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Conceptual framework for the study of food waste generation and prevention in the hospitality sector

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ABSTRACT

Food waste has significant detrimental economic, environmental and social impacts. The magnitude and complexity of the global food waste problem has brought it to the forefront of the environmental agenda; however, there has been little research on the patterns and drivers of food waste generation, especially outside the household. This is partially due to weaknesses in the methodological approaches used to understand such a complex problem. This paper proposes a novel conceptual framework to identify and explain the patterns and drivers of food waste generation in the hospitality sector, with the aim of identifying food waste prevention measures. This conceptual framework integrates data collection and analysis methods from ethnography and grounded theory, complemented with concepts and tools from industrial ecology for the analysis of quantitative data. A case study of food waste generation at a hotel restaurant in Malaysia is used as an example to illustrate how this conceptual framework can be applied. The conceptual framework links the biophysical and economic flows of food provisioning and waste generation, with the social and cultural practices associated with food preparation and consumption. The case study demonstrates that food waste is intrinsically linked to the way we provision and consume food, the material and socio-cultural context of food consumption and food waste generation. Food provisioning, food consumption and food waste generation should be studied together in order to fully understand how, where and most importantly why food waste is generated. This understanding will then enable to draw detailed, case specific food waste prevention plans addressing the material and socio-economic aspects of food waste generation.

1. Introduction

Food waste has become increasingly visible in policy and academic debates, due to its detrimental environmental, social and economic impacts (Gustavsson et al., 2011); however, evidence on the drivers that give rise to food waste throughout the food supply chain is still limited (Betz et al., 2015). Research tends to focus on household and retail food waste, in order to inform national and local waste management policy (see Parizeau et al., 2015; WRAP, 2013). Emerging literature covering entire food supply chains (Beretta et al., 2013; Mena et al., 2014), the hospitality sector (Pirani and Arafat, 2015), and canteens in workplaces (Goggins and Rau, 2015) provides insights into the somewhat neglected topic of food waste generation outside the household. These gaps in literature exist because the significance of food waste has been recognised only recently, and due to the way food waste has been approached in research (Garrone et al., 2014). Food waste has been studied largely from an engineering, technological perspective, with the exception of a small but growing number of researchers from other disciplines (Cohen, 2015; Edwards and Mercer, 2007; Evans, 2014; Papargyropoulou et al., 2014). In addition, food waste has predominately been studied either through quantitative (see Beretta et al., 2013) or qualitative (e.g. Evans, 2011) methods; however, there have been limited peer-reviewed papers using mixed methods.

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Given the knowledge gap in food waste patterns and drivers outside the household and the limitations of existing methodological approaches, this paper proposes a mixed methods conceptual framework for the study of food waste generation and prevention. The framework is aimed at providing measures for food waste prevention in the hospitality sector, based on a comprehensive assessment of the context, drivers and patterns of food waste generation. The paper also presents a comprehensive case study of food waste generation in the hospitality sector, as a means to illustrate this conceptual framework. The case study demonstrates how the proposed conceptual framework can provide a deeper level of analysis and offers substantial empirical data on food waste generation.

The paper is structured as follows. Section 2 presents the background, origins and applications of the tools, methods and research strategies incorporated in the proposed conceptual framework and how the framework was developed. Section 3 explains how these tools, methods and research strategies have been applied within the framework. In Section 4 a case study of food waste generation in a hotel restaurant in Malaysia is used as an example to illustrate how the proposed conceptual framework can be applied in a real research setting. The discussion on how the results from the case study relate to the literature on food waste generation is also presented in Section 4. Finally, the conclusions and the implications of the paper are presented in Section 5.

2. Literature review

This section provides a brief review to the main components of the proposed conceptual framework, with a focus on their origins and applications. It begins with tools and concepts used to collect and analyse quantitative data such as waste audit, Material Flows Analysis (MFA) and eco-efficiency analysis. Next, the section introduces the background to more qualitative research designs such as ethnography and grounded theory, and qualitative methods such as participant observation, interviews and focus groups. The section concludes with the development of the proposed conceptual framework, emerging from the literature.

The first quantitative method discussed in this section is the waste audit. Waste audits are used in baseline studies to assess hotspots of food waste generation and inform waste prevention and management strategies (WRAP, 2011). They measure the quantity and composition of waste streams with the use of weighing scales and in-situ compositional analyses. Often waste audits are carried out for small samples that represent a larger population since they are time and labour intensive. They are often repeated at different times to account for seasonal or other time related variations. In research, waste audits are mainly applied in descriptive, baseline waste characterisation studies (Okazaki et al., 2008; Wilkie et al., 2015).

