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Impact Entrepreneurship and Innovation from the Nova School of Business Economics.

Science-Based Entrepreneurship in Finnish Dairy: A Case Study of Valio and Comparative
Analysis with Solar Foods

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Abstract

This thesis, as part of a larger study, delves into the framework of science-based entrepreneurship, utilizing a case study approach with a primary focus on the Finnish company Valio. Through a comparative analysis between Valio and the modern company Solar Foods, the research explores key aspects of science-driven entrepreneurial practices, innovation strategies, and market positioning. While Solar Foods is not the central focus, its inclusion serves as a valuable reference point, allowing for a nuanced examination of distinct entrepreneurial models within the context of the evolving food industry. The findings contribute to a deeper understanding of science-based entrepreneurship and provide insights that can inform strategic decisions for companies navigating the intersection of science, technology, and entrepreneurship.

Keywords: Business Model Innovation, Valio, Food industry, Innovation strategy, Comparative Analysis, Science-based Start-up

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1. Introduction

In this thesis, we aim to explore and understand the different dynamics of science-based entrepreneurship with a focus on two Finnish companies; Solar Foods and Valio. Solar Foods is a Finnish company that focuses on developing innovative food products using scientific and sustainable methods. The company's main product is made from carbon dioxide from air and water and renewable electricity. The process uses bacteria that transform these raw materials into nutritious protein. The result is a protein-rich powder that can be used versatilely in various food products. Valio is a more traditional Finnish food company that specializes in dairy products. It is one of the world's largest producers and exporters of dairy products. Valio manufactures a wide range of dairy products, such as milk, cheese, yogurt and spreads. The company is known for its high-quality products and investment in research and development. Valio also aims to promote sustainable agriculture and environmental responsibility.

The primary objective is to compare and contrast the business models, technological innovations, market positioning, and overall strategies of these two companies which both operate in the food sector. As science-based companies become a rising trend in the food industry, our research seeks to understand not only the intricacies of business model creation but also the potential impact of these novel ideas on the composition of our future plates. We explore the products in development, ranging from alternative protein sources to sustainable

food technologies, and analyze how these innovations may redefine consumer choices and industry standards.

The structure of the thesis is as follows. Firstly, a comprehensive introduction of both companies that sets the stage for the actual research. This will be followed by literature review on science-based entrepreneurship as a concept. The methodology section outlines the research design and data collection methods. The theoretical framework dives into the concepts and characteristics of science-based entrepreneurship while providing examples from different fields.

A notable part of the thesis is dedicated to comparative analysis, where we highlight the similarities and differences between the two named companies. The conclusion summarizes key findings, contributions to the field, and suggestions for future researchers.

The work is divided between two individuals, each responsible for specific sections. This thesis concludes the sections written by Milla Repo.

2. Theoretical framework

In this chapter we aim to explore the key concepts and terminology linked to Science-based entrepreneurship, present a framework for our study and clarify our research objectives and research questions. Rather than grow to displace the industry giants, science-based ventures generally provide the ideas and innovations that ignite competition and drive market and industry evolution (Schumpeter, 1928, Geroski and Pomroy, 1990).

2.1.1. Differences between Science-based entrepreneurship and Evidence-based entrepreneurship

Science-based entrepreneurship is often confused with evidence-based entrepreneurship. In this subchapter we aim to explain the key differences between the two concepts while highlighting their intertwining aspects. (Colombo, M. 2012)

Science-based entrepreneurship involves leveraging scientific discoveries and innovations in the process of creating an operating business. It highlights the integration of advanced science, research and technological advancements into commercial objectives and impact creation. In science-based entrepreneurship, the knowledge generated from scientific research forms the very foundation for creating products, services, or processes. This approach often involves close collaboration with academic and research institutions, aiming to transform scientific discoveries into tangible and marketable solutions.

While Science-based entrepreneurship combines the worlds of science and commercialism, Evidence-based entrepreneurship emphasizes making decisions and crafting strategies based on empirical evidence and data. Evidence-based entrepreneurship relies on careful analysis of relevant data, research findings, and real-world observations. Evidence-based entrepreneurship uses solid proof in confirming assumptions, testing hypotheses and leading enterprises. It highlights thorough examination to guarantee that decisions are rooted in reliable and trustworthy evidence.

Science-based entrepreneurship and Evidence-based entrepreneurship can complete each other. A science-based entrepreneur may use evidence-based practices to validate and refine their business strategies, ensuring that decisions are not only rooted in scientific principles but also supported by data.

Role of SBEFs in Leveraging Scientific Knowledge:

These entrepreneurial enterprises, deeply rooted in scientific advancements, serve as pivotal agents in harnessing and commercializing knowledge originating from universities and public research organizations. As asserted by Wright et al. (2007), Science-based entrepreneurial firms (SBEF) are widely recognized as indispensable catalysts for the revitalization of high-tech industries. They bridge the gap between academic research and market applications, translating scientific discoveries into practical solutions. (Kriz, Rumyantseva and Welch, 2022)

Challenges and Contributions of SBEFs:

Despite their significance, it's noteworthy that, in many instances, SBEFs may not attain substantial growth. However, the knowledge generated by these firms remains a valuable asset. According to Colombo, Mustar, and Wright (M., 2010), this intellectual capital can profoundly contribute to the innovativeness of their clientele. Additionally, it holds the potential to be effectively transferred and used by external entities through strategic partnerships, collaborations, or mergers and acquisitions.

