Environmental Knowledge Management in Food Service Industry: A Preliminary Empirical Research Study From Companies in Poland

Bartłomiej Kabaja
Kraków University of Economics, Poland

kabajab@uek.krakow.pl

Abstract: The last phase of the food chain, the food service industry, stands out because of its significant waste emissions, energy and natural resource consumption. This occurs in the situation of disposing of uneaten, cleaning consumption areas, disinfecting vegetables and fruits, among others. It should be borne in mind that also a very large amount of consumer products constitute waste that is difficult to manage in the system. Therefore, environmental protection in the food service industry requires the implementation of good practices both at the corporate management level, but also these procedures must be put into practice at the lowest operational levels. Therefore, the aim of the study was to assess the functioning of environmental knowledge management in the food service industry. The method of individual interviews was used, which makes it possible to collect a wide range of information regarding the opinions, perceptions and comments of the subject. The interview was based on a semi structured interview form, which consisted of several survey steps. The research was conducted in Poland. Due to the scarcity of publications in this field, it was considered that the individual interview would be a suitable tool for obtaining detailed and in-depth information on environmental knowledge management in the food service industry. The results of the collected data gave a broad picture of the situation of the food service industry in Poland and potential opportunities to increase environmental protection. Undoubtedly, the survey confirmed that better knowledge management in this specific industry is required. Employees' responses indicated a lack of training in this area. Which made it much more difficult for them to make pro-environmental decisions on the job. Posters and other materials in graphic form, which on the one hand would remind of the necessity of pro-environmental behavior but on the other hand would indicate the right course of action, turned out to be good solutions. The research made it possible to draw attention to a very important aspect of knowledge management relating to environmental procedures and principles. Despite the existence of a large number of environmental regulations, it appears that front-line employees are not convinced about the maximum involvement of their companies in pro-environmental activities and there is an area where more could be done.

Keywords: Knowledge management, Environment, Food service, Employees, Waste

1. Introduction

The food service industry is a significant branch of the European economy. Despite some slump as a result of restrictions related to the covid-19 pandemic, the sector is gradually beginning to recover. The value added in the European union combined with the accommodation sector was E203.6 billion in 2021 (Businesses..., 2025). Globally, the food service market is estimated to be worth $3,486.58 billion in 2024, with a forecast of $6,810.86 billion by 2032 (Food Service..., 2025). The food and beverage subsector includes: traditional restaurants, fast-food or take-away restaurants whether as permanent or temporary stands with or without seating, cafeterias, mobile food trucks, catering services, as well as bars, coffee shops and mobile beverage vendors (UNSD Classifications, 2025). This market is increasing its share due to: rising household incomes, increasing numbers of working women and increased logistical utility of food by companies (e.g. deliveries). This market is divided into actors: networked and independent. Chain operators are those that operate under a single brand in several locations with the same name. Their organisation of work, menu or décor are each point very similar or even the same. The largest chains include restaurants such as McDonald's, Starbucks, Domino's or KFC. But when considering the entire market, the number of independent establishments is greater than that of chains (Food Service..., 2025).

The dynamics presented, as well as the prospects for rapid growth, make us reflect on the environmental impact of this industry. In the context presented, it may be significantly burdened by the growth of the food service industry. As environmental protection becomes a major goal in all industries, stringent regulations and consumer awareness will play an increasingly important role in the implementation of these processes. These requirements will not bypass the food service industry.

One possible solution to these problems is to implement environmental knowledge management in companies in the food service industry. The more widely this concept is implemented, the more visible the effects will be on a general scale. As a rule, in this area of the economy, a lot of attention is paid to health, technical and technological issues. So perhaps it is worth looking at organisational and management aspects. Good organisation, management and proper procedures are key to achieving positive end results. Very often, the food service industry remains on the margins of research and interest as an area that could bring significant

benefits in terms of environmental protection. Therefore, the aim of this study is to examine how environmental knowledge is created, stored, shared and used in catering companies operating in Poland. The study aims to identify the level of implementation of environmental knowledge management, good practices, limitations and challenges from the perspective of line employees. The scope of the study includes surveying employees of small, medium and large enterprises with varying lengths of service and from catering establishments with different specificities of operation (cafés, restaurants, fast food). The paper begins with a description of the food service industry and its impact on the environment. It then discusses the concepts of environmental knowledge management. The next section describes the research methodology. The results and recommendations are presented further on.

