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Methodologies for quality assessment of highway operators based on governance best practices with emphasis on toll collection ecosystem

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ABSTRACT

Service quality and the user satisfaction are the main targets for highway operators to take into account in their business plan; moreover, healthy financial stability is critical to the harmony of this environment. In this sense, the toll collection system has a key role for the highway operation sustainability. The Toll Collection System is an ecosystem that involves the quality and maturity of operations, business processes, institutional aspects, equipment maintenance and infrastructure management. The creation of a methodology for quality assessment of the entire Toll Collection ecosystem allows establishing quantitative and qualitative parameters, which may be monitored and evaluated, therefore enabling useful tools for the operator's decision-making process and government agencies assessments. The methodology was applied to nineteen highway operators from Brazilian concessions, which together manage more than 5400 kilometers.

1. Introduction

In the last decades, investments of the Government of the State of São Paulo (Brazil) in its Roads and Highway Systems were not enough to keep pace with the growth in traffic volumes and changing patterns of the road transportation business.

To increase the speed of investments in the modernization of the State Road Infrastructure and to improve the quality of services to users, the State Government started to transfer the management of key highways to private companies, under the terms of Bill 9361 signed on 5th July 1996.

With the transfer of part of the public infrastructure to the private sector, the role of the public administration had to be reordered, focusing its priorities on areas where its presence is essential, such as education, health and public safety. As a result of this reordering, it was necessary to set up an organization to serve not only as a controller, but as a mediator between the public authorities (State Government), the Highway Operators and users of the highway network in the State of São Paulo.

Therefore, the Regulatory Agency for Delegated Transportation Services in the State of São Paulo – ARTESP was created in 2002. Its primary goal is to ensure compliance with the rules governing delegated public services and to ensure the implementation of clauses in contracts executed between the State and the private operator.

Efficiency in operation and management of highways are among the requirements of contracts for concessions, which include a variety of commitments agreed to in public-private partnerships-PPPs. However, the supervisory role by regulatory agencies such as ARTESP faces challenges in tasks such as the assessment of the actual level of services offered by the new operators and its confrontation with what was established in the concession contract.

Among ARTESP's duties are the confirmation of modernization works and expansion of the road infrastructure and services, compliance with risk reduction program, and running and maintenance of highways according to international quality standards.

Various operational instruments of measurement and analysis have been experienced in monitoring highway operator's activities, however sensible and strategic visions have always been among the main goals of ARTESP, in order to support the

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Government in decisions and strategies concerning concession programs. All the regulatory initiatives aim to establish the real benefits of concession programs to society, showing the proper use of public infrastructure and its contribution to the development of the regions served by the highway system conceded.

Quality assessment has to be based on best practices, rapid implementation and classic models so that the evaluation process costs do not compromise benefits. Studies of quality assessment of urban transportation systems (Boltze and Jentsch, 2010) highlight the difficulty in running and maintaining quality programs, which may take years before their full implementation. The methodology presented in (Yang and Regan, 2013) uses quantitative and qualitative indicators to asses the road management equipment.

Furthermore, studies (Liebert and Niemeier, 2010; Morrinson, 2009) highlight that assessment results are the first step in the decision-making processes of policy makers in the airline industry or any other regulated sector. Under scrutiny are the differences in the efficiency of governance frameworks. The authors emphasize the role of infrastructure managers, government agencies and researchers in developing models that examine different stakeholders' requirements.

The basic function of governance system is to coordinate the activities of the different actors involved in a coordination relationship as well as motivate and encourage participants to comply with the terms of the agreement made. Coordination is defined as the process of organization or adaptation of individual components in a particular order. In order to evaluate likely differences between appropriate and inappropriate behaviors, the governance system should provide ways to control the activities where control can be understood as the process of monitoring and evaluating the performance of the various actors (Albers, 2005). The studies presented in (Yang and Regan, 2013; Liebert and Niemeier, 2010; Morrinson, 2009) are not directly applicable for the assessment of governance of quality of services provided by road operators, so it was necessary to extend the use of governance models already mature in other sectors, adapting these models to the highway concession sector. In this sense, the COBIT guide (IT Governance Institute, 2007), recommended by ISACA –The Information Systems Audit and Control Association- for Information Technology Management (IT) is a model often used in assessment of corporate information technology environment. COBIT presents important features that suit the purpose of governance models in technological environments. Several cases of application in the industry can be seen in (ISACA and COBIT, 2016). A survey of articles related to COBIT reported in (Ridley et al., 2004) confirmed that the great majority of the publications identified were practitioner-oriented, with very few academically-oriented publications.

