Biovaaka: Driving Sustainable Food Waste Tracking and Reduction in Finland

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Abstract:	This case study explores the escalating global issue of food waste, a challenge that has far-reaching implications for environmental sustainability, economic efficiency, and social equity. It sets the stage by painting a comprehensive picture of the food waste problem, underscoring the urgency of finding innovative solutions to mitigate its impact. At the heart of this case study is Biovaaka, an innovative waste reduction company born out of a collaborative effort to address the food waste crisis. The case study outlines the creative mechanisms through which Biovaaka operates, employing cutting-edge technology and community-based strategies to minimize food waste in the restaurant and food catering industry. Furthermore, the case examines the hurdles Biovaaka faced, from technological challenges to scaling up their operations, alongside their triumphs in creating a scalable and replicable

	model for waste reduction. It highlights the pivotal role of external support from governmental and non-governmental organizations, which provided the necessary resources and platform for Biovaaka to intensify its impact. Through targeted interventions and community engagement, Biovaaka demonstrates that incremental adjustments in how food waste is approached can lead to substantial environmental and social benefits.

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Abstract

This case study explores the escalating global issue of food waste, a challenge that has far-reaching implications for environmental sustainability, economic efficiency, and social equity. It sets the stage by painting a comprehensive picture of the food waste problem, underscoring the urgency of finding innovative solutions to mitigate its impact. At the heart of this case study is Biovaaka, an innovative waste reduction company born out of a collaborative effort to address the food waste crisis. The case study outlines the creative mechanisms through which Biovaaka operates, employing cutting-edge technology and community-based strategies to minimize food waste in the restaurant and food catering industry. Furthermore, the case examines the hurdles Biovaaka faced, from technological challenges to scaling up their operations, alongside their triumphs in creating a scalable and replicable model for waste reduction. It highlights the pivotal role of external support from governmental and non-governmental organizations, which provided the necessary resources and platform for Biovaaka to intensify its impact. Through targeted interventions and community engagement, Biovaaka demonstrates that incremental adjustments in how food waste is approached can lead to substantial environmental and social benefits.

Learning Outcomes

By completing this case study, students should be able to:

- identify the issues related to food waste in general and specific to Finland;

- identify and discuss Biovaaka's competitive scenario and strategies for gaining competitive advantage;
- discuss the technologies being deployed by Biovaaka in reducing food waste and their effectiveness compared to industry standards;
- reflect on Biovaaka's operations and business strategies contributing to environmental sustainability and capturing opportunities for improvement.

Introduction

Food waste represents a significant global challenge, adversely affecting the environment, societies, and the economies of nations worldwide. According to the CEO World magazine (2024), the United Nations Environment Programme (UNEP) Food Waste Index Report highlights that nearly 931 million tons of food are discarded annually. This waste contributes to 8 to 10 percent of global carbon emissions arising from producing food that is never consumed. According to the report, about 17 percent of worldwide food production ends up as waste, with households accounting for 61 percent of this total. The food service and retail industries are responsible for 26 percent and 13 percent of food waste, respectively. The UNEP Food Waste Index Report (2021) discovered that the amount of food thrown away by each person is about the same in countries with different levels of income, from lower-middle to high-income ones. Given these facts, it is very important to cut down on food waste. When food is wasted, it makes it harder for people to get the food they need and puts extra pressure on how countries handle their trash. Too much-wasted food also contributes to ongoing environmental problems like pollution, climate change, and the loss of different kinds of plants and animals (CEOWORLD, 2024). When evaluating food waste, it is more insightful to consider the per capita food waste within a country rather than the total gross amount of food wasted. There is an urgency to address food wastage, not only as an

environmental concern but as a critical societal and economic issue. The United Nations Sustainable Development Goal 12.3 aims to halve food waste at the retail and consumer level and to reduce food loss across supply chains. An interesting find is that not all countries in the top 10 list of food wasters are developed nations. Rather, the list shows the countries wasting food are from the regions ranging from Africa to the Middle East, Asia and Europe. In 2020 in the EU, nearly 59 million tons of food went to waste, which is 131 kg of wasted food per citizen living in the European Union (EU) (EuroStat, 2023). As per the data from Statista (2023), Belgium and Denmark also stand out for their high figures at 250kg and 221kg per person, respectively. By contrast, Croatia and Slovenia had a far lower waste output per person, at 71kg and 68kg, respectively. Estimates show that up to 10 percent of the 59 million tonnes of food waste that is generated in the EU every year are somehow linked to date labeling: 53 percent of consumers do not know the meaning of "best before" labeling and 60 percent of consumers do not know the meaning of "use by" labeling (EU Commission, 2015). The EU Commission is therefore about to establish a common enactment for its member states to monitor food waste at every step of the food chain (EU Commission, 2018).

Food Waste in Finland

Finland, known for its stunning natural landscapes, including thousands of lakes and expansive forests, stands as a beacon of tranquility and natural beauty in Northern Europe. Finland's economy is diversified, with significant contributions from technology, manufacturing, and services sectors. The Finnish culture, rich in traditions, literature, and arts, also embraces innovation and technology, making it a unique blend of the old and new. As a member of the European Union, it plays a significant role in regional politics and economics (The World Bank, 2024).

In Finland, like in many developed countries, food wastage is a significant concern that spans the entire food supply chain, from production to consumption. The Finnish approach to managing food waste combines meticulous data collection, public awareness campaigns, and innovative solutions aimed at minimizing waste at every stage. Recent studies and reports indicate that Finnish households, retail outlets, the catering sector, and primary production all contribute to the nation's food waste footprint (Finish Environmental Institute, 2019).

