
Chapter 1 – Introduction

The hospitality industry is particularly vulnerable to food waste due to its high production volume, menu diversity, fluctuating guest counts, and the operational complexity of all-day dining, buffet service, and MICE activities. Recent studies show that foodservice businesses can generate between 30 and 40 percent edible waste daily, much of which is preventable through effective monitoring and control mechanisms (Lee & Huang, 2023) (Vardopoulos et al., 2025).

Despite increased awareness of sustainability standards, many hotels still lack systematic waste measurement practices, relying instead on subjective estimation and informal reporting. According to (Afzal et al., 2022) in high-volume hotel kitchens, controllable food waste often arises from preparation trim, spoilage, forecasting inaccuracies, poor storage management, and overproduction. Without verified data, management is unable to identify high-cost waste categories or implement targeted corrective actions. This gap is reinforced by the absence of structured protocols, inconsistent staff practices, and limited visibility of real-time waste volumes across operational areas.

Based on preliminary operational observation within the hotel's food and beverage department, controllable food waste was estimated at approximately 5% - 6% of total food cost a figure consistent with findings by (Májková & Večeřová, 2025), who reported that most hotel establishments estimate their food waste levels at below 6% of total food produced, though systematic monitoring remains rare (Afzal et al., 2022). Preliminary observation was conducted over a three month period prior to formal data collection, serving as the basis for study justification. Because this waste is neither formally tracked nor analyzed, the property experiences ongoing financial leakage, limited forecasting accuracy, and reduced kitchen efficiency. The lack of standardized tracking makes it impossible to assess the true magnitude of waste, identify its primary sources, or determine cost-saving opportunities.

This Business Improvement Project (BIP) aims to address this gap by designing and implementing a structured, data-driven food waste tracking protocol. By establishing measurable processes, standardizing reporting, and integrating digital tools, the project seeks to improve cost visibility, strengthen inventory management, and drive a significant reduction in controllable food waste during the pilot implementation period.

1.1 Background

Food waste has become one of the most critical sustainability and operational efficiency challenges within the global food service industry. Recent global assessments indicate that a substantial portion of food produced for human consumption is never consumed, resulting in significant economic losses and environmental consequences. According to the Food Waste Index Report published by the United Nations Environment Programme (Division, 2024), approximately 1.05 billion tones-of food were wasted globally in 2022, representing nearly one fifth of all food available to consumer. A considerable share of this waste originates from food service establishments such as hotels, restaurants and catering operations.

Within the hospitality sector, food waste occurs at multiple states of the food service process, including procurement, storage, preparation, cooking and post-consumption disposal. Hotel operations, particularly those offering buffet dining, large scale banquet services, and multi outlet food production, face unique challenges that often increase the risk of food waste generation. Service expectations within upscale hospitality environments frequently require consistent food availability, menu variety and visually abundant displays. While these standards contribute to guest satisfaction, they often lead to over production and inefficient resource utilization.

Recent academic research has identified food waste as a significant operational issue in hospitality management. Studies indicate that food service establishments may waste between 20% and 40% of total produced, depending on the type of service model and operational management practices (Lévesque et al., 2024). This level of waste not only increases food procurement costs but also contributes to environmental degradation through unnecessary resource consumption, greenhouse gas emissions, and landfill accumulation.

Food waste in hospitality operations can generally be classified into two major categories: controllable food waste and uncontrollable food waste. Controllable food waste refers to waste that arises from operational inefficiencies and management decisions, including over production, inaccurate demand forecasting, improper storage, excessive portion sizes and inadequate inventory rotation practices. In contrast uncontrollable food waste consist of unavoidable losses generated during food preparation processes, such as bones, shells or inedible vegetable components.

Among these categories, controllable food waste represents the most critical target for

operational improvement because it can be reduced through systematic management intervention. However one of the primary barriers to effective food waste reduction in hospitality operations is the absence of accurate and consistent measurement systems. Many hotels rely on visual estimation or general assumptions when evaluating food waste levels rather than employing structured measurement protocols.

The absence of standardized waste tracking systems limits the ability of management to identify the root causes of food waste. Without reliable operational data it becomes difficult to evaluate which stages of food production contribute most significantly to waste generation. Consequently, many waste reduction initiatives remain reactive rather than strategic, focusing on general awareness rather than data driven operational improvement.

