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# The Effect of the Perceived Utility of a Management Control System with a Broad Scope on the Use of Food Waste Information and on Financial and Non-Financial Performances in Restaurants

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**Abstract:** The purpose of this study is to analyse the effect of the perceived utility of a management control system with a broad scope on the use of food waste information and on financial and non-financial performances in restaurants. To collect data, a questionnaire was administered in Brazilian restaurants. Data from 206 restaurants were analysed with structural equation modelling, which was performed with SmartPLS software. The results reveal that a management control system of broad scope, which includes non-financial information, is oriented towards the future, and contains an external and long-term focus, assists in the use of information on food waste. In addition, the use of information about food waste by managers improves the financial and non-financial performance of restaurants. The study contributes to the literature by showing that broader information systems are effective in managing food waste, and they can also contribute to improving performance.

**Keywords:** management control system design; broad-scope; food waste; information; performance; food service industry

## 1. Introduction

Food waste is a significant global problem with consequences for food security and economic, social and environmental sustainability [1–3]. Food waste refers to “food which was originally produced for human consumption but then was discarded or was not consumed by humans. Includes food that spoiled prior to disposal and food that was still edible when thrown away” [4] (p. 112). According to the United Nations Food and Agriculture Organization (FAO), food waste is only measured for products intended for human consumption and excludes animal feed and product parts that are inedible. The FAO estimates that the loss and waste of food is one-third of the total amount of food produced: approximately 1.3 billion tons [5]. Reducing food waste levels is critical to mitigating hunger and reducing pressure on natural resources [1,6–8].

Reducing food waste is an interdisciplinary and multisectoral task that requires study from different perspectives [3,9,10]. In companies, this task is addressed by business management [4,11], which presupposes the incorporation of waste information in the planning and control system. Studies have recommended the implementation of information systems to manage food waste, e.g., [6,12–15]. However, it is challenging to design management systems that incorporate food waste measures in a manner that facilitates decision-making [16,17].

A management control system (MCS) can play this important role, as it can provide useful information for decision-making [18] and influence people to achieve organizational goals [19–21],

because an MCS facilitates the appropriation of the benefits of sustainable innovations in organizations [22]. Such systems can be designed to provide more sophisticated information, which can facilitate the decision-making process and the coordination of various activities related to food waste [13,15]. These broad information systems are referred to in the MCS literature as “broad-scope” [23,24]. The scope dimension has three sub-dimensions: focus, quantification, and time horizon [25]. “Focus” refers to whether the information is collected from within the firm or outside it (e.g., economic, technological and market factors). The quantification feature pertains to whether the information is financial or non-financial. “Time horizon” refers to the extent to which the information relates to future rather than historical events. Thus, broad-scope information is externally focused, non-financial, and future-oriented [23]. To enhance the process of making decisions regarding food waste, it is essential to align scope with this use of an MCS. Thus, information of a broader scope can be used to support decisions regarding food waste. These performance measures for food waste can be formed by a combination of broad-scope measures [26]. For example, they can be formed from financial and non-financial information (e.g., costs, revenue from scrap, amount of waste). In this study, we propose to fill a gap in the management studies literature by aligning scope of MCS and use of food waste information for application in restaurants.

Studies reveal the importance of management mechanisms [13,15], such as big data [14] and performance indicators [27]. However, Warshawsky [28] recognized that the current business information system does not provide sufficient information for the management of food waste. In addition, the limited use of food waste information may be hampering related decision-making. There is relatively little empirical research examining how or under what circumstances MCS, more specifically the scope and use of food waste evaluation systems, can assist in the communication and management of food waste. Thus, investigating the importance of information of a broad scope for different levels or types of decision [23] can be fundamental. The purpose of this study is to analyse the effect of the perceived utility of a management control system of broad scope on the use of food waste information and on financial and non-financial performance in restaurants. To attain this objective, we used a questionnaire and used structural equation modelling to analyse data collected from 206 restaurants.

