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THE IMPORTANCE OF QUALITY AND STANDARDIZATION IN BABY FOOD PRODUCTION: A BOST METHOD PERSPECTIVE

Krzysztof MIELCZAREK[1*], Stanisław BORKOWSKI[2]

[1] Częstochowa University of Technology; krzysztof.mielczarek@pcz.pl, ORCID: 0000-0003-3701-0192
[2] Kielce University of Technology; borkstanislaw@gmail.com, ORCID: 0000-0002-3403-1214
* Correspondence author

Purpose: The article aims to promote initiatives in the field of food safety within a company producing products for infants and children. It focuses on the types of non-conformities and the opinions of respondents (employees) regarding the importance of quality, visual control, and standardization, as assessed through the BOST survey. Since quality systems are flexible, each company must adapt system requirements to the nature of its business and its specific capabilities. The requirements set by ISO standards can be met in various ways. In line with the principle of continuous improvement, the method of gathering data for efficient system operation and management should be tailored to the company's current capabilities and the tools available on the market. In the era of ubiquitous electronics, it is possible to collect information directly from production devices automatically, significantly reducing the time required to transfer information from production to supervision. This approach not only enhances the quality of information but also accelerates the detection of non-conformities in finished products.
Design/methodology/approach: This study is based on a review of literature sources, raport from the company and the results of our own empirical research carried out using the BOST method based on a prepared questionnaire.
Findings: The article highlights the significance of evaluating both quality and standardization in the production process. By identifying key factors influencing quality and implementing practical recommendations, manufacturers can enhance their processes. The results obtained for small and medium-sized enterprises align with findings from tests conducted in other companies.
Originality/value: An innovative tool called the spread scale was used to assess the importance of factors describing Toyota's 2nd, 6th management principle and the roof of the Toyota House, enabling the evaluation of relationships between them. The practical use of surveys allows companies to leverage the practical knowledge of employees at the production level. This approach can contribute to identifying key areas critical to the enterprise's functioning.
Keywords: toyotarity, quality, BOST, standardization.
Category of the paper: Empirical research paper.

1. Introduction

The health of society is an invaluable asset, and food safety is a top priority. It is closely linked to the assessment and classification of various levels of hazards posed by food products at the point of consumption. Since such risks can be introduced at any stage of the food chain, effective control is essential at every step. Modern consumers, increasingly aware of the risks associated with food products, their sourcing, and processing, seek food that is not only safe for health but also rich in nutrients, flavorful, and environmentally friendly. To meet these expectations, entities in the food market must demonstrate their commitment to producing food that aligns with consumer demands.

In response to these expectations, food producers have recognized the need to develop and implement advanced food safety and quality assurance systems. Over the years, numerous systems have emerged in the food industry, designed to achieve and maintain high standards of product quality and safety. Among the most widely adopted are Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCP), ISO 9001, and ISO 22000. A defining feature of these systems is their integrated, systemic management of food quality and safety, which includes comprehensive supervision and control throughout the food chain, adhering to the "from farm to table" principle. By obtaining certifications for these systems, producers not only enhance their market image but also build greater trust with customers and business partners. The implementation of automation provides companies with opportunities to enhance production processes and improve product quality. Investing in automation offers financial benefits by reducing the number of non-compliant products and qualitative advantages by decreasing consumer complaints, which in turn fosters greater consumer trust in the company (Sagan, 20212).

The survey and research method known as BOST was developed as a result of the author's fascination with Toyota Motor Company, particularly its management and production systems, which was further deepened after reading Jeffrey Liker's book The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer.

BOST studies, also known as Toyota's management principles in the form of questions, were created to assess the practical application of these principles among various manufacturing and service companies in Poland. Toyota's management principles in the BOST method are described with specific characteristics, where a set of factors is grouped into "areas". Some principles are divided into two or even three areas. This method outlines Toyota's management principles through its defining factors.

The idea for an article on the quality and standardization of baby products may have emerged as a result of several key factors. Modern consumers, especially parents, are setting higher standards for baby food products. They expect these products to not only be tasty but, most importantly, safe, healthy, and free from artificial additives. As a result, manufacturers

must adjust their production processes to meet these expectations. The article could explore how producers manage to meet these requirements and how quality and standardization play a key role in maintaining consumer trust. Baby products are subject to strict regulations regarding quality and safety, both at the national and international levels. Standards such as ISO 22000, HACCP, GMP (Good Manufacturing Practices), and other quality guidelines are necessary to ensure that these products are safe for infants and young children. The article could examine how these regulations impact the production of baby food and how companies navigate compliance with these rules in the context of quality and standardization (Salgar et al., 2023).

The quality of baby products is not just about the product itself, but also the production processes, quality control, packaging, and transportation. Understanding the role of standardization in this context is crucial to ensuring that consumers have confidence in the products they purchase. The article aims to understand how quality and standardization affect the safety of products for children, as well as consumer satisfaction. Children, especially infants, are particularly sensitive to contamination and poor food quality, which is why it is so important that production processes comply with high quality standards. The article may also aim to indicate areas where the quality and standardization of children's products can be improved, taking into account the latest technologies, changing regulations and growing consumer demands. With these tips, companies can better adapt their production strategies to meet market expectations. The article may introduce a new approach to assessing the quality of children's products, e.g. by using advanced analysis methods, such as correlation analysis, preference scales (e.g. BOST), or three-dimensional models of assessing the impact of various factors on quality. This may provide new tools and assessment methods that will be used not only in scientific research, but also in industrial practice.