2. Environmental Impact of the Food Service Industry

The nature and peculiarities of the food service industry result in the consumption of large amounts of basic utilities such as water and energy, which are used to prepare meals and preserve raw materials and finished dishes (Bulhões et al, 2021). Which very often takes place in a refrigerated environment. In turn, their step-by-step processing into a finished product generates a lot of waste and requires energy intake to generate heat (Strasburg and Jahno, 2017). This makes it imperative that sustainability issues and ideas should be particularly relevant and intrinsic to the food service industry and spread among employees.

Improper or lack of waste management and used packaging generated by the food service industry are further areas of environmental protection that suffer heavily as a result of the industry (Jang, Kim and Woo, 2023). These hazards further include the use of non-biodegradable chemicals (disinfectants, preservatives), which can enter the environment as a result of improper handling (Chemical hazards ..., 2019). Finally, the impact on the environmental load depends on the type of food product (Garnett, 2011). Meat and its derived products tend to generate more negative environmental impacts (Clay, 2004). Although not fully informed, consumers and all workers in the industry in this regard are not fully informed. The unavailability of clear and understandable data on the environmental impact that is associated with food production makes it difficult to choose products that generate less negative environmental impact (Marreiros and Ness, 2009). The lack of such information on packaging or menus makes it impossible to compare products and make an environmentally friendly choice. In the absence of such information, some people are not even aware of this possibility. Garnet (2011) points out that just allowing consumers to choose more sustainable food products, can be an excellent initiative to reduce and partly solve the problem of negative environmental impacts. Another factor generating emissions and environmental burden is the increasingly common delivery of food and meals to customers, which customers are not aware of (Varese et al, 2024). In addition, food delivered by suppliers is often packaged in additional plastic packaging. This results in it being over-packaged and generating above-normal waste. Figure 1 presents the level of waste generated by the food service industry. As can be seen, the values are very high.

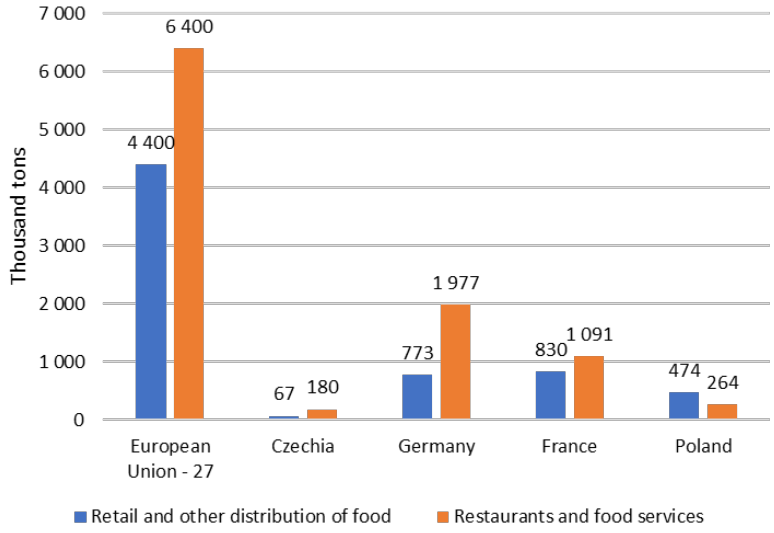

Figure 1: Food waste - bio, household and similar, waste collected in industries related to the food service in 2022

