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Abstract

Service Oriented Architecture (SOA) has been proved to be a significant integration paradigm in many sectors including healthcare. The importance of the development of integrated Information Technology (IT) services and infrastructures in healthcare is enormous as medical errors that occur due the non integrated nature of healthcare systems result in the loss of human lives. The normative literature demonstrates that organizations have difficulties in getting full benefits from SOA adoption for various reasons. Thus, we suggest that the investigation of Critical Success Factors (CSFs) related to SOA implementations in healthcare is important as the understanding of these factors may help organizations to increase the benefits they get from SOA and improve SOA acceptance rate. As a result we review the literature to identify SOA CSFs in healthcare and we classify them. Then we test them through a case study in a public healthcare organization. The results stress the crucial importance of governance and culture and proposed that a new CSF called "Communications" should be considered. In doing so, we extend the body of literature and we suggest that further research is required to better understand SOA CSFs in healthcare.

1   Introduction

In the past, healthcare organizations attempted to address various issues, such as: (a) public/private partnerships, (b) managed competition and (c) managed care (Ham, 2003). Even though they managed to improve healthcare services, some problems such as integration still exist (Mahmood, 2007). In many cases, investments resulted in heterogeneous and fragmented Health Information Systems (HIS), that still face difficulties in terms of interoperability, operation, safety and management (Mantzana, 2006, Maenpaa *et al.,* 2009). In addition to this, medical errors that occur through the non-integrated HIS are estimated to have resulted in the loss of 23.000 persons per year in United Kingdom (Khoumbati *et al.,* 2006b). Thus, the need for integrated HIS in a safer, interoperable and more manageable environment motivated organizations to consider the adoption of paradigms such as Service Oriented Architecture (SOA).

SOA is an architectural paradigm that supports reusability and emphasizes on breaking business processes into smaller blocks of functionality (e.g. services). These small blocks are well defined, self-contained modules that provide standard business functionality and are linked together to build an integrated business process (Papazoglou *et al.,* 2008). Organizations that adopt SOA can: (a) reduce costs, (b) provide higher return on investment (c) reuse and integrate services and legacy systems, (d) reduce time to market and (e) better align business with IT (Mueller Benjamin, 2010, Marks, 2008, Koumaditis and Themistocleous, 2011).

Despite SOA benefits Heffner (2009) indicates that, 41% of SOA users in the Global 2000 firms believe that: (a) SOA has delivered less benefit than expected, (b) 17% claim they face problems and (c) will not expand SOA use. This reveals that even thought SOA is considered a valuable architectural paradigm its application, efficiency and performance are affected by various factors.

In an attempt to study this area, we focus on CSFs. Initially we review published cases from: (a) various industries (non-specific sector) and (b) healthcare, to build a proposition, which was then, tested using a qualitative case study strategy. The case study was carried out in a big public healthcare organization with 1.5 million members that at the time faced with two issues: (a) the cost of the services provided were exceeding by far the amount of revenue it produced and (b) a change in the institutional framework regarding the hiring of contractors resulted to personnel reduction (up to 44%). Reflecting these challenges the administration decided to implement e-health services based on SOA. The remaining of the paper is structured as follows Section 2 presents the SOA CSFs, Section 3 the Case Study, Section 4 the Discussion and Lessons Learned and Section 5 Conclusions and Future Research Agenda.

2   SOA Critical Success Factors

For this paper, we reviewed representative studies gathered from various databases, such as: (a) Google scholar, (b) IEEE Xplore, (c) AISeL and (d) Science Direct. In these databases we used a keywords search "*SOA Critical Success Factors*", against categories, such as: (a) keywords, (b) title and (c) abstract. Additional steps included a backward references search, were we reviewed the references of the studies yielded from the keyword search, thus extending our knowledge of the theory and methodology used (Levy and Ellis, 2006). We then integrated these studies with the results from a wider research, using the same databases, but with keywords referring to "*SOA implementation*". Additionally, in an attempt to provide valuable insights for the IS community we organized the review in a conceptual structure (e.g. CSF/CSF in healthcare) (Vom Brocke *et al.,* 2009).