In essence, science-based entrepreneurship operates as a conduit between scientific inquiry and entrepreneurial endeavors, offering a pathway for the transformation of knowledge into tangible, marketable innovations. The works of Chen, Wan, and Chen (2021), Wright et al. (2007), and Colombo, Mustar, and Wright (2010) collectively shed light on the intricate dynamics, challenges, and transformative potential within this nexus of science and business.

2.3. Objectives and research questions

As stated before, the main aim of this research is to investigate further into science-based entrepreneurship within the food industry by drawing comparisons between their business model designs and those of more conventional operations. Additionally, we seek to highlight success factors, identify pain points, and track recurring patterns in successful science-based entrepreneurship ventures.

This thesis is designed with two primary objectives:

1. To Examine the differences between the business models of Solar Foods and Valio:

Investigate and analyze the business models of Solar Foods and Valio, focusing on their innovation processes, customer mapping and market strategies. This objective aims to provide an understanding of how these companies differ in practises in terms of business model within the food industry (Comparing science-based and traditional).

2. To distinguish the key success factors and challenges within the Finnish food sector that influence consumer willingness to adopt and embrace products manufactured by science-based companies in the innovative food industry

By addressing these two objectives, the thesis aims to bring valuable insights into the business model design, success factors, and challenges faced within the science-based entrepreneurship, using Solar Foods and Valio as an example from the food industry. These objectives are carefully aligned with the research questions of the thesis, which set the ground for our research.

Research questions are the following:

1. How do the business models of Solar Foods and Valio differ in their integration of science-based solutions, innovation processes, and market strategies?
2. What are the key success factors and challenges associated with science-based entrepreneurship, specifically in the context of Solar Foods and Valio?
3. What market entry strategies could Solar Foods possibly leverage from Valio regarding the consumer acceptance aspect?

2.4. Theoretical model: Business Model

To highlight the distinctions between the two companies, we use the Business Model Canvas as a tool for effectively delineating and contrasting their respective business models. The Business Model Canvas provides a visual and structured framework, enabling a comprehensive examination of the key components that shape the operational and strategic aspects of each company. This approach facilitates an understanding of the diverse elements bordering their business models, thereby enhancing the clarity of the comparative analysis.

3. Comparative Analysis: Valio and Solar Foods

2.3. Case Study: Valio

2.3.1. Historical Background of Valio

Valio, established in 1905, has evolved into a cornerstone of the Finnish dairy industry. Originally founded by Finnish dairy farmers seeking to collectively process and market their

milk, the company's early focus on butter production soon expanded to include a line-up of dairy products, including cheese and milk powder. Valio's history is an inspiring description of resilience, adaptability, and commitment to quality. (www.valio.fi, n.d.)

Throughout the years, Valio has consistently invested in research and development, showcasing a dedication to innovation. This commitment is underlined by the introduction of lactose-free milk products in the 1990s, a pioneering move that addressed the needs of lactose-intolerant consumers and positioned Valio as a forward-thinking industry leader in its field.

2.3.2. Mission and Vision of Valio

Valio's mission is rooted in the delivery of high-quality dairy products while promoting sustainability and responsible business practices. The company is faithful in its support of farmer-owners, ensuring returns for their contributions and maintaining a shared structure that encourages collective decision-making.

Aligned with this mission, Valio intends a future where dairy products contribute positively to the consumers and planet's well-being. The company aspires to be a leader in providing sustainable and nutritious dairy solutions, acknowledging the global challenges of food security and environmental impact. Valio's vision summarizes its commitment to innovation, sustainability, and meeting the evolving needs of consumers. (Lamprinak, 2019)

Valio is a highly inspiring company for anyone looking for innovative ways of food production with a vision for sustainability. Valio places a strong emphasis on sustainability, integrating environmentally friendly practices throughout its operations. The company is actively involved in initiatives aimed at reducing its carbon footprint, optimizing resource usage, and promoting animal welfare. By implementing sustainable farming practices and

investing in energy-efficient technologies, Valio seeks to contribute significantly to the overall sustainability of the dairy industry in multiple ways. Valio places a strong emphasis on sustainable farming practices. The company works closely with its dairy farmers to implement environmentally friendly methods, including efficient resource utilization, reduced greenhouse gas emissions, and soil conservation. These practices aim to minimize the environmental impact of dairy farming. In addition to sustainable farming practices, Valio actively invests in renewable energy sources to power its operations. By transitioning to renewable energy, such as wind and solar power, the company reduces its dependence on non-renewable resources and lowers its carbon footprint by doing so. This commitment aligns with global efforts to transition towards cleaner energy alternatives. (www.valio.fi, n.d.)

They also take into high consideration water conservation. The efficient use of water resources is a key focus for Valio. The company implements water conservation measures in its production processes and encourages sustainable water management practices on the farms it works with. This commitment helps address water scarcity concerns and promotes responsible water usage. In addition to this, Valio is dedicated to minimizing waste generation and promoting recycling throughout its value chain. This includes efforts to reduce packaging waste, optimize production processes to minimize by-products, and encourage the recycling of materials. The company's waste reduction initiatives contribute to a circular economy and reduce environmental impact by doing so. (Lamprinakis, 2019)

Valio recognizes the importance of biodiversity in its actions. The company also supports biodiversity conservation initiatives on the farms it collaborates with, promoting practices that protect natural habitats, preserve biodiversity, and enhance the overall health of ecosystems. As one would reasonably expect, Valio places a high priority on animal welfare.

