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# Towards improved understanding of reverse logistics – Examining mediating role of return intention

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ABSTRACT

Considering enormous adverse impact of improper disposal of e-waste on green house emissions and global climate change, it is imperative to develop improved understanding about reverse logistics. However, as majority of consumers prefer to store their e-waste at home rather than returning it to producer thereby limiting the successful implementation of reverse logistics, it is important to understand the psychological determinants of consumers' intention to return e-waste so that effective strategies could be designed accordingly. This research work aims to strengthen e-waste acquisition from the consumers by determining the psychological determinants of intention to return e-waste. This research work aims to strengthen e-waste acquisition from the consumers by determining the psychological determinants of intention to return e-waste. For this, a survey instrument was administered on 750 mobile phone users in India and structural equation modeling was used to analyze the responses.

Research findings show that return intention acts as a mediating variable in prediction of return behavior. Further, perceived behavioral control, subjective norms, moral norms, willingness to sacrifice were identified as antecedents to return intention. Given the possibility of increased proportion of e-waste returns through strengthening of behavioral intentions, the study findings and suggestive inputs may help the firms in fulfilling their "Extended Producer Responsibility".



## 1. Introduction

Researchers across the globe have been debating and discussing environmental sustainability issues in an attempt to lead the society toward safer existence (Saysel et al., 2002; Biermann and Boas, 2010). Thus, in past few decades, from pollution to deforestation, and global warming to waste disposal, varying concerns about environmental sustainability have emerged. Amongst these, the recent hazardous phenomenon that is significantly threatening human and ecological health is the rapidly generating electronic waste (Robinson, 2009; Widmer et al., 2005; Schwarzer et al., 2005; Nnorom and Osibanjo, 2008a,b). According to an estimate (UNEP, 2006) the global generation of electronic waste has been increasing by around 40 million tons. Moreover, it has also been pointed out that e-waste contains toxic chemicals (Man et al., 2013) that cannot be simply dumped in landfills due to emission of methane which poses threat to the environment (Robinson, 2009; Widmer et al., 2005), Needless to say, e-waste poses significant threat to one and all, and deserves due attention.

Interestingly, the growth of e-waste is partly attributed to increasing population and urbanization on one hand (Achankeng, 2003; Kollikkathara et al., 2009), increased consumption (Nnorom and Osibanjo, 2008a,b) and improper handling of resulting waste on the other. In past few years, the newer and faster gadgets coupled with falling prices and quicker obsolescence have only ensured that volume of waste electronic equipment has grown in an alarming manner (Borthakur and Sinha, 2013; Khetriwal, 2013; Zhang et al., 2012). This is substantiated by the statistics which indicates that by the year 2020, e-waste generated from computers is likely to increase by 500 per cent in India and by 400 per cent over 2007 levels in China (Young, 2010). It is further forecasted that e-waste generated from discarded mobile phones would be about seven times higher than 2007 levels and 18 times higher by 2020 in India. To make the situation even grimmer, as per the findings of some studies (Saoji, 2012; Chatterjee and Kumar, 2009) the electronics industry is not only expected to grow at a fast pace, but is also likely be one of the largest industry globally. This obviously indicates that further increase in e-waste generation is on the cards.

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Importantly, as already pointed out, unlike other form of solid waste, e-waste cannot be simply dumped in landfills because, this trash happens to be especially hazardous to the local environment and nearby communities (Wilcox, 2008). Thus, if someone simply landfills e-wastes, toxic elements in the electronics could trickle into the land and contaminate groundwater (Liu et al., 2009; Wilcox, 2008), and if it is burned, heavy metals like lead, cadmium and mercury from the e-waste, are expected to cause serious damage to the atmosphere (Hageluken, 2007). From economic viewpoint too, the presence of valuable and reusable components in the e-waste, mean that it requires proper handling (Robinson, 2009; Allsopp et al., 2006). Thus, in all likelihood, without proper training and information, consumers are not expected be able to dispose the electronic product and the producers' role becomes obvious and important in dealing with e-waste.

Further, in developing countries like India where almost 90–95% of the e-waste is being recycled by informal sector (Chatterjee, 2015), there was a need of supportive policy for informal sector for dealing with adverse impact of recycling on health and environment (Chi et al., 2011).

This primarily is the reason, as to why, for controlling the process of e-waste management, the responsibility of e-waste recycling has been put on the manufacturer (Saoji, 2012), and in many countries, local and federal governments have enacted regulations and policies relating return management of various used and end-of-life products (Ongondo et al., 2011). Thus, electronic equipment manufacturers are required to recapture and properly dispose off electronic products through implementation of reverse logistics — which includes the process of "planning, implementing and controlling backward flows of raw materials, work-in-progress, finished goods and information, from the point of consumption to the point of recovery or proper disposal" (Tibben-Lembke and Rogers, 1998). Through effective implementation of reverse logistics, the producers are expected to meet the compulsory legal requirement of recovery and proper disposal of e-waste thereby helping in sustainable management of e-waste as envisaged under Extended Producer Responsibility (MoEF, 2011; OECD, 2001).