Moreover, we present in Table 1, the factors identified in the studies, mapped against the dimensions utilized in Shang and Seddon (2000) model. This model has been widely used in the past to classify integration technologies (Khoumbati *et al.,* 2006b, Chen, 2006). Moreover, Shang and Seddon (2000) propose five distinctive dimensions, such as: (a) Operational, (b) Managerial, (c) Strategic, (d) IT

Infrastructure and (e) Organizational. In Table 1, the left column "*Dimensions*" is formed using the Shang and Seddon (2000) framework, the "*CSFs*" column presents factors identified in the literature and mapped with the preceding column, while the "*Description*" column presents a more analytical explanation and the "*References*" column presents the reference/s.

Dimension	CSF	Description	Wong-Bushby et al., (2006)	Yoon et al., (2007)	Kajko-Mattsson et al., (2007)	Blanton (2009)	Schelp et al. (2009)	Chang et al., (2009)	Haresh et al., (2009)	Antikainen et al.,(2009)	Lee et al., (2010)	Aier et al, (Aier et al., 2011)	Nasr et al., (2011)
Operational	Maturity Identification	Detailed description & mapping of the current state of SOA.				✓							
	Roadmap	Goal oriented map with instructions that explain the goals and the path to reach them.				✓					✓		
	Complexity	Increasingly interacting processes amplify difficulty of operational handling of the system.					✓				✓		
Managerial	Roles	SOA calls for responsibilities-to-roles.		✓							✓		✓
	Team	A team with understanding and experience in change management and clear vision of SOA.	✓							✓	✓		
	Governance	An overall plan to provide compliance with regulations (internal/external) and check services concerning capability, security and strategic business alignment.		✓	✓			✓	✓	✓	✓	✓	
	Funding	The use & control of resources as part of the new business plan.							✓		✓	✓	
	Measurement	Assessing performance of service processes.					✓				✓		
	Risk	Data confidentiality and security.								✓	✓		
Strategic	Long-term Planning	Long term business plan to include reusable services that fit future business.								✓			
	Clear Goals	Clear goal setting based on business value.									✓		
	Project Identification	Identify early SOA adopters, low complexity pilots based on existing needs for change.	✓								✓	✓	✓
IT Infrastructure	Resources	Prediction of exact amount and use of IT resources.						✓			✓		
	Standards	Generating standard definitions of SOA technology.									✓		
	Testing	Tools and methods to test new integration approaches and services.											✓
Organizational	Alignment	Top management, stakeholders, actors, strategies, processes, and technology alignment towards successful SOA implementation.						✓	✓	✓	✓	✓	
	Culture	Cultivate SOA friendly environment to: (a) reduce resistance to change, (b) assist individual business units to take ownership of data, processes IT systems and (c) get commitment at the board level.	✓	✓				✓	✓	✓		✓	✓
	Experience & Training	Availability of skills and training.		✓				✓	✓			✓	✓

Table 1.   SOA Critical Success Factors

Lee *et al.,* (2010) identified factors affecting successful SOA implementation, using literature review and interviews from industry stakeholders. Additionally, Haresh *et al.,* (2009) empirically examined the adoption of SOA across fifteen firms by pinpointing the practices that require attention for the successful implementation of SOA so as to achieve business value. In the same lines, Antikainen *et al.,* (2009) indicated factors influencing SOA development for achieving business objectives. The aforementioned studies seem to complement each other and formulate a pattern of CSF in SOA implementation that covers a wide spectrum. An interesting difference is among them that Antikainen *et al.,* (2009) identified that the long-term aspect given to SOA consist a valuable factor for IT development. In other words, knowledge about business strategy was seen as a useful input for designing reusable services and architectures that would fit future business needs without major re-implementation efforts.