The scientific development of the article is valuable for several reasons. Baby food is a highly sensitive product category, where maintaining quality and standards is essential to safeguarding the health of young consumers. The article addresses a research gap by exploring how standardization and quality influence production processes and demonstrating their optimization through the BOST methodology. By emphasizing decision-making tools like the BOST method, it supports businesses in enhancing production efficiency and meeting evolving consumer and regulatory demands. Additionally, the publication provides valuable insights for researchers and practitioners, highlighting the importance of quality and standardization in building consumer trust and achieving long-term success. The study’s conclusions also have broader relevance, extending beyond baby food production to other sectors of the food industry, thereby offering significant practical and scientific benefits.

The aim of the article is to analyze the importance of quality and standardization in baby food production from the perspective of the BOST method. The study focuses on identifying key factors influencing the maintenance of high production standards and evaluating the role of the BOST methodology in optimization and decision-making processes within this industry.

2. Safety Systems

The production of baby food is a specialized area within the food industry that combines the principles of nutrition, food safety, and quality control. It requires careful attention to ingredients, processing methods, and packaging to ensure that products are safe, healthy, and suitable for infants. With growing consumer awareness of food quality and safety, baby food manufacturers must prioritize both nutritional standards and sustainable practices to meet the needs of modern parents. Ensuring health safety (Berdowski, 2008) as well as the broadly understood quality of food is achieved through the implementation of quality management systems in a facility. One such system is the Hazard Analysis and Critical Control Points (HACCP) system, which is specifically focused on ensuring the health safety of food (Odintsova, Panin, 2021). For this reason, it is often referred to as a food safety management system (Turlejska, 2003). The HACCP system is inseparably linked to the implementation of Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP). From the perspective of food producers and processors, these practices can be integrated into a single food safety system. The Food Safety and Nutrition Act provides the following definition of GHP: "Good Hygienic Practice (GHP) refers to actions that must be taken and hygienic conditions that must be met and controlled at all stages of production or trade to ensure food safety".

Every enterprise is required to develop its own in-house program or instruction for Good Hygienic Practices, which forms the basis for implementing the principles of the HACCP system. Such a program should consider the organizational structure and specific activities of the facility. All techniques and methods used in the facility, as well as hygiene recommendations, should be described through appropriate procedures or instructions that address the specific requirements to be met. Procedures and instructions for GHP/GMP must be strictly followed by all employees. In the awareness of the average person, including employees working in the food industry, the concept of hygiene or Good Hygienic Practice is associated with cleaning and disinfection processes, as well as the personal hygiene of employees. In reality, it is a much broader concept, encompassing several closely integrated areas aimed at achieving one goal: food safety (Leonov, Shkaruba, 2018).

The Food Safety and Nutrition Act provides the following definition of GMP: "Good Manufacturing Practice (GMP) refers to actions that must be taken and conditions that must be met to ensure the safety of food, materials, and products intended for contact with food, in accordance with their intended use". GMP is a combination of effective production procedures and efficient control and supervision of production, ensuring that production occurs under conditions that allow the creation of products that meet predetermined quality requirements (Silverman, 2012, p. 380). The general principle of GMP is to eliminate any improvisation and randomness from the manufacturing process. All activities must be performed exactly as outlined by written instructions and procedures. Each activity must be

recorded and confirmed in the appropriate documents, and production verification strictly follows the documentation. GMP principles may include, for example, supplier control, building, room, and equipment maintenance; waste and sewage management; operation of utilities (e.g., water, steam, ice, airflow); pest and rodent control; storage, movement, and segregation of raw materials, semi-finished products, and products; cleaning and disinfection schedules; personal hygiene, work clothing; and management of guests and employees (Hamrin, Hoeft, 2012).

Analyzing the recommendations that a food producer must adhere to, ten basic principles or slogans of Good Hygienic and Production Practices can be distinguished:

- Before starting any work, ensure you have the required procedures and instructions.
- Always follow the instructions precisely, do not use "shortcuts" or "improvements". If you don't know or understand something, ask your superiors or consult the relevant documentation.
- Before starting work, ensure you are using the correct raw material or semi-finished product.
- Ensure that the technical condition of equipment and devices is correct and that they are clean.
- Work to minimize the risk of product contamination, and contamination of premises, equipment, and devices.
- Be attentive and prevent errors and mistakes.
- Report any irregularities and deviations from established process parameters to management.
- Take care of personal hygiene, maintain your workplace in cleanliness and order.
- Take responsibility for your actions (Turlejska, 2003).

The genesis of the HACCP system dates back to the 1960s in the United States when Pillsbury, in collaboration with NASA and the Natick Research Laboratory, received a contract to prepare food for the "Apollo" space program (Szczyrba, Ingaldi, 2024). In 1975, the HACCP concept was publicly presented at a food protection conference. Experts from the World Health Organization (WHO) endorsed HACCP (Kielesińska, 2018). In 1980, general HACCP principles and definitions were presented by the International Commission on Microbiological Specifications for Foods of the WHO. In 1983, HACCP principles were incorporated into the Codex Alimentarius. The Codex Alimentarius (Food Code) is a collection of internationally accepted nutrition standards, practices, recommendations, and guidelines used by international food control services, the agri-food industry, and scientific communities (Sharma et al., 2019). It is a source of global standards for ensuring food safety and consumer interests, as well as a guarantee of access to up-to-date information on global scientific achievements in the field of food safety and quality (Rosak-Szyrocka, Abdulhassan, 2020). It also provides an opportunity to address national and transnational interests related to facilitating international trade in food (Silverman, 2012).

