizational factors



# Research Problems

- Most studies have been conducted in North America, mainly the US and Canada.
  - Need to explore whether the SFs identified in this context are equally relevant in other global contexts.
  - Literature reviews of SFs in other fields found that there is a set of common SFs regardless of organization size, industry, or country.
- Ngai et al. (2008) found common SFs in ERP across 10 different countries and regions.
- Saini et al. (2013) found insignificant differences in the SFs of ERP in SMEs compared with large ones in India.



# Research Problems

- Previous studies have recognized the problem of the many (often overlapping) SFs and addressed the need to improve their categorization (Meijden et al., 2003) as a basis for
- improving the HIT implementation knowledge (Rahimi et al., 2009) to create a common basis for both research and practice.
- IT managers should see such a condensed list of SFs as a practical checklist to assist in HIT implementation efforts.
- Our review of the literature shows that further theorizing is needed on SFs of HIT implementation.



# Research Questions & Method

- What is the relationship between SFs?
- And to what extent are the identified SFs relevant in the Nordic countries?
- A survey to IT managers in Nordic countries' healthcare organizations
  - IT managers have rich information about the IT implementation in their organizations.
- Exploratory factor analysis was used to produce groups of SFs characterized by statistical similarity;
- Then, the comparison of SFs at the country level was checked using ANOVA.



# Literature review: 25 SFs

- After literature reviewed & pilot tested, the questionnaire includes 25 SFs
- Commitment and support of leaders
- System quality
- End-user participation and involvement
- Service and information quality
- Infrastructure quality
- Cooperation among administration, IT, and clinical functions
- Sufficient resources



# Literature review:25SFs

- Staff training
- Co-development of the system and the workflow
- Collaboration with vendors
- Project management
- Meeting the needs of end-users
- Multi-disciplinary teamwork
- Performance of the project team
- Technical support
- Organization openness in change and innovation



# Literature review: 25 SFs

- Meeting the needs of management
- Organization strategy
- Organization experience in change and innovation
- Information communication technology (ICT) strategy
- Meeting the needs of external stakeholders
- Project champions
- Regulation
- Incentives
- Influence of external environment



# Survey administration

- In practice, IT managers have different job titles, and they work in various organizational units. Therefore, it is not easy to determine who is an IT manager in a healthcare organization.
- In this research, one group of respondents was identified directly by the researchers using publicly available information on healthcare organizations.
- To supplement this method, the researchers also asked specific contact persons in some healthcare organizations to forward the survey to “the individual who is responsible for the automated information systems in your hospital.”



# Survey administration

- The final list of potential respondents included 309 persons (Denmark: 85; Finland: 109; Norway: 69; and Sweden: 46).
- A link to the questionnaire on the survey website was sent to the respondents
- The IT managers were asked to evaluate and show the degree of perceived importance for each factor in a 7-point Likert-type scale
- The survey duration was two months and a total of 94 responses at 30.42% response rate.



# Survey administration

- The jobs of the respondents who were contacted via contact persons needed to be verified
- Based on background information collected from the respondents on their work titles and job roles
- After the screening was completed, a total of 91 responses were included in this study



# Profile of respondents by countries

<b>Countries</b>	<b>Number of respondents</b>	<b>%</b>
Denmark	14	15.4
Finland	32	35.2
Norway	25	27.5
Sweden	20	22.0
Total	91	100.00



# Sample characteristics

- The average age: 50 years
- Almost 60% had a previous management job
- 36% were female
- high education level: technical (38.5%), followed by business school (14.4%) and medical science (13.6%).



# Ten Most Important Success Factors

- (1) commitment and support of leaders,
- (2) system quality,
- (3) end-user participant,
- (4) information and service quality,
- (5) infrastructure,
- (6) departments cooperation,
- (7) resources,
- (8) staff training,
- (9) co-development of the system and workflow, and
- (10) vendor cooperation.



# Factor analysis

- .The principal component analysis was used to explore which, if any group would emerge
- .The screen plot was used to identify the optimal number of factors to be considered.
- .The 25 SFs were independently subjected to varimax-normalized rotation.
- .To get the most information, SFs with a loading of .400 or greater were considered.



# Factor analysis

•SF12 (“meeting the needs of end-users”) has the lowest loading; however, it is an important contributor to the content of the scale. Thus, we decided to not eliminate it (Pett et al., 2003).

•Two success factors, SF5 (“infrastructure quality”) and SF11 (“project management”), were dropped since the meaning of these SFs did not fit with the groups in which they load (Hair et al., 2009; Pett et al., 2003).

•Factor analysis was performed once again to determine whether the factor group structure remained stable.



The final result after the second factor analysis.

Table 3: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.786
Bartlett's Test of Sphericity	Approx. Chi-Square	876.051
	df	253
	Sig.	.000



# Factor analysis

- Six groups of factors

- Group 1: Culture Conductive to Change

Incentives

Experience in change and innovation

Regulation

Organization openness in change and innovation

- Group 2: System & Service Quality

System quality

Service and information quality

Collaboration with vendors

Influence of external environment



# Factor analysis

## •Group 3: Collaboration

Cooperation among administration, IT, and clinical functions

Sufficient resources

Multi-disciplinary teamwork

Technical support

Staff training

Performance of the project team

## •Group 4: Alignment

Co-development of the system and the workflow

Meeting the needs of management

Information communication technology (ICT) strategy

Meeting the needs of external stakeholders



# Factor analysis

- Group 5: End-user Involvement

End-user participation and involvement

Meeting the needs of end-users

- Group 6: Management Commitment

Commitment and support of leaders

Project champions



# Cross-country Comparison: Similarities

- Despite being in different countries, IT managers have similar evaluations of SF Groups 2, 3, 4, 5, and 6
  - the contents of these groups describe the activities or duties of IT managers.
- If certain similarities are consistent across the countries, it may be possible to derive a list of fundamental success factors with little variance across countries.



# Cross-country Comparison: Differences

- Only Group 1 is different

- Finland was significantly different from other Nordic countries. Norway was also different from Denmark. However, Sweden did not significantly differ from Norway and Denmark.

- Taken together, these results suggest that the perceptions of IT managers regarding the importance of culture is really different and are based on country context.

- the aspects in this group being perhaps “softer” and more related to mindset than the other groups. In addition, this difference might be because Group 1 has aspects that cannot easily be formalized, while the other groups have elements that can and should be somewhat formalized in an IT project. Finally, the variables in Group 1 seem to have a strong link to the national healthcare environment.



# Future research

- Further studies are needed to validate our instrument and findings in other contexts.
  - To derive a common set of SFs for HIT implementation in a range of countries.
  - Recommendations for HIT implementation worldwide can be made on a more solid footing.
  - The similarities that we found in IT managers' perspectives can save efforts and resources in HIT implementation



# Future research

- A success prediction model can be proposed and verified by future research.
- Six SF components might be interrelated in cause–effect relationships.
- If these relationships are verified, it would contribute to the discovery of the different roles of many SFs in HIT implementation.
- This would, in turn, help IT managers and other stakeholders focus on the most important issues and how they impact HIT success.