In order to enhance the aforementioned findings we reviewed cases of SOA implementations (Wong-Bushby *et al.,* 2006, Kajko-Mattsson *et al.,* 2007, Schelp and Aier, 2009, Yoon and Carter, 2007, Blanton *et al.,* 2009, Nasr *et al.,* 2011). The value in including these additional cases is twofold: (a) to verify the existing literature and (b) to discover new factors. Indeed, two more factors that need attention were revealed. In more detail, Nasr *et al.,* (2011) report that *testing* is a factor that can affect SOA implementation, multiple testing tools and methods are required (Nasr *et al.,* 2011). Also, Blanton *et al.,* (2009) point out the value of *SOA maturity identification,* thus utilize a detailed account of the level of SOA parameters already placed and what follows (Blanton *et al.,* 2009).

Thus far, the review on SOA CSFs reveals that a good knowledge foundation around CSFs of successful SOA implementations exists, with at least 18 factors (see Table 1). These factors resemble a non-specific sector list. However, earlier reports has described healthcare as a sector holding unique factors regarding adoption and implementation of new technologies (Khoumbati *et al.,* 2006a, Mantzana *et al.,* 2008, Leonard, 2004). Thus, the need to implement SOA in healthcare requires the investigation of SOA CSFs related to the healthcare. In this way, this research attempts to fill a gap in the area of SOA in healthcare.

Using direct content analysis and the CSFs identified in Table 1, we examined 70 cases from the *"SOA in healthcare"* conference and gathered 22 articles (OMG, 2008). Despite conducting a central coverage (reviewing the literature pivotal to a topic e.g. SOA in healthcare) of the literature, it is our understanding that the research quality was maintained due to the exhaustive theme of the conference (technical, managerial, business, etc), the time frame used (cases from the first conference till 2010) and the sufficient number of articles gathered (Vom Brocke *et al.,* 2009). Subsequently, we identify and classify SOA CSFs in healthcare, as these are summarized in Table 2, using Shang and Seddon (2000) model.

The outcome of the review, demonstrates that the most frequent reported CSFs in the cases reviewed are: (a) governance, (b) roadmap, and (c) culture. Especially, governance is in many cases considered a critical factor to SOA and one that is required from an early stage (Felton, 2010, Gaydos, 2010).

Also, the focus on healthcare cases revealed a new CSF, called "*enforce decisions*". Moreover, Wendell (2009) and Mulrooney (2010), reflect on the need to establish tools and methods for the detailed execution of SOA related decisions and/or the ownership of specific services. They report that this enforcement can minimize the time delay experienced due to negotiations, unclear ownerships and misunderstanding and thus assist SOA implementation.

Overall, the CSFs identified (e.g. Table 1) seem to fit in healthcare (e.g. Table 2) with one addition ("enforce decisions"), thus the resulting nineteen factors can form the extensive list of factors that any healthcare organization can consider in a SOA implementation. In order, to evaluate our proposed list we proceeded to examine the proposed CSFs with empirical data.

Dimension	CSF	Huff (2008)	Gilbertson(2008)	Vengco (2008)	Mirhaji et al., (2008)	Giokas (2008)	Stephens (2008)	Wrightson (2008)	Riben (2009)	Welker (2009)	Miller et al., (2009)	Wendell (2009)	Mulrooney (2009)	Smith et al., (2009)	Gaydos (2010)	Weiler (2010)	Ferguson (2010)	Felton (2010)	Pandit-Pant (2010)	Do et al., (2010)	Bugrara (2010)	Mulrooney (2010)	Rosen (2010)
Operational	Maturity Identification	✓													✓								
	Roadmap			✓					✓	✓					✓	✓	✓						
	Complexity																	✓					
Managerial	Roles													✓									
	Team					✓												✓					
	Governance		✓	✓					✓	✓				✓	✓	✓	✓	✓	✓	✓			
	Funding											✓											
	Measurement																					✓	
	Risk				✓					✓	✓												
Strategic	Long-term Planning				✓										✓			✓					
	Clear Goals											✓			✓								
	Project Identification			✓														✓	✓				✓
IT Infrastructure	Resources		✓	✓																			
	Standards				✓	✓			✓							✓							
	Testing												✓		✓	✓						✓	
Organizational	Alignment													✓			✓						✓
	Culture		✓	✓					✓					✓			✓	✓					
	Experience & Training																	✓		✓			
	Enforce Decisions											✓										✓	

