

ORIGINAL RESEARCH**Systems-practice framework: An integrated approach for foodservice management**Sarah GOONAN,¹ Miranda MIROSA² and Heather SPENCE¹*Departments of ¹Human Nutrition and ²Food Science, University of Otago, Dunedin, New Zealand***Abstract**

Aim: There is increasing pressure on foodservice organisations to improve the sustainability of their operations and to do so practitioners must be equipped with appropriate tools. In this paper, a tool to guide management strategies for pro-environmental behaviour change is introduced. The tool is based on a new framework that combines two existing models: the widely used foodservice 'systems model' and a model from sociology proven to be effective for understanding sustainable practices, the 'social practice model'.

Methods: This new hybrid 'systems-practice' framework is applied to an ethnographic case study, using document analyses, observations, focus groups and interviews, to investigate food waste in hospital kitchens. The present case study illustrates the practical implications of employing this approach and enhances the external validity of the proposed framework.

Results: The present study showed how the social practice model added to the existing systems model emphasised the role of foodservice personnel for generating pro-environmental practices, and thus offered a more people-based approach to foodservice management.

Conclusions: The case study data provided evidence for the efficacy of a systems-practice approach to foodservice. This is especially relevant for encouraging a more environmentally aware behavioural orientation within foodservice systems. Based on easy-to-follow steps presented in the adjoined 'application of the systems-practice guide', practitioners can use the framework to either understand practices that already exist in their operations, with the purpose being to ensure further systemisation of positive practices, or to effect change by creating new sustainable practices and phasing out existing unsustainable practices.

Key words: environment, food service, practice, social research.

Introduction

The foodservice industry is faced with sustainability challenges across the scope of practice.^{1,2} Within the academia, addressing complex environmental problems in foodservice management requires scholars to embrace new and innovative ways of thinking. Part of this process is the admission that not one discipline has all the answers, and the best possible outcomes are more likely to occur when researchers reach across disciplinary boundaries to amalgamate their specialised knowledge in an interdisciplinary fashion. This paper proposes a model with a hybrid framework using

models from two disciplines, a systems model from foodservice, and a social practice model from sociology. Specifically, the objective of this paper was to suggest that social practice theory enhances the value of the foodservice systems model as a management tool by identifying elements of pro- and non-environmental practices as well as target areas for potential pro-environmental behaviour change initiatives. The literature review section provides the theoretical backdrop for the framework, describing both the systems model and its application in foodservices and the social practice model as a tool for effecting pro-environmental behaviour change. Following this, the models are combined and the new integrated systems-practice framework is presented and discussed. To demonstrate the value of the framework, a case study investigating food waste-related practices in hospital kitchens is briefly described. The final section discusses the implications of the integrated framework for practitioners.

Many social researchers emphasise the holistic nature of sustainable practices and encourage a systems approach to research.^{3–5} Spaargaren⁵ described the systems concept as things or objects that do not figure in isolation, but hang together in specific ways with inter- and intradependencies

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between people and physical and material objects. A definition of the systems model commonly used in the foodservice industry is 'a system is a set of interdependent parts that work together to achieve a common goal'.⁶ A foodservice organisation, therefore, can be considered as a system. The systems model thus defined is widely taught and used as a management tool and is hereafter referred to as the 'systems model'.

A systems approach to management in foodservice organisations focuses on the interrelationships of all activities and facilitates problem solving and decision making.⁶ While it guides foodservice managers with the organisation of large amounts of information, it also focuses on the entire foodservice system and facilitates an in-depth scrutiny of all of its parts or subsystems.^{6,7} The systems model is a set of inter-related and interdependent parts with inputs, subsystems that perform the operations of the foodservice, and outputs, all of which sit under the broad functions of control, management and memory. All system parts interact with the environment external to the foodservice, and feedback from any part of the system provides managers with information necessary to adjust performance to achieve foodservice goals. Systems react to internal and external forces to maintain a dynamic equilibrium with their environment. Different inputs and operational processes are managed to achieve goals, or to 'achieve equifinality' in systems terminology.

The systems model considers human inputs from the perspective of their skills and abilities and their impact on the system. As such, it is a very useful management tool. However, it does not emphasise how attitudes, motivation, social norms and habits influence behaviour in relation to the formal controls, processes and goals of foodservice. Integrating concepts from social practice theory helps address this gap.