The company works closely with its farmers to ensure that ethical treatment of animals is a central focus. By promoting and enforcing strict animal welfare standards, Valio seeks to raise the overall standards of animal care within the dairy industry. (www.valio.fi, n.d.)

Valio actively pursues and stands by various sustainability certifications and standards. These certifications, such as those related to organic farming, fair trade, and environmental management systems, provide external validation of Valio's commitment to sustainable practices and contribute to the overall improvement of industry standards.

Valio recognizes the social dimensions of sustainability and engages with local communities. The company supports community development initiatives, invests in education and healthcare, and contributes to the well-being of the communities where it operates. This holistic approach addresses the broader social aspects of sustainability.

Another way Valio seeks to contribute significantly to the overall sustainability of the dairy industry is how they place a strong emphasis on transparent communication regarding its sustainability initiatives. By openly sharing its goals, progress, and challenges, Valio fosters accountability and encourages industry-wide dialogue. This transparency not only helps build trust with consumers but also inspires other stakeholders to adopt sustainable practices.

Global presence of Valio is beyond remarkable. While Valio's origins lie in Finland, the national company has successfully expanded its footprint internationally. Valio's products are distributed in numerous countries, and the company has positioned itself as a trusted brand in the global dairy market. This global expansion signifies Valio's commitment to sharing its expertise in dairy production and promoting Finnish dairy products on the international stage. (Lavikka, 2020)

Valio's roots lie in its cooperative structure, a pioneering concept that brought Finnish dairy farmers together to collectively process and market their milk. Valio's spirit ensured that farmers could put together resources, share risks, and secure fair returns for their agricultural ventures. This foundation structure laid the groundwork for Valio's success, fostering a sense of community and shared responsibility among its members.

During this time of working on our Work Project regarding innovative food production, we have studied the possible key factors for Valio's success as a dairy company in Finland and worldwide. What we have concluded is that it can be due to a combination of factors, including its cooperative structure, commitment to innovation, focus on quality, sustainability initiatives, and strategic global expansion. These are some key elements that we have discovered to be contributed to Valio's success.

First and one of the most important reasons for success is commitment to quality and innovation. At the heart of Valio's success is a stable commitment to quality and a culture of innovation. The company has consistently adapted to market demands, evolving from a focus on butter production to a diverse range of dairy products. The introduction of lactose-free milk products in the 1990s is a great example of Valio's ability to anticipate and address consumer pains, showcasing its innovative approach to product development to meet the needs of customers.

Another important factor we found for Valio's success is having sustainability as their core value. The company has proactively embraced environmentally friendly practices, implementing sustainable farming methods and investing in energy-efficient technologies. By prioritizing sustainability, Valio not only aligns itself with modern consumer values but also contributes to global efforts to address climate change and environmental concerns.

Regarding what comes to their strategic global expansion, Valio's decision to expand beyond Finnish borders has been a definitive strategic cornerstone of its success. By entering international markets, the company has broadened its consumer base and established itself as a trusted brand worldwide. This strategic expansion not only fuels the growth of Valio but also allows the company to share its expertise in dairy production on the international stage.

Valio's success is not only reliant on traditional dairy products. The company's ability to diversify its product portfolio has been magnificent. Offering a broad display of dairy products, including cheeses, milk powders, and specialized health-oriented options, Valio caters to diverse consumer preferences and nutritional needs, further solidifying its position in the market.

Another key aspect of Valio's triumph is its sharp understanding and responsiveness to consumer pains. The company has demonstrated a consumer-centric approach by introducing products that address specific dietary concerns, such as lactose intolerance, and adapting its offerings to changing consumer trends. This adaptability ensures that Valio remains relevant in a constantly evolving market. (Valio, n.d.)

Valio's success is emphasized by the trust it has gathered from consumers. Over the years, the company has built a strong brand known for quality and reliability. This trust has played a pivotal role in Valio's success, both domestically in Finland and internationally, where consumers seek out Valio products with confidence.

The success story of Valio is a well rounded narrative constructed with cooperative heritage, a commitment to quality, innovation, sustainability initiatives, strategic global expansion, a diverse product portfolio, a consumer-centric approach, and the establishment of brand trust.

As a global dairy powerhouse, Valio stands as an inspiration in the industry, showcasing how a company with a vision can evolve and thrive, leaving a lasting mark on the world of dairy.

In conclusion, Valio's transformative journey from a local dairy company to a global industry leader showcases its resilience, innovation, and unwavering commitment to sustainability.

The company's mission and vision reflect its dedication to delivering high-quality dairy products, supporting its farmer-owners, and contributing to a more sustainable and responsible future for the dairy industry. Valio's success is not only a pivotal chapter in the history of Finnish business but also an inspiring case study for those exploring the dynamics of the dairy industry and cooperative business models.

2.3.3. Valio's Market positioning and competitors

What we have found is that Valio's market positioning is characterized by its strong presence in the dairy industry, both in Finland and internationally. Valio is recognized for its commitment to quality, innovation, and sustainability, positioning itself as a trusted and socially responsible brand.

Valio is known for producing high-quality dairy products. The company's long history and dedication to innovation have allowed it to introduce a diverse range of products, including lactose-free options, cheeses, and health-oriented dairy solutions. This commitment to quality and innovation enhances Valio's appeal to consumers seeking premium and cutting-edge dairy products.