Table 2.   SOA Critical Success Factors in healthcare

3   Case Study

The CSFs of SOA implementations in healthcare presented in Table 2 were tested through a case study. Klein & Myers, (1999) argue that the case study is a valid strategy to be used in the IS research field. Case study strategy was followed as it supports the investigation of: (a) little-known phenomena (SOA CSF in healthcare) and (b) complex processes (SOA implementation) in their natural setting. In order to structure case studies the researcher should: (a) identify specific research questions (issues) before conducting research and (b) do the fieldwork systematically according to a planned schedule (Yin, 1994). Thus, we structured a research plan to conduct an exploratory research. In more detail, the case study was in a healthcare organization and multiple data collection methods were employed, such as: (a) documentation, (b) interviews, (c) direct observation, (d) participant observation and (e) archival records (Strauss and Corbin, 1998).

The case organization is a **Publ**ic **In**surance **Or**ganization (Publinor)[1] with more than 1,5 million members. In this research we employed multiple data collection methods and conducted face-to-face semi-structured interviews with 4 professionals during a period of 4 months. Also, we gathered appropriate documents and records portraying the issues at hand. The interviews were tape-recorded and the transcription outcome was discussed and verified with the interviewees. Moreover, methodological triangulation was used to preserve the reliability and validity of the findings. The finalized material was then compared with the outcome of the literature review (Table 2).

Publinor was chosen for study due to its resent involvement in a SOA initiative. This organization consists of 57 regional healthcare services and contracted partners (pharmacists, doctors, diagnostic centers, private clinics and physiotherapists), that provide healthcare services to insured members. Publinor aims to: (a) organize, monitor and control the provision of healthcare to its members, (b) improve the quality and efficiency of healthcare services provided, (c) manage and control the funding and (d) utilize available healthcare resources. It is estimated that Publinor monitors and interacts with 12.744 doctors, 2.685 diagnostic centers and labs, 710 physiotherapists, 1.100 opticians and 9.735 pharmacies making it a large multidimensional organization.

From a technical point of view, Publinor uses among others a CENtralized Information System (CENIS), which consists of several subsystems, like: (a) protocol and financial management, (b) members' registry, (c) warehouse, (d) management of insured members' hospitalization, (e) payroll of the Publinor's employees, (f) IS Management - Business Intelligence (MIS - BI), (g) safety management system (create users' accounts, assign roles, etc) and (h) disaster recovery system. CENIS uses web-services to connect with cooperating healthcare bodies and retrieve data (e.g. doctors' registry).

When a new administration was appointed to run Publinor the organization was facing two major problems: (a) the cost of the services provided were exceeding by far the amount of revenue it produced and (b) a change in the institutional framework regarding the hiring of contractors resulted to personnel reduction of 44%.

In an attempt to address these issues several solutions, such as Informatics and Communication Technology (ICT), were introduced. The most strategic action that Publinor took focused on the implementation of a SOA based electronic prescribing system with an integrated sub-system, that records diagnostically and medical referrals, named DIAGNOSIS. The system was created with the assistance of an external sub-contractor. The system's platform is web-based open source and was provided for free to the contracted physicians and diagnostic centers. The physicians use the platform to refer the patient to a diagnostic centre (using coded list of diagnostic tests and diagnosis– ICD10) and the diagnostic centre execute the referred diagnostic tests and charge the Publinor. The initial objective of Publinor was to create a proof-of-concept pilot version of DIAGNOSIS with appropriate functionality and evidence of cost-reduction. In more detail, the pilot version alongside statistical data revealing cost-reduction, were included as part of a campaign towards users and public dissemination (web-site, conferences, etc). The success of the campaign provoked the motivation and full adoption of the services was achieved.

To this end, the DIAGNOSIS was a successful application as it was developed within an allocated budget (placed by external sponsor), time schedule (10 months), high level of end-user usage (84% of the doctors) and met the design (SOA and IT) specifications. In addition the empirical data revealed that the majority of CSFs summarize in Table 2 was critical for SOA implementation at Publinor.