3. Research Methodology

The survey for the study on the quality and standardization of children's products was created following several key steps. Initially, the main objectives of the survey were defined, which included assessing the quality of children's products and the extent of their standardization in the studied enterprise. The goal was also to understand consumer preferences and evaluate the impact of various factors on the perceived quality of the products. Before conducting the actual study, the survey underwent a pilot test to ensure that the questions were clear, the answers were understandable, and the overall structure of the survey was appropriate. The pilot test also allowed for the assessment of the time required to complete the survey. Respondents were selected based on the characteristics of the studied enterprise. The study involved employees from the production department, as well as individuals from various age groups and educational backgrounds, ensuring a diversity of opinions. This process of survey development enabled the collection of reliable data, which could then be used to analyze the quality and standardization of children's products in the studied enterprise. The research was conducted in a company producing food for infants and young children. The study was conducted in 2023. The questionnaire survey was carried out in the researched enterprise producing baby food product 45% production workers. i.e. nearly half of workers. Such a large research group of directly production workers will allow to precise identification of areas requiring improvement in the surveyed enterprise. The second part of the research involved conducting surveys using the BOST questionnaire (Liker, 2005; Borkowski, 2012a, 2012b). In the survey, participants were asked to provide personal characteristics, namely:

Please mark "+" in the appropriate box.

Gender: Male, Female.

Education: 1 – Below average, 2 – Average, 3 – Higher I degree, 4 – Higher II degree.

Age: 1 – Up to 25 years, 2 – 26-35 years, 3 – 36-45 years, 4 – 46-50 years, 5 – 51-55 years, 6 – 56-60 years, 7 – 61-65 years, 8 – Over 65 years.

Total work experience: 1 – Up to 5 years, 2 – 6-15 years, 3 – 16-20 years, 4 – 21-25 years, 5 – 26-30 years, 6 – 31-35 years, 7 – 36-40 years, 8 – Over 45 years.

Current employment is your place of work: 1 – First, 2 – Second, 3 – Third, 4 – Fourth, 5 – Fifth, 6 – Further.

I was admitted to the current company in the mode: (You can select two answers) 1 – Normal, 2 – On the basis of transfer, 3 – Due to better financial conditions.

This article presents an analysis of the answers given to the question contained in the BOST questionnaire (Borkowski, 2016b). In order to form an opinion, it is essential to understand the viewpoints of workers from different ranks in the enterprise. This allows for a better understanding of the enterprise through the eyes of its workers. BOST is a survey where the questions are well-matched, making it possible to assess the enterprise and its intangible assets

(Taiichi, 2008). First question referring to the roof of Toyota's house (E1 area). Employees have answered the following question: "Which factor is the most important in your enterprise?" Please fill in the blanks with 1, 2, 3, 4, 5 (5 the most important factor):

JA		Quality
KO		Cost
CR		Execution time
BP		Work safety
MZ		Staff morale

The second question refers to the second Toyota principle (E3 area). Principle 2. Create a continuous and smooth process of problem revelation. Area E3. Set of factors describing Toyota's second management principle. Employees answered the following question: "Rank the importance of production process factors?" Please fill in the blanks with 1, 2, 3, 4, 5, 6 (6 the most important factor) (Mielczarek, 2021):

CP		Continuous system for identifying problems
PE		Halting production upon detecting a quality issue
SZ		Standardized tasks, processes, and documents
EU		Granting authority downward
ST		Using only reliable technology
SW		Implementing visual control

The third question refers to the sixth Toyota principle (E6 area) (Liker, Hoseus, 2009). Principle 6: Standard tasks are the basis for continuous improvement and empowering employees. Area E6: A set of factors describing Toyota's second management principle. Employees were asked to answer the following question: " Rank the importance of types of standardization in ensuring continuous improvement of processes in your company?". Please fill in the blanks with numbers 1, 2, 3, 4, 5, 6,7 (7 the most important factor):

CW		Standardization of task completion time
PU		Standardization of the process
MP		Standardization of workstation storage
DO		Standardization of documents
SN		Standardization of training
PI		Standardization of information flow
ZA		Standardization of employment

To assess the structure and properties of the research sample, statistical analysis measures such as arithmetic mean, quartile deviation, and coefficient of variation were used (Pułaska-Turyna, 2011).

To determine the degree of variability in the studied statistical feature, the following ranges of the coefficient of variation were adopted: 0-20%: low variability of the feature, 20-40%: moderate variability of the feature, 40-60%: high variability of the feature, 60% and above: very high variability of the feature.

Consumer preferences reflect and formalize consumer tastes and are not influenced by product prices or the consumer's budget but solely by the satisfaction, happiness, or utility they provide. Preferences enable consumers to make choices when faced with various alternatives.

Consumer preferences arise from the desire to satisfy their needs. Among the many goods available in the market, consumers select those that meet their expectations. These choices reflect their tastes, preferences, and personalities, forming a determinant of demand that specifies what people want to buy.

When selecting appropriate goods, consumer decisions are significantly influenced by factors such as age, family status, taste, education level, existential needs, and socio-economic development. A consumer, aiming to maximize the satisfaction of their needs, is guided by rational considerations as well as the standards prevailing within the social group to which they belong (Rosak-Szyrocka, Ulewicz, 2016).

In the BOST method, the term "preference" is understood in the context of making choices regarding the importance of factors describing Toyota's management principles (Knop, Borkowski, 2017). Respondents prioritize factors, assign importance, determine priority, rank one over another, and make decisions about their significance (Knop, Mielczarek, 2018).

