Building a Certification and Inspection Data Infrastructure to Promote Transparent Markets

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ABSTRACT

This article reports on data architecture that reduces information asymmetries to support public-private collaboration to govern product certification and inspection for promoting transparent markets and building consumer trust. The data architecture is a proof-of-concept set of data standards called the Certification and Inspection Data Infrastructure Building Block (CIDIBB) for data storage, retrieval, sharing and automated reasoning of data that can be used to respond the question: what constitutes a trustworthy certification and inspection process? CIDIBB consists of three interrelated ontologies, focusing specifically on certified fair-trade coffee that has the potential to become universally applicable to any certification and inspection process for products or services. The evaluation results suggest that CIDIBB is able to test the trustworthiness of certification schemes, providing consistent results. CIDIBB will contribute to support public-private collaboration to solve public problems such as the promotion of sustainable production and fair labor practices.

KEYWORDS

Building Block, Certification, Data Infrastructure, Inspection, Ontology, Sustainable Production, Virtual Certificates

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1. INTRODUCTION

Classic market economic theory of supply and demand works under the assumption of perfect information—both sellers and buyers have access to full information about the state of the market (Stigler, 1957). Unfortunately, these assumptions about information in free markets are often not true; information asymmetry clouds the relationship between buyers and sellers in the market. When we buy a pair of running shoes or a pound of coffee, for example, we do not know if they were manufactured using child labor, exploiting workers or damaging the environment. Governments, NGOs and private organizations have developed strategies to reduce information asymmetries such as labeling and certification, chain-of-custody, and infomediary platforms. The third-party certification and labeling industry, for instance, has expanded rapidly since the 1990s (Albersmeier, Schulze, Jahn, & Spiller, 2009; Jahn, Schramm, & Spiller, 2005). Private organizations have also increasingly campaigned for chain-of-custody – the ability to trace the path of products from producers to consumers. Both third party certification and chain-of-custody rely on labels attached to the product, thus on the clarity and verifiability of such labels (Starobin & Weinthal, 2010). Consumers, unfortunately, often do not have the ability to drill down the information behind the label in order to make informed choices. Moreover, the rapid proliferation of labeling further obstructs the ability of consumers to understand the meaning behind labels, making them no longer adequate to provide warranty of trusted information (Jarman & Luna-Reyes, 2016).

Furthermore, harsh competition for contracts has rendered third party certifiers with the high risk of false incentives and adverse selection (Albersmeier et al., 2009), and many third-party certifiers are lacking credibility and their schemes are proven fallible by the increasing number of fallacious and vastly exaggerated claims (Starobin and Weinthal, 2010). Arguably, governing such a complex market requires collaboration between government and private entities. Unfortunately, standardized data, tools, and applications that could facilitate sharing information to support efficient collaboration between government and private entities is yet to exist. For that reason, in this paper, we propose that the provision of a data architecture and data standardization potentially could alleviate the difficulties in developing a public-private collaborative governance for promoting transparent markets. This architecture constitutes an ontology-based building block for a system that enables standardized reporting of certification and labelling practices, including the potential for supporting the identification of a trustworthy virtual certificate. That is to say, this paper presents a set of ontologies and an assessment framework that can be used to respond to the question: what constitutes a trustworthy certification and inspection process?

We introduce the concept of a Certification and Inspection Data Infrastructure Building Block (CIDIBB), combining the ontologies and a process that involves the use of 28 questions to assess the trustworthiness of any given certification. The assessment results demonstrate the indispensable function of governance mechanisms to make available the necessary information to reduce information asymmetry in the market, which is a significant contribution of the paper. The development of the 28 questions as well as the set of ontologies were specified, conceptualized, implemented, and evaluated based on data collected through interviews, the focus group, the survey, and archives. Technology infrastructures constitute only one of the components for realizing a more transparent market for consumer products (Graham and Haarstad, 2011). The research reported here, nonetheless, is part of a larger project called I-Choose that focuses on building information sharing networks to support consumer choices. The project includes both the technology components in terms of data standards and procedures (CIDIBB) as well as governance and policy components (Jarman & Luna-Reyes, 2016).

The paper is organized in 7 sections including this introduction. Section 2 summarizes previous research in FIPP systems and ontologies. Section 3 describes the general approach in building and testing CIDIBB. Section 4 includes a brief description of the main components of CIDIBB as a set of three ontologies, CertIN, FLO, and CiTruST. Section 5 presents an empirical evaluation of CIDIBB, showing ways in which CiTruST can be used to automatically classify certification systems in terms
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