The Finnish government, alongside non-profit organizations and private enterprises, has been proactive in its efforts to quantify and reduce food waste. Initiatives such as the national waste reduction campaigns and the support of startups focusing on food waste reduction technologies exemplify the comprehensive strategy employed. Notably, Finland has also participated in EU-wide projects to standardize food waste measurement methodologies, aiming to provide more accurate and comparable data across member states. In terms of specific figures, research has highlighted that Finnish consumers contribute a considerable amount of the overall food waste, with estimates suggesting that each person wastes approximately 20-25 kilograms of food annually. The retail sector has made strides in reducing waste through better inventory management and by donating unsold but still consumable food to charities. The catering sector, too, has seen initiatives aimed at reducing plate waste through portion control and customer education. Despite these efforts, challenges remain in accurately capturing data across all segments, particularly in primary production and processing stages, due to the variability in waste reporting standards and practices. As Finland continues to refine its waste reduction strategies, the focus is increasingly on leveraging technology and community engagement to foster a culture of sustainability and resource efficiency.

Food wastage occurs across various stages of the supply chain, including primary production, manufacturing, retail, the catering sector, and households in Finland. This multi-faceted issue encompasses losses from initial agricultural production through to processing, distribution, commercial food service activities, and ultimately, consumption within domestic settings. In the food waste hierarchy, the primary aim is that food should be eaten and, if impossible, fed to animals or used as raw material for non-food products (Papargyropoulou et al., 2014).

This case study will primarily concentrate on food wastage within the restaurant and catering sector, excluding other segments of the supply chain. It will examine the efforts of Biovaaka, a Finnish company, and its innovative initiatives aimed at combating food waste in Finland.

Background

Biovaaka is a provider of food waste management services in the business-to-business (B2B) space in the Food and Agriculture Tech and Environment Tech market segments. The company is situated in Lappeenranta, Finland. The company was founded in 2018 by Mattias Green and Valtteri Ahonen and works in the waste management sector with about 8-9 employees who provide services in tech waste management (Sense, 2024). Biovaaka's goal is to integrate food waste tracking and measurement seamlessly into the routine operations of in the food catering and restaurants sector. To achieve this, they have designed a food waste tracking system that is both fast and simple. This tracking system is an online platform that provides features such as automatic plate loss monitoring, food waste monitoring, and more. Biovaaka was developed in cooperation with LAB University of Applied Sciences and LUT (Lappeenranta-Lahti University of Technology). Food waste significantly affects a restaurant's profitability, with restaurants

contributing to up to 20 percent of all food waste. The process of monitoring food waste is typically manual, becoming a slow and intrusive task during peak times.

Operation Model of Business

Monitoring and visualizing food waste enables its reduction, leading to cost savings. The Biovaaka system offers a tailored approach to minimizing food waste in professional kitchens. Recognizing the unique nature of each restaurant and kitchen, the system provides various methods for tracking food waste. Detailed and transparent reports provided by this tech system deliver insights into food waste at various points, enhancing both operational management and the effectiveness of food waste mitigation strategies. Food business clients utilizing the Biovaaka system have achieved notable decreases in their food waste, underscoring the system's efficacy in waste reduction efforts (Biovaaka, 2024).

Food Waste Calculator

The first step in reducing food waste is to make food waste tracking a part of the business's daily life. Tracking food waste should be easy and fast for any restaurant and catering service as it is vital to identify all the stages where food loss occurs. The Biovaaka system provides accurate information on the amount and type of food waste generated in a professional kitchen. A typical calculator of Biovaaka's service in a restaurant shows information in Table 1.

Table 1: Food waste calculator*

Board	550 meals/week
Cost of meals	EUR 5.50/meal

The total cost of the meal	EUR 3025
Food Wastage	25 percent
Meal's wastage	137.5 meals/week
Cost of meals wasted	EUR 756
With Biovaaka (30 percent less wastage)	EUR 227/ week
With Biovaaka monthly save	EUR 908

* Based on information available on website (https://biovaaka.fi/)

In reducing food waste, it is important to identify all stages where food waste occurs. With the help of the Biovaaka system, professional kitchens can get precise information about the amount of food waste generated in all the different stages and act accordingly.

