IT Process Improvement in Telehomecare Services for Diabetic/Hypertensive Patients in a Developing Country: Design and Evaluation into an Ecuadorian Company

Hugo Roldán, Andrés Larco(✉), and Carlos Montenegro

Escuela Polittécnica Nacional, Quito, Ecuador
vroldan@cbs-ec.com,
{andres.larco, carlos.montenegro}@epn.edu.ec

Abstract. This study shows a solution for IT process improvement in Telehomecare Services, developed by an Ecuadorian Company that provides services to Diabetic/Hypertensive patients. Based on the current situation, the Design combines the perspective and benefits of business process models and IT management best practices, through the concept of the responsibilities matrix, including an IT governance component. The Evaluation is done with the design implementation; besides, an impact analysis using the process capacity model is realized. Results show the technical and operational applicability of the model, as well as an effective improvement of IT services, consequently of service to patients. Thus, the work provides a practical tool formally developed according to DSR approach and using complementary methods. The solution includes components not explicitly integrated into technical literature for a sensitive issue.

Keywords: Telehomecare · IT management · ITIL · ISO 9001 · DSR

1 Introduction

E-health is broadly defined as the application of information and communication technology (ICT/IT) to health and healthcare [1]. ATA published a guideline to establish a set of principles guiding the development and deployment of their activities [2]. Application of telemedicine and/or telehealth on the home environment is usually described as Telehomecare or more recently as home telehealth or home based eHealth. The Office of Health and the Information Highway (OHIH) [3], defines Telehomecare as the use of two-way communication electronic networks to transfer information and data required for medical diagnosis, treatment, consultation, and/or health periodic reviews between patient residence and a healthcare facility.

Telemedicine services always comprise a combination of IT services and highly person-oriented services (non-IT services) [4, 5]. Especially for ITIL, a service is a means delivering value to customers by facilitating the outcomes that customers want to achieve without the ownership of specific costs and risks [6]. At the same time, ISO 9001 is used when an organization needs to demonstrate its ability to provide generic

Á. Rocha et al. (eds.), *Recent Advances in Information Systems and Technologies*,
Advances in Intelligent Systems and Computing 570, DOI 10.1007/978-3-319-56538-5_84

products or services that meet customer and applicable statutory and regulatory requirements; and, aims to enhance customer satisfaction [7]. In this work, ITIL and ISO 9001 are combined through a responsibilities matrix (RACI), as an alternative to formalize and improve the Telehomecare IT services. The Case Study is realized in a company that has already implemented ISO 9001 in management processes.

2 Background and Literature Review

2.1 Telehomecare Opportunities

From a business perspective, e-health represents a market in the early phase of development, where the small and medium enterprises, technology-driven companies and innovators could have great opportunities [8–11]. Moreover, Hogenbirk *et al.* [12] and Hunting *et al.* [13] found that Telehomecare has the potential to positively affect patient lives and strengthen models of health care provision. In the same way, Paré *et al.* [14] found home telemonitoring of chronic diseases seems to be a promising patient management approach that produces accurate and reliable data, empowers patients, influences their attitudes and behavior, and potentially improves their medical conditions [15].

From a professional perspective, there is a varied list of diseases susceptible of dealing with telemedicine techniques, including diabetes and hypertensive diseases; see for example [16, 17]. From an academic perspective, a bibliographic search revealed that although most reviews focus on studying the effects of home telemonitoring on patients with congestive heart failure, researcher interest has extended to other chronic diseases, such as diabetes, hypertension, chronic obstructive pulmonary disease, and asthma [18]. In the opinion of Janna *et al.*, technological advancements used for telemonitoring, help with a better hypertension manage, which has been recognized as the 'silent killer' [19].

The summarized evidence establishes that Telehomecare (and telemedicine) is useful in various chronic diseases, with positive effects on patients. However, from a business perspective, its sustainability in developing countries is a chronic issue in considering [20–24].

2.2 Telemedicine and Telehomecare in Ecuador

The National Plan for Telemedicine and Telehealth, published in 2010, states that national health system must be universal and at no cost to the entire population, through clinical (general and specific) consultations, defined diagnostic queries, or those considered as a second opinion [25]. Despite academic, public and private entities efforts, some of them described by Mijares [26] and Lopez *et al.* [25], there are less than five private companies currently providing Telemedicine services. Therefore, there is evidence that Telemedicine in Ecuador has an emerging development.