Valio's emphasis on sustainability is a key component of its market positioning. Consumers, particularly in recent years, have shown a growing interest in environmentally conscious and

socially responsible brands. Valio's sustainable farming practices, renewable energy initiatives, and overall commitment to reducing its environmental impact contribute to its appeal among consumers who prioritize sustainability. (Kiisk, 2019)

Valio's strategic decision to expand internationally has positioned the company as a global player in the dairy market. By entering diverse markets, Valio has been able to reach a broader consumer base and strengthen its brand recognition on a global scale.

Valio's diversified product portfolio allows them to cater to a wide range of consumer preferences. Whether it's traditional dairy products, specialty cheeses, or products tailored for specific dietary needs, Valio's diverse offerings contribute to its market versatility and appeal to a broad audience.

Consumer trust is a critical element of Valio's market positioning. Their commitment to transparency in its operations, adherence to high-quality standards, and open communication about its sustainability initiatives contribute to the establishment of a trustworthy brand image.

What we found about Valio's competition is that they face competition both domestically in Finland and on the international stage. Some of the factors influencing competition include local competitors, international dairy brands, niche and specialized brands, retailer private labels and ever changing customer preferences. (Karjalainen, n.d.)

In Finland, Valio faces competition from other dairy producers and cooperatives. Local competitors may differentiate themselves based on regional sourcing, specific product lines, or pricing strategies. The top competitors of Valio include Avenatur, OddlyGood and Kaslink Aito. These are Finnish and Swedish companies providing dairy-products or alternatives for dairy, for example oatmilk.

In the global market, Valio competes with international dairy brands. These competitors may have a strong presence in various regions and could offer similar or alternative products. Differentiation through quality, innovation, and sustainability practices is crucial in this worldwide competitive landscape.

Niche and specialized dairy brands may target specific consumer segments with unique products or attributes. Valio's ability to innovate and offer specialized products, such as lactose-free options, allows it to compete in these segments.

Private-label dairy products from retailers represent another layer of competition. Valio needs to position itself effectively against these alternatives, emphasizing the distinct qualities of its products and the trust associated with its brand.

Shifting consumer preferences, including a growing interest in plant-based alternatives, present a dynamic challenge for traditional dairy companies like Valio. Staying attuned to evolving trends and consumer demands is crucial in remaining competitive.

Valio's success in navigating the competitive landscape is linked to its ability to consistently deliver on its brand promises, maintain high-quality standards, and adapt to changing market dynamics. The company's commitment to sustainability and innovation serves as a key differentiator, allowing it to carve a distinctive space in a competitive and dynamic dairy industry.

2.3. Comparative Analysis of the Business models of Solar Foods and Valio

As we are comparing the two Finnish companies, Solar Foods and Valio, to understand predominantly Solar Foods business model, we demonstrate different orientations with their own distinct business models and focus on sustainability.

Solar Foods stands at the forefront of innovation with a distinctive business model centered around sustainable protein production. The company's primary focus is on developing Solein, a protein-rich substance created through a groundbreaking fermentation process. This process, powered by renewable energy sources, aims to generate a protein alternative without relying on traditional agriculture.

At the core of Solar Foods' business model is a commitment to addressing global challenges such as food security, resource scarcity, and environmental impact. By sidestepping the need for cultivable land and traditional farming methods, Solar Foods seeks to carve a niche in markets where sustainable and alternative protein sources are gaining prominence.

In terms of sustainability, Solar Foods leverages renewable energy, particularly solar power, in its production process, aligning its operations with environmentally conscious practices. The company positions itself as a pioneer, providing an innovative solution to the increasing demand for sustainable protein alternatives.

In contrast, Valio represents a long-standing player in the food industry, with roots dating back to 1905 as a Finnish dairy producer. Valio's primary focus is on traditional food production, offering a diverse range of products including milk, cheese, butter, and lactose-free options.

Valio's business model revolves around a cooperative structure, collaborating closely with Finnish dairy farmers to source milk for its production. The company emphasizes sustainability by implementing environmentally friendly practices in both dairy farming and processing. Valio is committed to reducing its carbon footprint, optimizing resource usage, and promoting animal welfare.

While Solar Foods and Valio operate in different domains within the food industry, both companies share a commitment to sustainability, through differing methods. Solar Foods innovates by creating protein alternatives, addressing challenges related to land use and environmental impact. Valio, rooted in tradition, pioneers sustainability within the context of established agricultural practices.

Solar Foods' specialization in sustainable protein alternatives highlights a response to the increasing demand for plant-based and environmentally conscious food sources. Valio, on the other hand, leverages its longstanding history and cooperative structure to maintain a strong foothold in the traditional dairy sector while embracing sustainable practices.

In conclusion, the comparison of Solar Foods and Valio illuminates the diverse approaches emerging within the contemporary food industry. Whether pioneering innovative protein solutions or upholding sustainability in traditional dairy production, both companies contribute to the broader narrative of evolving business models that seek to address the challenges and opportunities presented by a changing world.

