

Analysis of the Strategies for Incorporating the Informal Waste Collectors' into Formalized Systems: Engineering Management Perspective

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Abstract

Waste is now considered a valuable resource and the waste management call is shifting from waste disposal to waste utilization and resource management. In order to achieve the call for waste utilization, a number of players are involved in the waste management arena. This study analyses the strategies for incorporating the informal waste collectors (IWCs) into a formalized systems. A number of studies suggesting the integration of the informal waste collectors into formalized systems were analyzed. The study provides evidence that in most developing economies, waste recovery is performed by the informal waste sector (IWS) and that there is need to integrate the IWS into formalized systems. Suggested strategies attributing an engineering management approach are identified. Further, the studies indicate that, there is need for an empirical research on the strategies for integrating the informal waste collectors into formalized systems from an informal waste collector's perspective.

Keywords

Engineering, Informal, Integration, Management, Waste.

1. Introduction

In developing economies, waste recovery is an activity mainly performed by the informal waste sector. It consists of different categories of groups and all serving the purpose of resource recovery. Appropriately 2% of the urban population work in the informal waste sector in middle and low income economies (GIZ, 2011). In the society, the sector has contributed to the creation of recycling norms and initiated the development of recycling practices at household levels (Zen and Siwar, 2015). Most of the waste recovery and recycling is through the IWS in developing economies (Hoorweg and Bhada-Tata, 2012). Although the IWS is the key player in the recovery of recyclable and reusable waste, limited amounts of municipal waste are recovered and recycled (Buenrostro and Bocco, 2003). According to the World Bank (2012) only 4% of municipal solid wastes (MSW) are recovered. Even though the recovery rate is significantly low, the IWS continues to play a major role in sustainable resource recovery and recycling. They contribute to resource utilization and therefore looking up for the future generations. Despite this, little recognition has been given to the IWS. In Egypt state government recognition of the IWS resulted in 74.3% of waste been recycled by IWS in 2006 as compared to 10.6% recycled by the formal sector (Wilson et al, 2009). Recognition of the informal waste sector can result in an increase to resource recovery and therefore contributing to sustainable solid waste management.

Several studies have focused on the IWS and waste recovery. Integration of the IWS into formalized systems has been suggested by some authors. The integration of the IWS has been suggested as a method for waste management overall costs reduction for the formal sector (Masood, 2013; Wilson et al, 2009; Matter et al, 2013; Velis et al, 2012). Others have focused on frameworks for integrating the IWS with the formal sector (Davis et al, 2006; Velis et al, 2012; Paul et al, 2012; Wilson et al, 2012; Masood, 2012; Tsai, 2008; Wang et al, 1997). Recognition of the importance of the IWS to resource recovery was highlighted in these studies. However, most of these studies focused on framework design and used qualitative approaches and hence suggested strategies for integrating the informal sector into a formalized system.

Most of these studies have suggested strategies for integrating the informal waste collectors into formalized systems. Even though these strategies have been suggested, most of the informal waste collectors have not been integrated

into formalized systems in most developing economies. Little existence of IWS integrated into formalized systems is an indication to the waste management sector and policy makers that more research that focuses on the informal waste sector integration and the factors necessary for integration is needed in order to maximize resource recovery. The focus of this study is to analyze the strategies for integrating the informal waste sector into formalized systems from some selected studies using an engineering management perspective and therefore identify the research gap for future research. Analysis of the strategies from an engineering management perspective will provide future direction in waste management and resource recovery.

2. Literature Review

The collection of waste from generation points to disposal points is also performed by the IWCs. However, most of the IWCs are differentiated by their point of waste collection. According to Ezeah et al (2011), in most cities, six categories of informal waste collectors are known to exist and together they form a recycling network hierarchy (Wilson et al, 2006). These recycling networks contribute to sustainable development as they return recyclable and reusable waste back in the supply-chain networks. Private informal recycling involve activities that are based on extracting materials of value from a number of waste streams joined by upgrading and trading these materials to agriculture or industrial institutions (SWM in the World Cities, 2012).