The image of the food service industry's environmental impact described above becomes a challenge for managers and line workers in the sector. Despite many other requirements, such as overseeing economic efficiency, controlling orders and deliveries, or identifying and meeting customer requirements and expectations, environmental protection is another major challenge (Rocha and Viegas, 2023). In this situation, knowledge management and training of employees involved in the production of meals working in the food service industry prove to be very important. This path in the implementation of environmental policies, directly supports the path towards sustainability in food services (Košútová and Jarossová, 2014). This necessity is confirmed by studies on food waste minimisation, which indicate that there is a lack of qualified human capital in the implementation of effective environmental policies (Alamar et al, 2018).

A shortcoming of the food service industry in implementing comprehensive environmental solutions is its fragmentation. There are very many small and micro companies in this market. Research conducted by Llach et al. (2013) in small companies in the mass catering and restaurant segment, showed that their representatives show little attention towards taking measures and increasing their commitment to the environmental issues of their businesses.

3. Knowledge Management for Environmental Protection

Knowledge management, as well as knowledge itself, plays a very important role in the effectiveness and efficiency of an organisation's pro-environmental activities (Krause et al, 2019). The process of environmental knowledge development and its application in an organisation refers to the generation of pioneering skills, innovative solutions, better ideas and more efficient processes, with environmental concerns as the overarching common denominator (Frozza, Lima and Costa, 2023). Modern and progressive management concepts guide knowledge management processes in organisations, maximising the benefits of these practices. One of the many advantages of such an approach is the realisation of ambitious goals related to improving environmental performance (Song et al, 2020). The term green knowledge management dedicated to this phenomenon has emerged in the literature (Cai, Khan and Egorova, 2023). This concept, although relatively young, is defined as knowledge management practices of enterprises regarding the green aspects of business operations and integrating them with knowledge management factors (Abbas and Sağsan, 2019; Abbas and Khan, 2022). The environmental dimension of a company should be understood as its impact on living and non-living natural systems in land, air and water (Baumgartner and Ebner, 2010). This is therefore a very broad approach. By placing emphasis on environmental issues, an organisation can better understand its impact on the environment. It is also important to raise awareness in this area among line employees, who very often have a significant influence on it. Green knowledge management provides opportunities to build a culture of pro-environmental learning and optimise processes within the company (Yu et al, 2022). In addition, a well-functioning green knowledge management system builds an environment that supports innovation and motivates employees to make progress in this area. It should be remembered that many groundbreaking improvements in history have been introduced by line and operational employees. But the key to this was proper motivation and encouragement to innovate. This also includes various types of rewards.

The process of knowledge sharing and distribution seems to be very important, especially at lower positions and in industries where a high level of education is not required. Another example would be industries where there is a high turnover of employees, e.g. in co-operation with employment agencies or where work is seasonal or flexible. The conditions described result, among other things, in a more difficult knowledge retention process (Frozza, Lima, Costa, 2023), which is more difficult to retain in an organisation if there is a high turnover of employees. The food service industry seems to fit the description presented. When employees are more knowledgeable about the environmental aspects and pro-environmental techniques of the organisation, they thus have a lower level of uncertainty and more motivation to apply such measures (Abbas and Khan, 2022; Abbas and Sağsan, 2019). Knowledge management can play an important role in environmental protection activities. A properly managed and organised knowledge management system encourages company employees to seek, implement and share knowledge. The effective and consistent implementation of environmental knowledge can be a key success factor for organisations that choose this path (Martins et al, 2019). Furthermore, the advantages of this approach include placing environmental concerns on a par with the financial benefits of companies. Environmental knowledge management allows companies to take advantage of their own employees' resources without having to incur large financial outlays. Environmental knowledge is a special type of knowledge, and many employees educate themselves in this area, building up a resource that can be used for the benefit of their employer. This is a potential that is worth exploiting. This behaviour is also characteristic of younger generations. Therefore, the proper use of

knowledge management should be very helpful in companies' efforts to generate less and less impact on the environment. Unfortunately, a review of studies conducted by Martins et al. (2019) indicates that the number of studies using knowledge management in the context of sustainable development as a central focus is still small.