In recent years, researchers and industry practitioners have emphasized the importance of data driven food waste monitoring systems. These systems involve systematic measurement, recording and analysis of food waste quantities at different stages of food service operations. According to (Sigala et al., 2025), implementing structured waste tracking protocols can significantly improve operational transparency and enable hospitality managers to make evidence based decisions regarding production planning, menu engineering and portion control.

Technological developments have further strengthened the feasibility of implementing such systems. Digital waste tracking platforms, kitchen monitoring tools and data analytics software allow organizations to collect detailed information about waste sources and patterns in real time. These tools enable kitchen managers to identify inefficiencies within food production workflows and implement targeted interventions that reduce waste without compromising service quality.

Within hotel environments that operate multiple food outlets and large-scale banquet services, the potential benefits of data driven waste monitoring are particularly significant. Hotels frequently manage complex food production systems that involve high menu diversity, fluctuating guest demand and strict service standards. Without accurate operational data, kitchen management may rely heavily on intuition when making purchasing and production decisions, which can lead to systematic overproduction and increased food waste.

Preliminary observations within the selected hotel food service operation suggest that

controllable food waste accounts for approximately five to six percent of total food cost. Although this proportion may appear relatively moderate, the absence of structured monitoring systems prevents precise identification of the operational processes that contribute most significantly to waste generation. As a result, opportunities for improving operational efficiency and reducing food cost remain underutilized.

Furthermore, the growing emphasis on sustainability within the hospitality industry has increased pressure on hotels to adopt responsible resource management practices. Food waste reduction has become an essential component of corporate sustainability strategies, as it contributes to both environmental protection and organizational reputation, improve cost efficiency and support broader global sustainability goals.

Given these considerations, the implementation of a data driven food waste tracking protocol represents a promising approach to improving operational management in hotel kitchen environments. By systematically measuring and analyzing food waste data, hospitality organizations can develop targeted strategies that reduce controllable waste, improve cost control and support sustainable food service practices.

Therefore this research aims to examine how a structured data driven food waste tracking protocol can be implemented within hotel food service operations and to evaluate its potential effectiveness in reducing controllable food waste.

1.2 Research Problem

Despite growing awareness of sustainability and operational efficiency within the hospitality industry, many hotel food service operations still lack structured systems for measuring and monitoring food waste, in many cases, food waste quantities are estimated rather than systematically recorded, which limits management's ability to identify the operational causes and financial implications of waste generation.

The absence of reliable data creates significant challenges for hotel kitchen management. Without accurate measurement systems, it becomes difficult to determine which food production processes generate the highest levels of waste. Consequently, food waste reduction initiatives may rely on general assumptions rather than evidenced based analysis.

Within the selected hotel food service operations, food waste is currently not measured through a standardized tracking protocol. As a result, management lacks detailed information regarding

the types, quantities and sources of controllable food waste generated during daily kitchen operations. This limitation restricts the organization's ability to implement targeted operational improvements and achieve effective food cost control.

Therefore, the central problem addressed in this research is the lack of structured data driven food waste tracking protocol within hotel kitchen operations, which limits the ability to identify waste sources and implement effective strategies for reducing controllable food waste.

1.3 Research Questions

This research aims to answer the following questions:

1. What types of controllable food waste occur most frequently in hotel kitchen operations?
2. How can a structured food waste tracking protocol improve the accuracy of food waste measurement in hotel kitchens?
3. Which operational processes contribute most significantly to controllable food waste generation?
4. To what extent can a data driven tracking system reduce controllable food waste and associated food cost within hotel food service operations?

1.4 Research Objective

The primary objective of this study is to analyze the effectiveness of a data driven tracking protocol in reducing controllable food waste within hotel food service operations.

The specific objectives of the study are:

1. To identify and analyze the major sources of controllable food waste in hotel kitchen operations.
2. To design and implement a structured food waste tracking protocol suitable for hotel food service environments.
3. To evaluate the effectiveness of the tracking protocol in improving food waste measurement and operational transparency.
4. To compare controllable food waste generation patterns between the initial tracking phase and the structured implementation phase, and to evaluate observable changes in operational waste behavior following the introduction of a standardized monitoring protocol.