Recognition of the informal waste sector as a result of the roles they play towards waste recovery and management is cardinal. It should be pointed out that, waste removal is not the only activity they perform but working for themselves and their clients while creating a livelihood for their families. They collect waste at no direct cost to the taxpayers but they are not recognized, protected or supervised by the city authorities thus making their work difficult. As a result of this and other challenges, a number of studies have looked at ways of integrating the informal waste sector into formalized systems. The need to incorporate the informal waste recyclers into formalized systems at urban and local level frameworks was highlighted (Agarwal et al, 2005). Devi and Satyanarayana (2001) showed that, in urban communities, promoting micro-enterprises and organising the IWS has proven to be an effective way of affordable services extension. Wilson et al (2006) found that, an effective way of upgrading the ability of the informal recyclers to add value to collected materials is by training and organising them into micro-enterprises thus contributing to achieving more sustainable waste management. The findings from these studies have indicated that incorporation of the informal sector into formalised systems can contribute to sustainable waste recovery and management. Other studies have not only suggested the incorporation of the informal waste sector into formalised systems but have also suggested some strategies of achievement. Table 1 below depicts a summary of the strategies suggested by these studies.

Table 1: Studies on Informal Sector Integration into Formalised Systems and suggested Strategies

Reference	Identified Strategies
Fei et al (2016)	<ul style="list-style-type: none"> ✓ Training ✓ Price advantage ✓ Information platforms set-ups ✓ Recycling systems layouts optimization
Storey et al (2015)	<ul style="list-style-type: none"> ✓ Source waste segregation ✓ Effective community engagement ✓ Predictable and steady revenue sources
Kawai et al (2012)	<ul style="list-style-type: none"> ✓ Carefully monitoring of the role of informal sector ✓ Continuous collection of reliable data on recyclable waste
Medina(2002)	<ul style="list-style-type: none"> ✓ Recognition legally ✓ Policies at National ✓ Organization ✓ Conditions Allowance (institutionally, legally) ✓ Initiations of microcredit
Gunsilius (2012).	<ul style="list-style-type: none"> ✓ Voice (Organization) ✓ Visibility (contributions acknowledgment) ✓ Validity (legal and Political recognition) ✓ Viability (financial sustainability) ✓ First stages NGOs collaboration ✓ public acceptance

	<ul style="list-style-type: none"> ✓ Support politically
Matter et al., (2013)	<ul style="list-style-type: none"> ✓ Waste segregation at Household level
Atienza (2010)	<ul style="list-style-type: none"> ✓ approvable policies ✓ Organization ✓ Technical and economic assistance ✓ Safety and health insurance ✓ Enforcement of law ✓ information and education campaigns: IEC ✓ Suitable technology ✓ Local and national stakeholders gatherings
Sembiring and Nitivattanon (2010)	<ul style="list-style-type: none"> ✓ Partnership establishment between IRS members ✓ Policy makers' perception shift of the IRS ✓ Secondary raw material quality improvement
Chaturvedi (2011)	<ul style="list-style-type: none"> ✓ Channelization and Collection mechanism ✓ Development and capacity research/building ✓ Infrastructure ✓ Dissemination , dialogue and Policies activities
Gutberlet (2008)	<ul style="list-style-type: none"> ✓ IRS Inclusion into waste management ✓ Equity: income gender, social security ✓ Eco-health: environmental and social health ✓ Eco- efficiency: producer responsibility, packaging reduction ✓ Capital basis expansion ✓ Perspective long term: Sustainability ✓ Consideration of Topography
Wilson et al. (2006)	<ul style="list-style-type: none"> ✓ Authorities acceptance of the benefits provided by IRS ✓ Organization ✓ Micro and small/ cooperatives enterprises formation

3. Methodology

The focus of this research is to identify the strategies suggested for integrating the informal waste collectors into formalized systems. The first part of this study reviewed studies that have looked at this topic from both developed and developing economies. Research studies or articles with the key words of 'informal', 'waste' and 'integration' were searched from the different databases such as SAGE journal publications and Science Direct. A total of 15 articles were reviewed.