In this study, we argue that an MSC of broad scope is a means of assisting the decision-making process about food waste in restaurants for two reasons: (a) the decision-making environment about food waste in restaurants is dynamic; that is, food waste can occur at various stages (e.g., planning, purchasing, production, processing or cooking, cleaning, service, storage or stock management [29]); and (b) the information is broad in scope; that is, it is operational, financial, non-financial, external and forward-looking (e.g., product time to market, role of supply chain actors in food waste [13], operational aspects that lead to food waste [14,15], food management measures [16,17], and policies to avoid food waste [4]).

We contribute to the food waste literature by addressing this problem using a management control system (MCS). More specifically, we include in the MCS scope food waste information of a broad scope (i.e., non-financial, external, future-oriented and long term) and indicators that apply to food waste. We also expand empirical knowledge on the impact of food waste information on company results by analysing financial and non-financial performance in a segregated way. This analytical approach is adopted because studies have revealed that reducing food waste cannot be left to consumers alone; on the contrary, food waste reduction involves a double loop between consumers and companies [2]. The role of service companies, such as those in restaurants, can be important in reducing food waste [15,28]. We contribute to this field by empirically demonstrating that the scope and use of an MCS that includes food waste information improves the financial and non-financial performance of restaurants. This article contains sections on the background, materials and methods, results, discussion and finally a section on our conclusions.

## 2. Background

### 2.1. Broad-Scope of Management Control System

Management control systems (MCS) are formal systems designed to provide information to managers, and their scope can be broad or restricted. The first scope comprises internal, financial and historical information, while the second is non-financial, external and future-oriented information [23,24,30–34]. Information with a broad scope can be financial and non-financial, and it can deal with future events based on plans for internal operating activities and external circumstances (changes). Such information includes target price, net present value and flexible budget [31].

There is empirical evidence on the importance of the perceived utility of broad-based information to manage uncertainties and complexities in organizations [32,34]. Therefore, the perceived usefulness of broad-scope systems affects the way information is used in organizations [24]. Our study deals specifically with information of broad scope, as it considers that for the use of information about food waste, several elements are needed to assist decision-making processes on operational activities [29] and organizational approaches [35,36].

### 2.2. Use of Food Waste Information

An emerging flow of literature explored corporate decisions as essential elements for reducing food waste and better performance [13–15]. What is known is that decisions about food waste can occur during planning, purchasing, production (processing or cooking), cleaning, service, storage or stock management operations [29]. Among the decisions made by managers of different organizations, the following have been observed: (a) demand and menu planning [7,12,37–40], (b) purchasing decisions [41,42], and (c) eco decisions—internal and external controls [35,36].

The literature reveals that management interventions [13], as well as operational aspects [14,15], food management measures [16,17], and effective policies must be considered to avoid food waste in organizations [4]. For example, Dora et al. [27] demonstrated that the inclusion of food waste in the main performance indicators (KPI), as well as the use of appropriate planning and scheduling tools, helps companies to reduce waste and improve performance.

## 3. Materials and Methods

### 3.1. Questionnaire Design and Data Collection

To select subject companies in the restaurants, we used the register of companies in the tourism sector known as Cadastur [43]. From this register, 1011 companies were selected that had complete contact details. The restaurants were selected for our research for several reasons. First, our theoretical model was proposed to analyse the perceived utility of MCS (broad-scope) and use of information in food waste, and a single sector was recommended to decrease noise in the data [44]. Second, Brazil's restaurant network has expanded in response to a variety of factors, such as the organization of major events, including the soccer World Cup and the Olympics, which brought large numbers of tourists to the country [44]. However, another factor was the economic crisis faced by Brazil in recent years, one result of which was an employment shift of numerous individuals into the informal sector, including food selling as a means of earning a living. Third, waste in restaurants is significant [45], and the sector has been identified as the third-largest source of food waste [46].