In another sense, Table 1 shows statistics about the main causes of mortality in Ecuador [27]. Diabetes mellitus and Hypertensive diseases produce the greatest impact

Table 1. Main causes of mortality in Ecuador

Leading causes of death in Ecuador (%)					
	Causes	2011	2012	2013	2014
1	Diabetes Mellitus	7.15	7.29	7.44	6.99
2	Hypertensive diseases	7.03	8.45	6.64	5.67
3	Influenza and pneumonia	4.92	5.68	5.94	5.43
4	Cerebrovascular diseases	6.31	5.18	5.65	6.00
5	Land transport accidents	5.38	5.00	4.87	4.86
6	Ischemic heart diseases	3.23	3.26	4.66	7.03
7	Cirrhosis and other liver diseases	3.21	3.40	3.18	3.24
8	Urinary system diseases	2.82	2.74	2.97	2.72
9	Heart failure, complications, and ill-defined diseases	2.72	2.88	2.72	2.09
10	Stomach malignant neoplasm	2.63	2.71	2.49	2.52

on the country's population and generate an opportunity for development of Telehomecare services.

The US National Institute of Diabetes, Digestive, and Kidney Diseases (NIDDK) [28], recommends steps to be considered for the provision of medical services to reduce the impact of Diabetes and its care. This care can be provided by implementing Telehomecare modality. A similar procedure can be adapted for hypertensive diseases by considering the close relationship between these two diseases.

2.3 IT Management Services and Telehomecare

Value creation in Telemedicine is expressed through the benefits or outcomes for the service users [29]. Business model theory considers Infrastructure Management is how a company creates value and describes necessary abilities to provide its value proposition [31]. The main stakeholders, including policy makers, healthcare practitioners, and patients are all agreed that effective and efficient quality health care delivery is vital and that IT has a critical role in effective value-driven healthcare delivery [30]. Therefore, in a Telehomecare company, IT management is a major factor to be considered on the value proposition.

From IT Management perspective, a mechanism for IT value delivery is the implementation an adequate management process using best practices [48]. According to Gerke *et al.* [32], a reference model represents a set of best practices that provide clues to the design and control of IT service indicators, whose use promises to improve quality and contributes to compliance requirements. Pardo *et al.* [33] state that these models provide descriptions and/or best practices for different areas. In any case, companies gain an advantage in their implementation either for recognition in the professional field or certain realities such as maximizing ROI [34]. According to Oud [35], the existence of a vast number of standards and guidelines enables organizations to use one particular, or choose several of them in a given situation. Since there is no universal model, it is necessary to combine models that complement and/or to improve the details together.

In this work, ITIL covers the complete service life cycle: Strategy, Design, Transition, and Operation; these services are organized through a set of process and functions [6]. On the other hand, the quality management system of services should settle with quality criteria for implementing processes, using ISO 9001 [7]. ITIL and ISO 9001 separately have been employed in IT improvement processes, for example, in [33, 36–38]. Here, they are combined as an alternative to formalize and improve the Telehomecare IT services.

3 Methodology

According to Hevner *et al.* [40], Design Science Research (DSR) follows a pragmatic research paradigm that promotes for innovative artifact creation to solve real-world problems. Thus, design science research combines a focus on the IT artifact with a high priority on relevance in the application domain. These characteristics cover the needs because the work requires a model type artifact, which enables integration of Telehomecare business process and IT Management.

DSR is focused on the design and evaluation of technological artifacts (in the form of constructs, models, methods and instantiations), by applying two phases: Design, and Evaluation. Also, DSR provides a set of guidelines, which contribute to their proper application [39]. Criteria for model design as a search process was extracted of Montenegro *et al.* [41]; it is adapted for this case. The main idea is a top-down design; where as important and successively specific models and best practices for IT Management and business Telehomecare are included.

In the Evaluation Phase, qualitative method of Participant Observation for data collection is used, through the participant-as-observer role, where data are typically recorded in the form of field notes and involve an engagement that allows gathering more detailed and accurate information [42, 43]. Regarding the impact analysis, a literature review shows studies using maturity models in Telemedicine services [44], whose emphasis is on the overall assessment of process maturity; or gap analysis with benchmarking [45], which use potential solutions for comparisons. Here, Process Capacity Assessment model [46, 47] is used, taking into consideration that this model allows assessing, with greater rigidity, each separated process, before and after real implementation of the proposed model.