In similarity studies, the most widely used assessment method is the interval-based unidimensional comparative scale developed by Thurstone, referred to as the comparative scale (Sagan). The BOST method employs a proprietary scale (Borkowski, 2012), based on arithmetic means, which is called the range scale. This scale is divided into five zones:

0 – lowest preference,
0-20% – weak preference,
20-40% – moderate preference,
40-60% – average preference,
60-80% – strong preference,
80-100% – very strong preference,
100% – highest preference.

Subsequently, the similarity criterion was dependent on the number of factors: 4 factors - 18; 5 factors - 16; 6 factors - 14; 7 factors - 12; 8 factors - 10; 9 factors - 8; 10 factors - 7; 11 factors - 6; 12 factors - 5% of the scale length.

4. Respondents' Opinion on Perceived Quality

According to the principles of good practices in scientific research, it is essential to specify the conditions under which the results were obtained. As mentioned, the quality-related results were obtained from the production department. However, the assessment of the importance of selected factors was conducted by respondents (operational-level employees). Respondents identified their personal characteristics, the description of which is presented in Table 1.

Table 1.
Characteristics of respondents: percentage structure

Symbol	Features' marking and their rate characteristic					
	MK	**WE**	**WI**	**SC**	**MR**	**TR**
1	**28**	**0**	**13**	**9**	**9**	**47**
2	**72**	**28**	**23**	**16**	**34**	**22**
3		**63**	**16**	**28**	**3**	**31**
4		**9**	**16**	**9**	**16**	
5			**13**	**13**	**16**	
6			**13**	**9**	**22**	
7			**6**	**13**		
8	**32**		**0**	**3**		

Source: Author's contribution.

The data provided the following information: in the company producing porridge with additives, the majority of employees are women (72%).The analysis of discrepancies in production revealed that, in addition to quality, visual control is crucial in the company (Knop, 2018). Visual control helps identify non-conforming products, and standardization guarantees the repeatability of good results (Selejdak, 2013). Therefore, a survey was conducted in the company covering areas E1, E3, and E7, with limitations imposed by technical conditions. According to good research practices, the collected ratings should be statistically evaluated first. The importance measures of factors in the area are presented in Figure 1. Based on its data (Fig. 1a), a hierarchy of factor importance can be constructed:

$$JA > BP > MZ > CR > KO \quad (1)$$

The observed order of factors in the hierarchy is very rare because *Staff morale* (MZ) usually occupies the fifth or fourth position. In this case, it ranked third, following *Quality* (JA) and *Work safety* (BP). It is noteworthy that the *Cost* (KO) occupies the last position. Quality takes precedence because the produced product is a nutritional item for children, and the occurrence of accidents is also prohibited as they could lead to contamination of the porridge.

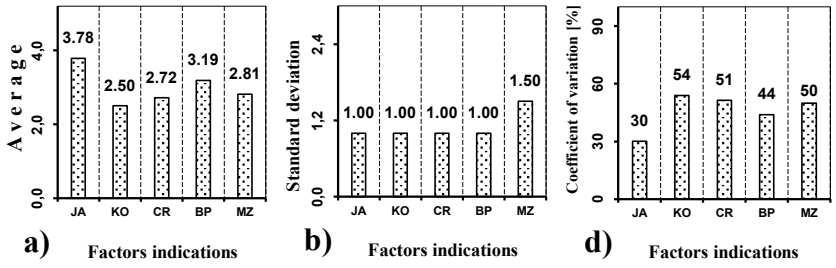

Figure 1. Roof of the Toyota House. Comparison: a) averages, b) standard deviation, c) coefficient of variation for factor ratings in Area E1.

Source: Author's contribution.

The data from Figure 1b indicate that 50% of the central units fall within the range of two assessments, and this applies to the set of assessments for factors: JA, KO, CR, BP. However, for the set of assessments Staff morale (MZ) factor, this range includes three assessments.

The coefficient of variability (Fig. 1c) ranges from 30% to 54%, encompassing two zones of feature differentiation. The sets of assessments for factors occupying the top two positions in the hierarchy have moderate feature differentiation (20-40%), while the sets of assessments for the remaining factors have strong feature differentiation (40-60%).

In reference to the data sets of assessments for factors in areas E3 and E6, two statistical characteristics have been determined: the arithmetic mean and the coefficient of variation (Fig. 2). Regarding the factors in area E3 (Fig. 2a), the hierarchy of importance is as follows:

$$CP > SW > ST > PE > EU > SZ \quad (2)$$

The processes in the examined company are organized in such a way that, according to the respondents, *Continuous system for identifying problems* (CP) is considered the most important. In the second place is the factor *Implementing visual control* (SW), which helps reveal quality issues in the packaging of porridge with additives. The sets of assessments for this area (Fig. 2b) have a coefficient of variation ranging from 32 to 60, thus covering two ranges. The sets of assessments for factors CP, ST, SW have moderate feature differentiation (20-40%), while the remaining factors have strong feature differentiation.