While many behavioural models focus on an individual's responsibility for the outcome of his/her actions, social practice theory shifts the focus towards the practice itself as the core unit of analysis. Although social practice theory has a long history dating back to prominent twentieth century social theorists such as Bourdieu, de Certeau, Foucault and Giddens, a new wave of theorists have been using and extending their ideas, and then applying them to new areas (e.g. consumption,⁸ science and technology,⁹ strategy research,¹⁰ and neuroscience¹¹). Many second-generation scholars promote social practice theory as an effective means for understanding sustainable practices in everyday life and encouraging pro-environmental behaviour.¹² A key message of social practice theory in the environmental context is that creating pro-environmental patterns of consumption depends on the transformation of current practices to make them more sustainable, rather than on the education or persuasion of individuals to change their behaviour. There is not one unified 'social practice theory', nor is there a unified definition what a social practice is. The definition of a social practice recently adopted as useful for pro-environmental behavioural change,³ and used in this research, is that practices are assemblages of constituent elements: materials (things, technology); images (mental activities, specifically

symbolic meaning or symbols); and skills (competence, bodily knowledge and procedures).⁹ These elements are dynamically integrated by practitioners through performance, resulting in one of three possible formulations: (i) the elements exist but are yet to be integrated; (ii) the elements are actively integrated; and (iii) the elements were integrated, but the sustaining links are no longer made.⁹ In other words, practices can be created, stabilized or broken as links among elements are formed, challenged or broken.

Using cooking as an example, the practice itself is cooking and the chef is the practitioner. Cooking involves a specific set of images (how the food should taste or the aesthetic appeal of a dish), skills (food preparation techniques) and materials (pots, knives, menus or cooking facilities). The links between the elements of images, skills and materials can be produced and maintained throughout the duration of meal preparation, as well as over many years of cooking. This perspective of social practice theory is useful in creating more pro-environmental behaviour. Foodservice managers should study the elements of behavioural practices in order to find ways to encourage staff to adopt more sustainable practices.

While social practice theory has not been applied to foodservice to date, and is not found in wider nutrition and dietetic literature, it parallels the conceptual grounding of ethnography by removing individuals from the core centre of analysis.^{9,13} Ethnography observes social systems, cultures and social life, including the activities of daily life, and focuses on people in the collective sense, by exploring their learned or shared behaviours, customs or beliefs. It uses a methodology that is increasingly being recognised by nutrition and dietetic scholars as a powerful way to understand a range of complex real-life issues such as the impact of context on dietetic practices¹⁴ and migrants' experiences with, and interpretations of obesity.¹⁵

The newly proposed systems-practice framework integrates social practice theory into the existing foodservice systems model (Figure 1).

The case study reported in the following method and results sections briefly describes an in-depth ethnographic case study on hospital food waste, which illustrates the theoretical and practical implications of employing a combined systems-practice approach and enhances the external validity of the proposed integrated framework. It is important to note that the case study results presented herein are an illustration of the combined models application rather than a full description of results (for these refer to, Goonan *et al.*¹⁶). The aim of the case study was to demonstrate how the addition of social practice theory to the foodservice systems model can reveal interesting insights that otherwise would have been undetected.

Methods

A major sustainability challenge in the foodservice industry is the volume of food waste the sector produces. The hospital sector has been identified as a major contributor to the food waste stream.^{4,17,18} Within hospitals, plate waste is the most

