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FOOD SAFETY CULTURE ASSESSMENT. SARS-CoV-2 PERSPECTIVE

Abstract: *This paper investigates the phenomenon of food safety culture (FSC) from the perspective of SARS-CoV-2-related hazards. The importance of FSC in the context of organizational culture, and its role in strengthening the quality and food safety management system were explained. The aim of the article is to propose the tool to measure and assess the level FSC concerning the risk connected with SARS-CoV-2 contamination. The SARS-CoV-2-based FSC assessment tool have been developed and the reliability of this tools have been confirmed. It was possible to identify the overall and the partial FSC levels in seafood company and to show which variables most significantly affect the employees behavior, and beliefs against food safety, and based on that areas for further improvement. The tool proposed by us may be applied by various food entities, especially those interested in meeting the mandatory requirements contained in the current EU food law.*

Keywords: *Organizational Culture, Food Safety Culture, Food Quality, Food Safety Management Systems, SARS-CoV-2*

1. Introduction

The demand for high quality food has constantly increased during recent decades and several studies have highlighted the fact that definition of quality is not unified but depends, rather, on the different perspective from which it is assessed (Laužikė et al., 2021; Heldman, 2022). Food quality (FQ) refers to the “characteristics of the food, that bear on its ability to satisfy stated or implied preferences” (Buckwell, 2003). Wiśniewska (2005) has defined FQ as “a collection of features and their determinants that apply to all stages from primary production to food consuming, and that fulfills various guidelines and directives, to meet broadly defined requirements of the consumers”. Food quality represents the sum of all properties and food assessable attributes.

Usually there are three accepted categories of food quality: sensory value, suitability value and health value (Onyenweaku et al., 2020). Among the health values food safety (FS) is considered critical (Tadić & Stefanović, 2007; Wiśniewska, 2017). Codex Alimentarius defines food safety as “assurance that food will not cause adverse health effects to the consumer when it is prepared and/or eaten according to its intended use” (FAO and WHO, 2020a). The same document indicates that: “People have the right to expect the food that they eat to be safe and suitable for consumption. Foodborne illness and foodborne injury can be severe or fatal or have a negative impact on human health over the longer term. Furthermore, outbreaks of foodborne illness can damage trade and tourism. Food spoilage is wasteful, costly, threatens food security

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and can adversely affect trade and consumer confidence". Meeting this postulate is much more difficult in the COVID-19 era. The more so because, as official statistics prove, the threat to FS is not decreasing. According to the recent report published by the World Health Organization (WHO) 600 million cases and 420 000 deaths each year occur as result of foodborne illness (...). The WHO Europe Regional Director considers that situation unacceptable (<https://www.fao.org/europe/...>,2021).

According to FAO and WHO (2020b) it is obvious to eliminate or reduce these risks. It is critical to protect employees from contracting COVID-19 and to strengthen food safety management systems (FSMS), including Hazard Analysis and Critical Control Point (HACCP) system, Good Manufacturing Practice (GMP), and Good Hygienic Practice (GHP), as the most relevant and effective solutions in this regard. As UNIDO (2020) specialists argue the emergence of SARS-CoV-2 is recognized to be caused by a lack of FSMS implementation. Therefore, during the COVID-19 pandemic and post-pandemic times, the food industry should indisputably follow FSMS principles at every stage, from the farm to the point of sale (Han et al., 2021). In parallel, as the researchers confirm, the activities of this type should be initiated within the organization, as the result of the employees' individual belief and awareness. This change is primarily a concern for the food safety culture (FSC) (i.e. Charlebois et al., 2021) and behaviour-based strategy (i.e. da Cunha, 2021).

Regarding mentioned above, the purpose of the paper is to propose the tool to measure and assess the level of food safety culture concerning the risk connected with SARS-CoV-2 contamination (the SARS-CoV-2-based food safety culture assessment tool-SFSCAT). It has been verified in a seafood industry company. The tool made it possible to identify the level of FSC, both holistically and from the perspective of five core criteria: (1) MS (management style)/FS (food safety)

policy, (2) leadership, (3) communication, (4) commitment and (5) work environment. To interpret the food safety level, FSC maturity scale (FSCMS) was applied. To analyze the obtained data the IBM SPSS Statistics v. 27 software was used.

2. The culture of food safety in the context of SARS-CoV-2

The global pandemic of COVID-19 has highlighted the significance of practices to enhance food chains and FS more than ever (Maragoni-Santos et al., 2021). The occurrence of this type of pandemic, especially COVID-19, has become severe not only for an individual, but also for the economies of the whole world, including the food industry (Barman et al., 2021; Jackson et al., 2021). The continuing challenges of COVID-19 on food manufactures make them more engaged to foster a positive FSC and in doing so, reduce the levels of non-compliance, product recalls and food contamination (Watson, 2021). The potential linkage between SARS-CoV-2 infection and FS is a key issue for governments worldwide to consider (Ceylan et al., 2020). Different international agencies indicate that there is no evidence that food may be a coronavirus transmitter (FAO and WHO, 2020b; EFSA, 2020). However, there are more and more studies confirming that such a situation is possible and the probability of the negative scenario increases with the complexity of the farm to fork process (i.e.: Han et al., 2020; Ceniti et al.; 2021; Jia et al., 2022). SARS-CoV-2 spread from staff to food products or food surfaces is conceivable (Ceylan et al., 2020). According to Djekic et al. (2020) who surveyed 825 food companies in 16 countries between May and August 2020, the emergency and FS plans are especially necessary in the event of water contamination and contamination of ingredients or packaging. To sum up such situations are taken into account by the studied food organizations. As Baltic et al. (2021) confirm, to date, the

