The Best Catalyst for Implementing e-Health

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Abstract: *In the field of telemedicine, e-Health aims at remotely monitoring the health status of the patient living independently at home. Also, IT governance is one of concepts that suddenly emerged and became an important issue in the information technology area .In addition,* ITIL *(IT Infrastructure Library) provides a* framework *of* Best *Practice guidance for service management. This paper demonstrates how ITIL can help to implement e-Health systems.*

Keywords: *e-Health; IT Governance; Information Technology Infrastructure Library (ITIL).*

I.   INTRODUCTION

Unsurprisingly, definitions of e-Health tend to include aspects of both health and technology; health is generally viewed in terms of process rather than outcome, and technology is seen as a means to supplement, rather than replace human activity. Difficulties in e-health implementation are an international phenomenon, with similar problems being widely reported (Khandelwal, 2006). This work has taken many forms and, importantly, it has raised questions about what 'successful' implementation actually means. For example, de Bont and Bal have described how a telemedicine service met organizational criteria for 'success' and yet failed to normalize in practice (Datasec, 2009). Despite this critical conceptual problem, much research has focused on issues of efficacy or effectiveness, with trials addressing the 'can it work/does it work?' questions. How new systems are 'implemented' remains a problem, and an important theme in much recent work has been the problem of 'resistance' or refractory behaviours of professionals -- and the assumption that their 'attitudes' to e-health are the root problem (Datasec, 2009).

Although there is a considerable body of work on factors promoting successful implementation in healthcare, implementation research within healthcare has been described as a 'relatively young science'. This is reflected in vigorous debates about how to understand implementation processes and about the theoretical tools that can be used to do this. Opportunity for incremental accumulation of knowledge; and an explicit framework for analysis. There are a number of theoretical frameworks that have been applied to studies of technological change in healthcare and informatics, and important contributions have been made to understanding the role of attitudes, and social transmission of innovations between or interactions within actor-networks (CausI, 2009).

IT governance standards and methodologies are used in non-healthcare industries and enterprises to provide a careful alignment of IT technologies and capabilities with the business goals of the enterprise (Zeinolabedin & at al, 2013). Levels of alignment can be measured; plans for improvement can be devised and implemented, with a monitoring framework in place to ensure a culture of continuous improvement. In terms of frameworks for IT Governance implementations, we considered ITIL as a reference throughout the study presented in this paper .we show how ITIL framework can be applied within a healthcare environment (Zeinolabedin & at al, 2013) (Rahbar, Zeinolabedin, & Afiati, 2013). We demonstrate the use of ITIL for e-Health to improve the alignment of e-Health with organizational targets, together with a monitoring process that measures what has been achieved, not only from the e-Health service balance scorecard point of view, but also working with Finance Departments to measure e-Health contribution to specific health care savings.

II.   LITERATURE REVIEW

To develop a theoretical framework for testing the ITIL effects on e-Health, multiple streams of related literature were examined. This consisted of studying previous and recent research literature to identify the nature of research that has been done thus far and what is yet to be studied, in the future.

1.1   E-Health

The term "e-health", coined in the latter part of the twentieth century, can already be found in around 4,000,000 Web pages. In the latter part of the nineteenth and early part of the twentieth century, medical applications were quick to derive benefit from the progress being made in the field of analogue telephony. The technology enabled not only individuals to call the doctor but also hospitals to transmit electrocardiograms over telephone lines. These were the early days of "tele"-medicine, or medical care delivered remotely. However, bandwidth limitations and the consequent low rate of data transfer over the copper wires then in use, coupled with interference and various types of noise, put a brake on the expansion of these analogue techniques (Eysenbach, 2008).

The prefix "e-", standing for "electronic", is similarly used in numerous other applications such as "e-learning", "e-governance" and "e-transport", to convey the notion of digital data (as opposed to conventional analogue data such as paper medical records, electrocardiogram printouts and x-ray film). Without digitization there would be no automatic processing and no instantaneous exchange via the network.