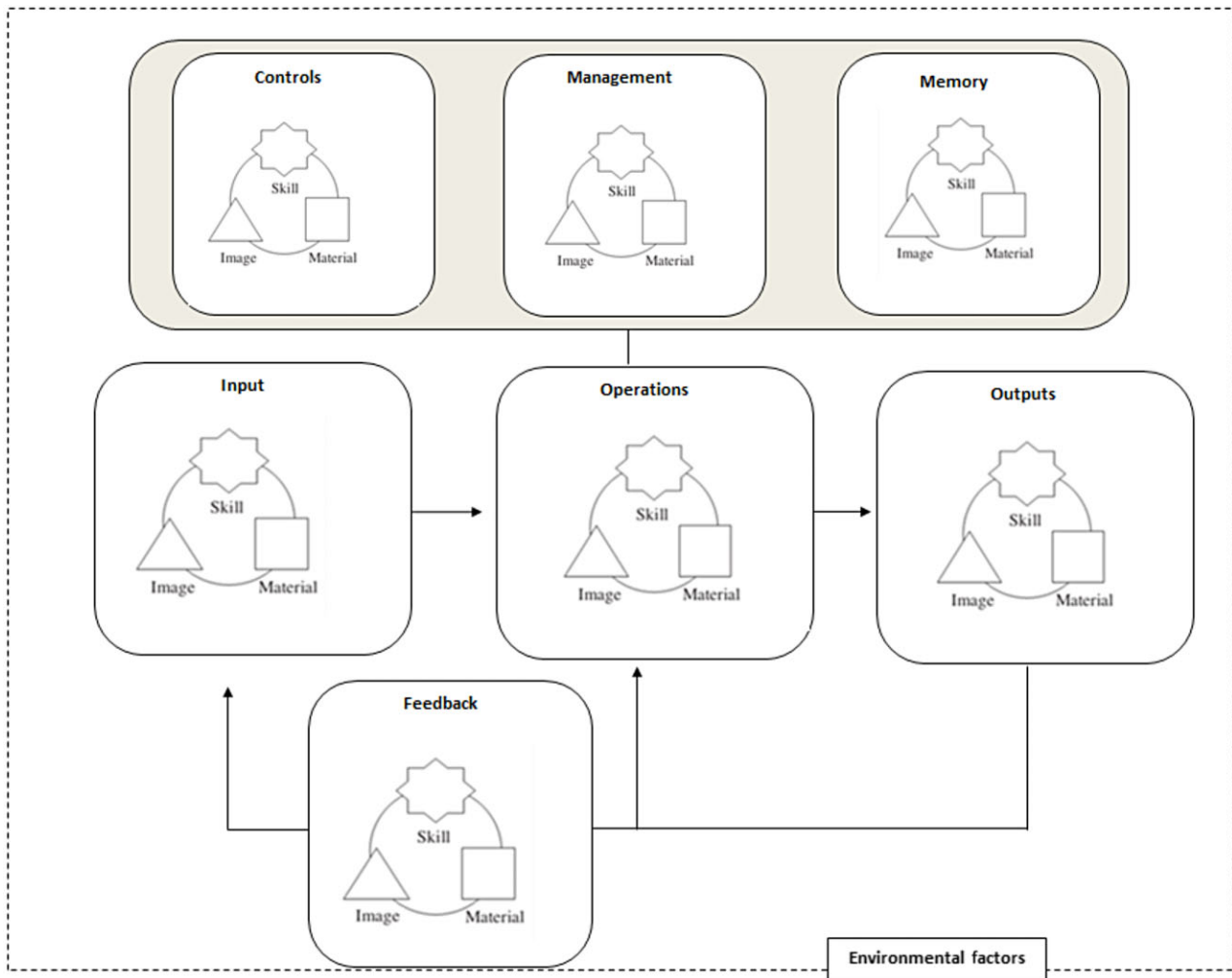


Figure 1 The systems-practice theoretical framework. Adapted from schematics by Pantzar and Shove and Payne-Palacio and Theis.^{6,9} Every component of the systems model can be understood to consist of materials, images and skill elements that form links to constitute a social practice. It is these links that practitioners can work to create, stabilize or break depending on the behavioural change they want to achieve.

frequent focus of researchers. What is obviously missing from the literature is a study of the waste generated in the kitchen functions of hospital foodservice, despite recommendations that this area required future research.¹⁷ Thus, examination of hospital food waste prior to patient consumption was deemed to be a topical and appropriate case study in which to apply the newly devised systems-practice framework.

Three of New Zealand's public hospitals, each of which had a contract with the supporting foodservice provider, were chosen as research sites. Each hospital prepared meals at their on-site kitchen using a cook-fresh production system, and generation of food waste prior to the point of consumption was confined to the kitchen. All hospitals were comparable in that they followed a similar 2-week menu cycle.

Ethnography uses a range of data collection techniques. Thus to investigate the generation of hospital food waste

prior to patient consumption, multiple methods were used to collect data over a 2-month period at the three hospital foodservice sites. The researcher was known to foodservice staff through previous work experience at all sites. All ethical approvals were obtained from the district health boards' Research Committee and the University of Otago's Ethics Committee (which conforms to the provisions of the Declaration of Helsinki as revised in 2008).

Written informed consent was obtained by all focus group participants and interviewees. The integrated framework of systems and social practice theory (Figure 1) was used to structure the data collection and analysis process (Figure 2).