possibility that SARS-CoV-2 can survive in vegetables, meats or other foods is based only on assumptions with no direct and unmistakable evidence to show that SARS-CoV-2 can be transmitted from food or food packages to humans. They add, however, that available data about COVID-19 outbreaks showed that slaughterhouses and meat processing plants are suitable environments for spreading SARS-CoV-2. They add that in previous literature, several outbreaks in meat sector enterprises worldwide have also been analyzed (Baltic et al., 2021). There is no doubt that further research and evidence are necessary to explore the possibility of SARS-CoV-2 transmission via food and packaging materials. The more so as external institutional recipients want to be sure that everything has been done in the organization to prevent such a threat. As already mentioned, the most appropriate approach was the implementation of the FSMS, reinforced with the right FSC. The FSMS is a vital part of any modern food business. Organizations are obliged to control FS hazards to ensure that food is safe. A well-established FSMS allows for identifying risks to FS and detailing how they are controlled in the organization (Babeker et al., 2022). FAO and WHO (2020b) experts, and scholars worldwide (e.g. Djekic, et al. 2020), make it clear that to reduce the SARS-CoV-2 transmission via food and packaging materials and to minimize coronavirus transmission, it is critical to strengthen food hygiene, sanitation practices and personal hygiene measures, provide refresher training on food hygienic principles, introduce physical distancing and responsible behaviour at each stage of food processing. It is also essential to strengthen FSC recognized as a vital factor for improving FS practices (Sohail et al., 2022). FSC is an element of the overall organizational culture and organizational culture (OC) encompasses values and behaviours that contribute to the unique social and psychological environment of an

organization (Selvalakshmi & Guru, 2017). According to Schein (1985) OC can be understood as: “a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems”. As Scheuplein (1987) explains, OC reflects concepts, values, norms, and beliefs generally accepted by the employees. Hence, when considering the FSMS, all these elements can be taken into account with regard to food safety. Yiannas (2009) and Griffith et al. (2010a,b) were the first scholars who proposed definitions of FSC. According to Yiannas (2009), FSC is “the behaviour associated with food handlers”. Griffith et al. (2010a) defines it as “the aggregation of the prevailing, relatively constant, learned, shared attitudes, values and beliefs contributing to the hygiene behaviours used within a particular food handling environment”. As indicated by Global Food Safety Initiative (GFSI) FSC can be defined as “shared values, beliefs and norms that affect mind-set and behaviour towards food safety in, across and throughout an organization” (Global Food Safety Initiative, 2018). Since the pioneering publications on this subject (e.g. Yiannas, 2009; Griffith et al., 2010 b; De Boeck et al., 2015), also now there are more and more works presenting various experiences related to FSC assessment (e.g. da Cunha et al., 2021; Jevšnik et al., 2021; Zanin et al., 2021). Although there are more and more works on FSC, it seems that this issue needs to be explored further, especially in European countries belonging to the former Eastern Bloc. This research gap is confirmed by a cross-sectional study conducted by Zanin et al. (2021). Conducting research in this area, and above all, encouraging food companies to measure the level of FSC, is all the more necessary as the criticality of this issue has been emphasized in European Union law, in the Commission Regulation

(EU) 2021/382 of 3 March 2021 amending the Annexes to Regulation (EC) No 853/2004 of the European Parliament and of the Council on the hygiene of foodstuffs as regards food allergen management, redistribution of food and food safety culture. This Regulation was preceded by changes to the Codex Alimentarius, which clearly indicated the necessity to implement FSC. A key condition for the successful operation of any food hygiene system is to create a positive FSC. The next condition is to recognize the behavior of employees with regard to FS. The aim is to assure that food is safe and suitable for people (FAO and WHO, 2020c). Moreover, before the relevant provisions in the Codex Alimentarius and in EU law appeared, the necessity to implement FSC was expressed in the requirements of FS management standards recognized by the GFSI, such as BRCS Global Standard for Food Safety (BRCS) or International Featured Standards (IFS). However, none of these documents explains what such an assessment is and how it works.

3. Sample and method

3.1. Respondents, and research steps

The survey was carried out in a small company. The study involved all company staff (21 people), and 100% properly completed questionnaires were received. The questionnaires (two A4 sheets) were distributed after a short explanation of the idea of the research by suitably instructed superiors. The employees were informed that participation is optional and anonymous. In order to increase anonymity and thus convince respondents to participate in the survey, there were no questions about the division they came from. It took about 15 minutes to complete the questionnaire, and after it respondents were asked to leave the questionnaires in a box prepared for this purpose. The stages of the study and the methods used are presented in Table 1.