Finally, DSR provides feedback stage for the artifact design [39]; this is executed through refinement: the initial model was refined on mapping ISO 9001-ITIL, on the identification of IT services and the impact analysis tools. Here, the refined model design is documented.

4 DSR Artifact Design Phase: Combined Model

The Fig. 1 shows the actual situation of IT processes in organizational context, where an ISO 9001 Quality Management System is implemented. From this reality, the Design proposes an IT process improvement using the coupling of ISO 9001 and ITIL; this is done through the mapping between models, using a RACI matrix [48].

The matrix includes all process actors, i.e., all parties that are responsible (R), accountable (A), consulted (C) or informed (I) for, or during, the processes activities. In the mapping process, each Management Quality System component is mapped with ITIL Services; then the roles of Services Strategy, Service Design, Service Operation, Service Continuous Improvement and IT Governance are identified. Only one A role must be determined; one or more R roles, and zero, one or more C and I roles too. For example, for managing component "5.3 Quality Policy", "Service Strategy" has an A role, and is executed by "Policies, Standards and Risk" of IT Governance, with R role.

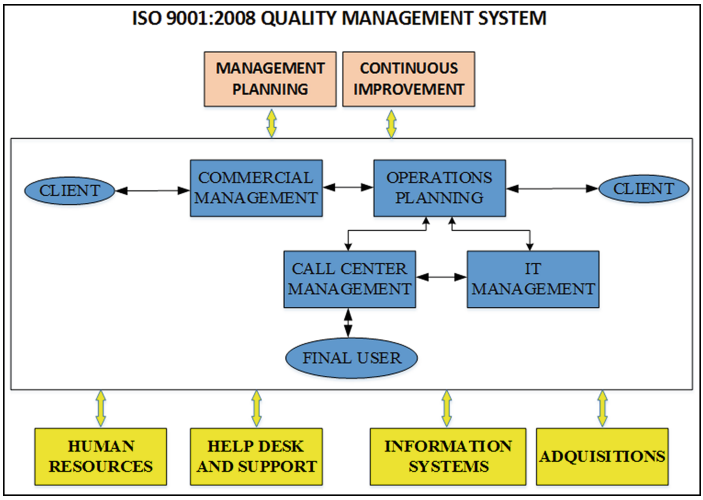


Fig. 1. Original IT processes in organizational context

Table 2 shows an extract of mapping results, where those components ITIL with roles A and R are present; C role appears where overlay to A or R; other elements are not considered. A governance component is included, which completes the ITIL service management approach. The 13 ITIL processes identified would be specified in a model use case.

The new processes are included in a quality management system formed, in this case, with four processes types: Governance, Key, Support and Continuous Improvement. Figure 2 show the IT processes in organizational context, after the mapping application.

At Table 3 the summary of Life Cycle components for IT Services is presented (first column); the ITIL processes (second column) are consolidated on IT processes of ISO 9001 (third column) and classified according to processes type (last column).

Table 2. ISO 9001-ITIL mapping (Extract)

ISO 9001 Clause		Service Strategy	Demand Management	Service Portfolio Management	Roles and responsibilities	Policies, Standards, and Risk	Service Design	Service Level Management	Transition Service Planning and Support	Problem Management	Incident Management	Event Management	Continuous Improvement	Service Measurement
		Service Strategy			IT Governance		Service Design		Service Transition	Service Operation			Service continuous improvement	
5.1 Management commitment	5 Management responsibility	A			C	R								
5.2 Customer focus		A						R						
5.3 Quality Policy		A				R								
5.4.1 Quality Objectives		A											R	
5.4.2 Quality Management System Planning		A											R	
5.5.1 Responsibility and Authority					A									
5.5.2 Management representative		A												
5.5.3 Internal Communication					A									
5.6.1 General		A						R					C	
5.6.2 Inputs review		A						R					C	
5.6.3 Outputs review		A						R					C	