Individual data collection tools were developed for each of the collection techniques: document analyses, observation, focus groups and interviews. Each tool incorporated components of the systems model to ensure food waste was noted throughout all stages of the subsystems studied and then each of these subsystem components was further

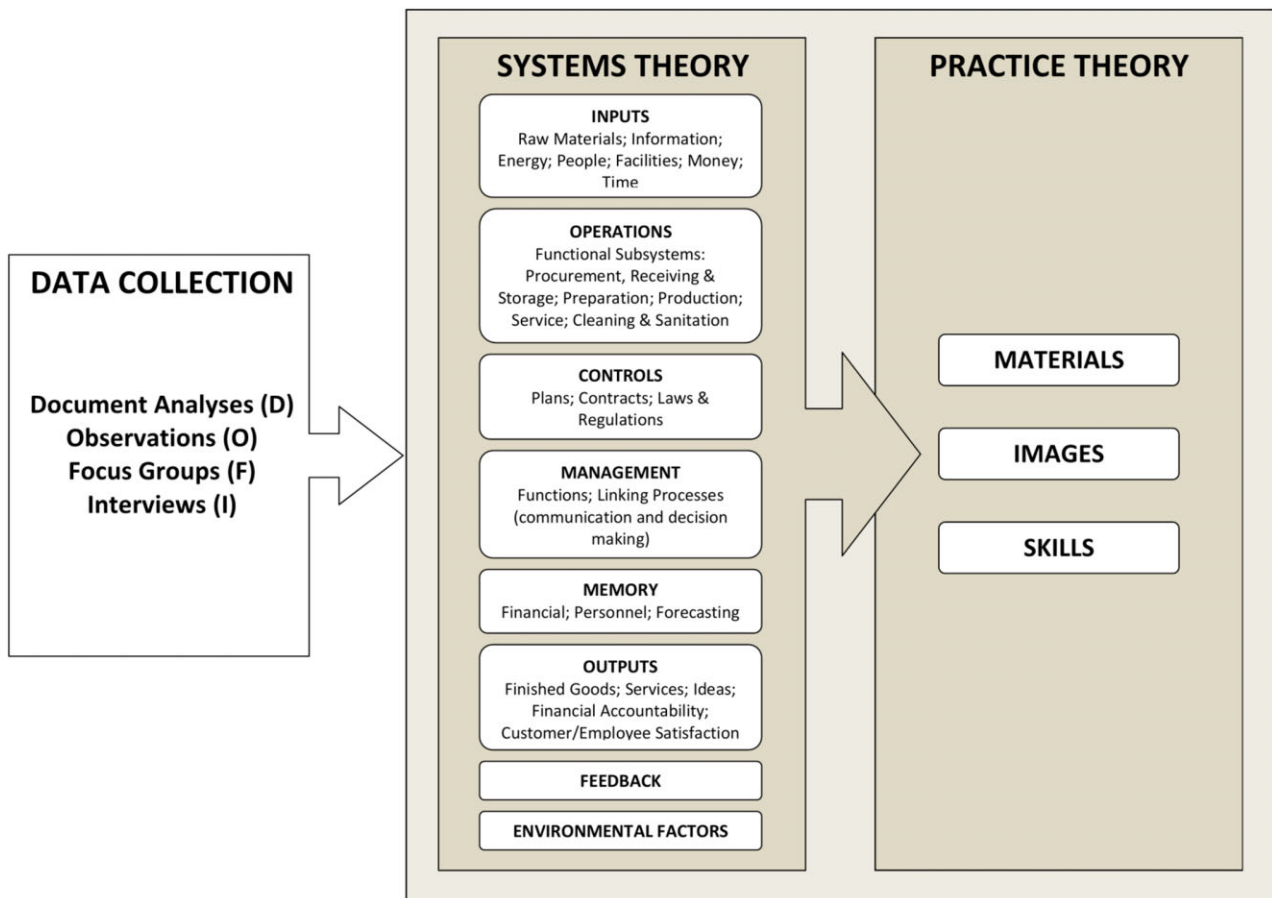


Figure 2 The systems-practice framework as used to structure the data analysis process. A range of data collection techniques can be used to explore each individual component of the systems model in turn. Within each of these areas, the researcher specifically considers all three elements of practice theory (materials, images and skills).

broken down into the three social practice theory elements (materials, skills, images) for further investigation.