Table 1. Research steps

No	Step	Methods used
1	Contact with the enterprise and preparation of its characteristics	Monographic method, secondary data analysis, Case study
2	SFSCAT development	Conceptual work
3	Conducting the research at the company	Questionnaire survey method
4	Analysis of the collected results	Statistical analysis Analysis and synthesis
5	Drawing conclusions	Synthesis and logical reasoning

3.2. General description of the company

The company under study operates in the north of Poland. It's core activity is providing logistics services; handling and storage of packed frozen food products; cross-docking; documentation flow; value added logistics services; etc. The company has implemented complex FSMS including ISO 9001, ISO 14001 and ISO 45001, and is complying with IFS Logistics, BRC Storage & Distribution, MSC Chain of Custody standards, and SMETA (Sedex Members Ethical Trade Audit) 4-pillar norm. The company employs 21 staff with seven divisions responsible for operational, tactical and strategic aspects. At the operational level, there are the following divisions: I - responsible for product handling; II - responsible for customer service; III - dealing with technical activities. At the tactical level, there are three divisions, responsible for administrative & human resources management, quality assurance, and finance & accounting. At the top of this structure is the management (CEO). Among additional bodies there are: Management Representative for Quality & Food Safety Assurance (MRQFSA); Crisis Management Team; and Interdisciplinary HACCP Team.

To protect employees against COVID-19 disease, all the recommended precautions (see FAO & WHO, 2020b) have been implemented, such as, among others, specific hygiene rules, ongoing testing in terms of coronavirus, strict rules on visits, e.g. inspectors, external auditors, customs services, etc. Employees are also covered by additional insurance against coronavirus infection. Thus, the enterprise has adapted to the requirements set by institutional clients, considered as a condition of cooperation.

3.3. Research tool, hypothesis, and statistical testing

For the research purpose, a questionnaire developed and verified by Neal et al. (2012) and by Wiśniewska et al. (2019) was used as a model. It was divided into two parts. The statements (sub-criteria) were translated into the respondents' native language, and linguistically checked. An important modification in relation to the original tool was the introduction to the statements a reference to the hazards associated with

SARS-CoV-2. In this way, SFSCAT was developed. The first part of SFSCAT contained 38 sub-criteria, divided into five core criteria: (1) MS/FS policy, (2) leadership, (3) communication, (4) commitment and (5) work environment. All of them end additionally with the statement: “and SARS-CoV-2-related hazard” (see Appendix). The second part, the metrics section, concerned the following variables: age, the length of employment in the company, and the length of experience in the food logistics industry. To assess FSC the five-point Likert scale was used, where: “1” means – strongly disagree, “2” – means rather disagree, “3” – means no opinion, “4” – means rather agree, “5” – means strongly agree.

To interpret the FSC level, the scale presented in Table 2 was used. The scale, in its original version was proposed by Dr Derek Watson of the University of Sunderland and developed for food sector (Zhai & Watsan, 2021; Enlighten...). The research took place in December 2021.

Table 2. FSC maturity scale (FSCMS)

Level	Rating	Action level towards FS
1	1.0-1.8	Very high risk Immediate action required. Probably legal FS requirements are not being met
2	1.9-2.7	High risk The company team has a reactive attitude. Further investigation is necessary to identify areas of concern to minimize the high-risk rating
3	2.8-3.5	Middle risk The company team is committed to FS issues. It is critical to develop awareness and understanding of the risk related to FS
4	3.6-4.1	Low risk The company team understands the role of FS issues and follows the rules. It is important to consider information from FSC survey and generate improvements involving all levels the workforce.
5	4.2-5.0	Very low risk The company team has a proactive attitude. The management needs to maintain that level. Regular assessment of FSC and continual improvement are still necessary.

The following three H_0 hypothesis were tested:

- H1: The employees participating in the research are not consistent in their assessments of individual sub-criteria
- H2: Age and length of employment in the company do not differentiate opinions between the groups of the company's employees regarding FSC sub-criteria.

- H3: Length of experience in the food logistics industry influences on assessment of the FSC sub-criteria.

Cronbach's alpha was calculated to assess the scale reliability. A scale is considered reliable if the Cronbach's alpha coefficient is ≤ 0.700 (Stadler et.al., 2021). To explain the variability of respondents' answers descriptive statistics and one-way ANOVA analysis of variance were used.

4. Results and discussion

The demographic and vocational features of the respondents are shown in Table 3.

Table 3. Respondents' characteristics

	N	%
Age		
<35 years old	6	28,6
35-45	10	47,6
46-55	4	19,0
>55	1	4,8
Total	21	100,0
Length of employment		
< 2 years	0	0,0
2-4 years	3	14,3
> 4 years	18	85,7
Total	21	100,0
Length of employment in the industry		
< 3 years	2	9,5
3-5 years	3	14,3
6-10 years	10	47,6
> 10 years	6	28,6
Total	21	100,0

The scale of SFSCAT was high reliable (Cronbach's $\alpha=0,959$) and it means that the responses to individual statement/sub-criterion by a single employee were similar. It means also that the constructed scale correctly measured what it was supposed to measure (see Table 4).

Table 4. Reliability validation

Cronbach's alpha	Cronbach's alpha based on standardized items	Number of items
.957	.959	37

According to the study it appeared that the average rating for the overall FSC level is 4,64. Bearing in mind the FSC maturity scale (see Table 2) it appeared that "The company team has a proactive attitude. The management needs to maintain that level. Regular assessment of FSC and continual improvement are still necessary.". This level is identified as 5 - "Very low risk". The highest average ranks among the FSC criteria were given for the criterions: "commitment" (4,75) and "MS/FS policy" (4,73); and the lowest for "communication" (4,44) (see Figure 1).