Biovaaka's Services

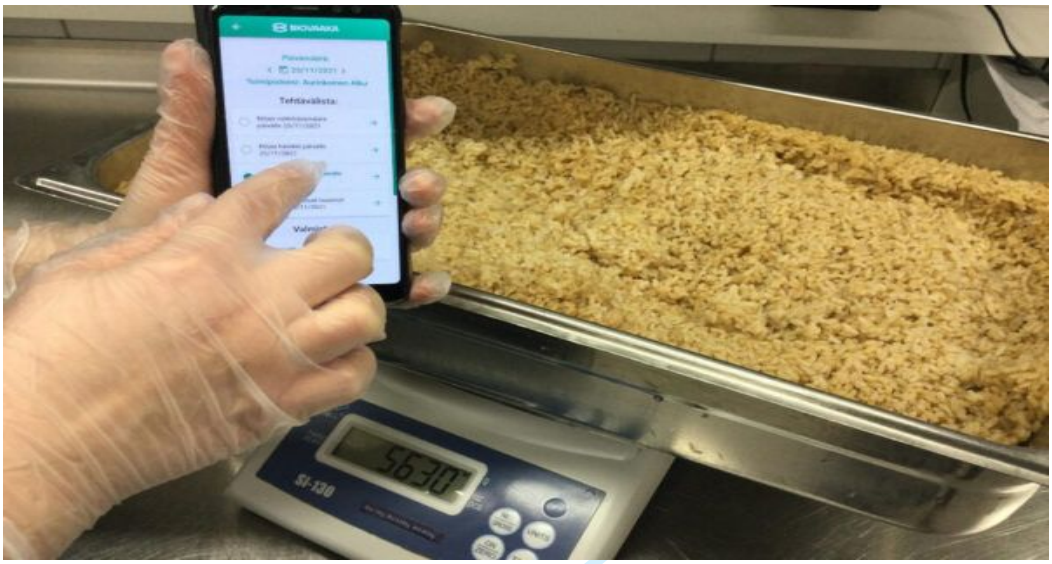
Biovaaka's services encompass diverse options for monitoring food waste, enabling its clients to select the most suitable solution. Biovaaka's tools aggregate all data on food waste in a single location, facilitating detailed and comprehensive tracking of information. Below are descriptions of the solutions the company offers.

Biovaaka Flow: Demand and Supply Situations

This service offers allows for easy, cost-efficient integration of waste management into daily operations. Biovaaka Flow eliminates the need for manual record-keeping, providing a digital tool

that helps minimize waste. It is accessible by any mobile device or computer, and only a kitchen scale and internet connection are required.

Figure 1: Biovaaka Flow



Source: Biovaaka website, 2024

Beyond logging food waste, Biovaaka Flow also captures data on how much food is actually consumed in a portion at restaurants compared to how much is served; providing a fuller picture of food waste and actual consumption. This information enables the generation of detailed reports to help in decision-making about portion sizes, and allows restaurants to know how much raw material they need to purchase and how much food they should prepare.

Biovaaka Pro

The Biovaaka Pro service allows the waste in a container to be measured on a scale, displaying the waste amount on a screen and recording the data. The monitor and the scale are provided with the

service (as shown in Figure 2) and all the data is stored in the cloud to be accessed by the restaurant and the company.

Figure 2: Biovaaka Pro

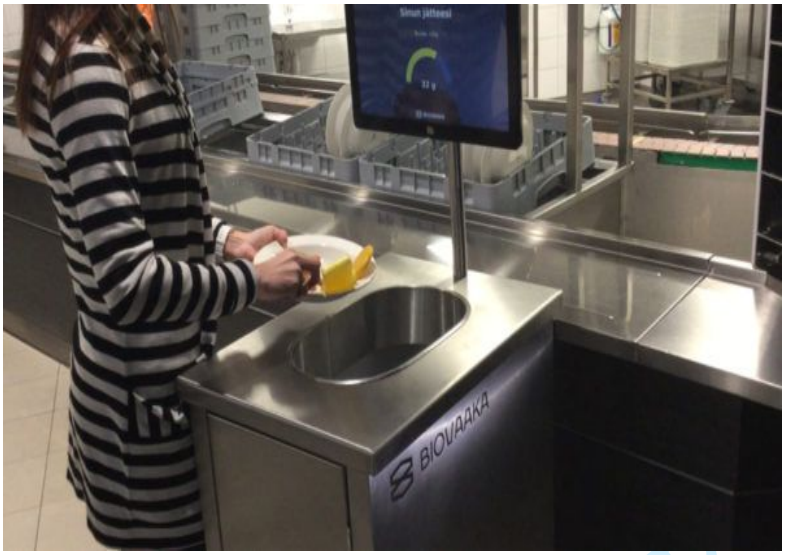
Source: Biovaaka website, 2024

Biovaaka Serve

Biovaaka Serve offers automated tracking of plate waste. In this context, customers are also included in the food waste management process. Involving the customers helps make them aware of food waste, encouraging them to reduce food waste. Biovaaka Serve is suitable for a restaurant environment where diners return their dishes themselves. Once the customer has finished their meal, they go to empty their plate into the Biovaaka Serve bin, which is attached to a scale. The scale displays the amount of food waste for that customer, followed by the total weight of wasted food on that particular day in the restaurant. The Biovaaka Serve tool is a revolutionary system for buffet operations, educational institutions, hotels, and restaurant chains. The system displays the food waste of customers on a screen; it is an attempt to reduce food waste by making customers

aware of the amount of food they are wasting. In addition to tracking plate waste, the system can be set up to track other sources of food waste, providing information on all food waste in one package.

Figure 3a: Biovaaka Serve



Source: Biovaaka website, 2024

Figure 3b: Biovaaka Serve

Source: Authors, 2024

Biovaaka's Food Waste View

Biovaaka View is another service, which makes consumers aware of cumulative food wastage data on a large screen. The data from the restaurant's food wastage is shown on the screen while the customers are enjoying their meals, reminding them not to order excessively or take an amount of food from the buffet that they are unable to finish. Making food waste visible helps to influence and engage everyone in the goal of reducing food waste. Having this display on reducing food waste can also showcase businesses' concern for the environment, showing customers how they are contributing to their corporate social responsibilities.