The term "health" is used broadly and does not refer solely to medicine, disease, healthcare or hospitals. The scope of e-health is health in general, with its two major facets, namely public health – which is the responsibility of States and is geared towards preventing and responding to disease in populations – and healthcare, which is geared towards individual patients and the treatment of disease.

One of the more commonly cited definitions presents e-Health as:

'An emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology' (Eysenbach, 2008).

Although healthcare accounts for over 95 per cent of health expenditure in the majority of countries, it should not be forgotten that public health (including diseases relating to the environment, ageing, predictive medicine, and so on) is, and will continue to be, at the heart of sustainable health systems in both rich and developing countries alike (CausI, 2009).

In addition, the challenges facing healthcare systems in the twenty-first century have been well described: an aging population; increasing prevalence of long-term conditions; improving health technologies leading to better survival; and rising expectations of healthcare all combine to put ever increasing pressure on available healthcare resources. Although each country is pursuing individual solutions to these challenges, some common approaches are clearly apparent, including the use of information and communication technology (ICT). The use of ICT is expected to lead to improvements in healthcare quality (*e.g.*, through better communication) and efficiency (*e.g.*, through reduced duplication of investigations). Australia, New Zealand, and the UK have been at the forefront of attempts to embed ICT into routine healthcare, with the UK investing £12.4 billion over 10 years. However, despite political commitment and substantial investment, there has been significant variability in the success of different e-health implementations across the British National Health Service (NHS). Many projects have been subject to considerable delay, increasing budget deficits, and in some cases, severely negative impacts on the quality and effectiveness of care (CausI, 2009).

2.2 ITIL

Nowadays, IT is an integral part of modern organizations. Whether you use email to communicate with your customers, a server to allow you access to the Internet or a website to promote your brand, IT is at the core of many businesses. For those reasons, companies expect IT support to be available, responsive and to communicate regularly with them. Therefore, technology (IT) needs to be managed in such a way that it can meet the needs of customers.

The Information Technology Infrastructure Library (ITIL) is a set of best practices to follow for IT service management, based on real world experiences. ITIL is globally adopted, both in the public and private sectors, and allows organizations to deliver services that meet their customer's needs, at a price their customers are willing to pay (OGC, 2011).

ITIL is seen as the most popular and successful of all the service management frameworks, the main reasons being:

1- It is non-prescriptive. ITIL is a set of best practice guidance (rather than rules) which means organizations can take bits and pieces from the framework to make it fit and work for their own organization. ITIL does not have to be followed strictly; you can take what you want from the framework.
2- It is considered best-practice throughout the industry
3- It is vendor neutral, meaning that it can be adopted in any IT environment – it's not restricted to Microsoft, Linux, Unix, IBM machines, or Intel chips – it's neutral with respect to technology and suppliers.
4- ITIL is successful because it is successful. With its ease of use and documented real world experience, ITIL is seen as the most popular framework to use. No other framework can compete against it, meaning if you're entering into service management, you will most probably adopt ITIL.
5- It is a best-practice framework that will save you time, effort and money. By adopting this framework you can cut IT costs whilst increasing productivity (OGC, 2011).

Additionally, a key idea of adopting a framework such as ITIL is that the end customer of the business will be served better because the internal customers and users are better served by the IT team.
ITIL is based around a service lifecycle. This lifecycle has been documented as five core books, titled: Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement.
For that reason**, Service Strategy:** The axis around which ITIL revolves, giving guidance in the form of objectives and policies. It helps define what the company needs to do to support its customers (a bit like a mission statement), covering the scope of two areas:

1- Define a strategy for how the service provider will offer services to meet the customer's needs
2- Define a strategy for the management of those services