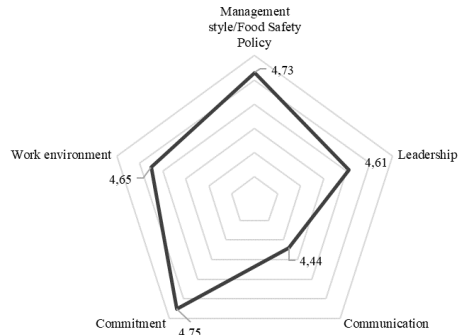


Figure 1. FSC core criteria (average values)

As can be seen, each of the assessed criteria reached level 5. The highest average ranks (see Figures 2-6) were given to the statements (sub-criteria): "Management formally agrees to follow FS principles regarding SARS-CoV-2" (Criterion - MS/FS policy, sub-criterion Q2 - 5,00), "Organization improves and makes changes when there are SARS-CoV-2 related problems with FS" (Criterion - MS/FS policy, sub-criterion Q1 - 4,90). The lowest ranks were for: "Management appreciates employees who pay particular attention to FS regarding SARS-CoV-2 risks" (Criterion Leadership - sub-criterion Q11 - 4,10); "Employees encourage each other to follow SARS-CoV-2 FS principles" (Criterion - Communication, sub-criterion Q19 - 4,24). Thanks to the scale used, it turned out that one of these results qualifies to level 4

(Q11), while the next is very close to it (Q19). Despite a very high overall rating, it turned out that the weakest link is appreciating employees for their work and thus motivating them by noticing their daily effort. The role of this factor has been emphasized, e.g. in works written by Neal et al. (2012), Arendt et al. (2013) or Babeker et al. (2022). Therefore, the attitude of mutual, open group discussion, shared care and collective involvement in FS should be more strongly promoted (Nguyen & Li, 2021).

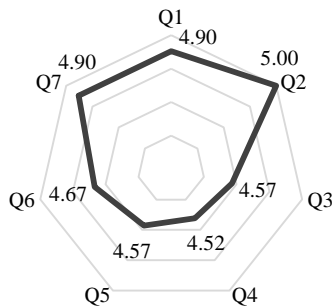


Figure 2. Ratings for MS/FS policy

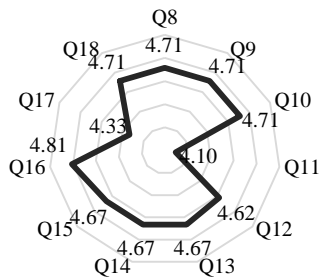


Figure 3. Ratings for Leadership

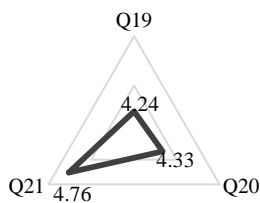


Figure 4. Ratings for Communication

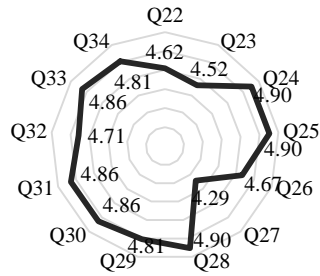


Figure 5. Ratings for Commitment

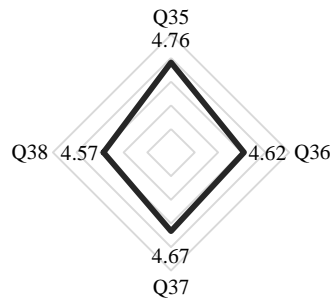


Figure 6. Ratings for Work environment

It was confirmed that the highest compliance of responses was obtained for the “communication” and the smallest for the “work environment”. It may mean that not all employees have the same knowledge and belief in measures, infrastructure and equipment for maintaining FS. Many factors can affect employees' beliefs and attitudes regarding food safety (Charlebois et al., 2021; da Cunha, 2021). According to the study the age and length of employment in the company did not significantly differentiate the opinions of employees. However, the variable that significantly differentiates some opinions was the length of experience in the industry (see Table 5, Table 6 and Table 7). As can be seen, the opinions on FS mainly depend on the length of employment in the industry. Thus, the H2 hypothesis was verified negatively.

H3 hypothesis is only partially true, as it concerns only 4 out of 38 opinions (that is, there are significant differences between group means) (see Table 6 and Table 7).

Table 5. The results of the intergroup analysis of variance due to the length of employment in the industry*

Dependent variable	Test value and probability
Q6	F(3, 17)=3.27, p=0.05
Q30	F(3,17)=7.29, p=0.02
Q32	F(3,17)=5.00, p=0.01
Q35	F(3,17)=4.32, p=0.02

* Only significant differences between group averages are included

Table 6. One-way ANOVA results due to the length of employment in the industry

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Q6	Between groups	3.900	3	1.300	3.266	.047
	Inside groups	6.767	17	.398		
	In total	10.667	20			
Q30	Between groups	2.571	3	.857	7.286	.002
	Inside groups	2.000	17	.118		
	In total	4.571	20			
Q32	Between groups	3.886	3	1.295	5.004	.011
	Inside groups	4.400	17	.259		
	In total	8.286	20			
Q35	Between groups	4.243	3	1.414	4.319	.019
	Inside groups	5.567	17	.327		
	In total	9.810	20			

Table 7. Descriptive statistics of variables significantly differentiated due to the length of experience in the food logistics industry