Figure 4: Biovaaka View

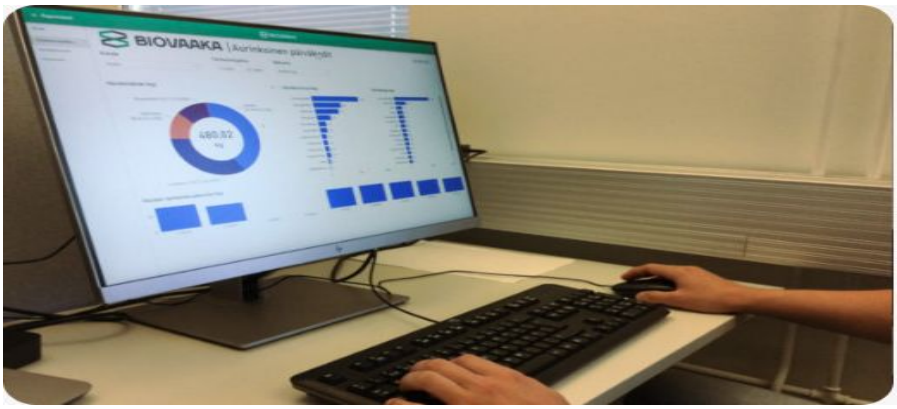
Source: Biovaaka website, 2024

"In essence, our company provides comprehensive digital solutions to track food wastage. These tools not only measure waste but also offer insights to enhance business efficiencies," as noted by Laura Järvinen, sales and marketing manager of Biovaaka.

While the Biovaaka tool is sophisticated, it cannot combat food wastage alone—it requires a collective effort. The most substantial impact can be made in the realm of food education, particularly among the young. Children can learn early on about the importance of not discarding food. It is they, Järvinen believes, who will eventually become advocates for these values.

With the help of clear reporting, the clients of Biovaaka can monitor and reduce food waste. They can use this information to support kitchen operations, saving money establishing themselves as sustainable businesses.

Figure 5: An inclusive reporting of the data visible to the clients for better waste management



Source: Biovaaka website, 2024

Pros and cons of Biovaaka

Biovaaka leverages advanced technologies to mitigate food waste and promote sustainability. While its innovative approach brings substantial benefits, it also entails several challenges. A detailed examination of the pros and cons of Biovaaka's technologies indicates its impact, value, and potential areas of improvement (as shown in Table 2).

Table 2: Advantages and disadvantages of the technologies used by Biovaaka

Technology	Advantages	Disadvantages

Biovaaka Flow	- Easy to set up - Cost-effective - Suitable for large-scale deployment - Provides real-time data for immediate action	- Requires manual input and tracking which can be time-consuming - Potential for human error in data entry - Limited to the accuracy of manual measurements
Biovaaka Serve	- Visualizes food waste, helping to change attitudes and behavior - Provides detailed reports and insights - Helps in identifying waste patterns - Encourages staff to reduce waste through visible feedback - Automated data collection reduces human error - Centralized data management for easy analysis	- Initial setup cost might be high - Requires commitment from staff to consistently use the system - May require integration with existing kitchen workflows, which can be disruptive - May require training for effective utilization

Biovaaka Pro	- Provides comprehensive waste tracking - Can be integrated with other kitchen management systems - Automated calculation and recording of food waste data - Fully integrated system offering easy access to the data by the food service providers	- Higher initial investment compared to manual systems - Potential technical issues or maintenance requirements - Dependency on reliable internet connectivity for cloud services no available information.

Client's Experience with Environmental Sustainability

The Biovaaka bio scale reduces food waste at the takeout table at Kouvola's Pizza & Buffa restaurant located in Prisma Kouvola, one of the most popular food places for locals and international travelers in Finland. The bioscale provides real-time feedback to customers on their waste levels using smiley faces when they return their plates. A green smiley signifies minimal waste, while a red face suggests that a more modest serving should be considered next time. The bioscale collects a standard amount of unavoidable waste, acknowledging the presence of inedible items such as bones and shells that remain on the plate.

Kouvola's Pizza & Buffa had two scales in test use, improving the measurement of food waste. At Pizza & Buffa, one bio scale is positioned at the tableware return point, where customers empty their plate scraps. The second scale is in the back room of the kitchen, where it weighs the food waste generated during kitchen work. The first week of the test showed that the scale gives a new perspective on waste management. The staff was relieved to not have the extra work of manual calculation of wasted food and instead took up other important tasks in the restaurant. At the same time, at the table return point, customers visibly witnessed the amount of food waste while emptying their plates; reducing a significant amount of food waste (SOK, 2023).

Tuomo Keskinen from Finland's SOK Mara superstore chain stated that by analyzing kitchen waste data from the waste received using Bio scale, they identified the sources that generated more waste than expected and promptly took action to address them. Tuomo Keskinen reports that the restaurant has used the system's reports to identify initial strategies for cutting down on waste. Data analysis of kitchen waste pinpointed specific areas where waste exceeded goals, prompting swift action. Tuomo also mentions that customers have shown a keen interest in the waste reduction trial and appreciate the encouragement to consume more mindfully.

Espoo Catering in the city of Espoo supplies almost 80 percent of the city's catering services. The main customers are schools and kindergartens and they prepare around 80,000 meals every day for a couple of hundred locations and service points, from baby to adult. Along with the city of Espoo, they have set a goal to reduce food waste every year, and have succeeded in doing so repeatedly since 2014. Last year, the loss decreased by about 6 percent. Control systems using Biovaaka Pro and this digitalization became an integral part of their kitchens. At Espoo Catering, for instance, the convergence of food waste tracking, operational oversight, and recipe management enables the system to tailor food preparation volumes based on the dish's demand.