Service Design:
Once the strategy is clear, services can be designed to meet the strategic objectives. The purpose of this volume is to design services that underpin the strategy with the main objectives of delivering high quality, cost effectiveness and the requirement to meet the needs of customers. Service Design should deliver a service that works, including designing a service to meet current and future business needs. The designing of services is often influenced by requirements, business benefits and constraints.
Service Transition:
Once a service has been designed, it will then be transitioned into the 'live' environment. This transition needs to be carefully planned and managed, managing the risks involved so that you minimize the impact if something goes wrong during the transition period. Another important part of Service Transition is setting expectations on how well you think the services will perform. There is no point setting unrealistic expectations which will never be met.
Service Operation:
Service Operation deals with the management of the live services. Capacity and resources need to be managed, risks need to be understood, whilst service assets need to be protected. Service Operation is vital for effective Service Management, and this is the part of delivering a service where you start to see your Return on Investment (ROI).
Continual Service Improvement:
This volume interacts with all the phases in the lifecycle, where they continually need to change and improve what they do. This book helps you review, analyze and prioritize these improvements across the whole lifecycle, helping you to understand what to measure and why (OGC, 2011).

Fig. 1 ITIL Framework (OGC, 2011)

2.3 ITIL & e-Health

Governance is the set of management or leadership processes used by people structures to take decisions, grant power to make decisions happen and monitor results and performance. These structures can take different forms of socio-political or economical government, in the broader sense of this term. This approach to Governance as a concept is broadly supported including the World Bank and the IMF. In the wider sense, governance implies a macro management or leadership process to make socio-political and economical decisions followed by the government structures put in place to achieve those decisions. From the healthcare perspective it implies the whole range of decisions taken by societies to deal with the healthcare issues of different collectives. At the result**,** we can explain what Governance means within the context of the health care system: a process to ensure results are achieved in line with a set of taken decisions related with the direction, fundamental rules and structures established by each HCO or healthcare Board to move the healthcare system as a Corporations in that direction (Datasec, 2009).

This analogy can be applied to develop the IT Governance and e-Health concepts. The difference strives on the scope of the decisions taken within the spheres of influence and accountability of each of these sub-structures of the healthcare system. Throughout this paper, we have adopted the approach presented by Mårten Simonsson and Pontus Johnson in their effort to consolidate a vast literature available around this concept. They suggest that IT governance is about taking IT related decisions and implementing them by using Governance practices and resources (CausI, 2009). Therefore, we considered ITIL as a reference throughout the study presented in this paper**.**

III.   RESEARCH DESIGN

This research has taken a qualitative approach using case studies. A Few hospitals that had implemented ITIL and e-Health in Iran were chosen. ITIL and e-Health have only been introduced into Iranian hospitals within the last few years.

IV.   FINDINGS & DISCUSSION

The central claim of this paper is that e-Health governance is a key factor for improved health services. Indeed, Adopting IT Governance can help health care organizations delivering e-Health.

ITIL evolved to solve issues such as Lengthy support wait times, Unreliable application availability, Break-change-break cycle, Inconsistent and unreactive customer support, Over-promising & under-delivering and Current resources failing to meet business demands and too expensive.

Additionally, Value of ITIL for Business is Strategic alignment and Derive greater value (ROI), for Management Clarifies services and expectation and Provides a base line to measure services, for Staff understands roles and accountabilities and Clarifies priorities.

Now, this question is necessary why should e-Health Adopt ITIL? Because the adoption of ITIL Increases customer satisfaction, Improves service availability, leads to increase business profits and revenue, financial savings, Reduces rework and lost time, Improves resource management and usage, saves time to market for new services, makes effective decisions and so on.
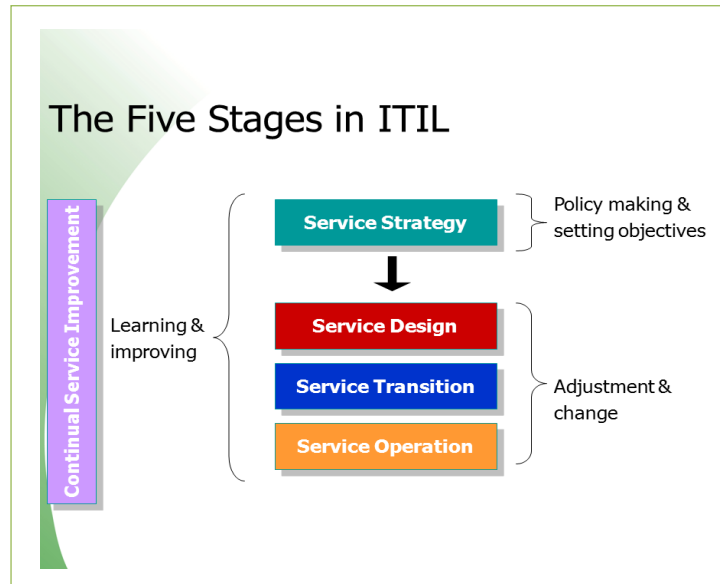
Fig. 2 Five stages in ITIL