1.5 Scope & Limitations

This research focuses on the analysis of controllable food waste within hotel kitchen operations. The study specifically examines food waste generated during preparation, production and service stages within the hotel's main kitchen and associated dining outlets.

The research evaluates the implementation of a structured food waste tracking protocol designed to measure waste quantities, identify waste sources and support operational improvement initiatives.

Limitations of the Study

Several limitations may influence the findings of this research.

1. the study is conducted within a single hotel food service operation, which may limit the generalizability of the results to other hospitality contexts.
2. the duration of the waste monitoring implementation may not capture long term operational variations or seasonal fluctuations in food waste generation.
3. the accuracy of waste measurement may depend on staff compliance and training in recording waste data during daily kitchen operations.
4. the study focuses exclusively on waste generated within the kitchen and service areas and does not analyze food losses occurring within the external supply chain.
5. The study utilizes a quantitative observational design based on a fourteen day data collection period. Which may limit the statistical power of the findings due to the relatively small dataset size.
6. The research does not include a formal pre implementation baseline measurement, as the tracking protocol was introduced from the commencement of the observation period. Comparison are therefore limited to patterns identified within the observation window itself.
7. A significant methodological limitation of this study is the absence of a true pre-intervention baseline measurement. Data collection commenced simultaneously with the introduction of the tracking protocol on Day 1, meaning that Day 1 itself functioned as part of the intervention period rather than as a controlled baseline observation. As a consequence, the pretest phase (Days 1-7) represents an early-adoption operational condition rather than a genuine pre-protocol baseline. This design characteristic limits the degree to which causal attribution can be made between protocol introduction and

waste reduction outcomes. Future research is recommended to incorporate a dedicated baseline observation period conducted prior to any protocol introduction to enable more rigorous before-after comparisons.

8. The pretest phase of this study represents the initial seven-day period during which the tracking instrument was introduced and staff familiarization with recording procedures was ongoing. As such, pretest data may reflect a transitional operational condition rather than a fully stable baseline, and should be interpreted accordingly.
9. The posttest phase covers the subsequent seven-day period during which tracking procedures had been consistently applied and staff recording compliance had stabilized. Comparisons between phases therefore reflect improvements in measurement consistency alongside any observable changes in waste generation behavior.

1.6 Significant of Study

This study provides several important contributions to both academic research and hospitality industry practice.

Academic Contribution

The research contributes to the growing body of literature on sustainable hospitality management and food waste reduction strategies. While previous studies have primarily focused on quantifying food waste levels, fewer studies have examined the role of structured operational tracking protocols in reducing controllable waste within hotel environments.

Practical Contribution for Hospitality Industry

For hospitality practitioners, the study provides a practical framework for implementing systematic food waste monitoring systems. The findings may assist hotel management in improving operational efficiency through better production planning, portion control and inventory management.

Environmental Contribution

Reducing food waste also supports environmental sustainability by minimizing unnecessary resource consumption, reducing greenhouse gas emissions, and decreasing landfill waste.

Managerial Contribution

The study demonstrates how data driven decision making can enhance operational management in hotel kitchens. By utilizing reliable waste data, managers can identify inefficiencies, implement targeted corrective actions and improve overall food cost control.

Chapter 2 - Literature Review

This chapter will discuss various studies and theories relevant to the research topic of reducing food waste that can be controlled through the implementation of a data-driven tracking system in hotel food service operations. The purpose of this literature review is to better understand current research developments, identify the theoretical concepts underlying the research, and identify research gaps that this study can address.

The literature review in this chapter is divided into three main sections: the theoretical framework, a review of previous research, and identification of research gaps and research novelties.

2.1 Conceptual Framework

Based on the various theories presented previously, this study develops a conceptual framework that illustrates the causal relationship between information technology implementation and operational optimization. This framework maps how the use of a Data Driven Tracking System serves as a key catalyst in transforming conventional food waste management into a more precise and measurable system in the hotel environment.

As presented in:

1. Data Driven Tracking System Integration as a Key Intervention

A data-driven tracking system is positioned as an independent variable that triggers changes in three operational functional pillars:

- **Waste Monitoring:** Provides full visibility into the volume and type of waste generated.
- **Production Control:** Enables tighter control over the amount of material processed to align with actual needs.
- **Decision Making:** Provides a robust database for managers to make strategic decisions that are no longer based on intuition.