As a first step in our exploratory research, the list of CSF's was introduced and evaluated through the empirical data collected from Publinor. Initially, the interviewees were asked to comment on the

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[1] Due to confidentiality restrictions the name and country of the organization is not revealed.

proposed CSF as these were classified in the five dimensions of Table 2 namely: (a) Operational, (b) Managerial, (c) Strategic, (d) IT Infrastructure and (d) Organizational. All, interviewees were positive about the use of the aforementioned classification and they approve the five dimensions.

Operational Dimension: Empirical evidences indicated that CSF **maturity identification** was performed by Publinor as part of a SWOT analysis. Publinor placed itself in an initial SOA maturity stage and identified the steps required to improve its maturity level. The steps that Publinor identified toward this direction were: (a) utilize expertise, (b) use related technology and (c) integrate, educate and influence others (employees, stakeholders, and funds). These steps were achieved through a gradual transition and formed a **roadmap** towards SOA implementation. Empirical evidence indicated that **complexity** was not realized as CSFs in this case.

Managerial Dimension: Publinor created **teams** with a clear structure. A Project Team A (3 members) and an IT team containing members of a larger IT team was appointed at Publimor to run the project. From the developer (external) a project Team B was appointed to cover the project's needs. Team B consisted of 2 project managers and a dedicated IT team (3 members). Publinor gave **roles** only to Team A (e.g project manager, integration advisor, management representative) and placed task to the rest employees. As stated from a top manager "…*the structure of the public sector is such, that responsibility lies on the top...*".

Empirical evidences indicated that **governance** was focused on the alignment of strategic business goals (e.g. e-health services) with the current legislation. Laws issued decades ago did not foresee the use of e-health services and opposed in issues related to e-health, such as: (a) privacy and patient's data confidentiality, (b) functionality and (c) management. The project had to be in accordance to the legislation running at that point thus Team A with the legal service team (already running as part of Publinor) produced a legislation proposal. After revision, the top management of the Publinor with the aid of government officials produced a new law proposal, which was the first directed to assist e-health services and to cover the project. As a top manager stated "…*we started designing a plan mainly for enterprise and IT management and ended up with a law proposal…*". Furthermore, as stated Publinor's approach on service development and integration of systems involving sensitive patient data were in accordance to national laws and regulations. Especially in the case of patients' history and exams Team A always confirmed their approach with the Country Data Protection Authority (CDPA) considering all **risks** and safety measures.

Additionally, Publinor's plan was based on utilizing the results from **measurement** (usage and cost reduction) to push the change for the initiative. Thus, top management aimed to get results as quickly as possible. In the same lines, managers produced weekly reports and communicated the results, as to create a favorable climate for the project. The measurement focused on the use and functionality of the services and mapped with the cost reduction it produced. Also, empirical evidence indicated that **funding** was not realized as a CSF in this case. In addition to this, three interviewees reported that **communication** should be included as a CSF. In more detail, communication was seen as a tool to promote the project (established through the campaign), get commitment, motivate the users and get feedback (established by a one day formal presentation of the pilot to local union's representatives) and as part of everyday business (different communication channels were created between project teams, the top management and users).

Strategic Dimension: The top management recognized that: (a) DIAGNOSIS was a revolutionary system and (b) the healthcare environment was in a reform state. Therefore, Publinor planned for immediate results but recognized the **long-term** applicability of the project by other organizations (public bodies) as well. Accordingly, the focus was divided between getting the system to work but also built a reputation around it. Thus, the **goals** were placed accordingly. As far as, the **project identification** Publinor concentrated in a project that could produce cost reduction and be based on IT sophistication, thus chosen DIAGNOSIS.

IT Infrastructure Dimension: Empirical evidences indicated that Publinor estimated the exact use of technological **resources** needed, but they were also flexible to allow the use of any applicable resource from external stakeholders (other public bodies, contractor) so as to overcome problems and depletion. The only **standards** applied were standardization and coding of medical data. These proved time consuming and required more resources than originally planned. Despite, as stated this issue was resolved without affecting the overall timeframe of the project. While, as proposed by the sub-contractor **standard** definition for SOA technology was adopted mainly from best practices. The **testing** was based on the functionality and usage of services at the pilot phase. The recorded problems were reported back to Team A in a formal way (report). Then a procedure was followed in which the problem was evaluated, discussed with the project manager (sub-contractor) and resolved, or if needing an approval, Team A reported back to top management.