According to the picture above, we can divide our findings to five categories;

The first category is related to Service Strategy- This phase provides guidance in the design, development, initial planning and implementation of service management and answers questions such as: Will there be a demand for this service?, How will it be funded?, Where will it be located?, What is the time frame?, Who will build it?, How do we create value for our customers, How should we define service quality, What services should we offer, How do we differentiate ourselves from competition, and How do we allocate resources and so on.

Furthermore, **Service Portfolio Process** completes set of services managed by a Service Provider- it concentrates why a customer should buy these Services, why they should buy these Services from us, what the pricing or chargeback models are, what our strengths, weaknesses, priorities and risks are, and how our resources and capabilities should be allocated.

Demand Management Process understands and influences customer demand for IT services and also provides capacity to meet demand.

Financial Management Process is budgeting, accounting and charging requirements.

As a result, **Service Level Package (SLP)** that is designed to meet the needs of a particular business activity, transfers to the next phase.

The second category is related to Service Design- This phase includes architectures, processes, policies, and documentation and answers questions such as: What will the capacity be? What services will be offered? What are the associated costs? What service levels will need to be met? What supplier agreements need to be place? and so on.

In addition, **Service Level Management Process** is responsible for negotiating Service Level Agreements and ensuring that these are met.

Availability Management Process ensures services are available when needed and IT infrastructure, processes, tools & staff roles are appropriate for the agreed targets.

Capacity Management Process matches capacity of IT to the agreed business demands in a cost effective and timely manner**.**

IT Service Continuity Management Process ensures that agreed service levels can be resumed in event of a disaster.

Information Security Management Process manages IT security risks.

Supplier Management Process obtains value for money from suppliers and ensures suppliers meet the targets contained within their contracts.

Then, **Service Design Package (SDP)** that defines all aspects of an IT service and its requirements, transfers to the next phase.
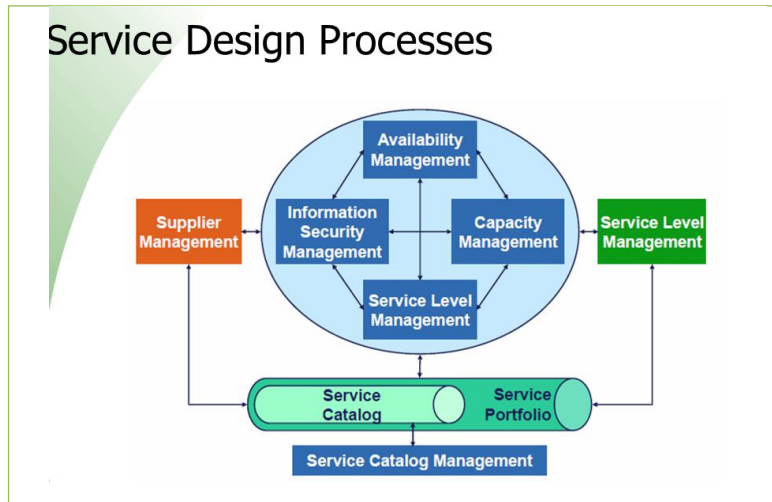
Fig. 3 Service Design Processes (OGC, 2011)

     The third category is related to Service Transition- This phase controls transition of new, changes IT services into operation, predicts cost, quality and time estimates, and aligns transition plans with the business and also answers questions such as: How will traffic be diverted? How will changes be communicated to the public and other stakeholders? What determines when the hospital is ready?

Over and above that, **Change Management Process** ensures change happens in a controlled manner.

