

## Chapter 8.15

# An Approach to Efficient Waste Management for SMEs via RBVOs

**Stamatia-Ann Katriou**  
*ALTEC S.A., Greece*

**Ioannis Ignatiadis**  
*Kingston University, UK*

**Garyfallos Frigidis**  
*Technological Educational Institute of Serres, Greece*

**Evangelos Tolia**  
*ALTEC S.A., Greece*

**Adamantios Koumpis**  
*ALTEC S.A., Greece*

### ABSTRACT

Businesses are aware of the popular demand for careful waste management as a high priority environmental issue. Small and Medium-sized Enterprises (SMEs) face greater pressure when coping with waste products, because they often lack necessary resources or expertise. E-business could offer unique opportunities both for SMEs wanting to dispose of their waste or find waste management services and for SMEs who deal with specific aspects of waste disposal itself. This

chapter proposes an approach for locating actors involved in the transportation, disposal, recycling and reuse of waste created by SMEs. Our approach incorporates the notion of Request Based Virtual Organizations (RBVOs) using a Service Oriented Architecture (SOA) and an ontology for the definition of waste management requirements. The populated ontology is utilized by a Multi-Agent System which performs negotiations and forms RBVOs. This approach enables SMEs to find appropriate partners, handle waste management and gain competitive advantage in the marketplace.

DOI: 10.4018/978-1-60960-587-2.ch815

## INTRODUCTION

Small and Medium-sized Enterprises/Businesses (SMEs) have specific challenges and opportunities related to their waste products, namely items needed to be disposed of. Waste management in this chapter refers to the widest concept of organizing, handling, transporting, recycling and disposing responsibly of all types of waste generated by SMEs. It is now essential that interactions of SMEs both seeking and offering services related to waste management require thoughtful analysis of which partners could benefit them the most. Systems need to be devised to meet this criterion and this is one area where e-business needs to be expanded. Waste management for SMEs is now a global priority as the green movement gathers pace (Gadenne, Kennedy, & McKeiver, 2009; Hidalgo, Irusta, & Feroso, 2008; Vives, 2006). Waste Management has now become a highly complex issue.

According to The Economist's 2009 'Special Report on Waste', the average Westerner produces over 500kg of municipal waste a year. In addition, both developed and developing countries generate vast quantities of construction and demolition debris, industrial effluent, mine tailings, sewage residue and agricultural waste (McBride, 2009). It has been estimated that the quantity of waste collected worldwide is between 2.5 and 4 billion metric tons (not including construction and demolition, mining and agricultural waste). Rich countries spend some \$120 billion a year disposing of their municipal waste alone and approximately \$150 billion on industrial waste (Lacoste & Chalmin, 2006). The amount of waste that countries produce tends to grow in tandem with their economies, and especially with the rate of urbanization. Waste firms see a rich future in places such as China, India and Brazil, which at present spend only about \$5 billion a year collecting and treating their municipal waste. Concern about global warming should also provide a boost for the waste business. Waste is not just a

substance that needs to be disposed of; it is also a potential resource. It can be burned to generate energy and new technologies turn sorted waste into fertilizer, chemicals or fuel. Paper, plastic, aluminum, etc can be recycled. Much waste can also be reused (McBride, 2009). Waste, thus, is now an opportunity for new business ventures, as well as for extra revenues or cost savings in existing enterprises.

Many businesses are becoming more aware of the popular demand for more careful waste management as a high priority environmental issue which could also be used to promote a firm's image. Business communities are responsible for large quantities and varieties of waste material. Acting in order to reduce and treat this waste appropriately can be easier for large organizations because they possess extensive resources and benefit from savings of scale. However, Small Medium Enterprises (SMEs) are in a unique situation. On the one hand they may have adopted waste management practices that are adapted to their operations. On the other hand, sometimes out of thoughtlessness and sometimes as the result of ignorance or a lack of understanding of the basic principles of effective waste management, many are content with meeting minimal requirements or restricting the adoption of such practices. Many SMEs have been found to fail to fulfill all waste management regulations due to lack of knowledge about the current environmental legislation relating to small companies (Gadenne, Kennedy, & McKeiver, 2009; Hidalgo, Irusta, & Feroso, 2008). There is also the case of management's good will being stifled by complex problems and the barriers imposed by limited resources (Dennis et al., 2003).

Waste management is a complex and demanding issue that needs the contribution of a variety of experts to be handled successfully. Nevertheless, there is no such collaboration system supporting the management of waste in practice or in the literature. Companies and municipalities wishing to recycle, or find other ways of disposing of their

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