Analysing the specifics of the food service industry, factors hindering knowledge management include, but are not limited to: employee turnover - lack of motivation for training, seasonality, short employment time, dispersed organisational structure, difficulty in transferring knowledge between branches, changing legal requirements (sometimes different in different cities/municipalities), time pressure, customer service orientation, diversity of operational models, non-standard working hours of employees - hindered communication, low level of formalisation, strong price competition, lack of reporting systems and the fact that environmental protection is not a priority for customers of restaurants of other food service outlets. It is worth adding that the very high proportion (89%) of companies with 0 to 9 employees confirms the fragmentation of the industry. The fact that such a large number of very small companies exist is not conducive to formalising knowledge management processes within their structures. Detailed data are provided in Figure 2.

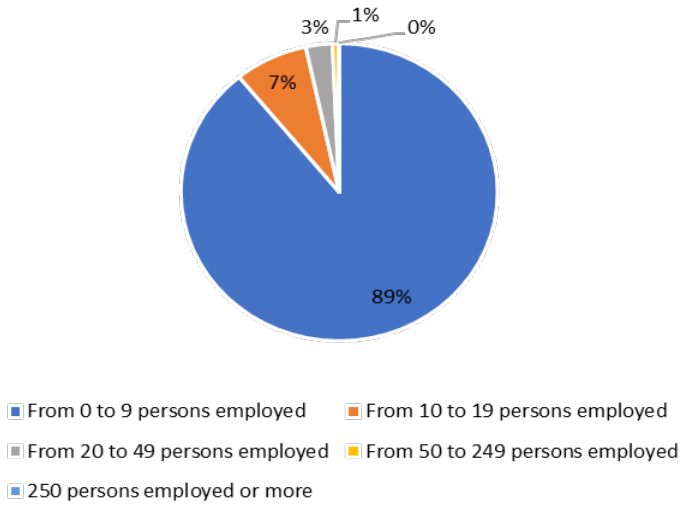

Figure 2: Percent of companies operating in 2023 in the EU food and beverage services industry by number of employees

The conditions described above create difficulties for the introduction of proper knowledge management processes, although informed enterprises should be prepared to do so and counteract the organisational difficulties mentioned. A properly planned environmental knowledge management system in food service industry companies should be resilient and prepared for these disruptions. In view of the presented development and dynamics of the food service industry market, an assessment of the functioning of environmental knowledge management in this industry was taken as the aim of the study.

4. Methodology

The empirical research was conducted based on qualitative research methodology and concepts. The Individual In-Depth Interview (IDI) method was used to achieve the stated aim of the research study, as a valid primary data collection strategy must be based on objectives (Gratton and Jones, 2010). An Individual In-depth Interview is a direct conversation between a researcher and a single respondent without the presence of a third party. This survey is very well suited to deepen the understanding of the phenomenon under study. In this case, these were issues of environmental knowledge management in food service industry companies. The Individual In-depth Interview method allows the emotional and motivational behavioural patterns of respondents to be accessed and allows sensitive issues to be explored. This type of research is well suited to groups characterised by scarcity and difficult accessibility (Filimonau and Krivcova, 2016). This rationale corresponds to the characteristics of the food service industry, where a significant proportion of people are employed part-time, a large number of people are self-employed and there are unpaid family workers in this business who support their relatives (Businesses..., 2025).

4.1 Data Collection

Ten individuals, employees of the food service industry, were invited to participate in the study. The details of this sample and its characteristics are presented in Table 1. Participation in the study was voluntary. Socio-demographic information was collected at the end of each IDI session. Five women and five men participated in the study. Interviews were conducted between December 2024 and March 2025 among employees of companies operating in Poland.