Organizational Dimension: Publinor's top management was the driving force behind the initiative and only when the first results (demo and cost reduction reports) appeared the rest of the stakeholders started to **align** with the aim of the project.

Publinor's top management cultivated a SOA friendly **culture**, which with the relevant experience in IT already in place (IT culture) grasped the opportunity to install a system that could: (a) reduce the cost, (b) enhance the services provided, and (c) be used as a guide for other organizations. In this respect, many **decisions** were deliberately imposed from the top management level to rest of the organization stakeholders (especially managers) and the outcome was presented as a functional solution that everyone had to adopt and use. As reported from a top management official *"…this was a plan to overcome bureaucracy and negative behavior that is usually the case in public organizations and it worked as we gained valuable time and revealed in the end a functional service"*. Publinor's IT department was considered an asset from the start. Their sophistication came from: (a) **training**, (b) **educated personnel** and (c) related projects. A compact training plan was delivered to DIAGNOSIS's users (doctors and pharmacists) and guidelines/manuals made available on Publinor's web-site.

4   Discussion and Lessons Learned

Firstly, empirical evidence indicated that **funding** was not reported as a CSF by interviewees but its existence was observed. The case organization could not proceed to the implementation of the project without external funding. Thus, Publinor firstly secured the finding from external bodies and then proceeded to the implementation of the project. **Complexity** was the other factor that was not reported by interviewees. Apparently this was not a CSF as Publinor developed a new system from scratch and its dependencies with other co-existing systems were small. The reason for this was that most of the business processes of Publinor were not automated and thus there was no complexity in terms of systems integration. However, it should be noted that this is not a typical case as many organizations have at least automated but not integrated HIS. For this reason we assume that this CSF does exist but to prove this further research is required.

Another interesting point revealed by the interviews, was a new CSF called **communications** that was revealed by our field work (mentioned by 3 interviewees) and added to the Managerial dimension, as seen in Figure 1. Recent studies on CSFs concur that communications play a critical role in IS project success (Nasir and Sahibuddin, 2011).

A different approach between the literature review and empirical data was also seen in the **roles** appointed to employees. The tasks they were assigned required the ability to take decisions that the role they held did not allow them to. Thus, in many cases caused operational problems (e.g. delays, arguments) and had to engage in meetings with the top management that hold the appropriate roles to resolve them. In SOA projects placing roles and responsibilities instead of tasks is seen as a better approach (Biske, 2008).

Empirical findings revealed that **governance** holds a top priority amongst the CSFs list. The top priority given to SOA governance is in accordance with the views of many researchers (Josuttis, 2007, Marks, 2008, Niemann *et al.*, 2008, Biske, 2008). They reported that SOA implementations require governance mechanisms to excel, otherwise the architecture will end up complex, uncontrolled, brittle and eventually discarded (Koumaditis *et al.*, 2009). For example, in the case of the Publinor, the creation of a tight, IT skilled, organizational structure (Team A), alignment of services with strategic business goals (DIAGNOSIS and cost-reduction) and compliance with regulations (legislation proposal) provided valuable governance to SOA implementation.

Evermore, according to our fieldwork **culture** was placed among the top CSF, as it is considered vital for SOA implementations. Organizations can be beneficiated from SOA implementations by cultivating SOA culture. Thus, reducing the resistance to change caused by SOA application and motivating individuals (users or decision makers) to assist the maturity of SOA. For example, the Publinor followed the pilot/proof-of-concept approach to gain the stakeholders/users cooperation and motivated them to get involved in the project. Although, it was top management dedication to the project that firstly and foremost drove the project to its successful outcome.