2.3.2. Business Model Canvas Analysis

Valio Business Model Canvas Attributes:

- Customer Segments: Targets consumers with a preference for traditional dairy products, benefitting from an established customer base.
- Value Proposition: Offers a range of dairy products, emphasizing quality, tradition, and sustainability in dairy farming.
- Channels: Utilizes traditional distribution channels for dairy products, including supermarkets and retailers.
- **Customer Relationships: Benefits from established consumer trust in traditional dairy products, providing a sense of familiarity.**
- Key Activities: Engages in dairy farming, processing, and the production of a variety of dairy products.
- Key Resources: Collaborates closely with dairy farmers, emphasizing a cooperative structure, and prioritizes sustainability in farming practices.
- Revenue Streams: Mainly derived from the sale of traditional dairy products in established markets.

Solar Foods Business Model Canvas attributes:

- Customer Segments: Targets environmentally conscious consumers seeking sustainable and innovative food options.
- Value Proposition: Provides Solein, a novel protein alternative, addressing challenges related to land use and environmental impact.
- Channels: Utilizes channels emphasizing innovation and sustainability, focusing on communication and education about Solein.
- **Customer Relationships: Faces the challenge of building trust and acceptance among consumers unfamiliar with lab-grown or air-based food products.**

- Key Activities: Concentrates on research, development, and the production of Solein, emphasizing sustainable protein alternatives.
- Key Resources: Leverages intellectual property in innovative protein production, skilled scientists, and sustainable manufacturing facilities.
- Revenue Streams: Primarily from the sale of Solein to food manufacturers and potential licensing of technology.

2.3.3. Consumer Perception and Acceptance

Solar Foods faces the challenge of introducing a new unknown concept to consumers who may possess a skeptical attitude towards lab-grown or air-based food products. The success of Solar Foods' business model relies on building awareness, educating consumers, and fostering acceptance of Solein.

Valio benefits from an established consumer trust and familiarity with traditional dairy products. However, there may be a need for adaptation to changing consumer preferences for more sustainable options. Valio's challenge lies in maintaining its strong position in the traditional dairy sector while responding to evolving consumer demands.

In conclusion, while Solar Foods and Valio operate in distinct segments within the food industry, both contribute to the evolving narrative of sustainable business models. Solar Foods pioneers innovation in alternative protein sources, addressing global challenges, while Valio combines tradition with sustainability in dairy production, leveraging an established customer base.

We are particularly interested in understanding how Solar Foods plans to enter the market and attract customers. The company has announced that they are ready to sell their products in all European Union countries by 2025. Our research aims to do market research and find ways to help Solar Foods successfully launch Solein in the Finnish market and build a strong and loyal customer base, similar to what Valio has achieved.

4. Methodology

3.1. Research method

Recognizing the importance of consumer perception in the success of such ventures as Solein and Solar Foods, our research aims to deep dive into the attitudes and opinions among consumers in Finland towards Solar Foods and the innovative food industry as a whole.

This study is driven by the recognition that Solar Foods faces a unique challenge: introducing a product that is not only novel but also challenges traditional ideas of food production. The unfamiliarity of consumers with lab-grown or air-based food products creates an opportunity to dig deep into their perceptions, attitudes, and reservations. With the aim of shedding light on the crucial consumer-related sides of Solar Foods' business model, our research is designed to conduct a comprehensive survey.

The insights gained from this research will not only contribute to a deeper understanding of customer perceptions but will also play an important role in shaping the customer-centric aspects of Solar Foods' business model. By bridging the gap between Solar Foods and the Finnish consumer, we aspire to pave the way for informed marketing strategies, tailored customer messaging, and potential adaptations to align with consumer preferences.

Furthermore, the research holds the possibility of tailoring their approach to resonate with the diverse preferences of the Finnish consumer base.

3.2. Sample design

We adopted a quantitative research approach, employing a survey methodology to efficiently reach a broad spectrum of respondents within a limited timeframe. The utilization of surveys facilitated the collection of data from a diverse pool of participants while maintaining a focus on numerical analysis. Anonymity was emphasized in survey administration to minimize potential biases and encourage candid and reflective responses from participants.

To maximize outreach, we leveraged social media platforms, particularly Facebook, and participated in Finnish Facebook groups dedicated to food-related discussions, which exhibited a considerable presence of food enthusiasts. Notably, these groups, including “Satokausi-ruoka” (Harvest season food), “Mitä tänään syötäisiin” (What should we eat today), and “Helpot ja Nopeat reseptit” (Easy and Fast recipes), were identified as active communities engaging in food-related conversation and demonstrating responsiveness to food-related questionnaires. The decision to target such groups stemmed from the recognition that their members share a passion for culinary, thereby aligning with the primary focus of our investigation on the food aspect rather than emphasizing the technological and innovative facets.

Given the presumption that respondents mostly consist of non-experts in the innovative food industry, we inferred that our sample largely includes regular consumers who frequently shop at Finnish supermarkets and maintain an interest in the food industry. This assumption aligns

with our objective of collecting and understanding the perspectives from individuals that represent a typical Finnish consumer demographic.

The questionnaire was conducted through Google Docs, selected for its user-friendly interface and widespread familiarity. The platform's simplicity aimed to enhance participant engagement and streamline the data collection process, ensuring ease of use for respondents.

In summary, our research was operated through a quantitative survey methodology to engage input from a diverse and representative sample of Finnish consumers, predominantly sourced from active Facebook groups with a focus on food-related discussions. The emphasis on anonymity, the strategic selection of platforms, and the use of a familiar survey tool collectively aimed to elicit meaningful data for the forthcoming launch of Solein within the Finnish market.