Hence, they modify the menu based on the feedback they receive. Expertise in culinary techniques and efficient management of food preparation are critical factors in mitigating food waste. Unserved food can be safely chilled and repurposed for future meals. Additionally, redistributing surplus food from the service line through donations or sales contributes to waste reduction. Espoo Catering practices this by selling remaining food to interested individuals.

Competition

As the company remains focused on specializing in reducing food waste in professional kitchens, it appears to be relatively niche with a focus on sustainability and efficiency in the food service industry. Few other companies are operating in the same industry focused on waste reduction and contributing to zero carbon emissions in the environment. However, it's known that Biovaaka operates in a specialized segment that addresses environmental and cost-saving concerns by offering solutions for tracking and minimizing food waste. This area of operation likely places Biovaaka in competition with other companies aiming to improve sustainability and operational efficiency in professional kitchens and food service establishments. The company's approach to reducing food waste through visibility and tracking indicates a strategic focus on environmental sustainability and cost reduction, which are critical factors in the competitive landscape of food service industry solutions. Table 3 illustrates the various clientele bases of Biovaaka.

Table 3: Clientele base of Biovaaka

Name of the organization	**Type of establishment**	**Service Remarks**	**Type of service from Biovaaka**

Kouvola's Pizza & Buffa	Restaurant	Both staff and customers highly appreciate it.	Biovaaka Serve Biovaaka Pro
Tuomo Keskinen	Restaurant	The staff in the kitchen find it easy to keep track of their daily food waste. The customers have significantly contributed to reducing food waste with Biovaaka serving while emptying their plates.	Biovaaka Pro Biovaaka Serve
Espoo Catering	Catering Service	They cover almost 80 percent of the catering services in Espoo; contributing significantly to minimizing food waste around the city.	Biovaaka View Biovaaka Serve Biovaaka Pro
Vuoksenniska school	Public School	The pupils at the school cafeteria significantly reduced food wastage.	Biovaaka Serve Biovaaka Pro
Kampusravintolat Oy	Eateries	Operate at academic institutions and public places; reducing food waste both in kitchens and from the plates of the customers.	Biovaaka Pro Biovaaka Flow Biovaaka Serve

			Biovaaka View

Below are some of Biovaaka's competitors.

eSmiley

This company is a Copenhagen-based Danish-origin business that specializes in improving food safety and reducing food waste within the food service industry. The company offers digital tools and services designed to streamline food safety compliance and minimize waste. Their solutions include in-built software for food safety management, waste tracking systems, and training modules aimed at educating staff on best practices in food handling and waste reduction. Through all of these operations, eSmiley expediates a culture of safety and sustainability in food service establishments, inspiring businesses to comply with regulatory requirements and to operate more sustainably and cost-effectively. One of the key factors of eSmiley that differentiates them from Biovaaka is that they operate all over the Nordic countries; whereas Biovaaka only operates in Finland.

Hukka AI

Hukka AI is a Finland-based technology company developing an intelligent software as a service (SaaS) solution to measure, scrutinize, and reduce food waste in professional kitchens. The company's service was first introduced in the spring of 2020 and since then they have served a large number of commercial kitchens around the country. The company found that many restaurants and commercial kitchens do not want costly digital scales and set-up systems. Therefore, they aim to provide an easy, affordable, and intelligent tool to reduce food waste. Hukka AI strongly focuses on its competitive advantage, which is creating more sustainable and profitable professional kitchens without any initial investments.

SWOT Analysis of Biovaaka and its Competitors

SWOT analysis is a simple yet powerful tool for assessing an organization's resource capabilities and deficiencies, market opportunities, and external threats to its future (Thompson et al., 2013). This analysis examines four key characteristics to compare how competitive the business can be within its industry. Here, Biovaaka has a tough crowd to compete with in terms of being constant at the peak of its market for six years' time. Being the trendsetter does not ensure Biovaaka's crown in the future. Table 4 shows certain weaknesses and threats which also should be considered to tackle challenges in the industry, such as the competition from other tech solutions.

Table 4: SWOT Analysis of Biovaaka and its Competitors

Brands	Strengths	Weaknesses	Opportunities	Threats

Biovaaka **Res Q Club**	- Innovative solutions - Collaboration with academic institutions - Comprehensive tracking solutions - Proven track record - Automated data collection - Finnish consumers' preference towards domestic products - User-friendly app - Large network of partners	- Affordability and high initial setup cost - High R&D Costs - Limited geographic presence - Limited to urban areas	- Expansion into international markets - Collaboration with other systems - Offering affordable products and solutions - Expansion to new cities	- Competition from other tech solutions - Dependence on Internet connectivity - Similar apps in the market

Oddbox	- Unique value proposition - Direct-to-consumer model	- Dependent on restaurant participation - Logistical challenges - Limited to specific regions	- Increasing awareness of food waste - Growing consumer interest in sustainability - Expansion to new regions	- Restaurant participation consistency - High operational costs - Competition from other subscription services
Froodly	- Direct discounts for consumers - Partnership with local stores	- Reliant on store partnerships Variable availability of items	- Expansion of partnerships - Increasing consumer savings awareness	- Competition from similar discount platforms - Store partnership retention
Karma	- Easy to use - Broad range of food items	- Limited to participating stores	- Expansion to new markets	- High competition - Market saturation - High competition

eSmiley **Hukka AI**	- Large user base - Strong brand recognition - Use of sophisticated technologies - Education programs for employees - Greater market coverage - Integration of modern technologies	- Dependent on business participation - Limited geographic coverage could not be identified from the given info in the main case	- Growing awareness of food waste - Further market expansion - Strengthening brand loyalty - Consumers' growing interest towards sustainability - Food service organizations' growing interests for food waste reduction	- Market competition - Retention of business partnerships - Growing competition