Data were collected in the order of document analyses, observation, focus groups (cooks, kitchen hands, menu processors, supervisors) and interviews (foodservice managers). Document analyses involved exploration of existing records including company policies and plans, production and service materials, waste records, and quality assurance tools and records. Observations were conducted under natural settings, for approximately 9 hours at each site, over lunch and dinner services. Singleton's¹⁹ recommendations for observational data collection were adopted; a process involving a combination of free-form field notes, checklists and photographs. One 30-min focus group was conducted per site and a total of seven semi-structured interviews were conducted with managers, representing the scope of management across the three sites. Key discussion areas for the focus group and interviews were drafted based on the information obtained from previous data collection techniques. In terms of the data analysis, Braun's²⁰ guidelines for thematic analysis were manually applied (using Microsoft Office Excel and Word 2007) and the integrated

systems-practice framework was used to guide this stage of the research as well. The researcher became familiar with data by transcribing verbal data, reading, re-reading, consulting the literature and noting down initial ideas. Grandparent nodes were created according to the components of the systems model (inputs, operations, controls, management, memory, outputs, feedback and environmental factors). Within each grandparent node, information was assigned to parent nodes related to the systems model's subsystems (e.g. for 'management', this was 'management functions' and 'linking processes'). Under each subsystems component, data were then coded and collated into child nodes according to social practice theory elements of practice (materials, images or skills). Data were then summarised and integrated with extracts, quotes and photographs.

Using 'people' (a systems input) and 'images' (a practice element), results described in the following section illustrate one application of the combined systems-practice model. Data sources are indicated by I (interview with managers), F (kitchen staff focus groups), O (observations) and D (document analysis). Following this, key results for all of the

system inputs are summarised in Table 1 and then discussed in the text according to the three social practice elements, materials, images and skills.

Results

Results for 'people' and 'images' were that perceptions of the importance of food waste differed between managers and kitchen staff. Managers focused more on the cost than on the environmental implications, and believed their staff paid less attention to waste because they did not consider the cost (I). However, kitchen staff did express concern about the cost of waste and they also raised its social implications (F). Managers felt that attitudes and habits of kitchen staff were a challenge to minimising waste, with long-term cooks retaining well established habits and routines rather than adapting practices to current volume forecasts (I). Staff closely involved in production (cooks, supervisors) were more conscious of waste than those on the periphery of production volume activity (tray line service staff) and were more proactive in measuring and recording waste. Analyses similar to the 'people/images' example above were done for all subsystems and practice elements. Key case study results are presented firstly in Table 1, as systems components and corresponding elements of social practice theory, secondly as a summary of insights and strategies for creating more sustainable practices and lastly, as a generic step-by-step guide for practitioners.

Material elements of waste generation identified included food waste, plans, policies and quality controls, and communication. During document analyses and observations the most notable material element was food waste produced directly or indirectly within every subsystem of the systems model. The forecasting and service subsystems generated highest waste volumes; storage, preparation and production generated least. Managers acknowledged that use of pre-prepared ingredients shifted responsibility for food waste further up the food chain supports Hargreaves³ suggested one should look beyond single practices and towards relationships within and between whole bundles of practices that co-exist in particular domains of everyday life. Results for other material elements were that the link between policy for measuring waste (material) and the level of importance kitchen staff placed on it (image) influenced the level of compliance, and this suggested that visual communication in the kitchen would be beneficial for raising awareness of pro-environmental practices.

Images around food waste were identified primarily through focus groups and interviews with foodservice personnel involved in waste-related activities. Results (in addition to the people/images results previously described) showed reasons for food waste within each site and explanations were postulated for higher levels of waste reported in hospitals compared with other foodservice settings. Although individual attitudes and behaviours on food waste should not be viewed in isolation, results showed that the people themselves are responsible for making and breaking practices. Results supported previous researchers' conclu-

sions and helped explain how practices work and how they could be reformed.⁹ For example, the comment 'I don't know why we couldn't give food to pig farms' (F) shows that staff are starting to think about links between elements of practices and ways which they could be broken and reformed to become more sustainable.

Key results for the skills elements were the forecasting and waste management systems. Inconsistencies in waste management practices were found between the three sites and this may have reflected a training gap, affecting images and skills around handling waste. Results illustrated how waste-related practices are integrated and influenced by multiple practitioners within a hospital organisation.

While it was useful to consider the individual elements of both the systems theory and the social practice in isolation, a more nuanced and in-depth understanding was obtained by integrating the two approaches. Examples of how social practice theory contributed to knowledge gained through application of the systems model are shown in Table 2.

Based on the case study data, four generic steps were identified that practitioners can employ to guide management strategies for pro-environmental behaviour change. These are: (i) identify the problem; (ii) apply a systems model; (iii) apply social practice theory to investigate deeper and pinpoint people-related reasons for unsustainable practices; and (iv) Devise strategies to rectify the problem. These steps are described in Table 3.