Service Asset and Configuration Management Process tracks and reports the value and ownership of IT assets and also maintains information about IT components, including the relationships between them.

Release and Deployment Management Process ensures the correct components are released into the live environment, plans and oversee the rollout.

     Transition Planning and Support Process plans and coordinates resources to ensure that the requirement of Service Strategy encoded in Service Design are effectively realized in Service Operations, identifies, manages and controls the risks of failure and disruption across transition activities and also can improve a service provider's ability to handle high volumes of change and releases.

     Service Validation and Testing Process provides objective evidence that the new or changed service supports the business requirements including the agreed Service Level Agreements and the service is tested against the utilities and warranties set out in the service design package.

     Knowledge Management Process ensures that the right person has the right knowledge at the right time to deliver and support the services required by the business.
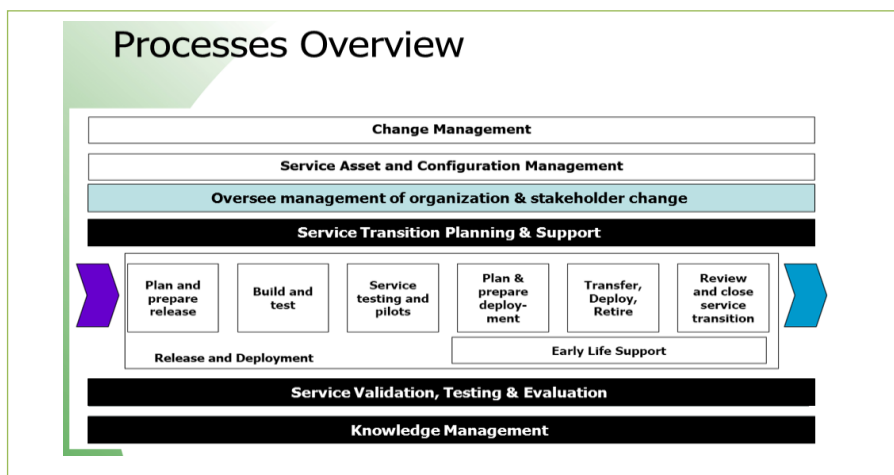

Fig. 4 Service Transition Processes (OGC, 2011)

     The fourth category is related to Service operation- This phase delivers agreed levels of service to users, manages applications, technology and infrastructure that support the services and also focuses on matters such as: Day to day activity of the hospital, Availability for patients, Staffing, Customer service, and Billing.

Moreover, **Incident Management Process** restores normal service as quickly as possible and minimizes adverse impact on business operations.

Problem Management Process includes diagnosing causes of Incidents, determining resolution, ensuring the resolution is implemented and maintaining information about Problems, workarounds and resolutions.

Event Management Process provides the ability to detect events, make sense of them and determine if the appropriate control action has been provided.

Access Management Process makes sure that the policies and actions defined in Security and Availability Management are executed appropriately.

The fifth category is related to continual service improvement-This phase creates and maintains value for customers through continual evaluation and improvement and also includes concepts such as: Analyze reports, which areas need improvement? , and Implement corrective actions.
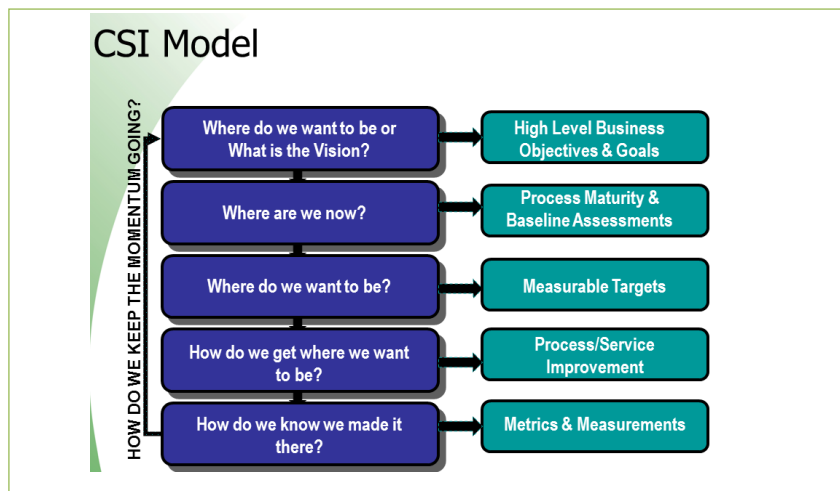