Each interview lasted between approximately 35 min. and 56 min. The content of the interviews was recorded after obtaining consent from the respondents. The interview followed a semi-structured interview script. The questionnaire provided the opportunity to adapt it to the narratives and themes of the respondents when they wanted to share their experiences and insights. The questionnaires were pilot-tested to refine incomprehensible questions and content. This was done in order to make them as comprehensible as possible for food service industry employees.

Table 1: Characteristics of the study sample

Gender	Seniority in food service industry/(total seniority)	Type of business	Range of business
W	4 (4)	Café	Single-company
M	3 (6)	Restaurant	Single-company
W	3 (3)	Café and bakery	Local network company
M	6 (6)	Fast food	International network company
M	3 (4)	Pizzeria	International network company
W	9 (12)	Café	Single-company
M	17 (15)	Fast food	International network company
M	5 (8)	Restaurant	Local network company
W	12 (25)	Restaurant	Single-company

The interview itself consisted of the following stages: introduction, exploration of the creation of environmental knowledge, exploration of ways of storing environmental knowledge, exploration of the processes of sharing environmental knowledge, ways of using environmental knowledge, summary and conclusion of the interview. This arrangement implemented the definition of knowledge management, which considered the following elements of the process to be the most important, namely: knowledge creation, knowledge storage, knowledge sharing and knowledge utilisation. These processes were chosen because they are well established in the literature and thus reflect the full life cycle of knowledge in an organisation. (Davenport and Prusak, 1998; Alavi and Leidner, 2001; Sağsan, 2006). This makes it possible to identify gaps and barriers at each stage. Furthermore, this division seems to be clear and understandable to operational employees in the catering sector. Very often, due to their specialisation, they are not familiar with more complex and specialised concepts of business management. The concept of knowledge management based on its creation, storage, sharing and use seems to be very appropriate for conducting this study (Sağsan, 2006).

4.2 Data Analysis

Before analysis, the interviews were transcribed. A verbatim transcript of the statements was made based on the recordings. In the first stage of the analysis, the collected source data was reviewed, read and initial notes were made. In the second stage, preliminary coding was carried out to generate themes and categories (Braun and Clarke, 2022). Open coding was used, mainly due to the exploratory nature of the study, as the analysis was intended to be exploratory and illustrative (Matthews and Ross, 2010). There are not many studies of this type in the literature, especially those conducted in Poland. Next, a search for themes was conducted. At this stage, the codes were grouped into broader thematic categories. In accordance with the study assumptions, the analysis was focused on four stages of the knowledge management process. These were knowledge creation, storage, sharing and implementation. In the final stage of the analysis, quotations from the study were selected and then included in the text. The aim of this study was to gain a deeper understanding of the under-researched topic of environmental knowledge management in the catering industry and to examine the hidden determinants and relationships related to this issue.

5. Results

The analysis and interpretation of the results was based on the definition of knowledge management, which distinguishes its following components and aspects: knowledge creation, storage, sharing and utilization (Davenport and Prusak, 1998; Alavi and Leidner, 2001; Sağsan, 2006). Accordingly, the qualitative thematic analysis proceeded in the order presented. As a first step, statements regarding knowledge creation in the food service industry were assessed.

The data collected indicate that in companies in the food service industry, there are no systems in place to support the creation of environmental knowledge concerning rank-and-file employees. In the surveyed examples of organisations, there were no mechanisms and motivations to encourage employees to participate in this process. Here is an example of a statement:

> *"...there is always talk about environmentalism, there is talk about replacing plastic with paper and such simple activities that everyone knows about. But it never occurred to me that it might actually be worth changing the lighting, or maybe teaching the employees themselves so that they put these ideas into practice..." (M, 3(6), Restaurant, Single-company).*

The main rationale for managers to take pro-environmental measures is financial benefit. If pro-environmental solutions were more profitable, managers and restaurant owners would be interested in this. The financial motive also proved to be very motivating for the employees who took part in this study. As they often stated, if they got some kind of financial bonus from each reported pro-environmental initiative, they would be more willing to engage in such activities. In employees of organisations with an international reach, there was a perception that managers were not trusted or open with them in creating environmental knowledge on the job. In contrast, employees of smaller companies who were in contact with the owners declared that their ideas could be well received by these owners. However, despite all this, environmental issues in the food industry service sector are regarded as optional and not the most important.