3.3. Limitations

While the chosen survey methodology using anonymous surveys on Facebook offers distinct advantages, it is crucial to acknowledge potential limitations that may impact the reliability and depth of the gathered data. We must note that since the primary demographic is expected to be non-experts in the innovative food industry, may this result in responses and lack of awareness and therefore lower response rates or completed surveys.

The open nature of Facebook groups introduces challenges related to sample composition, potentially leading to unrepresentative data. Anonymity, while fostering candid responses, may contribute to response bias, with participants offering socially desirable or superficial answers.

Furthermore, the survey format and online environment may restrict the exploration of participants' attitudes, limiting the ability to probe nuanced responses. The potential for duplicate responses poses challenges in ensuring dataset integrity, and generalizing findings to the broader population may be difficult due to the diverse nature of Facebook groups.

In addition, the absence of incentives for participation and the limited contextual understanding of the innovative food industry may affect respondent motivation and the depth of their responses. To mitigate these limitations, careful studying of survey results is necessary. Employing complementary research methods, conducting targeted subgroup analyses, and transparently reporting limitations will enhance the overall validity and reliability of the research outcomes.

3.3. Reliability and Validity of results

In the context of our survey on consumer attitudes toward the innovative food industry and Solar Foods, the reliability of our research methods can be incidental to the consistency of participant responses. The employment of an anonymous survey on Facebook introduces certain challenges to reliability, such as the potential for varying interpretations of survey questions, diverse participant backgrounds, and the open nature of Finnish online forums. To enhance reliability, additional attention was given to conducting clear survey questions, minimizing loaded tone, and actively monitoring the responses not acceptable for our research, meaning troll messages etc.

Validity of the survey conducted, focuses on the accuracy with which the research methods measure what they are intended to measure. In our survey, the validity of our research methods is linked to the degree to which participant responses genuinely reflect their

attitudes and perceptions. The potential for response bias in an anonymous online survey introduces challenges to validity, as participants may provide socially desirable responses or may not fully comprehend the innovative food industry concepts. Remaining transparent in reporting limitations and acknowledging potential biases contribute to the validity of the research.

7. Analysis

(Disclaimer: Analysis is written and conducted as a part of a larger study together with a co-writer and peer, Meri Silvennoinen)

In this chapter we analyze the business model composition of Valio and Solar Foods and draw conclusions and suggestions for Solar Foods market entry strategy.

7.1. Suggested implications for science-based entrepreneurship

In the domain of science-based entrepreneurship, Solar Foods emerges as a notable case study, pushing the boundaries of innovation in sustainable protein production. As the global demand for alternative and environmentally friendly food sources continues to rise, Solar Foods offers valuable insights into the implications for science-based entrepreneurship in the food industry.

At the heart of Solar Foods' entrepreneurial journey is a commitment to innovation and disruption. By harnessing cutting-edge technology and scientific processes, the company challenges traditional norms in food production. The development of Solein, a protein-rich substance obtained from a unique fermentation process, exemplifies the transformative potential of science-based entrepreneurship. To our minds, entrepreneurs in this space should

take note of the impact that disruptive technologies can have on addressing critical global challenges.

Solar Foods' emphasis on sustainability is a key pillar of its entrepreneurial character. The company addresses the urgent need for sustainable protein sources by leveraging renewable energy, particularly solar power, to create a protein alternative. This underscores the potential for science-based entrepreneurship to not only meet market demands but also contribute meaningfully to environmental and social sustainability. As we have been exploring science-based ventures throughout our work project, we strongly think it is beneficial for entrepreneurs to consider the integration of sustainable practices as a strategic imperative.

As Solar Foods navigates both science and entrepreneurship, its market positioning reflects an urgent awareness of evolving consumer trends. The company strategically positions itself to meet the growing demand for alternative protein sources, aligning its innovative product offerings with shifting consumer preferences towards plant-based and sustainable options. When we look at the fascinating case study of Solar Foods, we have learned that entrepreneurs should recognize the importance of staying accustomed to market dynamics and understanding consumer behavior to carve a niche in rapidly changing industries.

The success of Solar Foods also underscores the importance of collaboration in science-based entrepreneurship. The company's ability to bring together expertise from fields such as renewable energy, microbiology, and food science highlights the value of collaboration in addressing complex challenges. This is truly inspiring and based on their success, we suggest future entrepreneurs to actively seek partnerships and collaborations that leverage diverse skill sets and knowledge domains.

As we have discovered before in our work project, science-based entrepreneurs must navigate the regulatory landscape and consider ethical implications. Solar Foods, operating in the realm of alternative protein production, may encounter regulatory challenges related to novel food approvals and safety standards. Entrepreneurs should be proactive in engaging with regulatory bodies and proactively addressing ethical considerations to build a foundation of trust with consumers and stakeholders.

What we have discovered is that the journey of Solar Foods also sheds light on the importance of strategic investment and scaling strategies for science-based ventures. Entrepreneurs in this field may face unique challenges in scaling production and gaining market traction. Strategic partnerships, investment in research and development, and a well-defined scaling strategy are crucial components for sustained growth in science-based entrepreneurship.