As a consequence of the foregoing considerations, this paper presents a methodology developed to establish an assessment and governance model based on best practices, inspired by the Reference Architecture Control Objectives for Information and related Technology (COBIT).

Policy makers need the information to determine differences in the efficiencies of the governance structure, the performance of operations and infrastructure management, and fulfillment of different stakeholder's expectations (Krathu et al., 2012).

The methodology defines business objectives and evaluation criteria, establishes metrics for analysis (Performance and target Indicators, and critical success factors), and organizes its activities around dominions, processes and activities. Special attention is given to the evaluation of management assets that, in the IT case, are represented by software applications, information databases, IT infrastructure and human resources.

The application of this architecture for the transport business, more specifically the governance of Toll Collection Systems of conceded highways in the State of São Paulo, was carried out by a multidisciplinary team with experts from research institutes, Transportation Regulatory Agency, and consultants working in strategic areas of the road transportation business.

The methodology presented here may help to detect control weaknesses that are undesirable in toll collection systems. It is useful to assess the user satisfaction of conceded roads as it will affect citizen's perceptions of public authorities' performance.

This paper is organized in five sections. The following section describes the reference model for assessing the quality of services provided by toll collection systems of highway operators. Section three describes how the evaluation process is conducted using a bottom up approach, starting by analyzing how effective the basic activities are performed, clustering activities into processes, processes into domains, and, finally, assessing the overall operation. Section four presents the results from the application of the proposed model in Highway Operators from the State of São Paulo highway system, from 2008 to 2012. Section five presents the conclusions and future works.

2. Reference model

The methodology was designed following the same principles and guidelines sponsored by CobIT, assimilating the method of aggregating Activities into Processes, Processes into Domains, and Domains into the Overall Evaluation. Balanced scorecard techniques were used to quantify the scores for all the assessments performed in the evaluation process. The application of the proposed method in all the 19 private operators of the State of São Paulo allowed benchmarking their performance against each other and with a reference level of quality defined by ARTESP.

As seen in Fig. 1, all the activities are clustered in business processes using the same technique used by CobIT. Similarly, those business processes are gathered in domains as presented in the frontal face of the cube. On the upper side of the cube are the Criteria by which the activities are evaluated, which were imported from CobIT and adapted to the transportation sector: Effectiveness, Efficiency, Confidentiality, Integrity/Authenticity, Availability,

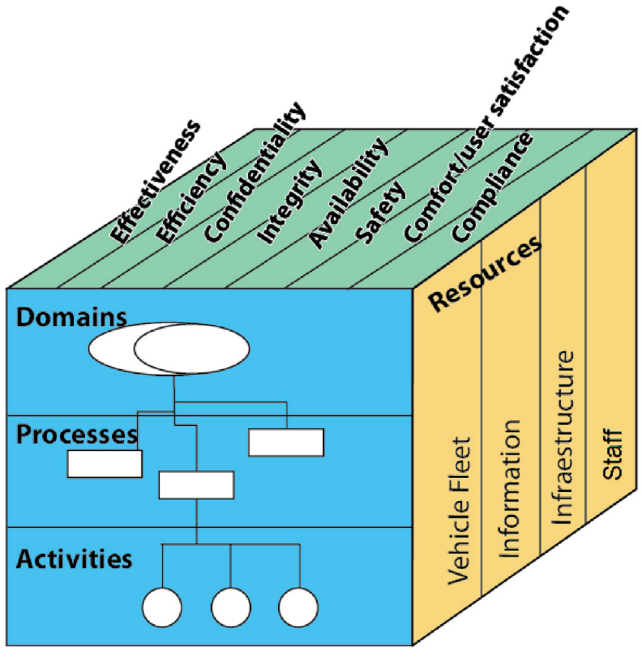

Fig. 1. Reference Model.
Source: Adapted from (IT Governance Institute, 2007)