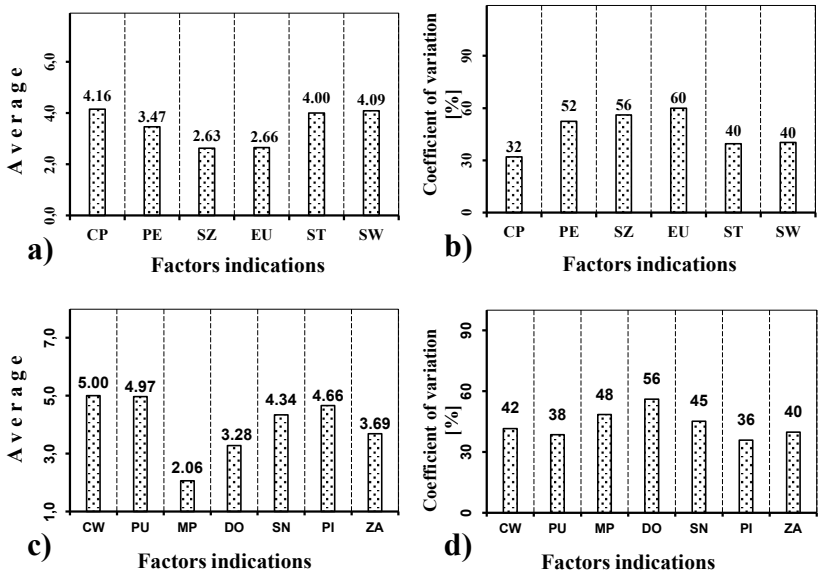

Figure 2. Comparison of averages (right column) and coefficient of variation (left column) for factor ratings in Areas: a), b) E3, c), d) E6.

Source: Author's contribution.

The data from Figure 2c authorize the construction of the following hierarchy of importance for factors in area E6, describing the foundations of continuous improvement through standard tasks.

$$CW > PU > PI > SN > ZA > DO > MP \quad (3)$$

According to the respondents, *Standardization of task completion time* (CW) is considered the most important, followed by *Standardization of the process* (PU), and *Standardization of information flow* (PI) is also important. It is noteworthy that *Standardization of training* (SN) is placed in the fourth, middle position. This suggests the existence of a train-ing system that

employees are not entirely satisfied with. The coefficient of variation falls within the range of 36-56%, covering two ranges: 20-40% with moderate feature differentiation (applies to sets of assessments for factors PU, PI), and the sets of assessments for the remaining factors have strong feature differentiation.

The relationships between the importance of factors in the BOST method are deepened by their similarities. The results regarding the similarity of factors in areas E1, E3, E6 are presented in Figure 3. Area E1 contains 5 factors, and the similarity criterion is 16% of the length of the scale range. The data in Figure 3a show that the most preferred factor is *Quality* (JA), emphasizing the importance of this factor by the absence of factors in the zones of very strong and strong preferences. The factor *Execution time* (CR) shows similarity to the employee *Staff morale* (MZ). The distribution of factors on the range axis for the data in area E3 (Fig. 3c) indicates the clustering of two factors in the zone of weak preference (0-20%) and three in the zone of very strong preference (80-100%). The similarity criterion for the area of 6 factors is 14% of the length of the scale range.

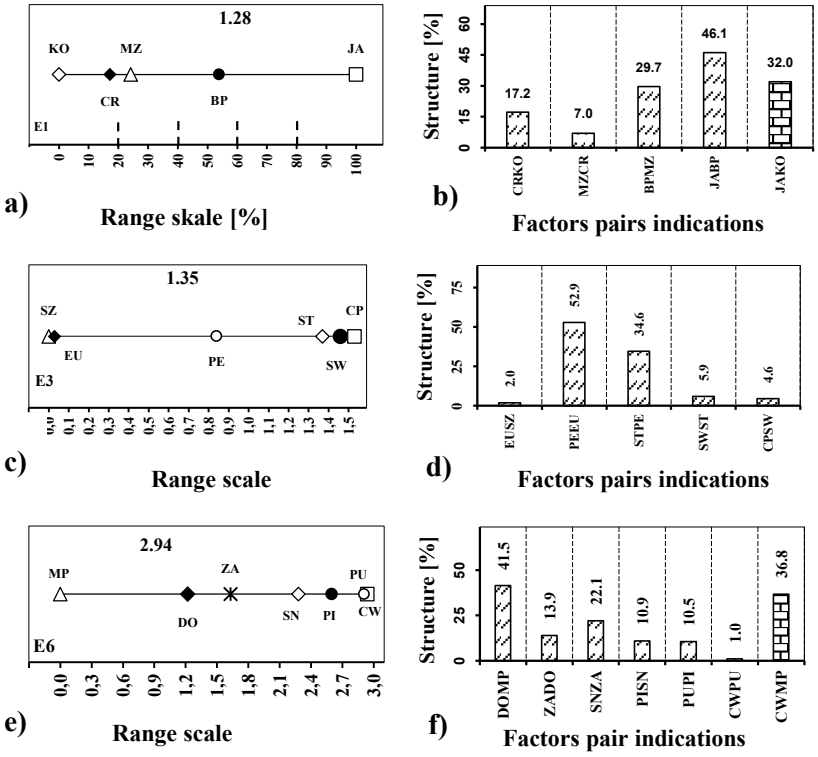

Figure 3. Assessment of factor similarity based on the range scale: left column - distribution of factors on the range scale, right column - structure of the scale. Related to data from areas: a), b) E1, c), d) E3, e), f) E6

Source: Author's contribution.

Factors such as *Continuous system for identifying problems* (CP), *Implementing visual control* (SW), and *Using Only Reliable Technology* (ST) show relative similarity in terms of preferences. This implies that visual control is supported by the other two factors, as reliable technology generates fewer quality problems than outdated (declining) technology.