Discussion

The results from the case study described in this paper support the benefits of systems thinking in foodservice, including more effective problem solving, planning and communication. Results also demonstrate how elements of practices can direct managers to unsustainable behavioural links that need to be broken and reformed and to those that should be applauded and consolidated because they contribute to a pro-environmental foodservice. The study showed how social practice theory emphasises the role of foodservice personnel in generating pro-environmental practices, and thus offers a more people-based approach to foodservice management. For example, results indicated the need to move beyond economic success, and to incorporate social and ecological values as measures of sustainability. They also indicated that understanding images that are important to the staff (such as social implications of food waste) may help managers find effective ways to structure and deliver materials and skills (e.g. visual resources and training sessions). Such findings underline the need for practices that are consistent with waste measurement policies, procedures and feedback mechanisms.

The newly developed systems-practice framework was useful for guiding the selection of an appropriate methodology. The systems model provided a structured framework for scrutiny of all parts of the foodservice and ensured that all subsystems were investigated in relation to food waste generation. The practice model added another layer to the systems analysis by identifying reasons, attitudes and values

Table 1 Summary of key case study findings organised by systems component and the elements of social practice theory

	<i>Images</i>	<i>Materials</i>	<i>Skills</i>
Inputs	Perceptions of importance of waste differed between managers and kitchen staff. The focus of food waste for managers was financial rather than environmental or social implications.	Minimal food waste produced during procurement, receiving, storage, preparation and production. The use of pre-prepared ingredients significantly reduced waste generated.	General consensus was that there was a lack of staff training on food waste.
Operations	Managers thought waste occurred because staff rounded up production numbers. Despite guidelines, a discrepancy existed between what was considered a portion. It was felt that time pressure increased waste.	Most waste occurred at service (inconsistencies in portions, incorrect serving and forecasting). Measuring and recording wastage was inconsistent within and between sites. The reuse of leftovers differed between sites.	Knowledge of stock rotation and safety regulations was necessary to prevent spoilage or expiration of stored goods. Communication skills were important when consulting suppliers as orders were cancelled if stock levels were too high. Getting suppliers to visit more frequently was a challenge.
Controls	Staff members admitted to reusing leftovers to avoid unnecessary waste even though this was not allowed. All managers placed emphasis on the importance of portion control.	Two waste management systems were in place (measuring or visually estimating wastage) but not all waste was accounted for. Food safety and quality control regulations limit the redistribution of food (e.g. to pigs).	Familiarity with menu and knowledge of food safety were needed to make decisions on reusing leftovers. More accuracy required to ensure consistency with production numbers and portioning guidelines.
Management	Waste-related decisions were made through informal verbal communication between managers and staff, but language barriers were a challenge. Importance of balancing environmental initiatives with food safety risks.	There were few visual resources on waste displayed in kitchens. Food records were sent weekly to head office and were incorporated into the organisation-wide trend data. However, there was no constructive feedback from this current system.	Improved communication skills (within the kitchen and hospital wide) could help prevent waste. Recipe and portion adjustment were important management tasks for assisting with production control while adhering to contractual portion standards.
Memory	While most menu items were manually collated, others were based on a conventional number (that nobody was even sure where it had come from). The current process of manual counting menu items was seen to be a 'tedious task'.	No site used an electronic forecasting system, but all were developing one. At one site, an electronic system used to cost recipes and calculate the monetary equivalent of food waste had been recently implemented. A reduction in the volume of food waste had been noted since implementation.	Previous experience of foodservice personnel both within and external to the company influenced thoughts and food waste practices. Discrepancies were identified between the responsibilities of menu processors, cooks and serving staff in forecasting.
Outputs	Many staff members perceived waste as a big issue whereas managers agreed that the volume was minimal. Managers emphasised need for some waste as can't risk under supplying.	None of the sites had materials or documents, which provided an accurate account of the total cost of food waste.	An understanding of the meal number and waste management systems was required by foodservice personnel to assure an accurate recording of calculated meal output, leftovers and monetary value of wastage.
Feedback	Kitchen staff felt more feedback from managers on waste-related issues would help raise awareness in kitchen. A feeling that managers could be more proactive in identifying and resolving issues around food waste.	Site managers and foodservice personnel were not receiving feedback on the company-wide, waste management policy. Feedback forms were available at each site and at one site, the feedback document specifically addressed the topic of environmental performance.	Effective communication skills were required to ensure feedback was provided on waste-related activities and to help raise awareness of food waste. Sites needed to use information from the waste management system in a proactive way (for example, by making comparisons between waste volumes to identify peaks and troughs).
Environmental Factors	Establishing an 'Environmental Champion' initiative within each site was suggested as a means to drive environmental and sustainable processes.	The unpredictable nature of the environment (especially unforeseen patient discharges) affected the quantity of food waste. Changes in patient diet (if not communicated to the foodservice prior to production) lead to waste.	Time management during the preparation and production of special dietary items was mentioned as a way to prevent wastage. Better communication and understanding of patient characteristics within different wards was suggested as a way to minimise overproduction waste.