Fig. 5 CSI Model (OGC, 2011)

At the result, the figure below (fig 6) is a summary of our conclusions:

V.   CONCLUSIONS

Implementers had rich understandings of barriers and facilitators to successful implementation of e-health initiatives, and their views should continue to be sought in future research. ITIL can be used to solve many problems in implementation processes, and may be useful in implementation planning. Applying ITIL for implementation of e-Health has determined that ITIL can impact on delivering services increasingly. It has been identified that ITIL has the ability to impact business strategy, support and shape it. Also, it can impact and enhance IT strategy. The results of this exploratory research indicated that ITIL is one effective approach in implementing e-Health.

5.1 Implication for Practice and Limitations and Future Study

It has been identified previously that implementation of e-Health is the number one issue faced by Government. This research introduced ITIL as one approach to implementation of e-Health and the findings confirmed that it has the ability to do so. Therefore, using ITIL as a way of implementing e-Health could be a successful strategy.

The first limitation of this study was that because there were a small number of hospitals studied, reliability of the findings is minimal. To make the research more reliable a number of other hospitals need to be investigated. Another limitation was that as using ITIL to implement e-Health is a new concept to Iranian hospitals, limited research has been done in this area, which makes it difficult to compare the results of this study with others. With regard to the potential for future research, it has been identified from this research that ITIL has the ability and is an effective approach to implement e-Health. Measuring the extent to which ITIL and other IT Governance frameworks might be effective in implementation of e-Health could be the topic of further research.

	Purpose	Key Activities	Processes	Key Concepts
Service Strategy	To help IT Service Providers & their Customers operate & thrive in the long term; provide guidance in the design, development & implementation of Service Management	• Define the market • Develop offerings • Develop strategic assets • Prepare execution	• Service Portfolio Management • Demand Management • Financial Management	• Value creation • Utility & warranty • Service Level Package (SLP) • Resources & capabilities • Risk management • Service Portfolio
Service Design	To design new or changed services for introduction into the live environment (includes architectures, processes, policies & documentation)	Design... • New or changed service solutions • Service Portfolio • Technology architecture & management systems • Processes, roles & capabilities • Measurement systems & metrics	• Service Catalogue Management • Service Level Management • Availability Management • Capacity Management • IT Service Continuity Management • Information Security Management • Supplier Management	• 4 P's: people, products, processes, partners • Service Design Package (SDP) • Service Level Agreement (SLA) • Operational Level Agreement (OLA)
Service Transition	To deliver services into operational use	• Develop transition & support plan • Coordinate organization & service change • Plan, build, test & validate service release • Transfer, deploy, retire services • Provide early life support	• Change Management • Service Asset & Configuration Management • Release & Deployment Management • Knowledge Management • Transition Planning & Support • Service Validation & Testing • Evaluation	• Configuration Item (CI) • Configuration Management Database (CMDB) • Configuration Management System (CMS) • Service Knowledge Management System (SKMS) • Definitive Media Library (DML)

Service Operation	To deliver & support IT Services at agreed levels	• Monitor & control services
		• Manage Customer requests & communication
		• Manage events, incidents, problems
		• Generate metrics on service performance
		• Provide service performance reports
			• Incident Management
			• Request Fulfillment
			• Problem Management
			• Event Management
			• Access Management
				• Workaround
				• Known Error
				• Functions:
				  Service Desk
				  IT Operations Management
				  Technical & Application Management

Continual Service Improvement	To create & maintain value for Customers by identifying & implementing improvements	• Analyze service reports • Provide performance results • Define service benchmarks • Create Service Improvement Program	• 7-Step Improvement Process • Service Measurement • Service Reporting	• CSI Model • Deming Cycle

Fig. 6 Combining ITIL and E-Health

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