One of the reasons we chose Solar Food is that they offer a captivating narrative for entrepreneurs venturing into science-based endeavors, particularly in the dynamic landscape of sustainable food production. By embracing innovation, sustainability, market awareness, collaboration, regulatory diligence, and strategic scaling, science-based entrepreneurs can not only address pressing global challenges but also position themselves as spark for positive change in their industries. Solar Foods serves as an encouragement, illuminating the path for those seeking to bring together scientific innovation with entrepreneurial spirit in the pursuit of a more sustainable and resilient future.

7.2. Key learnings for Solar Foods from Valios business model

To our minds, through this work project we have discovered that Solar Foods could take valuable insights from the business model of Valio, a successful dairy company, even if it's a more traditional food production company.

One crucial aspect that Solar Foods could learn from Valio is the integration of sustainable practices. As Valio has implemented environmentally friendly initiatives, Solar Foods could explore how to reduce waste, and adopt eco-friendly packaging. In an era where sustainability is a significant concern for consumers, aligning business practices with eco-conscious values can enhance brand reputation and attract environmentally conscious customers.

Valio's success in market expansion could also serve as a valuable lesson for Solar Foods. Valio strategically entered new markets with their aggressive marketing, established partnerships, and diversified its distribution channels to provide insights into effective market entry strategies. This knowledge would provide great insights for Solar Foods as it seeks to expand its reach and tap into new consumer demographics.

In addition, consumer engagement is another area where Solar Foods could learn from Valio's business model. Valio has mastered the art of connecting with consumers through effective marketing, exceptional customer service, and leveraging social media. Solar Foods could adapt similar strategies to build and maintain strong relationships with its customer base. We are certain that engaged customers are more likely to become loyal advocates for the brand.

Quality and safety standards are paramount in the food industry, and Valio's commitment to maintaining high standards is a valuable lesson for Solar Foods. Learning from the best practices implemented by Valio in ensuring the quality and safety of its products can guide Solar Foods in establishing strong processes and protocols.

Collaborations and partnerships are often key drivers of success in competitive industries. As Valio has successfully forged strategic alliances with other businesses, Solar Foods could explore similar opportunities for collaborations. Partnerships can enhance research and development capabilities, open up new distribution channels, and contribute to overall business growth.

Lastly, adaptability to market trends is critical for any business's long-term success. Solar Foods could study how Valio stays attuned to changing consumer preferences and adjusts its product offerings accordingly. Previously mentioned Valio's skill to navigate shifts in market dynamics can help Solar Foods proactively respond to emerging trends and stay ahead of the competition.

In conclusion, what we have discovered in this work project, Solar Foods has the opportunity to learn from Valio's business model across various dimensions. As we have studied Valio's successes in sustainability, consumer engagement, market adaptation and quality production Solar Foods can gain insights that will positively contribute to its own growth, resilience, and success in the dynamic landscape of the food industry as a new player.

7.3. Data analysis

Our data analysis is based on the Questionnaire regarding “Perception of Innovative Food Industry and Solar Foods” and aims to discover Finnish consumers’ attitude towards the innovative food industry and Solar Foods. Our comprehensive questionnaire was designed to contain three distinct dimensions: participant demographics, perceptions and attitudes towards the innovative food industry, and the specific examination of Solar Foods, with a focus on their lab-produced protein, Solein. Our engagement with a diverse group of

individuals, total of 105 participants (5 inadequate), provided a wide range of insights that forms the foundation for this in-depth data analysis.

The research questionnaire was simply structured into three different sections. First and foremost, we gathered valuable demographic information to understand the diverse composition of our participant group. Subsequently, we delved into the intricate web of perceptions and attitudes prevailing within the Finnish consumer landscape concerning the innovative food industry. Finally, we honed our focus on Solar Foods, discovering perceptions and willingness to adopt their protein product, Solein.

Our research illuminates intriguing insights into the dietary preferences and plant-based protein integration among the surveyed participants. Notably, a considerable 29% of respondents reported using a lactose-free diet. Furthermore, 20% identified as vegetarians, with an additional 17% each embracing vegan and gluten-free diets, showcasing a spectrum of dietary choices.

A distinctive facet of our findings lies in the 1% of participants specifying adherence to a Kosher diet, contributing to the overall diversity observed in dietary preferences within our sample. This diversity not only reflects the dynamic nature of modern dietary practices but also sets the stage for a nuanced exploration of consumer attitudes towards innovative food products.

A striking 70% of respondents reported the absence of plant-based options in their weekly diets, suggesting a potential gap in current dietary practices that may be addressed by innovative food solutions. On the other hand, respondents who did use plant-based options displayed diverse choices: 24% integrated soy-based proteins, 22% opted for broad bean protein, 23% included rolled oats, and 11% explored alternatives categorized as "other." This

diversity in plant-based selections serves as a foundation for investigating potential correlations between individual attitudes towards plant-based consumption and their receptiveness to innovative food alternatives, such as lab-grown products like Solein protein.

7.3.1. Analysis on Consumer Perception towards Innovative Food Industry in Finland

The data reveals a considerable portion of respondents (60%) expressing limited familiarity with the concept of innovative or lab-grown food products. This suggests a potential lack of awareness or understanding within the surveyed sample. However, the remaining 40% (20% familiar and 20% very familiar) demonstrate a certain level of awareness and familiarity with innovative food concepts. A significant majority of respondents (64%) expressed a positive correlation between innovative food products and sustainable development, emphasizing their belief in the industry's potential to contribute positively to mitigating climate change. The contrasting 18% neutral and 18% disagreeing opinions highlight the diversity of perspectives within the sample. A substantial portion (67%) of respondents admitted to not having tried innovative food products. This observation sparks consideration of the term "innovative food" and its recognition within the sample. The 10% who have tried such products and the 23% uncertain about their experiences indicate potential challenges in defining and communicating the concept to consumers. Despite the lack of prior experience, a significant majority (46%) expresses interest in trying innovative food products. This positive response suggests an openness to experimentation among the respondents. However, 32% indicating a lack of interest raises questions about the specific factors influencing their attitudes and the need for targeted marketing strategies.