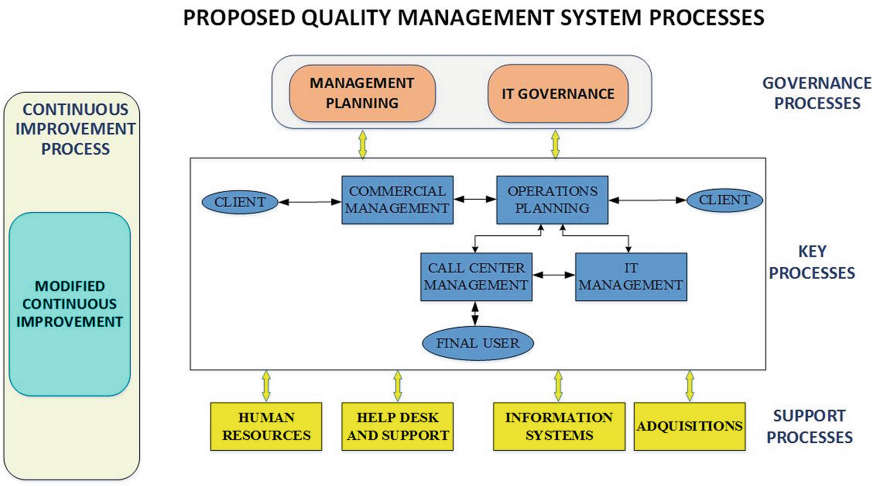


Fig. 2. IT processes in organizational context, after design application

Table 3. New IT services

Services life cycle and processes type			
IT macro process of services life cycle	ITIL process	ISO 9001 IT process	Process type
IT governance	Roles and responsibilities	IT governance (new)	Governance
	Policies, standards, and risk		
Service strategy	Service strategy	IT management (modified)	Key
	Demand management		
	Service portfolio management		
Service design	Service design		
	Service level management		
Transition service	Transition service planning and support	Help desk and maintenance (modified)	Support
Operation service	Event management		
	Incident management	Information systems (modified)	
	Problem management		
Continuous improvement service	Continuous improvement	Continuous improvement (new)	Continuous improvement
	Service measurement		

5 DSR Evaluation Phase: Implementing and Assessing the New Services in the Case Study

The IT new services implementation is realized in a case study, as a mechanism for evaluation; Roldán published detailed evidence of interest in it [49]. As mentioned, the qualitative method of Participant Observation was used for data collection, through the participant-as-observer role, that entails an engagement that allows gathering more detailed and accurate information. For this purpose, a researcher acted in the project work team of company, as a participant in the generation and explanation of the model, in planning activities, implementation decisions, and operational activities; and, other two researchers acted as participants in model generation and as observers in application and evaluation activities.

Table 4 summarizes relevant data of case study. The process design (Activity 2), generates a specification for each process (See an example on Appendix A).

Using a combination of the initial results of the PAM - COBIT assessment and the Pareto Rule, four processes are implemented and assess (Activities 3 and 4). Through a survey of IT staff, it is considered that the four processes, manage approximately 80% of the company operation. Results are presented in Table 5. It is noteworthy that there was an improvement in implemented processes, and that *Event Management* is the

Table 4. Relevant data about case study

		Case study: CRONIX	
Activity 1: actual situation	Actual situation overview	Cronix is an Ecuadorian company that provides general services of Contact Call Center to Ecuadorian and international markets, through technological processes based on recognized standards. Currently, has about 1,100 stations centralized in Quito	
	Services	Data processing sent through medical devices, for diabetic and hypertensive patients. Upon receipt, necessary data alerts are generated and send to doctors who perform monitoring. These alerts are also sent via email or SMS to the patients themselves or their relatives when there is not corresponding to normal values	
	IT platform	Windows and linux operating systems, Corporate databases, Document management system, Video conference system, and CRM software	
	Medical devices	Glucometer, Blood pressure, Balance, Pulsometer	
Activity 2	Processes design	• Service strategy • Demand management • Service portfolio management • Roles and responsibilities • Policies, standards and risk • Design service - general • Service level management	• Service transition • Event management • Incident management • Problem management • Continuous improvement- general • Measurement service
Activity 3	Implementation	The following IT services are identified: Network service and networking, CRM service, Email service, Internal telephone service and call center, Internal and external help desk service, Internet access service	
		Four processes are implemented; they are estimated that control 80% of the operation of the new IT management model; besides, these processes are in the groups of less initial development. The processes are Service strategy, Demand management, Event management and IT governance	
Activity 4	Impact analysis	For impact analysis of the model application, the following tasks are realized: 1. Mapping ITIL-COBIT to facilitate the use of PAM-COBIT Model; 2. Analysis of processes, using the PAM - COBIT model, before and after implementation	

