

Three Dimensional Perspective for Designing Healthcare Services

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Abstract

Successful e-Health system engineering mainly depends on accurate and complete modelling of the HealthCare (HC) processes. These HC service processes are governed by a variety of regulations and rules enforced by many distinct authorities. Availability of these governance directives mostly on paper based-medium makes a bunch of information logistics and related issues in HC processes of e-Health systems. Further, even captured such directives are getting often buried in lower technical realizations making its impossible not only real-time adoption but also manipulation on long run by respective non-technical higher authorities. In order to rectify and to facilitate these stakeholders' requirements for assistance with their access to these governing layers of e-Health solutions, in this work, we have proposed a three-dimensional ontological framework. This framework is expected to provide a complete and sound platform first to identify and then to develop eHealth solutions in compliance with those governing directives. In addition, it will ensure making convenient access with the non-technical higher healthcare authorities to monitoring and to governing HC processes. Proposed framework consists of three dimensions; 1) HC process activity dimension, 2) HC responsibility dimension and 3) HC directive enforcement dimension. The proposed approach facilitates the separation of concerns in HC governing perspectives in e-health solution development.

Keywords

e-Health, Healthcare Service Process, governing perspectives

1 INTRODUCTION

The evolution of E-Health system development can be classified into three main eras subjected to the overall requirement. In early 20th century the development effort mostly on technical message structure standardizations and (Health Level 7) HL7 versions have improved accordingly [1]. Later the development effort was motivated towards capturing not only technical level standardizations, but also strategic level realizations by means of semantic interoperability among heterogeneous applications [2][3]. According to the present studies, the evolving nature of complex requirements in HC context leads to the requirement of systematic mapping among the technical level requirements and strategic level governing requirements of the care pathways [4][5].

Also, many consequences have arisen due to this problem of less consideration of strategic level guidelines in HC [6]. Even though the requirement engineering of current e-Health systems follows the higher-level guidelines, the realizations of policy level requirements are hardcoded with the solution. Therefore, it is difficult to guide how to realize the governing aspects in the ultimate e-health solution. Thus, it is important to monitor and control governing perspectives of the organization in a separate layer while maintaining the integration with operation level requirements. Even though some higher level frameworks introduce the importance of maintaining governing perspectives separately, a systematic approach

with appropriate tools to address this requirement is lacking [6]. This research work provides a methodology to capture governing perspectives with three-dimensional framework. In order to align service oriented principals, HL7-OMG Healthcare Service Specification Project has proposed a trustworthy and policy-driven approach focuses on the capabilities and conformance criteria for HC services [4]. However, the step-by-step approach to realize the complex higher level requirement in e-Health solutions is unavailable. A recent study highlights the applicability of some OMG group standards to model clinical pathways and further analysis is required to derive a complete approach of policy based and rule-based service designing and deployment [5]. Therefore, this research provides a three-dimensional approach to realize rules in HC context as a separate conceptual model. The proposed study focuses on the care pathway guidelines to fulfil the requirement of rule-based service designing using appropriate modelling ontology. The remainder of this paper is organized as follows. Section 2 discusses the proposed three dimensional approach of HC rule realization with few subsections. Finally, Section 3 concludes the paper and presents directions for future work.

2 PROPOSED METHODOLOGY

The proposed approach is three dimensional; 1) HC process activity dimension, 2) HC responsibility

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dimension and 3) HC directive enforcement dimension. The graph with three dimensions in Fig. 1 presented the choreography of the proposed ontology.

2.1 HC Process Activity Dimension

In the proposed three-dimensional approach, it is required to identify the service process activities as a first phase. Clinical work flow modelling is fundamental phase in service process identification where several existing tools and methodologies such as (Business Process Modelling Notation) BPMN can be applied [7] [8]. As major generic activities in HC care pathway, patient registration, diagnosis and treatment have been considered in this study.

2.2 HC responsibility dimension:

The corresponding responsibility spectrum for a certain action can be derived with the Healthcare Responsibility Assignment Matrix (HCRAM). Responsibility dimension covers the identification of multiple types of responsibility perspectives involved with certain process activity. Responsibility Assignment Matrix (RAM) facilitates to analyse and identify roles of the actors in different tasks [8]. Multi-actor involvement for accomplishing single task where each actor assigned with specific duty is more common in clinical context. Also the authorship variation with some delegations occurs corresponding to some tasks. This collaborative nature of the role task relationship types should be identified and modelled explicitly. Four essential matrices identified along with HC tasks are; Perform (P), Consult (C), Accountable (A), Informed (I).

2.3 HC Directive Enforcement Dimension

The rules that covered the specific action and the responsibilities could be identified as different enforcement levels. Enforcement levels have defined in the BMM is used and adopted to represent enforcements in HC context [9].

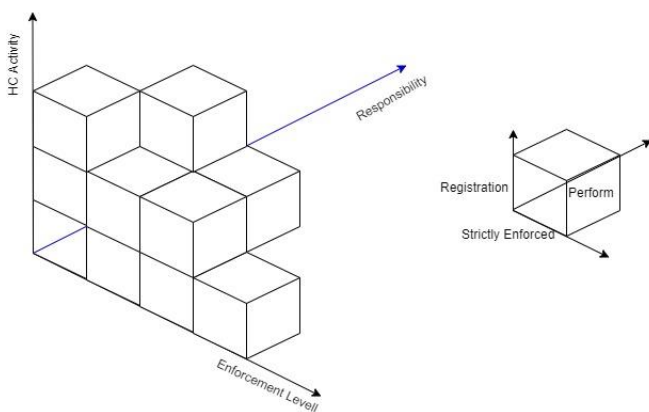


Figure 1 Three-Dimensional rule realization approach

3 CONCLUSION

The three-dimensional approach is proposed to identify and represent service rules in the healthcare domain. In activity dimension HC process perspectives have been captured and presented in terms of BPMN. Then in the

responsibility dimension, the responsibility perspectives have been modeled by utilizing HCRAM with four specific responsibility parameters. Enforcement level perspective, the third dimension is used to model service rules required to cover identified responsibility perspectives in the previous dimension. The work reported here introduced a conceptual framework in an endeavour to develop a complete and sound healthcare rule realization approach. The proposed work attempted to provide an extension to existed frameworks such as HL7/OMG that demanded as platform-neutral and network-accessible software service.

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