	- Large customer base - Affordable tools and systems for customers	- Focus on the Finnish market only	possibly same as above	- Growing competition

Challenges

One of the key challenges of Biovaaka is its competition. With eSmiley being an international company, their customer reach is very high. However, Finnish people have preferences toward domestic products, which works as an advantage for Biovaaka. On the other hand, Hukka, being a Finnish-origin company poses a strong challenge for Biovaaka as a competitor. As they focus on

affordability, Biovaaka needs to consider taking more actions toward building an affordable solution for food waste management. In addition to the competitors, there are other challenges Biovaaka encounters, such as R&D costs. In science and technology-driven industries, innovation is key to success, however, R&D can be extremely costly, with no guarantee of return on investment. Therefore, Biovaaka has to find the right balance between innovation and financial sustainability.

Another challenge is data security and privacy. As Biovaaka will have access to various companies' waste data, keeping this vulnerable information secure can be a challenge. Likewise, many organizations might not feel comfortable with their food wastage information being known to the public; therefore, ensuring the security and privacy of this information against cyber threats is crucial for maintaining consumer trust.

Moving Ahead

Biovaaka has been operating in the Finnish market for over 5 years and it shows promising prospects for the future of its business. The company can explore several strategies to enhance its offerings and create a positive impact on society. By leveraging technology and innovative practices, Biovaaka can address the growing challenges of waste management more efficiently and sustainably. A few plans for them could be as follows:

- *Waste sorting technology*: Invest in advanced sorting technologies that use AI and machine learning to automatically separate the food waste into animal feeding, anaerobic digestion, and composting. This can increase the efficiency and accuracy of dealing with food wastage.

- *Global expansion*: The competitor of Biovaaka, eSmiley, has operations in all of the Scandinavian countries, giving them the benefit of reaching a wide range of customers. Biovaaka can attempt to expand operations to other countries, especially those lacking in waste management infrastructure by bringing expertise and technology to these markets.
- *Expand the service line*: As dealing with food waste in various restaurants and commercial kitchens gives Biovaaka access and knowledge about the huge amount of food wastage, they can consider starting a service with a digital app that allows after-hours collection of food at a much lower price. This model is used in Denmark by a company called 'Too Good to Go' which operates with a mobile application that connects customers to restaurants and stores that have surplus unsold food.

For Biovaaka to stay ahead in the waste management industry, focusing on innovation, sustainability, and partnerships will be the keys to success. By adopting these strategies, the company can not only expand its business but also make a significant positive impact on the environment.

Discussion Questions

1. What are the key strengths and weaknesses of Biovaaka?
2. Identify Biovaaka's main competitors and analyze their strategies. How can Biovaaka gain a competitive advantage?
3. What technologies does Biovaaka use to reduce waste, and how effective are these technologies compared to industry standards? (See Further Reading for a discussion of industry standards.)

4. Discuss how the company's operations and business strategies contribute to environmental sustainability and identify any potential areas for improvement.

Further Reading

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Biovaaka: Driving Sustainable Food Waste Tracking and Reduction in Finland

Teaching Notes

Case Summary

Biovaaka is a Finnish company specializing in providing food waste management services in the B2B sector. Founded in 2018 by Mattias Green and Valtteri Ahonen, Biovaaka offers innovative solutions to track, monitor, and reduce food waste in professional kitchens. The company's services include Biovaaka Flow, Biovaaka Pro, Biovaaka Serve, and Biovaaka View, each tailored to meet the specific needs of its clients. By leveraging technology and collaboration with academic institutions, Biovaaka has successfully helped its clients achieve significant reductions in food waste while enhancing operational efficiencies. Biovaaka's operation model focuses on monitoring and visualizing food waste to enable its reduction, leading to cost savings for its clients. The company offers a range of services tailored to meet the unique requirements of different types of professional kitchens, providing detailed reports and insights to enhance waste reduction strategies. Apart from competition, Biovaaka encounters challenges such as R&D costs and data security concerns. Balancing innovation with financial sustainability and ensuring the security and privacy of client data are crucial for the company's success. To stay ahead in the waste management industry, Biovaaka can consider strategies such as investing in waste sorting technology, expanding globally, and diversifying its service line. By focusing on innovation,

sustainability, and partnerships, Biovaaka can expand its business and make a significant positive impact on the environment.

Teaching Objectives

Through completing this case study, instructors should be able to guide students to obtain a stronger understanding of:

- identify the issues related to food waste in general and specific to Finland;
- identify and discuss Biovaaka's competitive scenario and strategies for gaining competitive advantage;
- discuss the technologies being deployed by Biovaaka in reducing food waste and their effectiveness compared to industry standards;
- reflect on Biovaaka's operations and business strategies contributing to environmental sustainability and capturing opportunities for improvement.

Target Audience

Typically, the case would be pertinent to strategic management course at the undergraduate and graduate level.