Dependent Variable	Independent Variable Q3*	N	Mean	Standard Deviation SD	Standard Error
Q6	1	2	5.00	.000	.000
	2	3	3.67	1.528	.882
	3	10	4.70	.483	.153
	4	6	5.00	.000	.000
	Total	21	4.67	.730	.159
Q30	1	2	5.00	.000	.000
	2	3	4.00	1.000	.577
	3	10	5.00	.000	.000
	4	6	5.00	.000	.000
	Total	21	4.86	.478	.104
Q32	1	2	5.00	.000	.000
	2	3	3.67	1.155	.667
	3	10	4.90	.316	.100
	4	6	4.83	.408	.167
	Total	21	4.71	.644	.140
Q35	1	2	5.00	.000	.000
	2	3	3.67	1.528	.882
	3	10	4.90	.316	.100
	4	6	5.00	.000	.000
	Total	21	4.76	.700	.153

*1) <3 years, 2) 3-5 years, 3) 5-10 years, 4) > 10 years

Table 8. Multiple post-hoc comparisons using the Bonferroni test

Dependent variable	(I) QO3	(J) QO3	Difference of averages (I-J)	Standard error	Significance level
Q6	1	2	1.333	.576	.200
		3	.300	.489	1.000
		4	.000	.515	1.000
	2	1	-1.333	.576	.200
		3	-1.033	.415	.141
		4	-1.333*	.446	.050
	3	1	-.300	.489	1.000
		2	1.033	.414	.141
		4	-.300	.326	1.000
	4	1	.000	.515	1.000
		2	1.333*	.446	.050
		3	0.300	.326	1.000
Q30	1	2	1.000*	.313	.032
		3	.000	.266	1.000
		4	.000	.280	1.000
	2	1	-1.000*	.313	.032
		3	-1.000*	.226	.002
		4	-1.000*	.243	.004
	3	1	.000	.266	1.000
		2	1.000*	.226	.002
		4	.000	.177	1.000
	4	1	.000	.280	1.000
		2	1.000*	.243	.004
		3	.000	.177	1.000
Q32	1	2	1.333	.464	.064
		3	.100	.394	1.000
		4	.167	.415	1.000
	2	1	-1.333	.464	.069
		3	-1.233*	.335	.011
		4	-1.167	.360	.029
	3	1	.100	.394	1.000
		2	1.233*	.335	.011
		4	.067	.263	1.000
	4	1	-.167	.415	1.000
		2	1.167*	.360	.029
		3	-.067	.263	1.000
Q35	1	2	1.333	.522	.124
		3	.100	.443	1.000
		4	.000	.467	1.000
	2	1	-1.333	.522	.124
		3	-1.233*	.377	.027
		4	-1.333*	.405	.026
	3	1	-.100	.443	1.000
		2	1.233	.377	.027
		4	-.100	.296	1.000
	4	1	.000	.467	1.000
		2	1.333*	.405	.026
		3	.100	.296	1.000

* The difference of averages is significant at the level of 0.05.

Taking into account the comparisons made (see Table 6, Table 7 and Table 8) it turned out that the opinions of the surveyed employees in groups are different regarding the length of experience in the industry and the opinions differ significantly as far as the sub-criteria: Q6 (Criterion - MS/FS policy); Q30 and Q32 (Criterion - Commitment) and Q35 (Criterion - Work Environment). Opinions on the value of FS training (Q6) differed significantly between people working in the industry for 3-5 years and people working for over 10 years and were significantly higher in the group of people working ten years and above. In this case, it seems necessary to conduct refresher and effective training, to strengthen the awareness and to show how important they are in everyday work. The importance of FS awareness training is indisputable (da Cunha, 2021). The opinions about Q30 were significantly different (stronger) among respondents working for less than three years in the industry than among those working slightly longer (3-5 years working in this industry). As one can see, it is the same group of employees that requires special support in this regard. Also in this case, training is critical (da Cunha, 2021). The same can be said about knowledge sharing activities between the managers and employees (Indriyani et al., 2020), and open conversation about FS (Caccamo et al., 2018). It was significantly different (smaller) between employees with 3-5 years and employees with more than 6 years of work experience in the industry. This fact indicates that especially the group of employees with 3-5 years of such experience requires the previously mentioned actions to increase their beliefs and shape their attitudes towards FS (see Table 7 and Table 8). Therefore, the point is to shape the relevant FS climate (da Cunha, 2021), understood as a component of FSC and as an intrinsic environment that is recognized by the employees involved in FS (De Boeck et al., 2015). The role of FS climate in this regard has long been recognized in the

literature (Zohar, 2010).

Also, employees' beliefs regarding Q32 differed significantly considering the length of work in the industry (see Table 7 and Table 8). These differences were significantly higher in the group of employees with longer experience. Similarly significant differences between groups of respondents with different professional experience (Q03) concerned the beliefs related to Q35 (see Table 6 and Table 7). This situation again shows some neglect and lack of support from managers towards this rather small group of people. The more that employees with longer industry experience are more familiar with available infrastructure and policy regarding the necessary equipment. This may result from a better knowledge of the situation in the company. The same can be said about their knowledge about the superiors' attitude. To sum up, it is necessary to monitor the needs of employees working a little shorter in the industry. No support in this regard or insufficient supervision results in the ineffectiveness of the FSC. Their presence, in turn, is one of the main pillars of FSC (Griffith et al., 2010a, b; De Boeck et al., 2015; Wiśniewska et al., 2019, Zanin et al. 2021).