A questionnaire based on the literature was designed to collect the data. The variables found in the questionnaire are described in detail in Section 2.2 (Table 2). Before administering the questionnaire, a pre-test was conducted using four academics and a restaurants manager to ensure question comprehensibility, verify appropriate extent and determine the response time.

A specialized company performed the data collection. To guarantee the reliability of the collected data, the company follows procedures previously used for academic research [47]. First, an introductory letter and the study objectives were presented. Interviewees who agreed to complete the questionnaire

were included in the initial sample. The process of telephoning the restaurant members in the sample occurred from March to April 2020. The survey resulted in 206 responses, equivalent to 20.5% of the original sample population. This number of responses is representative and more than that of other studies in the area [7,36,38,45]. The characteristics of the respondents and restaurants are shown in Table 1.

**Table 1.** Descriptive Statistics for Demographic Variables (N = 206).

| Panel A—Respondent Characteristics  |             |     |                      |                             |     |
|-------------------------------------|-------------|-----|----------------------|-----------------------------|-----|
| Academic education                  | High school | 82  | Gender               | Female                      | 79  |
|                                     | Graduate    | 119 |                      | Male                        | 127 |
|                                     | MBA         | 5   |                      | 21–30                       | 29  |
| Tenure (years)                      | Up to 5     | 95  | Age (years)          | 31–40                       | 92  |
|                                     | 6–10        | 66  |                      | 41–50                       | 40  |
|                                     | +10         | 63  |                      | 51–60                       | 31  |
|                                     |             |     |                      | Over 61                     | 8   |
|                                     |             |     |                      |                             |     |
| Panel B—Restaurants Characteristics |             |     |                      |                             |     |
| Number employees                    | Up to 100   | 34  | Food service (style) | À la carte                  | 65  |
|                                     | +100        | 183 |                      | Buffet (kg)                 | 11  |
| Number seats                        | To 20       | 143 |                      | Buffet free                 | 25  |
|                                     | 21–40       | 57  |                      | À la carte and buffet       | 71  |
|                                     | 41–60       | 4   |                      | Buffet (kg) and buffet free | 29  |
|                                     | 61–80       | 1   |                      | Prato done                  | 3   |
|                                     | +81         | 1   |                      | Other                       | 2   |

We also tested possible biases in the sample. First, we evaluated common method bias, using the Harman single factor test [44]. The first factor showed a total explained variance of 31.25%, confirming the absence of the common method bias. Second, we performed the non-response bias test by comparing the first 10% of the answers to the last 10% [48]. There were no differences between the constructs, with the exception of financial performance ( $p < 0.05$ ); similar results were reported in the study by De Harlez and Malagueno [49].

### 3.2. Variable Measurement

The study variables were constructed based on the literature and organized in a manner that facilitated analysing the research elements: scope and use of information, food waste information, financial and non-financial performance, and characteristics of managers and restaurant companies (Table 2).

**Table 2.** Variables Measurement.

| Variables                              | Description  |
|--|--|
| Perceived Utility of MCS (Broad-Scope) | Information characteristics: (i) past and future facts, (ii) internal and external information, (iii) financial and non-financial information, and (iv) short-term and long-term thinking. |
| Use of FW Information                  | Food waste information use: (i) monitor internal compliance, (ii) internal processes, (iii) internal decision-making, (iv) external reports.   |
| Financial Performance                  | Perception of the financial performance of the restaurants: involves operating, net revenue, and return on investment.   |
| Non-Financial Performance              | Perception of (i) customer satisfaction, (ii) quality of products and services provided, (iii) development or product and service innovation, and (iv) employee resources.                 |
| Control variables                      | Manager characteristics (age, gender, and education) and the restaurants (number of employees and seats, and business maturity).   |

### 3.2.1. Perceived Utility of MCS

Broad-scope MCS was measured with four scope dimensions: non-financial, future orientation, external orientation, and long-term orientation [24,30,34]. The restaurant managers indicated the usefulness of the following information characteristics: (i) “compared with information on past facts, I think that information about future facts is ...”, (ii) “compared with internal information, I think that external information is ...”, (iii) “compared to financial information, I think non-financial information is ...”, and (iv) “compared to short-term information, I think long-term information is ...”. A five-point Likert scale was used to measure the questions (scale: 1 = not very useful, 5 = very useful). The respondents could also answer “C0” when they did not know the answer or felt the question did not apply to their circumstances.