Suggested Teaching Strategy

While ideally suited for a 90-minute class, it's conceivable that this may not be enough time to cover all the materials outlined in the analysis section. Given the wealth of data in the case, the instructor must decide which areas to prioritize during the analysis. Depending on the group's interests, the instructor can opt to delve into broader equity versus efficiency concerns within the

operational context or focus on the application of business optimization concepts. Naturally, this decision will also hinge on where the case falls within the course sequence. If students have already covered basic strategic management concepts, it could lead to engaging discussions on potential heuristics. The modular design inherent in case analysis grants instructors the flexibility needed to structure class discussions effectively. Additionally, instructors should encourage students to explore operational and managerial issues in other food waste tracking companies' systems and compare them with the challenges faced by Biovaaka.

Suggested Discussion Question Answers

1. What are the key strengths and weaknesses of Biovaaka?

Here, Table 4 directly informs and justifies the answer. *Key Strengths of Biovaaka:*

i. *Innovative solutions*: Biovaaka offers innovative and tailored solutions for food waste management in professional kitchens, addressing the unique needs of each client.

ii. *Collaboration with academic institutions*: The company collaborates with academic institutions like LAB University of Applied Sciences and LUT (Lappeenranta-Lahti University of Technology) to develop its technology and enhance its services.

iii. *Proven track record*: Biovaaka has a track record of successfully helping its clients achieve significant reductions in food waste, leading to cost savings and improved operational efficiencies.

iv. *Comprehensive tracking solutions*: The company offers a comprehensive range of services, including Biovaaka Flow, Biovaaka Pro, Biovaaka Serve, and Biovaaka View, covering various aspects of food waste tracking and reduction.

v. Automated data collection: Biovaaka collects real-time food waste data using its automated solutions. For example, Biovaaka's solutions combines all food waste data in one location. Likewise, in actual consumption situations, Biovaaka flow provides data on the actual amount of food being consumed.

vii. Finnish consumers' preference towards domestic products: Finnish consumers' prefer products and solutions that are originated in Finland. In this respect, Biovaaka has an advantage over the foreign competitors in getting acceptance in the local markets in Finland.

Key Weaknesses of Biovaaka:

i. *Limited geographic presence*: Biovaaka operates primarily in Finland, limiting its reach compared to competitors like eSmiley, which operates internationally.

ii. *High R&D costs*: Developing and maintaining innovative solutions can incur significant research and development costs, which may strain the company's financial resources.

iii. *Affordability and high initial setup cost*: While Biovaaka's services offer value in reducing food waste and improving operational efficiency, affordability may be a concern for some clients, especially smaller businesses with limited budgets. It also means that the initial setup cost can be high for the clients.

Overall, while Biovaaka has demonstrated strengths in innovation, collaboration, and customer satisfaction, it also faces challenges related to competition, geographic expansion, and financial sustainability. Addressing these weaknesses will be critical for the company's long-term success and growth in the food waste management industry.

2. Identify Biovaaka's main competitors and analyze their strategies. How can Biovaaka gain a competitive advantage?

Main Competitors of Biovaaka:

i. eSmiley: eSmiley is a Copenhagen-based company that specializes in providing solutions to improve food safety and reduce food waste in the food service industry. Their offerings include digital tools and services for food safety management, waste tracking systems, and staff training modules. eSmiley operates internationally and has a broad customer reach across the Nordic countries.

ii. Hukka AI: Hukka AI is a Finland-based technology company that offers an intelligent SaaS solution for measuring, analyzing, and reducing food waste in professional kitchens. Their service focuses on providing easy, affordable, and intelligent tools to minimize food waste, catering to the needs of restaurants and commercial kitchens.

Competitors' Strategies:

i. eSmiley:

International expansion: eSmiley has expanded its operations across the Nordic countries, allowing them to reach a wider customer base and establish a strong presence in the region.

Focus on food safety: In addition to food waste management, eSmiley emphasizes food safety compliance, offering a comprehensive suite of digital tools and services to ensure food safety standards are met in professional kitchens.

Technological innovation: The company leverages technology to develop advanced solutions for food safety management and waste reduction, staying at the forefront of innovation in the industry.

ii. Hukka AI:

Affordability: Hukka AI focuses on providing cost-effective solutions for food waste management, catering to the needs of small and medium-sized businesses with limited budgets.

Customer-centric approach: The company listens to the demands and requirements of its clients, developing its service based on customer feedback to ensure it meets their needs effectively.

Sustainability: Hukka AI emphasizes sustainability and profitability in professional kitchens, offering solutions that help reduce food waste while minimizing costs.

Gaining Competitive Advantage:

To gain a competitive advantage over its competitors, Biovaaka can consider the following strategies:

i. *Differentiation*: Biovaaka can differentiate itself by focusing on its strengths, such as collaboration with academic institutions. Innovative solutions such as edible food product packaging and biodegradable packaging can be introduced. Also, innovative food preservation methods can also be introduced i.e., find out new methods for extending the shelf life of food. Furthermore, Biovaaka can also differentiate itself by collaborating with food manufacturers, retailers, and logistics companies to create integrated solutions for reducing food waste across the supply chain.

ii. *Geographic expansion*: Expanding its operations beyond Finland can help Biovaaka reach a larger market and compete more effectively with international competitors like eSmiley. By exploring opportunities in neighboring countries or regions with limited waste management infrastructure, Biovaaka can create new business opportunities and establish itself as a key player in the industry.

iii. *Affordability and flexibility*: Offering flexible pricing plans and customizable solutions can help Biovaaka cater to the needs of different types of businesses, including smaller establishments with limited budgets. By providing affordable and scalable options for food waste management, Biovaaka can attract a wider range of clients and gain a competitive edge in the market.

iv. *Investment in technology*: Continuously investing in research and development to enhance its technology and offerings can help Biovaaka stay ahead of competitors and address evolving customer needs. By developing advanced solutions that leverage AI, machine learning, and data analytics, Biovaaka can provide more efficient and effective tools for food waste management, driving greater value for its clients.

