



Information Technology and Quantitative Management (ITQM 2015)

Impacts of the Technological Change Introduced by Smart Energy Metering in the Legal Department of an Electricity Utility

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Abstract

Even though intelligent measurements of energy consumption is envisioned by electric utilities as a strategic communication network to create transparency and efficiency in the operation of the energy industry, the transition from traditional to state-of-the-art technologies have induced a significant impact in the legal department of the utilities. Not straightforwardly understood by consumers unfamiliar with the updated innovative technologies, surprisingly, the modernization of the sector has generated complaints and legal processes that are everyday filed in the legal departments of the utilities. In connection with a project developed under the framework of the regulated ANEEL R&D Program (sponsored by the Brazilian Regulatory Agency responsible for controlling the electrical sector), a study was developed (i) to evaluate the litigation impact caused by the replacement of electromechanical to electronic meters and (ii) to estimate the additional operational costs generated by the introduction of smart metering technology. Making use of the time series methodology, forecasting univariate models, exponential smoothing, and dynamic regression, a case study was developed based on real data made available by an electricity utility operating in Brazil. Results of the work confirm the applicability of the dynamic regression model proposed that allowed an estimation of the impact of the new measurement technology introduced on the amount of input processes named billing complaint on the overall general mass litigation handled by the Legal Department of the utility.

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Peer-review under responsibility of the Organizing Committee of ITQM 2015

Keywords: Smart metering, Metrology, Time Series, Lawsuits, Measurement of electrical energy consumption

1. Introduction

The National Electric Energy Agency (ANEEL), which imposes regulatory conditions on how this service

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must be performed, regulates the electrical sector and the energy utilities in Brazil. As usual, regulation is based on normative procedures and bylaws that establish criteria to be followed by the utilities. In addition, in order to fulfil technical and operation criteria, every measuring instrument used must be certified by the metrology authority in the country (in Brazil: the National Institute for Metrology, Quality and Technology, Inmetro).

In line with government guidelines that encourage conscious consumption, energy utilities, in partnership with universities and research institutions, develop projects in energy efficiency and related matters. Among these projects, a few aim to increase measurement assertiveness of energy consumption in controlled concession areas of the utility. This goal has been achieved by systematic (and expensive) replacement of old fashioned electromechanical meters by intelligent electronic measurement technology in compliance with the applicable legislation that states that "*... the meter and any other measuring equipment must be provided and installed by the utility, at its own expense, unless provided otherwise in specific legislation.*" [1]

Particularly, this paper discusses and evaluates the administrative and organizational impact that such drastic technological change can induce in the legal department of the electrical utility studied, herein artificially named Electrical Energy Utility (EEU) to preserve its confidentiality.

Forecasting analysis based on Cochrane and Orcutt dynamic regression models of Time Series [2] was used to investigate to what extent the technological change introduced generated legal demands on *billing complaints* in the legal department of the utility. *Billing complaints* was chosen as the focus of the analysis as it proved to be the main offender in the Small Claims' Court and in the Common Civil Court where claims are filed against the studied utility.

Given the recurrence of the facts and benefiting from the statistical analysis employed, the study of the "legal universe" proposed in this work indeed contributes to advance the knowledge related to new matters of interest to the electricity sector as a whole.

2. Measurement of electrical energy consumption: state-of-the-art

2.1. Legislative and regulatory frameworks: electricity metering

Regulation on the use of electricity —considered a basic essential service— is a main function of the State. Compete to the regulator to establish the connection between electrical energy distributors and consumer of electricity. Therefore, imposed by law, the regulator —responsible for balancing interests of the government and authorized operators, and whenever needed, harmonize conflicting interests of users [3]— establishes a concession agreement to be signed between Government and private companies held responsible for providing access to electrical energy services.

Directly linked to the Energy Department, the regulatory agency responsible for the Brazilian electricity sector is the National Electric Energy Agency (ANEEL), created by Law 9.427, of December 26th of 1996, and established by Decree 2,335, at October 6th of 1997. Performing its regulatory functions, Aneel operates in compliance with the applicable legislation that reflects government guidelines and policies: to monitor all activities related to the generation, transmission, distribution and sale of electricity; to mediate, at the administrative level, any sort of conflicts that may arise between agents and between them and consumers and to supervise the electricity market in Brazil as a whole [3].

In addition to the supervision imposed by the regulator and enforced through regulatory requirements, measuring instruments used in the electrical sector must comply with specific technical requirements dictated by the Brazilian National Metrology Institute (National Institute of Metrology, Quality and Technology, INMETRO).

2.1.1. Legislative and Regulatory Frameworks: Electricity Metering

Due to its low cost and its availability in the market, the electromechanical meter is still the dominant measurement technology adopted in the Brazilian electrical sector. Functioning based on the principle of

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