Table 2 Summary of additional insights obtained by social practice analysis

<i>Foodservice systems model</i>		<i>Social practice model</i>		
<i>System component</i>	<i>Result</i>	<i>Element</i>	<i>Additional insight to unsustainable practice</i>	<i>Possible strategy for creating more sustainable practice</i>
Control (training)	Company environmental policy documents include an environmental awareness training module with a food waste component.	Material/image	Disagreement within both the managers' and kitchen staff groups on whether food waste was included in training programmes.	Review training programme and ensure food waste is consistently included in material. Include food waste as a regular topic in staff meetings.
Inputs (information)	Company environmental policy documents include an environmental awareness training module with a food waste component.	Image/material	Messages in food waste training were inconsistent with policy. Kitchen staff said the focus of food waste training was food safety and portion control, and did not include pro-environmental aspects. Managers said the focus of food waste training was cost rather than pro-environmental aspects.	Revise food waste training module to include multiple benefits that include pro-environmental aspects and create a consistent message. Display company environmental policy material where all staff can see it.
Inputs (information, people); operations (production subsystem)	Daily production forecasts are provided for cooks.	Image	Managers believed that experienced staff followed long-established practices rather than following daily production forecasts. Cooks reported that daily fluctuations in meal numbers were minimal.	Provide ingredients weighed according to production forecast. Daily staff meeting could include production forecast, recipe adjustment and would require commitment from cooks that forecasted quantities will be prepared. Increase supervision to ensure forecasts are followed.

Table 2 *Continued*

<i>Foodservice systems model</i>		<i>Social practice model</i>		
<i>System component</i>	<i>Result</i>	<i>Element</i>	<i>Additional insight to unsustainable practice</i>	<i>Possible strategy for creating more sustainable practice</i>
Control (waste policy); operations (service subsystem)	Waste measurement procedure to be followed at the end of each meal service.	Material/image	Compliance with the waste measurement policy depended on each individual's perception of its importance. Managers' motivation to measure waste was cost; they believed that kitchen staff were unconcerned about cost. Some kitchen staff identified the cost and others identified social implications.	Provide ongoing feedback to staff on waste measurement results and waste management performance. Food waste on agenda of all staff meetings.
Operations (service subsystem)	Portioning standards and guidelines are available.	Images	Poor understanding by service staff on what constitutes small, medium and large portion sizes; some staff applied their own subjective standards.	Training in the rationale of portion weight standards, understanding that portion size is linked to an objective rather than a subjective standard. Visual communication at the service centre for portion weights.
Control (policy, procedures)	Food safety plan covers use of leftover food.	Images	Lack of agreement on application of rules regarding reuse of food. Some practices contradicted food safety rules in order to reduce unnecessary waste.	Training emphasise reasons for food safety rules. Use of leftovers could be part of food waste discussions at regular staff meetings. Include reasons for differences in acceptable practices at home and at work.
Controls (portioning guidelines)	Recipes contain portioning instructions.	Skills	Cooks sometimes portioned a dish differently to the recipe's instruction.	Increase training in portioning methods.
Feedback (waste results)	Waste measurement is a key component of company waste management policy.	Skills/materials	No feedback system is in place to inform kitchen staff of success or failure of food waste management strategies.	Communicate waste measurement results to show improvements and encourage staff to identify with pro-environmental practices.

Table 3 Suggested application of the systems-practice framework

Despite management controls in place, an ongoing problem with an unsustainable outcome may exist in a foodservice. Using the following steps, application of the systems-practice framework could identify the cause(s) and suggest a solution:

1. Identify the problem.
2. Apply the systems model.
 - Analyse where on the model the problem sits. (Controls? Inputs? Operations? Feedback? Etc.)
 - Confirm that appropriate controls and processes are in place that should prevent the problem.
3. Apply social practice theory to investigate deeper and pinpoint people-related reasons for unsustainable practices.
 - Seek information from foodservice staff on reasons for unsustainable practices, using tools such as interviews, focus groups, observation and scrutiny of documents.
 - Identify themes that emerge from data collected.
 - Categorise data according to the elements of practice each theme contains. Elements are materials (things, technology), images (meanings, symbols), and skills (forms of competence, procedures).
 - Look for linkages between elements of practice and the ongoing problem as they are likely to illustrate the people-related reasons for the problem.
4. Devise strategies to rectify the problem. These may be more successful if they address the practice element identified in the collected data.
 - For example, an unsustainable practice that is identified as an image element may be more successfully broken if training focused on or appealed to an individual's sustainability beliefs or a popular environmental symbol, rather than informing them that the company policy states 'this is how it should be done'.

that influenced waste-related practices. An ethnographic approach facilitated a deeper understanding of the system and normal kitchen practices as it allowed the researcher to become immersed in the everyday life of the hospital kitchen culture.

Combining the two approaches in the systems-practice framework revealed interesting links between materials, images and skills of waste-related practices throughout the system that otherwise would have gone unnoticed, and facilitated a deeper investigation into how and why results were achieved. For example, with respect to materials, systems theory did identify degrees of noncompliance in measuring waste, but the additional lens of social practice theory allowed us to understand that noncompliance was related to the level of importance that the staff placed on measuring waste. Based on this finding, concrete management recommendations, such as commencing an environmental champion programme as a waste-reduction intervention (as described by Hargreaves³), are possible. The examples provided in Table 2 offered evidence for the efficacy of a systems-practice-based approach to investigate pro-environmental behaviour change within the foodservice sector.

The aim of this research was to offer a useful practitioner tool to guide management strategies for pro-environmental behaviour change. The case study presented in this paper illustrates how the proposed theoretical framework can be practically implemented to identify existing sustainable and unsustainable practices within a foodservice setting, and highlighted where opportunities for more sustainable practices could occur. A further strength of this framework is that it is able to provide insights of value for teaching sustainability to future practitioners, e.g. in foodservice management courses. The foodservice systems model is an abstract concept for students to grasp. The addition of practice

theory, with its focus on the elements of practice (materials, images and skills), helps provide both a focus on and reasons for everyday activities at each stage of the foodservice system. Furthermore, the significance of the proposed framework is that it emphasises the role of foodservice personnel in generating pro-environmental practices and the importance of understanding the fit of their attitudes with the rules and expectations of their workplace. Foodservice students may relate better to this more humanised approach.

One limitation of employing the systems-practice framework to conduct an in-depth analysis of a single social practice within a food service setting is that it overlooks the connections and conflicts among multiple social practices that occur simultaneously within an organisation. For example, in this case study on hospital food waste generation, although the use of pre-prepared ingredients reduced food waste, it contributed to increased levels of packaging waste. This example highlights the need to consider system-wide practices that collectively help organisations shift towards sustainable development. Another limitation of the framework is that as yet, it has only been applied to a single case study. However, conceptually, it is reasonable to expect that the framework could be adopted by other foodservice setting managers to investigate waste-related or other pro-environmental practices. Future case studies of applications of the framework within a diverse range of foodservice systems are therefore encouraged. Potential applications of the model include using the framework in foodservice settings to:

- Understand existing sustainable practices
- Understand existing unsustainable practices
- Create new pro-environmental practices (e.g. by actively integrating existing elements)
- Phase out existing unsustainable practices (e.g. by actively breaking links between existing elements)

The first two points address ways practitioners could use the framework to understand practices that already exist in their operations to ensure further systemisation of positive practices within the organisation, or alternatively, to ensure that negative practices do not spread to other areas of the foodservice. The last two points deal with effecting change in foodservice practices. Opportunities also exist to apply systems–practice-based research beyond the field of foodservice to nutrition and dietetics. For example, the investigation of sustainable practices throughout public health dietary interventions.

Ultimately, as food and nutrition experts, nutritionists and dietitians direct policy, education and changes in practice. Generation of sustainable practices in all areas of nutrition and dietetics will contribute to the sustainability of the global food system.

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Conflict of interest

None of the authors had industrial links or affiliations with the company whose foodservice operations were the focus of the research.

Authorship

Sarah Goonan's major contributions included undertaking all data collection and analysis and writing the first draft of the paper. Miranda Miroso's major contributions included project conceptualisation and design, project supervision, and co-writing the final version of the paper. Heather Spence's major contributions included project conceptualisation and design, project supervision, and co-writing the final version of the paper. M Miroso and H Spence each contributed ~45%; S Goonan ~10%. The thesis from which the paper came was written 100% by S Goonan.

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