In the next step of the analysis, it proceeded to identify the means of knowledge storage. In this component of knowledge management, forms of physical knowledge storage media were prevalent in food service industry establishments. These included posters, books and manuals. Very often kept in the back room and, as far as content was concerned, limited to basic information, such as how to segregate waste. In this area, the difference between small and larger companies concerned the presence of two aspects. In the large organisations there were procedure books. But according to the employees, the process of obtaining knowledge from them was difficult and inaccessible. Therefore, they hardly used them at all. The second aspect was the e-learning platform training that was provided in large organisations. Depending on the employees, they declared that these trainings were more or less focused on environmental topics, but they were never dedicated entirely to this topic. The practices of storing environmental knowledge, as described above, indicate that the actions taken by the companies represent the illusion of the presence of this knowledge, while its actual role in the operation of these companies is negligible.

The following part of the analysis assesses the processes of sharing environmental knowledge in food service industry companies. The interviews collected indicate that knowledge is mostly shared orally, informally and often intuitively. Employees learn by observing senior employees. This can be referred to as tacit knowledge as defined in the literature. In the course of the thematic analysis, the following themes emerged.

The most common forms of knowledge sharing are interpersonal contacts between employees, without formal procedures. The sources of knowledge are more experienced and longer working colleagues. They are the ones who share knowledge about environmental protection. The following statement from an interviewee:

> *"…There was no information on how to do it. It was just knowledge passed on verbally and you had to ask yourself how to do something. You just had to find out for yourself...." (W, 4(4), Café, Single-company).*

The only examples of systematic knowledge-sharing mechanisms are initial training. This mainly takes place in network companies. However, these trainings are in the form of e-learning and are rare. But even in large companies, there is no culture of continuous learning, which some respondents believe is a problem. In many cases, the role of knowledge-sharing tools is played by passive information media, such as posters on the wall, cards, written instructions. These are a substitute for direct communication and their main function is to remind people of certain established rules of conduct. The interviews identified that there is a lack of motivation mechanisms as to how to engage employees in sharing environmental knowledge and creating

innovation. Even if an employee has an idea, he or she does not know what to do with it, who to approach and wonders whether it is worth presenting it to someone, as the likelihood of it being implemented is low if it does not bring great financial benefits to the company. Nevertheless, the surveyed employees have ideas to reduce the environmental impact of the companies they work for. They want to acquire knowledge in this area and implement it. However, they are most in need of accessible and practical forms of environmental knowledge. The ways of sharing knowledge in the organisation reported by those surveyed are: practical workshops and training. Both activities organised as mandatory. The individual in-depth interviews conducted revealed that employees lack the forms mentioned above and they would be very helpful for them to better manage environmental knowledge in the workplace.

In the last part of the survey, the utilization of environmental knowledge was analysed. Despite the rather pessimistic data collected in the earlier stages, it turns out that the surveyed employees were able to cite some good examples of the operationalisation of environmental knowledge in companies in the food service industry. These data show that, despite the lack of environmental knowledge management procedures and adequate training, employees are capable of implementing pro-environmental measures. Good practices identified during the interviews include (Table 2).