Health effects emerge as the predominant factor influencing respondents' willingness to taste innovative food products, with 97% agreement. Taste and texture follow closely, collectively accounting for 91%. The lower importance assigned to marketing, company brand, and food

type suggests that tangible and sensory aspects play a more significant role in shaping consumer preferences.

The findings highlight the need to clarify and promote understanding of innovative food concepts among consumers. Marketing efforts should emphasize health benefits and sensory appeal, aligning with the priorities expressed by respondents. The positive interest in trying innovative food products indicates an opportunity for the industry, but addressing the factors influencing those with reservations is crucial for successful market penetration.

7.3.2. Analysis on Consumer Perception towards Solar Foods and Solein

The data indicates that there is lack of familiarity with Solar Foods among respondents, aligning with expectations due to the company's current absence from the Finnish consumer market. The limited awareness (76%) emphasizes the need for comprehensive marketing and education to introduce Solar Foods and its product, Solein, to the target audience. Despite the relatively low knowledge rate of Solar Foods among Finnish consumers, there is a notable interest in trying Solein. 48% of the respondents expressed interest towards lab-produced protein. This positive response highlights a potential market receptiveness to innovative food products.

The diverse attitudes toward adopting Solein as a substitute for plant-based proteins reflect a cautious yet open-minded consumer base. While 27% express optimism, the 42% leaning towards skepticism indicates that consumers have reservations, possibly rooted in limited knowledge or concerns about the product. The data on willingness to switch to Solein-based products for environmental reasons reveals a degree of skepticism within the sample. The lower likelihood (37%) suggests that while sustainability is a consideration, it may not be the primary factor influencing consumer choices in protein alternatives. What comes to the

factors in consideration to try out Solein, Health effects emerge as a top consideration (99%), emphasizing the importance of communicating the product's positive impact on well-being. The lower percentages for factors like marketing (9%) and company brand (30%) indicate that, at this stage, consumers prioritize tangible aspects such as health benefits and information availability. The open-ended question provides nuanced insights, capturing a spectrum of attitudes. Responses indicate varying levels of awareness, curiosity, and concerns about lab-created foods. Addressing these individual perspectives is crucial in tailoring communication strategies and product positioning to resonate with diverse consumer sentiments.

Overall Implications and Recommendations are the following: The findings underscore the need for strategic marketing campaigns that emphasize health benefits, environmental impact, and simplicity of ingredients to bridge the awareness gap. Education initiatives should address concerns raised in qualitative responses, fostering a more informed and receptive consumer base. Targeted communication aligning with consumer priorities can pave the way for successful market entry and acceptance of Solar Foods' innovative protein solution, Solein.

8. Conclusion

In conclusion, Solar Foods' journey exemplifies the transformative potential of science-based entrepreneurship, emphasizing innovation, sustainability, market awareness, collaboration, regulatory diligence, and strategic scaling.

The success of Solar Foods serves as an inspiration for future entrepreneurs seeking to navigate the dynamic landscape of sustainable food production. The key learnings from Solar Foods, outlined in the thesis, provide valuable insights for aspiring science-based

entrepreneurs. These include the importance of sustainability practices, market positioning, collaboration, regulatory engagement, and strategic investment.

The comparison with Valio's business model enriches the thesis by offering Solar Foods additional lessons in sustainability practices, market expansion, consumer engagement, quality and safety standards, collaborations, and adaptability to market trends. By incorporating these insights, Solar Foods can enhance its growth, resilience, and success in the competitive food industry.

This work project further presents a comprehensive data analysis focused on Finnish consumers' perception of innovative food products and Solar Foods' lab-produced protein, Solein. The findings reveal a diverse landscape of dietary preferences and a potential gap in plant-based options in consumers' weekly diets. The analysis also highlights the limited familiarity with innovative food concepts among respondents and the importance of health effects in influencing consumer willingness to try such products.

We would like to finish our thesis on the words of the co-founder of Solar Foods, Dr. Pasi Vainikka. He underscores the importance of resilience and hard work in pursuing one's aspirations. Whether venturing into entrepreneurship or any other endeavor, the call to action is clear: work diligently, surround yourself with a diverse and supportive network, and appreciate the value of collaboration in fostering a common vision. ([www.youtube.com](https://www.youtube.com/watch?v=UW3t3UW3t3U), n.d.)

The speech evoked a sense of possibility, emphasizing that, with dedication and the right connections, anything can be achieved. In essence, this thesis encapsulates a powerful message for students to embrace their passions, build meaningful connections, and pursue their goals with unwavering determination. Our master's thesis not only contributes to the understanding of science-based entrepreneurship in the context of sustainable food production but also offers practical insights and recommendations for both Solar Foods and

aspiring entrepreneurs looking to make a positive impact on the global challenges of the future.

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Appendix

1. Business Model Canvas: Solar Foods