The second part of this study involved identification and analysis of the suggested strategies of integration. Strategies were analyzed from an engineering management perspective and lastly a research gap was identified for future research purposes. Analysis of the strategies from an engineering management perspective was performed to identify those strategies which are within the field. According to Khalil (2010) engineering management is a fusion of business and engineering principles. Therefore in the arena of waste management with particular attention on the informal sector, strategies that apply both business and engineering principles are required for integration to sustainably drive the recovery process. Khalil (2010) further indicates that, engineering management avails technological problem-solving savvy of engineering and the management approaches for the purpose of solving complex enterprises from conception to completion. Therefore, the incorporation of the IWS into formalized systems requires strategies driven from an engineering management perspective.

4. Results and Discussion

Solid waste management involves inclusivity of different stakeholders. These are the providers, users and local authorities. Each stakeholder in solid waste management has a role to play and enhance the formation of different strategies for integration will benefit each if not all stakeholders. However, the results of the review suggested a

number of intervention strategies for incorporating the IWS into formalized systems. Examination of the recommended strategies indicates that most of the studies focused on strategies to be implemented by other stakeholders as consideration and beneficiation of the informal waste sector. Wilson et al (2006), Atienza (2010), Gunsilius (2012) Medina (2002) suggested organization of the IWS. Gutberlet (2008) and Sembiring and Nitivattanon (2010) Storey et al (2015) suggested that formation of partnerships with other stakeholders would contribute to sustainable resource recovery. Atienza (2010), Medina (2002) and Gunsilius (2012) highlighted law enforcement and political support as intervention strategies. Matter et al., (2013) and Storey et al (2015) indicated separation of waste at source as the intervention strategy. Other studies suggested training, formation of information platforms and many other strategies. Implementation of these strategies can benefit the informal waste sector. Nevertheless, the methodology used in the formation and conclusion of these strategies is purely qualitative and isolates the quantitative proof of the informal waste sector.

Analysis of the strategies from an engineering management perspective, a number of studies suggested strategies from that perspective. Gutberlet (2008), Chaturvedi (2011), Sembiring and Nitivattanon (2010), Atienza (2010), Storey et al (2015) and Fei et al (2016) recommended strategies such as; sustainability: long term perspective, producer responsibility, packaging reduction, Collection and channelization mechanism; secondary raw material quality improvement; Appropriate technology; Economic and technical assistance; Continuous collection of reliable data on recyclable waste; Training; Price Advantage; information platforms setups and recycling systems layouts optimization. These strategies have an engineering management perspective to achieve sustainable waste recovery and management if properly implemented.

Engineering concepts such as reverse logistics can be designed for the recovery of waste. However, integration between the formal and informal waste sector as well as the community and manufacturing industries should be established in order for the recovery system to be sustainable. Further, the identified engineering strategies can be incorporated in the recovery system of waste using engineering concepts of reverse logistics.

5. Research Gap

A number of strategies regarding informal waste sector integration have been recommended together with workable frameworks. However, most of these studies developed these strategies in isolation of the voice of the informal waste sector. The methodology used was purely qualitative and did not focus on the IWS as the main respondents to the suggested strategies. Therefore, the next studies should develop workable and quantifiable questionnaires based on some of these strategies and empirically assess the informal waste sector. Further, future research should focus on designing recovery systems that integrate the engineering solutions to the constraints faced by the IWS in the recovery of waste.

6. Conclusion

The benefit of integrating the informal waste sector into formalized systems is for all stakeholders. In order to achieve sustainable recovery and maximize on resource utilization, waste management stakeholders; service providers, service users and local authorities should properly and carefully implement these suggested strategies. During the implementation of these strategies, it is important that the views of all stakeholders are considered for effective and workable solutions. The informal waste sector should not be isolated in decision making as they are the major waste recoveries and recyclers in developing economies.

Therefore, the identified strategies from an engineering management perspective should be considered during the formation of questionnaires for investigating sustainable strategies for incorporating the IWS into formalized systems. Once the strategies are designed into a questionnaire, they should be empirically analyzed so that, there placement in the integration system is validated.

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Biography

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