

Chapter 81

Data Mining Approach to Decision Support in Social Welfare

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ABSTRACT

Knowledge discovery and data-mining techniques have the potential to provide insights into data that can improve decision making. This paper explores the use of data mining to extract patterns from data in the domain of social welfare. It discusses the application of the Integrated Knowledge Discovery and Data Mining process model (IKDDM) a social welfare programme in Jamaica. Further, it demonstrates how the knowledge acquired from the data is used to develop a knowledge driven decision support system (DSS) in the PATH CCT programme. This system was successfully tested in the domain showing over 94% accuracy in the comparative decisions produced.

1. INTRODUCTION

Knowledge Discovery and Data Mining (KDDM) involves the extraction of non-trivial, previously unknown patterns from data. Generally, having applied the relevant techniques and acquired new knowledge; this knowledge must now be introduced for use in the domain, more specifically by the decision makers. KDDM has been used extensively in several domains to improve data driven decision making with varying levels of success. There is however no evidence to suggest the application of KDDM in Conditional Cash Transfer type social programmes.

In the domain of social services, a Conditional Cash Transfer (CCT) programme is a type of Social Protection scheme that provides cash and non-cash benefits to people living in poverty with specific requirements related to school attendance and health-care (Narayan, 1999). Benefits are paid only if the applicants continue to meet the set minimum requirements. CCTs were first introduced in Latin America

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and the Caribbean (LAC) in 1995, and up to 2008, have been implemented in more than 18 countries in this region (Johannsen et al. 2009). Additionally, CCTs have been implemented in Sub-Saharan Africa, Asia and Europe (Barrientos et al. 2010; Das et al. 2005). Particularly within Latin America and the Caribbean, these programmes target the most vulnerable (as a result of their state of poverty) in the society. In some cases, communities are targeted based on their economic and social state, while others are demand driven. Cash and non-cash benefits are paid to households and individuals after they have been verified by programme administrators.

In Jamaica, verification is done through personal home visits. Potential beneficiaries are required to supply certain economic and social data about their household in the application. An economic assessment is usually done to evaluate their state of poverty. Based on the result of this assessment, the beneficiary may be provisionally approved. Those applicants provisionally approved are visited at home by a social worker who checks to ensure that the data submitted is accurate before disbursement of benefits can begin. This process is called verification. Verification can take several months based on the required manpower and travel. Additionally, the collected applicant data can become outdated especially in times of economic instability, thus, the data verification processes must be re-administered at least once per year to keep up-to-date with the changing status of households. This process is called recertification. Verification and subsequent recertification (at least once per year) become prohibitive often beyond the limits of the funding available in many countries (Johannsen et al. 2009), thus resulting in breakdown in the effective administration of some programmes.

Decision support systems (DSS) have the potential to reduce the costs associated with initial verification and recertification processes associated with CCTs. Since the initial processes for beneficiary targeting and approval involves massive data capture and some expert evaluation, we posit that KDDM can be applied to explicate new knowledge that can be used to reduce the need for manual labour in beneficiary verification and recertification.

This study demonstrates the use of knowledge discovery and data mining to extract knowledge from data sources in the social services domain and the subsequent implementation and assessment of a DSS which utilizes the knowledge to aid decision making in CCTs. In section 2 we review literature that is essential to development of a Decision tool in CCT, we provide a background to the KDDM methodology, DSS and CCTs. We proceed in section 3 to discuss our research design and methodology then present a case study using the IKDDM process model to develop a DSS.

2. BACKGROUND

2.1. Knowledge Discovery and Data Mining (KDDM)

Data mining can be viewed as a phase in the Knowledge Discovery process where so called mining-algorithms are applied on the data to produce useful patterns (also called models) (Fayyad et. al. 1996). Several studies have focused on the use of KDDM as a basis for realizing value in organisations and the popularity of KDDM has been spurred on by its successful application to sales and marketing and by extension the retailing industry (Berry & Linoff 1997). Over time, data mining has been used to assist with fraud detection in healthcare, accounting, credit card fraud detection, among others (Ferdousi, Maeda 2006; Sánchez et. al. 2009; Phua et. al. 2010; Tagaris et. al 2009).

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