### 3.2.2. Use of Food Waste Information

This construct was measured using food waste information. The information was adapted from the literature on eco-controls [35,36]. Recent research issues have been slightly adapted to the context of food waste [8,29]. We used four questions regarding the following topics to measure our construct: (i) monitoring of internal compliance with food waste policies and regulations, (ii) promotion of continuous improvement of internal processes to avoid food waste, (iii) provision of data for internal decision-making on food waste, and (iv) provision of data for external reports on food waste. A five-point scale was used (1 = not used to 5 = used). The respondents could also answer “0” if they did not know, or the question did not apply.

### 3.2.3. Financial Performance

Three questions have been widely used in the MCS literature to measure financial performance in restaurants. The measures assess operating profit [36,50], net revenue [51], and return on investment [44,52]. A Likert scale from 1 to 5 was used (1 = below average to 5 = significantly above average).

### 3.2.4. Non-Financial Performance

Non-financial performance was measured using a balanced scorecard (BSC), adapted from Elbanna et al. [50] and Abdel-Maksoud et al. [36]. This variable was measured by four items: (i) customer satisfaction (customer perspective), (ii) quality of products and services provided (internal business perspective), (iii) development or product and service innovation (innovation perspective), and (iv) employee resources (learning perspective). A Likert scale from 1 to 5 was used (1 = below average to 5 = significantly above average).

### 3.2.5. Control Variables

It was expected that characteristics of the manager and the restaurants are related to food waste. In this regard, we performed complementary analyses using the following manager characteristics: age, sex, and education. Age was measured in years of life. The gender variable was divided into male and female. Finally, education was separated into managers with a background in business and other backgrounds not related to business areas. We understand that these characteristics may influence the model because they are often noted in studies as variables that can cause food waste (for example, [6,26,53–56]). The restaurant characteristics included size (number of employees and seats) and business maturity. Employees were measured by the number of permanent contracts, and seats by the number of seats available to customers. The maturity of the business was measured by the years since the restaurant was founded. Studies indicate that the size of a food service company can play an important role in food waste generation [7,8,42,57].

### 3.3. Data Analysis

For the data analysis, we used structural equation modelling (SEM). SEM can be classified into two types: (i) SEM based on covariance (MEEBC) or (ii) simple LISREL models and the partial quadratic minimum, which amounts to performing SEM by parts [58]. This technique is appropriate because in this study we seek to analyse the relationship between broad-scope MCS, the use of food waste information and financial and non-financial performance in the restaurants.

For the analysis, we used Smart/PLS 3 software. The PLS-SEM analysis is performed in two stages: the first addresses the validity and adequacy of the constructs based on the relationship between the information and the latent variables (or constructs) and thus enables the researcher to evaluate construct reliability and validity; the second addresses the relationship between latent variables and enables one to verify whether an exogenous latent variable is related to an endogenous latent variable [50]. PLS does not require data to be normally distributed and can handle high complexity [58].

## 4. Results

### 4.1. Measurement Model

Initially, we verified the factorial loads of the model variables. According to Table 3, the loading factor values were very close to or above 0.7 and are thus in line with what is recommended by the literature [59]. To verify model reliability, reliability and validity checks were performed. The composite reliability (CR) values were all above 0.80, and the average variance extracted (AVE) values were larger than 0.5. Cronbach's alpha was also determined. Its values were very close to or above 0.7. Thus, all results are above the recommended limits, which indicates the internal reliability of the measurement model.