Table 5. Impact assessment of new model

Impact assessment of model using COBIT- PAM Model						
Model process	Capacity level 0		Capacity level 1		Capacity level 2	
	Initial	Final	Initial	Final	Initial	Final
Policies, standards and risk	15%	90%	0	56.67%	0	0.00%
Service strategy	5%	90%	0	54%	0	0.00%
Demand management	20%	85%	0	21.67%	0	0.00%
Event management	10%	100%	0	91.67%	0	77.91%

process of higher improvement, the logical result for a company with client service model; this means improved service to patients.

6 Discussion of Results and Future Work

The developed model does not refer to any technology or specific service. As a result, applications can be varied and adjustable to various types of companies providing similar medical facilities, such as cerebrovascular diseases, respiratory diseases, diseases of type cutaneous or subcutaneous, heart problems, among others. Considering it as a generic model, also it is possible its application in companies that already have in operation the ISO 9001 for service provision that depends on IT use.

In this way, this research contributes by providing a practical tool for practitioners. Additionally, it generates an expansion of the existing body of knowledge on IT management applied to Telehomecare, as well as on methodological considerations: the use of the RACI matrix concept of mapping the reference models, in the design phase; participant observation and process capability, on the evaluation phase.

According to DSR, possible future work is in two areas: improving understanding the Telehomecare and the relation with IT services, and instantiations [39]. Developed model, for a specific case, constitutes a starting point for generalization through refinements, at a higher level of abstraction. About instantiations, the model can be tested in controlled environments and case studies, to evaluate its characteristics and generalization possibilities.

In another perspective, here it is presented a relative successful case of Telehomecare, but it is important to study the contribution of improvement on Telehomecare IT services into the improvement of implementation sustainability, mainly in developing countries, where the success conditions of these technologies are hard, as is noted in some research.

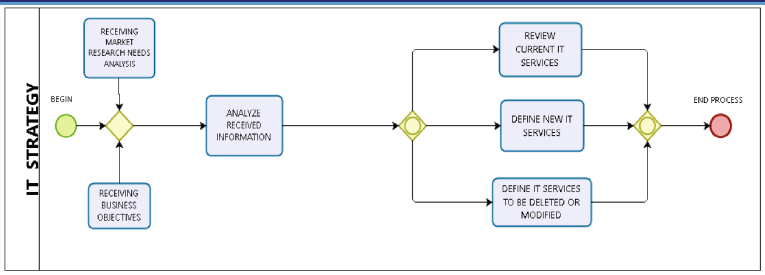
Appendix A: Service Strategy: Process Specification

SERVICE STRATEGY			
Name	Service Strategy	Code	Cronix-ES-01
Activity	Review current IT services; Define new IT services; Define IT services to be deleted or modified.	Version	1
Responsible	IT Director.	Status	Active
		Revision	Last Change: (28/10/2015)

DEFINITION	
Objective	The main goal of this process is to define the IT services that the company requires to perform the business services. This process also chooses customers and markets to offer the business services

Inputs	Outputs
Roles and Responsibilities definition IT Risk Matrix definition IT Policies description Capabilities for IT services supply Market research and end user's requirements	Catalog of Current services. Catalog of services to be removed. Catalog of new services.