Thus far, we showed that Publinor critically addressed the majority of the proposed SOA CSFs (Table 2) with the addition of **communications** but addressed with a low applicability **complexity** and **funding**, as seen in Figure 1.
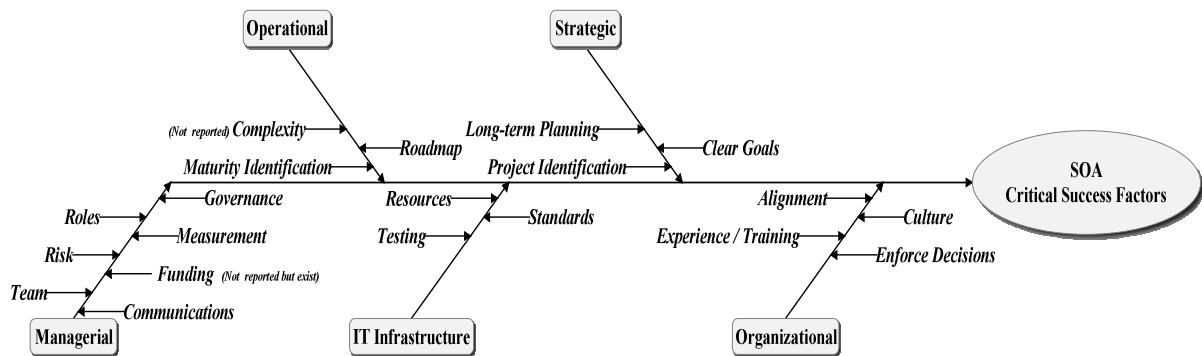

Figure 1.   SOA Critical Success Factors in Publinor

As reported above, we studied the area of SOA in healthcare and sought to understand the CSFs surrounding such implementations. Thus five key lessons that might be helpful to healthcare organizations as well as to researchers and IT practitioners are summarized below:

Lesson 1 - Each CSF identified have an important role during the implementation of a SOA application in healthcare. Their crucial role has been reported in the literature and was validated through this research.

Lesson 2 - The existence of different hierarchy was observed in the healthcare CSFs versus non-specific sectors research. Although, **governance** and **culture** holds top levels in both aspects, the rest of the top five referred CSFs differ. In healthcare cases (e.g. Table 2) the Operational (roadmap) and IT infrastructure (standards and testing) are more referred. While, and in the non-specific sector review (e.g. Table 1) the Organizational (alignment and experience\training) and Strategic (project identification) are placed higher. This difference in hierarchy requires more research to be analyzed.

Lesson 3 - The list of CSFs proposed and tested in this paper provides some insights in the categorization and identification of the CSFs in a healthcare setting.

Lesson 4 - The CSF called **Communication** was revealed as a new CSF and its role explained on the basis of the empirical data.

5 Conclusion and Future Research Agenda

This research investigates issues related to Service Oriented Architectures in healthcare organizations. In particular it focuses on the investigation of factors that are critical for the success of SOA implementations in healthcare sector. This is an interesting and equally important issue as the software applications in the healthcare sector are considered as critical since they control or manage data related to human lives. The significance of systems integration is also highlighted in the normative literature as: (a) at global basis millions of citizens lose their lives every year due to the non integrated nature of HIS and (b) many organizations have developed SOA applications but they have failed to get full benefit from them.

For this reason it is important to investigate issues associated to CSFs related to SOA implementations in healthcare organizations. This work focuses on this issue and can be considered as novel as it identifies and classifies SOA CSFs for solutions that have been developed in the area of healthcare. In this study we identify and classify SOA CSFs as these were derived from and extensive literature review. We then test these CSF in a real life case study and we validate their existence. In addition to this it was revealed that a new critical factor entitled "Communication" does exist. Although two of the CSFs we identified from the literature were not reported by the interviewees we believe that they do exist as we observed that: (a) funding was a CSF and (b) low level complexity helped the organization to better implement its SOA application. For this reason we assume that these two CSFs do exist yet further research is required to prove this. Another interesting finding was the fact that Publinor has the power to impose the implementation of the new system. The power of this organization was such that persuaded the government to change the legislation to support the smoother adoption of the system. Thus, top management support was of high importance in this case.

The future research agenda for this research involves the utilization of more empirical cases and the comparison between the current and the new findings, to extend the body of knowledge and evaluate our proposition through more empirical data.

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