5. Conclusions

It is possible to confirm that the tool (SFSCAT) used to measure the level of FSC in terms of SARS-CoV-2-related risks is reliable and may be recommended for research by other scientists. It was possible to determine that the FSC level is at 5. It appeared that the general attitude of employees towards the risks associated with SARS-COV-2 is very conscious and positive. Most likely, this positive assessment is due to the implementation of various FSMSs. The organization not only meets the mandatory requirements resulting from HACCP, GMP and GHP, but also complies with such voluntary standards like IFS Logistics, BRC Storage & Distribution

or MSC Chain of Custody. These are very strict and demanding systems that are assessed not only by the certification body, but also by institutional clients (as second party audits)

However, there are still areas for further improvement, e.g. employee appreciation, management support, listening to employees' needs, and strengthening motivation. In a pandemic period, in a situation of excessive stress and responsibilities, it is extremely important. Thanks to testing the adopted hypotheses, the research also shows that the employees' opinions on FS mainly depend on their industry experience. The age and the length of work do not matter so much. It turned out that the group of employees with 3-5 years of work experience in the industry requires appropriate support and motivation regarding FS. Cyclical training and supervision in the workplace are also

necessary. Moreover, the measurement of FSC should be repeated systematically, especially when it concerns such an important hazard. To have a complete knowledge of FSC, it is necessary to use qualitative methods, such as employee observation, audits or document review.

The limitation of the study was the fact that it was difficult to find comparable studies of this type. Future research should be extended to other organizations to examine problems and difficulties in implementing the improvements resulting from the FSC assessment. An interesting direction of research may also be the analysis of the difficulties related to the implementation of FSC in organizations of various sizes and specificity of operations. The more that its implementation is required by the food law of the European Union.

References:

- Arendt, S.W., Paez, P., & Strohbehn, C. (2013). Food safety practices and managers' perceptions: a qualitative study in hospitality. *International Journal of Contemporary Hospitality Management*, 25(1), 124-139.
- Babeker, A.M., Ebrahiem, M.A., Ahmed, A.R., & Mustafa, G.A. (2022). Evaluation of the Existing Food Safety Management System (FSMS) Implemented in Sudanese Sugar industries. *International Journal of Agricultural Science and Food Technology*, 8(1), 21-17. DOI: <https://dx.doi.org/10.17352/2455-815X.000140>
- Baltic, T., Rajic, S., Ciric, J., Brankovic Lazic, I., Djordjevic, V., Velebit, B., & Geric, T. (2021). Impact of COVID-19 pandemic on food supply chain: An overview. *Earth and Environmental Science*, 854, 1-4. DOI:10.1088/1755-1315/854/1/012007
- Barman, A., Das, R., & De, P.K. (2021). Impact of COVID-19 in food supply chain: Disruptions and recovery strategy. *Current Research in Behavioral Sciences*, 2, 100017. <https://www.sciencedirect.com/science/article/pii/S2666518221000048>.
- Buckwell, A. (2003). Food Safety, Food Quality and the CAP, Policy vision for sustainable rural economies in an enlarged Europe. *Studies in Spatial Development*, 4, 153-161.
- Caccamo, A., Taylor, J.Z., Daniel, D., & Bulatovic-Schumer, R. (2018). Measuring and improving food safety culture in a five-star hotel: a case study. *Worldwide Hospitality and Tourism Themes*, 10(3), 345-357. <https://doi.org/10.1108/WHATT-02-2018-0010>
- Ceniti, C., Tilocca, B., Britti, D., Santoro, A. & Costanzo, N. (2021). Food Safety Concerns in 'COVID-19 Era'. *Microbiology Research*, 12(1), 53–68, <https://doi.org/10.3390/microbiolres12010006>.