Waste studies rely heavily on quantitative data (Newenhouse and Schmit, 2000), which can be analysed with the use of tools and methods from the field of industrial ecology, such as Material Flow Analysis (MFA) and eco-efficiency analysis. MFA is a systematic assessment of the flows and stocks of materials within a system defined in space and time (Brunner and Rechberger, 2003). MFA connects the sources, the pathways, and the intermediate and final sinks of a material. MFA aims to model a socioeconomic system, identify its ecologically and economically relevant flows of energy, materials and chemical substances (Fischer-Kowalski and Huttler, 1999). MFA is often described using the metaphor that the material fluxes represent the metabolism of the system (metabolism of the anthroposphere (Baccini and Brunner, 1991) and industrial metabolism (Ayres, 1989)). The first applications of MFA were within the fields of economics and engineering, although MFA has been increasingly recognised as a useful decision making tool in resource, environmental and waste management (Deutz and Ioppolo, 2015; Rieckhof et al., 2014). MFA has been used in recent studies to quantify food losses in Switzerland (Beretta et al., 2013) and investigate food waste in the Swiss food service sector (Betz et al., 2015). Sankey diagrams can help to illustrate the MAF (Schmidt, 2008). A Sankey diagram is a graphic illustration of flows, like energy, material or money flows. The flows are depicted as arrows with the width of the arrows proportional to the size of the flow.

In addition to MFA, eco-efficiency is another concept from industrial ecology used in environmental and sustainability research (Gabriel and Braune, 2005). According to the World Business Council for Sustainable Development (WBCSD, 2000) eco-efficiency is concerned with creating more value with less impact. Eco-efficiency as an instrument for sustainability analysis, indicates an empirical relation in economic activities between environmental cost or value and environmental impact (Huppes and Ishikawa, 2005). Eco-efficiency can be expressed by the ratio of economic value/environmental impact (WBCSD, 2000). Eco-efficiency is improved by reducing the environmental impact while maintaining or increasing the economic value. Although the concept of eco-efficiency has been applied predominately at a product level, as a tool it has been used for example to promote the competitiveness of economic activities in a Finnish region and mitigate their harmful environmental impacts (Seppälä et al., 2005) and to evaluate waste management options in China (Zhao et al., 2011). In the waste management field it has been a useful tool in comparing competing waste management options (Pires et al., 2011).

Despite their strengths, eco-efficiency analysis and MFA do not allow for the analysis of social practices, motivations and behaviours of waste producers. A number of methods can be used to analyse such phenomena, such as ethnography and Grounded Theory (GT).

Ethnography is the systematic study of people and cultures, rooted in the social sciences used extensively in anthropology and sociology (Gobo, 2008a). Such studies are conducted on a system bounded in space and time and embedded in a particular physical and sociocultural context (Emerson et al., 2001). In ethnography, the researcher spends a considerable amount of time carrying out field work in order to participate in the social life of the actors observed, while at the same time maintaining sufficient cognitive distance so that he or she can remain objective (Emerson et al., 2001). Various data collection methods are available in ethnography, including participant observations, interviews, focus groups, audio-visual material and documents (Gobo, 2008b). A number of waste and food waste studies have used an ethnographic approach (Evans, 2014, 2011; Goonan et al., 2014; Gregson et al., 2013; Hetherington, 2004). In these studies a mixture of data collection methods were used such as interviews, focus groups and participant observation.

Participant observation is a qualitative method that involves the systematic observation, recording, analysis and interpretation of peoples' behaviour (Saunders et al., 2009). A certain level of immersion of the researcher in the research setting itself is required, in order to discover the material and social context in which the study is set within (Delbridge and Kirkpatrick, 1994). Gill and Johnson (2002) suggest four roles the researcher can adopt in participant observation: (i) complete participant; (ii) complete observer; (iii) observer as participant; and (iv) participant as observer. One of the advantages of participant observation is that it provides a form of triangulation for the other research methods adopted within the research design (Saunders et al., 2009). Along with participant observation, interviews have been commonly used in ethnographic studies (Sherman Heyl, 2001). Interviews can range from the highly structured as used in questionnaire surveys, through to the semi-structured, and the relatively

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