The similarity in preference among factors in area E6 is shown in Figures 3e and 3f, with a similarity criterion of 12% of the scale length. Factors such as *Standardization of task completion time* (CW), *Standardization of the process* (PU), *Standardization of information flo*w (PI), and *Standardization of training* (SN) form a cluster in the zone of very strong preference. As indicated by the data in Figure 3f, the factor *Standardization of Information Flow* (PI) shows similarity to the mentioned factors in terms of preference, meaning it supports these factors through the standardization of information flow.

An essential part of the BOST method is the assessment of the impact of respondents' characteristics on the ratings of factors. The results of this relationship are presented in Figure 4, in the form of 3D charts. The direction of the cone rotation indicates the correlation direction, with the top representing a positive correlation and the bottom a negative correlation, and the α level is given on the X-axis.

From the data in Figure 4a, it can be concluded that there are 20 correlation variations, including 11 positive ones. *Respondents' education* (WE) has only a positive influence on the ratings of the *Quality* (JA). *Respondents' mobility* (MR) does not have an impact on the ratings of any factor in area E1. The most active characteristics of respondents are their *Age* (WI) and *Tenure* (SC) – both with seven correlation variations. However, the factor most sensitive to respondents' characteristics is *Staff morale* (MZ), with six correlation variations. The following characteristics have an impact: gender (one variation, only at the $\alpha = 0.2$ level), *Age* (WI) at two levels ($\alpha = 0.2$ and $\alpha = 0.1$), and tenure (SC) at all three levels ($\alpha = 0.2$, $\alpha = 0.1$, and $\alpha = 0.05$).

The characteristics of respondents influence the assessments of factors in area E3 as follows:

- There are 21 correlation variations, including 8 positive ones.
- No personal characteristic influences the ratings of two factors: (PE) and (ST).
- Two respondent characteristics, *Gender* (MK) and *Mode of employment* (TR), do not affect the ratings of any factor in area E3.
- The most sensitive factor to the ratings in area E3 is the *factor Standardized tasks, processes, and documents* (SZ) – seven correlation variations, influenced by three respondent characteristics: *Age* (WE), *Work tenure* (SC), and *Mobility* (MR).
- The ratings of *Continuous system for identifying problems* (CP) are influenced by four respondent characteristics: *Education* (WE), *Age* (WI), *Work tenure* (SC), and *Mobility* (MR), with six correlation variations.
- The ratings of *Implementing visual control* (SW) are shaped by three respondent characteristics: *Age* (WI), *Work tenure* (SC), and *Mobility* (MR) – three correlation cases and six variations.

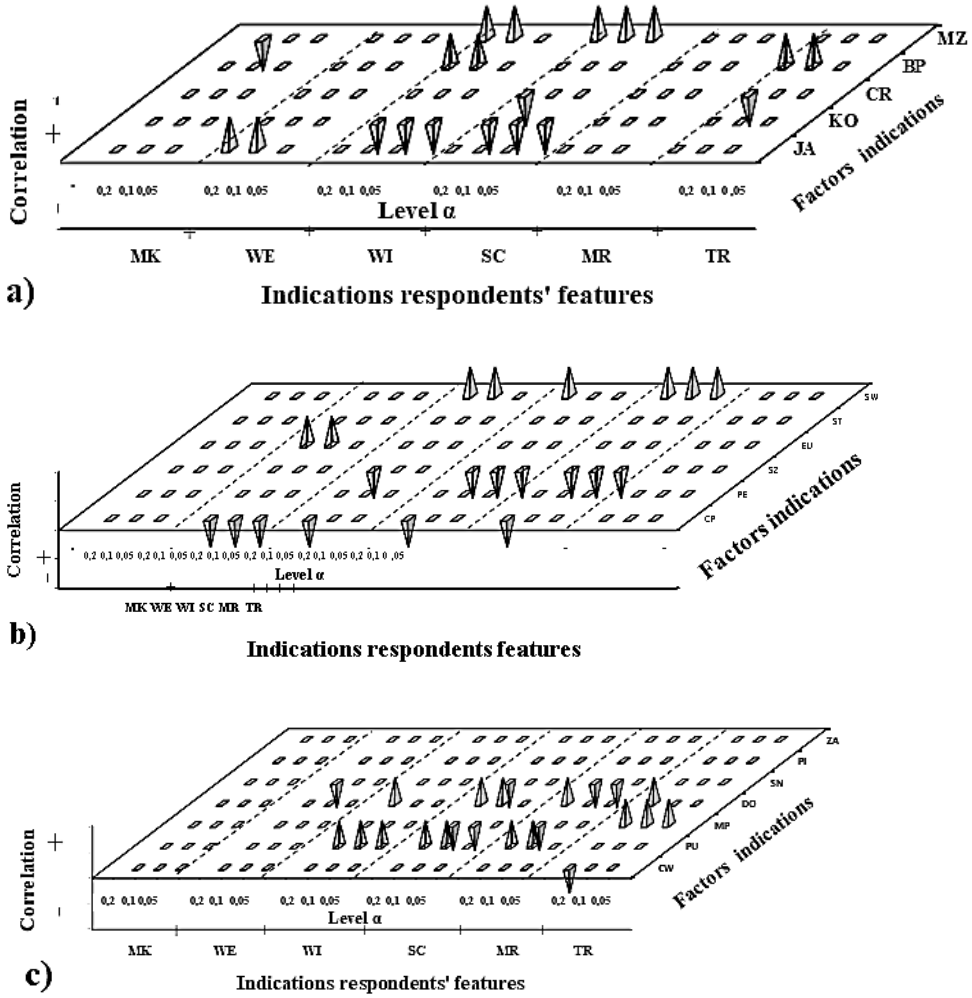

Figure 4. 3D compilation of correlation analysis results: influence of respondent characteristics on the importance of factors in Areas: a) E1, b) E3, c) E6.