Diagram



IT Strategy Process

Description

The service strategy process is the initiator of the other macro processes. It allows to define IT services that the company will implement to deliver the services that the company offers to their end users; also analyze the current IT services to determine processes that should leave. The new IT services are implemented based on the analysis of patients' requirements

Scope	a) Verify the current IT service catalog for diabetic and hypertensive patients in Ecuador b) Determine the IT services to be updated, modified or deleted c) Determine new IT services will be implemented
Relations	IT Governance, Event Management, Demand Management, Incident Management, Portfolio Management, Problem Management, Service Measurement

Indicator	Name	Equation	Goal	Period
	Services Review	(Number of annual service revisions/max (number of service revisions x 4)) x100	75%	Quarterly

References

1. Beuscart, R., Chazard, E., Duchene, J., Ficheur, G.G., Renard, J., Rialle, V.: "E-health," in Medical Informatics, e-Health, pp. 405–427. Springer, Paris (2014)
2. ATA: Home Telehealth. Clinical Guidelines (2003)

3. The Office of Health and the information Highway, Tele-Homecare. An Overview. Background paper for discussion (1998)
4. Peters, C., Blohm, I., Leimeister, J.: Anatomy of successful business models for complex services: insights from the telemedicine field. J. Manag. Inf. Syst. **32**(3), 75–104 (2015)
5. Kornak, J.: System requirements for delivery of telemedicine services. In: Cross, R.K., Watson, A.R.: Telemanagement of Inflammatory Bowel Disease, pp. 117–152. Springer, Cham (2016)
6. ITIL: ITIL. Best Management Practices product, TSO (2011)
7. ISO: ISO 9001: 2008. Quality management systems—Requirements (2008)
8. Bonfiglio, S.: A business perspective. In: Maharatna, K., Bonfiglio, S. (eds.) System Design for Remote Healthcare, pp. 251–276. Springer, Cham (2014)
9. Dansky, K., Palmer, L., Shea, D., Bowels, K.: Cost analysis of telehomecare. Telemed. J. e-Health **7**(3), 225–232 (2001)
10. Osmundsen, T., Jaatun, E., Heggem, G., Kulseng, B.: Service innovation from the edges: enhanced by telemedicine decision support. Pers. Ubiquit. Comput. **19**, 699–708 (2015)
11. Ooteghem, J., Ackaert, A., Verbrugge, S., Colle, D., Pickavet, M., Demeester, P.: Economic viability of eCare solutions. In: Szomszor, M., Kostkova, P. (eds.) eHealth 2010. LNICSSITE, vol. 69, pp. 159–166. Springer, Heidelberg (2011). doi:10.1007/978-3-642-23635-8_20
12. Hogenbirk, J., Liboiron-Grenier, L., Pong, R., Young, N.: How Can Telehomecare Support Informal Care? (2005). http://www.hc-sc.gc.ca/hcs-sss/pubs/home-domicile/2005-tele-home-domicile/index-eng.php
13. Hunting, G., Shahid, N., Sahakyan, Y., Fan, I., Moneypenny, C., Stanimirovic, A., North, T., Petrosyan, Y., Krahn, M., Rac, V.: A multi-level qualitative analysis of telehomecare in Ontario: challenges and opportunities. BMC Health Serv. Res. **15**, 544 (2015)
14. Paré, G., Jaana, M., Sicotte, C.: Systematic review of home telemonitoring for chronic diseases: the evidence base. J. Am. Med. Inform. Assoc. **14**(3), 269–277 (2007)
15. Kucik, C., Carmichael, J.: Telemedicine and future innovations. In: Gillman, L.M., Widder, S., Blaivas MD, M., Karakitsos, D. (eds.) Trauma Team Dynamics, pp. 187–192. Springer, Cham (2016)
16. eVisit: Telehealth Software Solutions for Providers. eVisit® (2016). https://evisit.com
17. ATA: American Telemedicine Association (2016). http://www.americantelemed.org/about-telemedicine/what-is-telemedicine#.V5pn1qK3taU
18. Kitsiou, S., Paré, G., Jaana, M.: Systematic reviews and meta-analyses of home telemonitoring interventions for patients with chronic diseases: a critical assessment of their methodological quality. J. Med. Internet Res. **25**(1), 1–23 (2013)
19. Jaana, M., Paré, G., Sicotte, C.: Hypertension home telemonitoring. Current evidence and recommendations for future studies. Dis. Manag. Health Outcomes **15**(1), 19–31 (2007)
20. Laouyane, A.: Telemedicine and developing countries. J. Telemed. Telecare **4**(2), 1–87 (1998)
21. Singh. B., Kaur, M.: International conference and workshop on emerging trends in technology. In: ICWET 2010 – TCET, Mumbai, India (2010)
22. Khalifehsoltani, S., Gerami, M.: E-Health challenges, opportunities and experiences of developing countries. In: 2010 International Conference on e-Education, e-Business, e-Management and e-Learning (2010)
23. Wickramasinghe, Y., Wijethilake, D., Vatsalan, D., Sudhahar, S., Arunathilake, S., Seneviratne, G., Thilakarathna, K., Chapman, K., Mahanamahewa, P.: BudhuDas: an eHealth business model for emerging countries. In: ST-Africa 2010 Conference Proceedings (2010)
24. Cheng, A., Metha, K.: A review of telemedicine business models. Telemed. e-Health **19**(4), 287–297 (2013)
25. Lopez, R., Vilela, L., Guaman, G., Echanique, P.: Programa nacional de telemedicina/telesalud –ecuador. Latin Am. J. Telehealth **2**(3), 286–301 (2010)