**Table 3.** Factor Loading, Reliability and Variable Validity Results.

| Variable                               | Item | Loading | Cronbach's Alpha | CR    | AVE   |
|--|------|---------|------------------|-------|-------|
| Perceived Utility of MCS (Broad-Scope) | Deb1 | 0.836   | 0.860            | 0.837 | 0.565 |
|  | Deb2 | 0.743   |                  |       |       |
|  | Deb3 | 0.657   |                  |       |       |
|  | Deb4 | 0.758   |                  |       |       |
| Use of Food Waste Information          | Use1 | 0.717   | 0.815            | 0.853 | 0.592 |
|  | Use2 | 0.804   |                  |       |       |
|  | Use3 | 0.719   |                  |       |       |
|  | Use4 | 0.832   |                  |       |       |
| Non-Financial Performance              | Nof1 | 0.840   | 0.880            | 0.908 | 0.713 |
|  | Nof2 | 0.878   |                  |       |       |
|  | Nof3 | 0.836   |                  |       |       |
|  | Nof4 | 0.821   |                  |       |       |
| Financial Performance                  | Fin1 | 0.910   | 0.904            | 0.938 | 0.835 |
|  | Fin2 | 0.939   |                  |       |       |
|  | Fin3 | 0.890   |                  |       |       |

In addition, we tested the discriminant validity by the criteria of Fornell and Larcker (Table 4). The results reveal that none of the correlations between the constructs was greater than the square root of the stroke, indicating that there is discriminant validity in the research model. This outcome demonstrates that the measurement model has satisfactory convergent and discriminant validity.

**Table 4.** Discriminant Validity—Fornell and Larcker.

|  | Broad-Scope MCS | Use of Food Waste Information | Financial Performance | Non-Financial Performance |
|--|-----------------|-------------------------------|-----------------------|---------------------------|
| Perceived Utility of MCS (Broad-Scope) | 0.751           |                               |                       |                           |
| Use of Food Waste Information          | 0.356           | 0.770                         |                       |                           |
| Financial Performance                  | 0.088           | 0.261                         | 0.914                 |                           |
| Non-Financial Performance              | 0.137           | 0.325                         | 0.498                 | 0.844                     |

#### 4.2. Structural Model

The broad-scope MCS, which includes food waste information and non-financial performance and is future- and external- and long term-oriented, positively and significantly impacts the use of food waste information. In addition, the use of food waste information, including the monitoring of internal compliance with food waste policies and regulations, the encouraging of continuous improvement of internal processes to prevent food waste, and the provision of data for internal decision-making on food waste and for external reports on food waste, positively and significantly affects non-financial and financial performance. Table 5 shows the structural model with the significant path coefficients.

**Table 5.** PLS Structural Model with Significant Path Coefficients.

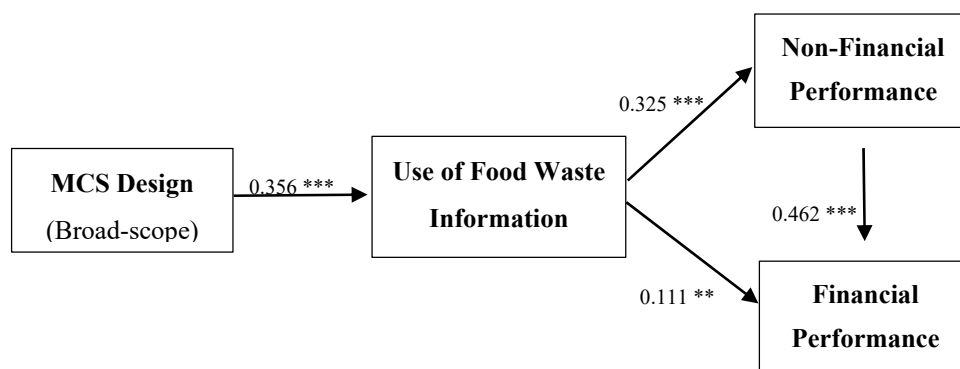
|  | Original Sample (O) | T Statistics ( O/STDEV ) | P Values  |
|--|---------------------|--------------------------|-----------|
| Perceived Utility of MCS (Broad-scope) -> Use of Food Waste Inf. | 0.356               | 4.921                    | 0.000 *** |
| Use of Food Waste Inf. -> Financial Performance                  | 0.111               | 2.039                    | 0.041 **  |
| Use of Food Waste _Inf. -> Non-Financial Performance             | 0.325               | 4.265                    | 0.000 *** |
| Non-Financial Performance -> Financial Performance               | 0.462               | 6.019                    | 0.000 *** |