The knowledge of how to reduce food waste is used extensively in practice, although in chain companies it is restricted by rigid and sometimes incomprehensible procedures for employees. The following is an example of what an employee said:

> *"… And there were some internal rules that employees were not allowed to take it after closing. If it doesn't sell, you just have to throw it away. And we were also so much verified out of it, whether it definitely ended up in the bin …" (W, 3(3), Café and bakery, Local network company).*

Table 2: Good practices identified in food service industry in Poland

Constraints in specific areas of company operations in the food service industry:			
packaging materials	**energy consumption**	**resource consumption**	**food waste**
- change of packaging from plastic to paper, - cutlery made from fruit seeds, - dispensing with extra paper bags, - allowing customers to bring their own packaging, - reducing the size of packaging and making it fit the product better.	- replacing light bulbs with energy efficient ones, - switching off advertising banners and appliances at night, - switching off air conditioning and controlling its use, reporting on electricity consumption, - one boiler, heating water for two dishwashers.	- water filter jug for employees, - repairs to "infinity" appliances, - use of own reusable beverage cups for employees, - use of coffee grounds as fertiliser for plants.	- using leftovers to create desserts or cocktails, - food waste for animals, - working with volunteers and food sharing initiatives - failed and unspent dishes can be eaten by employees.

Among all resources, companies in the food service industry save electricity the most. However, this is linked to the need to reduce operating costs. So this is further confirmation that ecology is a secondary effect of economic measures. A thematic analysis of individual in-depth interviews conducted with employees of the food service industry identified areas of improvement for the industry in terms of reducing environmental impact. The directions identified include:

- Improved waste segregation, introduction of fractional bins, labelling and visual instructions at the bins.
- Implementation of compulsory environmental training in the workplace, periodic training, the more detailed and practical the better, ending with a test or other form of knowledge check.
- Introduce a reward system for employees' environmental initiatives, setting up a system to support the submission of ideas.
- Collect, organise and make available good environmental practices used by frontline staff, either digitally or on paper.
- Make top management aware that environmental protection is not a cost but a marketing and image value.
- The need for environmental indicators in companies and their implementation in employee and team appraisal.

6. Conclusion

This research concerns a very important area of environmental knowledge management in a very specific and peculiar industry such as the food service industry. This industry is characterised by very dynamic growth but also by high fragmentation. There are a lot of small and micro companies operating in this market in Poland. As such, they have to cope with high legal requirements and customer expectations regarding environmental standards. Companies are able to cope with these challenges and mitigate their consequences through the early and gradual implementation of environmental procedures. These processes staggered over time and using innovation and employee involvement can be very effective on the way to achieving these goals. In many areas of the world, sustainability issues are gaining momentum and receiving significant consumer attention. However, the implementation of a comprehensive green knowledge management concept is required to reach its full potential.

Research conducted confirms that the food service industry is characterised by a very low level of organisational culture with regard to the implementation and management of environmental knowledge. This is particularly worrying as the industry has a major impact on the environment. The research conducted indicates the need for formal environmental knowledge management systems. Very often, the knowledge used by line employees is bottom-up, or related to the need to save money - if it comes from company management. The companies surveyed did not create an eco-innovator-friendly atmosphere. They did not in any way try to motivate employees to develop environmental opportunities and share these ideas. And, as is well known, the process of food preparation and delivery is complex and provides ample scope for taking action to reduce the negative environmental impact of the industry. The analysis of the material presented leads to the reflection that the best way to reduce the carbon footprint and environmental impact of the food service industry is probably through restrictive regulation.

7. Recommendations and Implications

The results of the study suggest the following practical implications. First and foremost, mandatory training in environmental knowledge should be introduced. Food service industry entities should promote good practices and create systems for reporting and rewarding employee initiatives. Other practical recommendations include the creation of unified, simple and clear tools for sharing and implementing environmental knowledge. From a theoretical point of view, the contribution of this study allows for greater attention to be paid to economic niches where the overall level of management may be low. This research confirms the importance of tacit knowledge in pro-environmental activities. Furthermore, the knowledge management model used (creation, storage, sharing, utilization) appears to be a good tool for describing and improving the food service industry. As for further research, it is recommended that larger-scale quantitative studies be conducted to examine the topic in greater depth and detail. Extending the research beyond one country is highly recommended in order to compare the results.

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