Though, at the outset, recovery and proper disposal of e-waste might appear as an additional responsibility, and hence, additional cost to the firm, researchers (Khetriwal et al., 2009) have reported that by implementing reverse logistic the firm is expected to gain direct as well as indirect economic benefits. While the direct gains can be due to the increased revenue through the valuable components and recyclable parts, the indirect gains result from the beneficial effect of marketing pro-environmental gestures and commitments thereby generating goodwill and positive image (Ravi and Shankar, 2012; Tibben-Lembke and Rogers, 1998). From factual point of view, there has been enough evidence in literature to indicate positive effect of proactive corporate environmental strategies on a firm's performance (Galdeano-Gómez, 2008; Wagner, 2005). Thus, it is envisaged that through an effective implementation of reverse supply chain, the producers will not only be able to meet the compulsory legal requirements, but will also be rewarded with tangible economic and intangible goodwill gains.

### 1.1. Relevance of study

Many researchers have been busy designing frameworks in reverse chains (Chan et al., 2010; Janse et al., 2010; Kilic et al., 2015), or studying the integration of reverse and forward chains (Rao, 2008; Pochampally et al., 2009) or have been delving on integrated logistic problems (Schultmann et al., 2006; Pishvaee et al., 2009), or have identified the role of diverse stakeholders in e-waste management (Borthakur and Sinha, 2013). Further, there have been attempts to study variability among stakeholders toward decision to waste or trade e-waste (Estrada-Ayub and Kahhat, 2014), while societal impact of e-waste recycling (Umair et al., 2015) and technology for recovery of metals from e-waste (Jujun et al., 2014; Kang and Schoenung, 2005) has also been assessed and reviewed. However, it is indeed surprising as to how the initial point of the chain, the consumer, has not been given consideration in reverse logistics literature. The important role of consumer has been highlighted by Prakash et al. (2015), who have identified customer perception toward reverse logistics as an important barrier in adoption of reverse logistics by electronics manufacturers. A glance through the literature on consumer behavior related to e-waste suggests that in few studies some researchers have identified the post consumption behavioral choices for end of life waste like mobile phones and have even reported that consumers tended to store their mobile waste at home rather than acting pro-environmentally and returning it to producer for recycling (NOKIA, 2008; Dixit and Vaish, 2013). Additionally, various other factors affecting consumers' decisions related to recycling of e-waste in general like waste minimization (Tonglet et al., 2004); willingness to recycle e-waste at the drop-off centers (Saphores et al., 2006); willingness to pay of green phone (Nnorom et al., 2009); preferences for e-waste recycling alternatives and willingness to pay for recycling convenience (Nixon et al., 2009); role of situational and economic benefits affecting willingness to participate in e-waste recycling in China (Wang et al., 2011), willingness to engage in recycling e-waste in US (Saphores et al., 2012); recycling behavior of ethnic minorities (Miafodzyeva et al., 2013), perceived barriers toward returning e-waste to producer (Dixit and Vaish, 2015); cues related to return intention for electronic products (Jena and Sarmah, 2015) have been studied by researchers but there is scarcity of literature that integrates the aspect of reverse logistics implemented by the manufacturer considering consumer as focal point for acquisition of e-waste which studies individual psychological determinants of return behavior. This comes at the backdrop of the fact that for changing behavior of consumers from 'storage' to 'returning' e-waste to producer as e-waste should neither be stored at home nor be disposed with household waste, it is important to identify important antecedents that affect the return behavior.

This research study tries to fill this void by analysing the indirect effect of return intention which has been considered an important precursor to pro-environmental behavior. This study analyses the mediating role return intention can play on actual behavior of consumers. Further, given the facts that e-waste generated from mobile phones has highest growth rate of eighty percent (Ramesh and Joseph, 2006) and that almost negligible mobile phone waste is available for recycling (MAIT and GTZ, 2007), the research focuses on mobile phone consumers with a view to understand antecedents to the return behavior. With aforesaid in mind, this study was undertaken so that:

a) the important factors affecting the return behavior of consumers could be identified in terms of both the relevance as well as significance, so that practically implementable strategies could be designed to improve the implementation prospects of reverse logistics.
b) ripples could be created for further inquests through related research efforts.

It is envisaged that better understanding of the dynamics of return behavior will provide useful insights as well as possible options of bridging the gulf between intent and actual behavior, and hence, will be immensely useful for planning relevant strategies aimed at encouraging improved return intent as well as the actual behavior of consumers. This is bound to have far reaching consequences on environmental sustainability because improved behavior to return the e-waste happens to be the very