- Ceylan, Z., Meral, R., & Cetinkaya, T. (2020). Relevance of SARS-CoV-2 in food safety and food hygiene: potential preventive measures, suggestions and nanotechnological approaches *Virus Disease*, 31, 154–160.
- Charlebois, S., Juhasz, M., Music, J., & Vézeau, J. (2021). A review of Canadian and international food safety systems: Issues and recommendations for the future. *Comprehensive Reviews in Food Science and Food Safety*, 20(5), 5043-5066.
- da Cunha, D.T. (2021). Improving food safety practices in the foodservice industry. *Current Opinion in Food Science*, 42, 127-133. <https://doi.org/10.1016/j.cofs.2021.05.010>.
- De Boeck, E.D., Jacxsens, L., Bollaerts, M., & Vlerick, P. (2015). Food safety climate in food processing organizations: Development and validation of a self-assessment tool. *Trends Food Science Technology*, 46(2), 242–251.
- Djekic, I., Nikolić, A., Uzunović, M., Marijke, A., Liu, A., Han, J., Brnčić, M., Knežević, N., Papademas, P., Lemoniati, K., Witte, F., Terjung, N., Papageorgiou, M., Zinoviadou, K.G., Dalle Zotte, A., Pellattiero, E., Sołowiej, B.G., Guiné, R.P.F., Correia, P., ... Tomasevic, I. (2021). Covid-19 pandemic effects on food safety – Multi-country survey study. *Food Control*, 122, 107800. <https://doi.org/10.1016/j.foodcont.2020.107800>,
- Enlighten. *How to undertake a food safety culture survey* (n.d.). Retrieved from <https://enlighten.team/documentation/undertake-food-safety-culture-survey/>
- EFSA. (2020). *Coronavirus: no evidence that food is a source or transmission route*. Retrieved from <https://www.efsa.europa.eu/en/news/coronavirus-no-evidence-food-source-or-transmission-route>.
- FAO (n.d.). *FAO, WHO set an example of collaborative action for safe food with a systems approach*. Retrieved from <https://www.fao.org/europe/news/detail-news/en/c/1410458/>.
- FAO and WHO (2020a). *General Principles of Food Hygiene, CXC 1-1969, Adopted in 1969. Amended in 1999. Revised in 1997, 2003, 2020. Codex Alimentarius International Standards*. Retrieved from http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B1-1969%252FCXC_001e.pdf.
- FAO & WHO (2020b). *COVID-19 and food safety. Guidance for food businesses. Interim guidance*. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/331705/WHO-2019-nCoV-Food_Safety-2020.1-eng.pdf.
- Global Food Safety Initiative (2018). *A culture of food safety. A position paper from The Global Food Safety Initiative (GFSI). VI.0*, Retrieved from <https://mygfsi.com/wp-content/uploads/2019/09/GFSI-Food-Safety-Culture-Summary.pdf>.
- Griffith, C.J., Livesey, K.M., & Clayton, D.A. (2010a). Food safety culture: the evolution of an emerging risk factor? *British Food Journal*, 112(4), 426-438.
- Griffith, C.J., Livesey, K.M., & Clayton, D. (2010b). The assessment of food safety culture. *British Food Journal*, 112(4), 439-456.
- Han, J., Zhang, X., He, S., & Jia, P. (2020). Can the coronavirus disease be transmitted from food? A review of evidence, risks, policies and knowledge gaps. *Environmental Chemistry Letters*, 19(5), 1-12. <https://www.doi.org/10.1007/s10311-020-01101-x>
- Han, S., Roy, P.K., Hossain, M.I., Byun, K.H., Choi, Ch., & Ha, SD. (2021). COVID-19 pandemic crisis and food safety: Implications and inactivation strategies. *Trends in Food Science & Technology*, 109, 25-36.

- Heldman, D. R. (2022). Chapter3 - Sustainability of the food supply chain; energy, water and waste. In P. Juliano, R. Buckow, M. H. Nguyen, K. Knoerzer & J. Sellahewa (Eds.), *Food Engineering Innovations Across the Food Supply Chain* (pp. 47-60). Academic Press. <https://doi.org/10.1016/B978-0-12-821292-9.00021-2>.
- Indriyani, R., Eliyana, A., Sobirin, A., & Nathanael, S. (2020). The effect of knowledge sharing and supply chain management on opportunity recognition through management skill in the food industry of SMEs. *International Journal of Supply Chain Management*, 9(3), 598-604.
- Jackson, J.K., Weiss, M.A., Sutter, K.M., Schwarzenberg, A.B., & Sutherland, M.D. (2021). *Global Economic Effects of COVID-19. Congressional Research Service*. Retrieved from <https://fas.org/sgp/crs/row/R46270.pdf>.
- Jevšnik, M., Bobnar, S., Šadl, M.S., & Raspor, P. (2021). Food Safety Culture Among Food Handlers in Slovenia, *Acta Microbiologica Bulgarica*, 37(1), 10-55.
- Jia, M., Taylor, T.M., Senger, S.M., Ovissipour, R., & Bertke, A.S (2022). SARS-CoV-2 Remains Infectious on Refrigerated Deli Food, Meats, and Fresh Produce for up to 21 Days. *Foods*, 11, 286. <https://doi.org/10.3390/foods11030286>.
- Laužikė, K., Uselis, N., & Samuolienė, G. (2021). The Influence of Agrotechnological Tools on cv. Rubin Apples Quality. *Agronomy*, 11(3), 463. <https://doi.org/10.3390/agronomy11030463>
- Maragoni-Santos, C., Serrano Pinheiro de Souza, T., Matheus, J.R.V., de Brito Nogueira, T.B., Xavier-Santos, D., Miyahira, R.F., Costa Antunes, A.E., & Fai, A.E.C. (2021). COVID-19 pandemic sheds light on the importance of food safety practices: risks, global recommendations, and perspectives. *Critical Reviews in Food Science and Nutrition*, 16, 1-13. DOI: 10.1080/10408398.2021.1887078
- Neal, J.A., Binkley, M., & Henroid, D. (2012). Assessing factors contributing to food safety culture in retail food establishments. *Food Protection Trends*, 32(8), 468-476.
- Nguyen T.T.B., & Li D. (2022). Empirical Evidence on Critical Success Factor from Multi-Level Environments and Their Relationships with Food Safety Management System. In: Nguyen T.T.B. & Li D. *Towards Safer Global Food Supply Chains* (pp. 37-70). Cham: Palgrave Pivot. https://doi.org/10.1007/978-3-030-93356-2_3.
- Onyenweaku, E.O., Ebai, P.A., & Fila, W.A. (2020). Food Quality: A Comparison of the Proximate Content & Sensory Properties of Some Composite Flour Meals. *Asian Food Science Journal*, 16(2), 32-40, <https://www.doi.org/10.9734/afsj/2020/v16i230170>
- UNIDO (2020). *Quality & standards and their role in responding to COVID-19*. Retrieved from <https://www.unido.org/sites/default/files/files/2020-04/Quality%20and%20Standards%20and%20their%20Role%20in%20Responding%20to%20COVID-19.pdf>.
- Schein, E. H. (1985). *Organizational culture and leadership: A dynamic view*. Jossey-Bass.
- Scheuplein H. (1987). Unternehmenskultur und persönliche Weiterentwicklung. *Zeitschrift Führung + Organisation*, 56(5), 12-37.
- Selvalakshmi, V., & Guru, K. (2017). Organizational cultural and organizational performance: Bridging the Quandaries. *International Journal of Applied Research*, 3(4), 658-660.
- Sohail, F., Abbas, M., Qasim, S., Khan, E., Ahmed, A., & Ali, S.R. (2022). Revitalizing the Restaurant Industry of Pakistan Amidst Covid-19 Pandemic: The Linkage Between Paramount Fundamentals. *Journal of Contemporary Issues in Business and Government*, 28(1), 150-164. DOI: 10.47750/cibg.2022.28.01.010