Source: Author's contribution.

The characteristics of respondents influence the assessments of factors in area E3 as follows:

- There are 21 correlation variations, including 8 positive ones.
- No personal characteristic influences the ratings of two factors: (PE) and (ST).
- Two respondent characteristics, *Gender* (MK) and *Mode of employment* (TR), do not affect the ratings of any factor in area E3.
- The most sensitive factor to the ratings in area E3 is the *factor Standardized tasks, processes, and documents* (SZ) – seven correlation variations, influenced by three respondent characteristics: *Age* (WE), *Work tenure* (SC), and *Mobility* (MR).
- The ratings of *Continuous system for identifying problems* (CP) are influenced by four respondent characteristics: *Education* (WE), *Age* (WI), *Work tenure* (SC), and *Mobility* (MR), with six correlation variations.

- The ratings of *Implementing visual control* (SW) are shaped by three respondent characteristics: *Age* (WI), *Work tenure* (SC), and *Mobility* (MR) – three correlation cases and six variations.

The results of the correlation analysis suggest that, according to respondents, the "physical" perception of factors such as *Standardized tasks, processes, and documents* (SZ) and *Continuous system for identifying problems* (CP) indicates malfunctioning (negative correlation).

Data from Figure 4c, concerning the results of the correlation analysis in the area of E6, indicate 23 correlation variations, including 15 positive ones. For the ratings of two factors, *Standardization of information flo*w (PI) and *Standardization of employment* (ZA), no personal characteristic of respondents has any influence. Ratings of *Standardization of the process* (PU) are most dependent on respondent characteristics – the number of correlation variations is 7, with three correlation cases influenced by three characteristics: *Age* (WI), *Work tenure* (SC), and *mobility* (MR), all correlations being positive. For the ratings of the Standardization of Documents factor (DO), four characteristics influence: age (WI), Work tenure (SC), *Mobility* (MR), and *Mode of employment* (TR), with a smaller number of correlation variations (5) and all correlations being positive.

During the analysis of the BOST survey results, it was decided to deter-mine correlations between the ratings of factors in the surveyed areas. The results in this regard are presented in the form of histograms. The appearance of the histogram above the axis confirms positive correlation, below the axis indicates negative correlation. The values 1 and -1 represent correlation at the $\alpha = 0.2$ level; 2 and -2 at the levels $\alpha = 0.2$ and $\alpha = 0.1$; 3 and -3 at the levels $\alpha = 0.2$, $\alpha = 0.1$, and $\alpha = 0.05$. Zero means no correlation under the adopted conditions of result analysis.

In Figure 5, the results show the impact of assessments of factors in area E3 on the assessments of factors in areas E1 and E6. No influence was observed, for the adopted conditions, of ratings of factors in area E3 on the ratings of factors such as *Quality* (JA) and *Mode of employment* (MZ). There are 4 correlation cases (two positive and two negative) and 9 correlation variations, including 4 positive ones. The most sensitive factor in area E1 is the *Cost* (KO) – two correlation cases, 5 variations, and the most active factor in area E6 is the (EU) factor (two cases, 5 correlation variations).

From the data in Figure 5b, it can be inferred that there are 12 correlation cases, 25 correlation variations, no correlation for *Standardization of employment* (ZA) factor, and the most sensitive factor to the ratings in area E7 is *Standardization of information flow* (PI) factor. The most active factor in the area is *Continuous system for identifying problems* (CP) factor (three correlation cases, six variations). The same number of correlation cases exists for *Granting authority downward* (EU) factor, but the number of variations is significantly smaller, standing at 3.

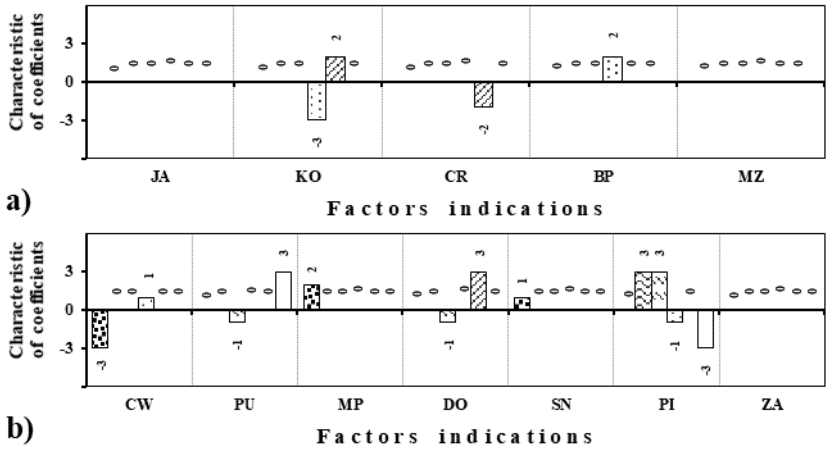

Figure 5. Summary of correlation analysis results: determining the impact of factor ratings in area E3 on factor ratings in Areas: a) E2, b) E6.

Source: Author's contribution.