\*  $p > 0.10$ ; \*\*  $p > 0.05$ ; \*\*\*  $p > 0.01$ .

Non-financial performance consists of customer satisfaction, the quality of products and services provided, product development or service innovation, and employee resources, and has an impact on operating profit, net revenue, and return on investment (financial performance).

## 5. Discussion

Our results reveal that a broad-scope MCS that includes non-financial information is future- and external- and long term-oriented, and affects the use of food waste indicators. The findings indicate that broad-scope information is important in managing food waste. This is because waste management involves the combination of various types of information. For example, there is a need for information on, e.g., waste costs, cost and revenue per dish, wasted food quantities and customer satisfaction. That is, managers require a mix of information that combines financial and non-financial data. Our results agree with previous studies that demonstrate that broad-scope MCS improves information relevance and that helps manage flexibility, decentralization and innovation [24,60,61]. It also reveals that the use of managerial information [13,15], and performance indicators [27] on food waste improves financial and non-financial results. Figure 1 shows the structural model with the significant path coefficients.



\*  $p > 0.10$ ; \*\*  $p > 0.05$ ; \*\*\*  $p > 0.01$ .

**Figure 1.** PLS structural model with significant path coefficients.

Management in restaurants also demands information oriented towards the future, which is consistent with [15,23,24,30–32,34]. For example, planning and forecasting is noted in the literature as the best way to reduce food waste. Strotmann et al. [62] and Derqui and Fernandez [12] argue that it is essential to define the objectives to be achieved. In addition, these objectives can be subdivided into quantitative and qualitative objectives. Generally, food waste occurs because of planning and forecasting errors, such as mistaken customer-number forecasts. Overestimating customer demand generates food overproduction, which has been identified as a primary cause of waste [2,7,16,17,37,45,62,63]. This overestimation of demand is in many cases generated by a lack of information; were it available, this information would make it possible to better plan food service activities, such as the accurate estimation of customer numbers. The flow of customers for the day, week or month is also important information, e.g., planning purchases, estimating the amount of food to be prepared, and calculating employee time off. Goh and Jie [64] note that to reduce waste it is necessary to implement measures based on accurate information that facilitate preparing the correct number of meals.

Previous studies have observed that the use of performance assessment information for food waste is not yet fully consolidated in the sector. For example, Otten et al. [17] found that only three food-generating businesses reported the presence of official targets for preventing food waste and that only three companies reported being in the process of creating such goals. In addition, these goals vary in terms of results (e.g., food volume or the amount of an ingredient used) and the level of responsibility (e.g., department or food preparation station). Most companies mentioned that these goals have been defined or are being defined at the corporate level. Two companies without goals reported that they thought they did not require such goals or that there was no corporate support for establishing them. Strotmann et al. [16] analysed food waste reduction before and after the process of developing and implementing measures to reduce waste. Their results reveal that there was a reduction in food waste after the implementation of the measures.