26. Mijares, M.: Hitos y desafíos de la Telemedicina y Telesalud en Ecuador, VITAE, no. 47 (2011)
27. Instituto Nacional de Estadisticas y Censos: Anuario de Estadisticas Vitales: Nacimientos y Defunciones 2013. INEC, Quito (2013)
28. NIH: Managing Diabetes (2014). https://www.niddk.nih.gov/health-information/diabetes/manage-monitoring-diabetes
29. Acheampong, F., Vimarlund, V.: Business models for telemedicine services: a literature review. Health Syst. **4**(3), 189–203 (2015)
30. Haddad, P., Wickramasinghe, N.: Conceptualizing business value of IT in healthcare to design sustainable e-Health solutions. In: de Twentieth Americas Conference on Information Systems, Savannah (2014)
31. Osterwalder, A.: The business model Ontology. A proposition in a Design Science approach. Ph.D. thesis (2004)
32. Gerke, K., Tamm, G.: Continuous quality improvement of it processes based on reference models and process mining. In: Americas Conference on Information Systems (2009)
33. Pardo, C., Pino, F., García, F., Piattini, M.: Homogenization of models to support multi-model processes in improvement environments. In: 4th International Conference on Software and Data Technologies, ICSOFT 2009 (2009)
34. Siviy, J., Kirwan, P., Morley, J., Marino, L.: Maximizing your process improvement ROI through harmonization. SEI. Carnegie Mellon University, Pittsburgh (2008)
35. Oud, E.: The value to IT of using international standards. Inf. Syst. Control J. **3**, 35–39 (2005)
36. ISACA: Overview of International IT Guidance, 3rd edn. Rolling Meadows, Illinois (2011)
37. ITG: COBIT Mapping: Mapping of ITIL v3. with COBIT 4.1. Rolling Meadows, Illinois (2008)
38. NYCE: NYCE: Normalización y Certificacion Electrónica S.C. (2015). www.moprosoft.com.mx
39. Hevner, A., Ram, S., March, S., Park, J.: Design science in information systems research. MIS Q. **28**(1), 75–105 (2004)
40. Hevner, A., Chatterjee, S.: Design Research in Information Systems. Springer, New York (2010)
41. Montenegro, C., Flores, D.: An Integrated Model for ICT Governance and Management. de ICCCS, Pointe aux Piments (2015)
42. Mason, J.: Qualitative Researching. SAGE Publications, London (2002)
43. SAGE: The SAGE Encyclopedia of Qualitative Research Methods. Given, L. (ed.). SAGE Publications, Los Angeles (2008)
44. van Dyk, L., Schutte, C.S.L.: The Telemedicine Service Maturity Model: A Framework for the Measurement and Improvement of Telemedicine Services, de Telemedicine, pp. 217–238 (2013)
45. Laue, P.: Gap analysis business impact of model driven architecture on next generation telemedicine service provision in the home healthcare sector. Master thesis, Stockholm, Sweden (2004)
46. ISO: ISO/IEC 15504-4. Information technology—Process assessment—Part 4: Guidance on use for process improvement and process capability determination (2009)
47. ISACA: Process Assessment Model (PAM): Using CobiT 5 (2013)
48. ISACA: COBIT 5.0. A business framework for governance and management of IT (2012)
49. Roldán, H.: Desarrollo de un modelo de gestión de servicios de TI para aplicaciones de Telemedicina en el Ecuador. Tesis de Maestría (2016)