Three areas are formed by their three pairs: E3-E1, E3-E6, and E1-E6. The results related to correlations for the third pair, E1-E6, are presented in Figure 6. In this case, on the X-axis, there are five factors for each area because Area E1 contains such a number of factors. The data in Figure 6 indicate the existence of 9 correlation cases and 15 correlation variations. Regarding the factors (CW) and (MP), no correlations were observed. *Quality* (JA) from area E1 shapes the ratings of three factors in area E6: (DO), (SN), (PI). Ratings of *Standardization of training* (SN) factor in area E6 are influenced by the ratings of three factors in area E1: (JA), (CR), (MZ).

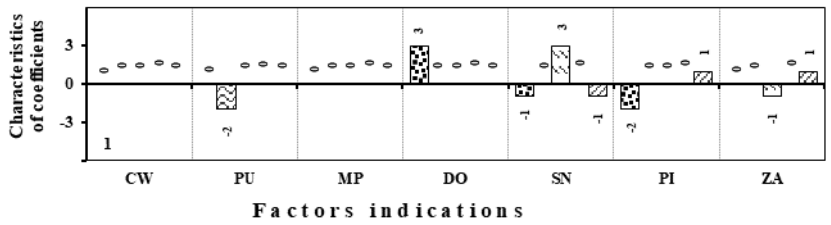

Figure 6. Summary of correlation analysis results: determining the impact of factor ratings in Area E1 on factor ratings in Area E6.

Source: Author's contribution.

5. Summary

The article presents systems that ensure food security. According to the research, the core of these systems is based on the ISO 22000 standard, which applies the principles of GHP, GMP, and the ISO 9001 system. This multi-dimensional approach to quality stems from the fact that the studied company produces products for children and infant. Thanks to the courtesy of the company management, a BOST survey was conducted in the areas of E1, E3, E6, and E12. Based on the structure of respondent characteristics (area E12), it was shown that the company has human resources that guarantee the achievement of goals. The majority of employees are women (typical for the food industry), 71% of the employees have higher education (63% with a Bachelor's degree), and 68% are in the most productive age range (25-55 years old). One in four employees (28%) has 28 years of experience, and only 9% of the employees have not worked in other companies before. Management takes care of specialists – 21% were hired with consideration for financial conditions.

It was shown that, according to the respondents, quality (area E1) is the most important of the five factors in Area E1 in their company. The respondents rated staff morale highly (a factor also from Area E1), indicating that the employees identify with the company's goals and are aware of their responsibility in adhering to procedures. The importance of visual control (Area E3) was emphasized by the respondents, and it ranked second in the importance hierarchy of the six factors, showing a similar preference to the most important factor – Continuous system for identifying problems.

Three factors from Area E6, namely the standardization of: task completion time, process standardization, and information flow standardization, fall within the very strong preference zone (80-100% of the range scale), showing a similarity in preferences.

Considering the theoretical analysis of the studied issue, the practical results, and their analysis, it can be concluded that the research objective has been achieved.

One of the main limitations is the small sample size of respondents, which predominantly consisted of employees from the production department. This could lead to a potential bias in the results, as the views of the production staff may not fully represent the perspectives of other departments, such as management, quality control, or logistics. These departments might have different insights or experiences regarding the importance of various factors affecting food safety and quality, and their absence in the study might skew the results.

Additionally, the lack of feedback from management or other decision-makers, who are responsible for setting strategic goals and overseeing the implementation of quality systems, represents another limitation. Managers often have a broader, more strategic view of the company’s operations, which could differ significantly from the more operational perspectives of the production staff. The results of this study are specific to one particular company. While this case study approach provides valuable detailed insights into the practices and

challenges of a single organization, it limits the ability to generalize the findings to other companies or industries. For example, another company in the food industry might have a different organizational structure, a more diverse workforce, or a different approach to training and quality management, which would influence the results of a similar survey. Another limitation is the inherent subjectivity of the BOST survey used in the study. While the BOST method is a useful tool for assessing organizational quality and management practices, it relies on the perceptions and opinions of the respondents, which may be influenced by individual biases or experiences. Respondents' personal preferences, work-related attitudes, and even their understanding of the questions can affect the results. Given these limitations, future studies could expand the sample size to include a more diverse set of respondents from different departments, including management, quality control, and logistics. This would provide a more comprehensive view of how different parts of the organization perceive and contribute to food security and quality management. Furthermore, future research could consider conducting similar studies across multiple companies or industries to identify common trends and best practices. By expanding the scope of the research, a more generalized understanding of the factors affecting food safety and quality can be achieved. In conclusion, while the article provides valuable insights into the systems ensuring food security, it is essential to recognize the limitations related to sample size, company specificity, and the subjective nature of the BOST survey. Acknowledging these limitations allows for a more nuanced understanding of the findings and opens up avenues for further research that can address these gaps and provide more robust conclusions.

Future studies could expand the research to other companies within the same industry. By comparing the situations and practices of different organizations, researchers would be able to confirm or refute the results obtained in the current study. This comparative approach could highlight industry-wide trends, challenges, and best practices, contributing to a deeper understanding of food safety and quality management systems across a broader range of companies. It would also help determine whether the findings are specific to one company or applicable to others in the same sector. In summary, future research directions focus on broadening the scope of the current study by including a larger sample, exploring other companies in the industry, and providing a foundation for future investigations. By addressing these areas, future studies can enhance the understanding of food security systems, improve the reliability of findings, and contribute to the continuous improvement of food safety practices across the industry.

In conclusion, the integration of quality and standardization practices, as evidenced by the company's adherence to ISO standards and the proactive measures identified in the BOST survey, is crucial for ensuring the safety and quality of baby food products. These practices not only comply with regulatory requirements but also build consumer trust, which is essential for long-term success in the food industry.

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