Lack of planning can also affect other activities and processes. For example, Bilska et al. [45] found that a substantial quantity of stock was lost due to unplanned purchases. Planning information can play an important role in reducing unplanned purchases at the consumer level [2,65] but also in the restaurants. Cicatiello and Franco [66] observed a lack of adequate records on food waste in supermarkets in Italy. Such information can also be essential to establishing marketing plans, such as promotions and daily specials as well as discounts [10], among other creative activities, as well as the increase in other strategies such as increasing the temperature of food storage [67].

Our results also indicate that external information (e.g., regarding the market) and use of management information [15] and big data [13] are important in making decisions concerning food waste. The restaurants must increasingly anticipate market changes, and for this they require information on the external environment, such as customers and suppliers. The food sector is highly sensitive to changes in the business environment and must be aware of any such changes. Thus, having



information regarding the external environment can mean faster adaptation. Therefore, the use of technology to support decision-making is increasingly identified as an essential tool to help reduce food waste [13,26]. It seems that managers recognize the importance of receiving more sophisticated information to managing food waste.

The results also reveal that the use of food waste information generates better financial and non-financial performance. This outcome shows that food waste management improves performance in restaurants. In addition, the improvement in non-financial performance has a positive impact on financial performance, which indicates that non-financial measures affect financial performance. Irani et al. [13] demonstrated that the use of managerial information on food distribution and consumption can improve the non-financial result (food security and reduced food waste). Wen et al. [15] showed that the use of information technology allowed waste management in restaurants. Dora et al. [27] demonstrated that the inclusion of performance indicators (KPI) and appropriate planning and scheduling tools helps companies to reduce food waste and improve performance.

To expand the results of the model, we performed complementary analyses with variables related to the characteristics of the respondents and the restaurants. The objective was to investigate possible characteristics that could help explain the results of the research model. We selected the variables used in these analyses from the literature. For example, researchers note that age, gender and education can be variables that affect food waste (e.g., [3,6,12,68]). Initially, we analysed variables related to restaurants managers. The results are shown in Table 6 (Panel A).

**Table 6.** Manager and restaurants control variables.

| Panel A—Manager Control Variables     |                                |                    |                 |            |                        |                 |
|---------------------------------------|--------------------------------|--------------------|-----------------|------------|------------------------|-----------------|
| Relations                             | Age                            |                    | Gender          |            | Education              |                 |
|                                       | Less Than or Equal to 30 years | More Than 30 years | Male            | Female     | Background in Business | Other Education |
| MSC-Sco→UseFW                         | 0.404                          | 0.395 ***          | 0.318 ***       | 0.377 ***  | 0.355 ***              | 0.595 ***       |
| UseFW→FinPerf                         | 0.192                          | 0.096              | 0.147 *         | 0.100      | 0.153 ***              | 0.080           |
| UseFW→Non-FinPerf                     | 0.396 **                       | 0.319 ***          | 0.265 *         | 0.364 ***  | 0.406 ***              | 0.020           |
| Non-FinPerf→FinPerf                   | 0.596 ***                      | 0.441 ***          | 0.488 ***       | 0.452 ***  | 0.412 ***              | 0.545 **        |
| Panel B—Restaurants Control Variables |                                |                    |                 |            |                        |                 |
| Relations                             | Employers                      |                    | Seats           |            | Business Maturity      |                 |
|                                       | Up to 10 employers             | +10 employers      | Up to 100 seats | +100 seats | Up to 10 years         | +10 years       |
| MSC-Sco→UseFW                         | 0.458 ***                      | 0.345 ***          | 0.364 ***       | 0.473 ***  | 0.426 ***              | 0.389 ***       |
| UseFW→FinPerf                         | 0.174 ***                      | 0.079              | 0.184 ***       | −0.003     | 0.216 ***              | 0.127           |
| UseFW→Non-FinPerf                     | 0.228 *                        | 0.400 ***          | 0.359 ***       | 0.210      | 0.329 ***              | 0.258 ***       |
| Non-FinPerf→FinPerf                   | 0.643 ***                      | 0.312 ***          | 0.471 ***       | 0.475 ***  | 0.681 ***              | 0.272 **        |

Note: MSC-Sco = Perceived Utility of MCS (Broad-Scope); UseFW = Use of Food Waste Information; Non-FinPerf = Non-Financial Performance; FinPerf = Financial Performance; \*  $p > 0.10$ ; \*\*  $p > 0.05$ ; \*\*\*  $p > 0.01$ .