- Stadler, M., Sailer, M., & Fischer, F. (2021). Knowledge as a formative construct: A good alpha is not always better. *New Ideas in Psychology*, 60, 100832. <https://doi.org/10.1016/j.newideapsych.2020.100832>
- Tadić, D., & Stefanović, M. (2007). Fuzzy Approach in Evaluation of Operations in Food Production. *International Journal for Quality Research*, 1(2), 97-104.
- Watson, D. (2021). *A Perfect Storm, Brexit, COVID-19 and Increased Cases of Food Contamination. A Case Study of How British Food Manufacturers Foster Food Safety Cultures*. In: *Business for Sustainability of the International Conference on Celebrating the 100 Years of the University of Dhaka*, Dhaka, Pakistan. (Unpublished).
- Wiśniewska, M. Z., (2005). *Organization and management of the quality and safety of food product. From farm to table*, Gdańsk: University of Gdańsk Publishing House (in Polish).
- Wiśniewska, M.Z. (2017). CARVER+Shock method and its application in a catering company in Poland. *British Food Journal*, 19(12), 2610-2629. <https://doi.org/10.1108/BFJ-11-2016-0554>.
- Wiśniewska, M.Z., Czernyszewicz, E., and Kaluża, A. (2019). The assessment of food safety culture in small franchise restaurant in Poland: The case study, *British Food Journal*, 121 (10), 2365-2378. <https://doi.org/10.1108/BFJ-03-2019-0152>
- Yiannas, F. (2009). *Food Safety Culture: Creating a Behavior-Based Food Safety Management System*. New York, NY: Springer.
- Zanin, L.M., Stedefeldt, E., & Luning, P.A. (2021). The evolvement of food safety culture assessment: A mixed-methods systematic review. *Trends in Food Science & Technology*, 118(Part A), 125-142.
- Zhai, Y., & Watson, D. (2021). Covid-19 a Gateway to Enhance China's Food Safety Culture. *Acta Scientific Microbiology*, 4(2), 19-28.
- Zohar, D. (2010) *Safety climate: Conceptual and measurement issues*. In *Handbook of Occupational Health Psychology (2nd ed)*. Washington D.C.: American Psychological Association.

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Appendix:

Management style/food safety policy and SARS-CoV-2-related hazard

1. FS principles are understandable for employees.
2. The Management Board formally agrees to follow FS principles.
3. The management asks employees for help in improving our FS programme.
4. Employees are obliged to participate in training on FS principles.
5. New employees are offered all necessary training to do their work in compliance with FS principles.
6. FS training provides us with the necessary skills and/or knowledge to follow FS principles.
7. The organisation improves and makes changes when there are problems with FS.

Leadership and SARS-CoV-2-related hazard

8. The management constantly encourages staff to respect FS principles.
9. The management emphasises the significance of FS principles, even when restaurant employees are burdened with work overload.
10. The management often checks if all employees are complying with FS principles.
11. The management appreciates employees who pay particular attention to FS.
12. The management sometimes encourages employees to do things that are in conflict with FS.
13. The management is looking for new solutions when employees do not follow FS principles.
14. Even when no one was watching, management would follow all FS principles.
15. The management encourages employees to report any problems related to FS.
16. The management believes that FS is very important.
17. The management demonstrates leadership, appreciates employees focused on FS.
18. The management follows all FS principles.

Communication and SARS-CoV-2-related hazard

19. Employees encourage each other to follow FS principles.
20. Employees inform the manager if there is a problem with FS.
21. The management emphasises the importance of FS by talking to employees.

Commitment and SARS-CoV-2-related hazard

22. Employees are involved in the FS programme.
23. Employees take responsibility for the proper food preparation.
24. Even if nobody is watching, employees follow all FS principles.
25. Employees know when they should wash their hands in order to protect food from contamination.
26. Employees know why they should wash their hands in order to protect food from contamination.
27. Employees follow FS principles even when they are overload.
28. Employees always follow FS principles when they do their work.
29. Employees think it is important to follow all FS principles, not only those of higher importance.

- 30. I think the way I do my work can influence FS.
- 31. Employees support FS.
- 32. Employees know that problems with FS can happen because of malpractice.
- 33. Employees know when they should change gloves to protect food from contamination.
- 34. Employees know why they should change gloves to protect food from contamination.

Work environment and SARS-CoV-2-related hazard

- 35. The management provides employees with equipment and/or tools necessary to follow FS principles.
- 36. The management provides appropriate tools for training and/or education in the field of FS.
- 37. The equipment has been designed in a way that allows proper cleaning.
- 38. The pest control programme is effective, so there are no traces of rodents and/or insects in the restaurant.