Overall, by leveraging its strengths, exploring new markets, offering flexible and affordable solutions, and investing in technological innovation, Biovaaka can gain a competitive advantage and maintain its position as a leader in the food waste management industry.

3. What technologies does Biovaaka use to reduce waste, and how effective are these technologies compared to industry standards?

Biovaaka uses several technologies to reduce food waste in professional kitchens. These technologies are designed to streamline waste tracking, provide real-time feedback, and facilitate data-driven decision-making. Some of the key technologies employed by Biovaaka include:

i. *Biovaaka Flow*: This technology offers a comprehensive solution for managing food waste across multiple locations. It integrates waste management into daily operations, eliminating the need for manual record-keeping. Biovaaka Flow allows for easy tracking of food waste using kitchen scales and provides detailed data on demand and supply situations.

ii. *Biovaaka Pro*: Biovaaka Pro is a service that provides automated waste tracking using scales placed in waste containers. The system records waste amounts in real-time and stores the data in the cloud. It also includes installation, training, maintenance, and customer support services, making it a comprehensive solution for waste management in large kitchens.

iii. *Biovaaka Serve*: This technology offers automated plate waste tracking, involving both kitchen staff and customers in the waste management process. It encourages customers to be mindful of their food waste by providing real-time feedback on their waste levels. Biovaaka Serve is particularly effective in buffet-style operations, where customers can return their plates themselves.

iv. *Biovaaka View*: Biovaaka View is a technology that displays cumulative food waste data on large screens in dining areas. It serves as a constant reminder to customers to be mindful of their food waste and encourages them to reduce waste by adjusting their portions. This technology enhances transparency and accountability in waste management efforts.

In terms of effectiveness compared to industry standards, Biovaaka's technologies are highly regarded for their ability to streamline waste tracking, provide real-time feedback, and facilitate data analysis. These technologies offer comprehensive solutions that address various stages of the waste management process, from monitoring and tracking to analysis and reporting.

Compared to industry standards, Biovaaka's technologies stand out for their user-friendly interfaces, seamless integration into existing operations, and ability to provide actionable insights for waste reduction. The company's collaboration with academic institutions also ensures that its technologies are at the forefront of innovation and align with industry best practices.

Overall, Biovaaka's technologies are considered highly effective in reducing food waste in professional kitchens, and they set a high standard for waste management solutions in the industry. Their ability to provide comprehensive, user-friendly, and data-driven solutions positions Biovaaka as a leader in the field of food waste management.

4. Discuss how the company's operations and business strategies contribute to environmental sustainability and identify any potential areas for improvement.

Biovaaka's operations contribute significantly to environmental sustainability through its focus on reducing food waste in professional kitchens. By offering innovative technologies and services, Biovaaka helps its clients minimize food waste generation, leading to several environmental benefits:

i. *Reduction in greenhouse gas emissions*: Food waste decomposition in landfills produces methane, a potent greenhouse gas. By reducing food waste generation in professional kitchens,

Biovaaka helps mitigate greenhouse gas emissions, thus contributing to climate change mitigation efforts.

ii. *Conservation of natural resources*: The production, transportation, and disposal of food require significant resources, including water, energy, and land. By reducing food waste, Biovaaka helps conserve these resources, promoting more sustainable food production and consumption practices.

iii. *Protection of biodiversity*: Agriculture, food production, and waste disposal activities can have adverse impacts on biodiversity, including habitat destruction and pollution. By minimizing food waste, Biovaaka helps reduce the environmental footprint associated with these activities, thereby supporting biodiversity conservation efforts.

iv. *Less pressure on landfills*: Food waste makes up a significant portion of municipal solid waste, leading to overcrowded landfills and increased environmental pollution. By diverting food waste from landfills through its technologies and services, Biovaaka helps alleviate pressure on landfill capacity and reduces environmental pollution.

v. *Promotion of circular economy*: Biovaaka's approach to food waste management promotes the principles of a circular economy by reducing waste generation, recovering valuable resources from waste streams, and recycling organic materials through composting or anaerobic digestion.

Despite its significant contributions to environmental sustainability, Biovaaka may still have areas for improvement to further enhance its impact:

i. *Expansion of operations*: While Biovaaka operates primarily in Finland, expanding its operations to other regions or countries with limited waste management infrastructure could broaden its environmental impact and reach a wider audience.

ii. *Technological innovation*: Continuously investing in research and development to improve its technologies and services can enhance Biovaaka's effectiveness in reducing food waste and maximizing resource recovery.

iii. *Education and outreach*: Increasing awareness and educating stakeholders about the environmental benefits of food waste reduction could amplify Biovaaka's impact. This could involve providing resources, training, and support to clients, as well as engaging with policymakers, consumers, and the general public.

iv. *Collaboration and partnerships*: Strengthening collaborations with academic institutions, industry partners, and government agencies can facilitate knowledge-sharing, innovation, and the adoption of best practices in food waste management and environmental sustainability.

Overall, while Biovaaka has made significant strides in promoting environmental sustainability through its operations, there are opportunities for further improvement to maximize its positive impact on the environment. By continuing to innovate, collaborate, and educate, Biovaaka can play a pivotal role in advancing sustainable food waste management practices and contributing to a more environmentally sustainable future.