The results reveal that the relationship between perceived utility of MCS (broad-scope) and the use of food waste information is not significant for managers of up to 30 years of age. This outcome indicates that younger managers may have less experience and skill with management systems, and a lesser ability to plan [2]. In contrast, the use of food waste information had a positive and significant impact on financial performance for male managers with business experience. Studies have found that a business background can be important in management, as managers with training in this area tend to be more conservative and accurate when making forecasts [69,70]. This background also makes them more adept at making strategic decisions.

The relationship between the use of food waste information and non-financial performance was not significant for managers trained in areas other than business. One of the explanations is the cognitive capacity related to the implementation of management systems and the use of information from managers trained in the business area [71–73]. Although demographic characteristics are expected to offer predictive power in relation to food waste management [26], the empirical evidence from this study reveals that age (i.e., younger managers), gender and training in other areas (than business) do not significantly affect the results.

The restaurants control variables used in this study to reflect size are presented in other studies as characteristics related to food waste [7,8,57]. The results for the restaurant characteristics reveal that those enterprises that are larger (more than 10 employees and more than 100 seats) and with more years of operation (over 10 years) do not perceive that the use of food waste information improves financial performance. In larger restaurants with more than 100 seats, the use of information on food waste is also not significantly related to non-financial performance. This is a curious result, since it was expected that larger restaurants would make greater use of information about food waste; consequently, this greater use of information would be reflected in financial and non-financial performance. New studies can better explore these relationships and expand knowledge about possible factors that may explain these results.

This study contributes to the literature by demonstrating that a management control system that includes food waste information can help improve performance in the restaurants. The results also reveal that using broader information systems can help with waste management. Thus, the study not only contributes to the literature but can also assist managers, accountants, and controllers in the restaurants.

## 6. Conclusions

The aim of this study was to analyse the effect of the perceived utility of a management control system of broad scope on the use of food waste information and on financial and non-financial performance in restaurants. To conduct the study, a questionnaire was used in Brazilian restaurants. To analyse the data provided by 206 responses, structural equation modelling was performed.

The study concludes that a comprehensive MCS, i.e., one that includes non-financial information, is future- and externally oriented and long-term, affects the use of food waste indicators. This outcome indicates that more comprehensive information helps restaurant managers make decisions regarding food waste.

Our study provides empirical evidence that the use of food waste information in restaurants (a—internal compliance with waste policies and regulations; b—continuous process improvement; c—waste data provision; d—external waste data) improves non-financial performance (a—customer satisfaction, b—quality of products and services, c—development and innovation of products and services, d—human resources) and financial performance (a—operating profit; b—net revenue; c—return on investment). The study finds that the use of broad-scope information on food waste improves organizational performance. These findings provide evidence that can assist restaurant managers in the design of management systems.

Although the results are robust, our study has several limitations. The findings represent manager perceptions regarding the scope and use of food waste information and business results. For example, managers can overestimate the performance of their businesses compared to their competitors. Several questions in the study regarding the use of information were adapted to the food waste context. Despite these limitations, the study results are an important addition to knowledge regarding food waste management.

Future research may investigate other aspects of the management system, such as diagnosis and interactive use. In addition, more research is needed on the role of planning and control systems in food waste, so that it is possible to analyse the reflection of management issues (e.g., purchasing planning, training of kitchen staff, and employee and customer awareness) in the level of food waste and the

companies' operating and financial results. It is also important to study the incentive systems related to food waste and their impact on employee motivation. Studies that assess manager motivation and economic gains in connection with MCS design and use are encouraged.

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