Version 2.0

A Culture of Food Safety

Position Paper from the Global Food Safety Initiative (GFSI)

March 2026

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Foreword

Since the publication of the first Global Food Safety Initiative (GFSI) Position Paper on a Culture of Food Safety in 2018, the concept of food safety culture has gained significant traction across the global food supply chain. What was once an emerging idea has increasingly become recognised as a critical factor influencing food safety performance, organisational behaviour, and consumer protection.

The 2018 paper played an important role in establishing a common language for discussing food safety culture. It stimulated dialogue across industry, regulators, certification programme owners, and academia, and helped to catalyse the integration of cultural considerations into food safety management systems and assurance programmes.

Feedback gathered from stakeholders across the GFSI community including discussions at industry conferences and other engagement forums indicated a need for greater clarity on GFSI's role in this area and for an update to its position to focus more clearly on defining the core framework for food safety culture rather than prescribing implementation approaches. Alongside this feedback, the field itself has continued to evolve. In recent years, a substantial body of academic research, practitioner guidance, and industry experience available in the public domain has expanded understanding of how organisational culture interacts with food safety systems.

To support this effort, GFSI commissioned an expert in this field to conduct an independent review of the academic and professional literature relating to food safety culture. The objective of this work was not to prescribe implementation approaches, but rather to examine the accumulated evidence and determine whether the foundational concepts and dimensions remain valid and relevant. The findings of this review have informed the updated framework presented in this second edition.

In this update, GFSI clarifies its role within the food safety ecosystem. As a benchmarking organisation, our primary function is to provide the **'what'**—the core conceptual reference points and dimensions that enable global alignment. The **'how'**—including specific maturity models and diagnostic tools—rightly remains the remit of standards owners, food businesses, and specialists.

While the framework is supported by insights drawn from over two decades of research, this second edition is specifically informed by an independent review of academic and professional literature published since the 2018 position statement.

By consolidating this recent evidence base, the updated paper provides a refined, evidence-informed description of food safety culture intended to support continued alignment and improve food safety outcomes worldwide.

Quick Start Guide

About this Quick Start Guide

Purpose: A short, at-a-glance companion to the GFSI Position Paper that lets readers grasp the definition, the dimensions, and their critical components—without reading the full report.

Who it's for: Senior leaders, site managers, auditors, trainers and regulators who need a common reference point and shared vocabulary.

What it contains: A plain-language précis of the paper's core messages, the wheel diagram (Fig. 1) for instant orientation, and pointers to Fig. 2 where the critical components are listed.

What it does not do: It does not prescribe implementation tools, diagnostics, maturity models or interventions—those remain outside the scope of the Position Paper and therefore the Guide.

How to use this guide:

1. Orient quickly: scan the wheel (Fig. 1) and the two tiers.
2. Signpost detail: use Fig. 2 when you need the critical components behind each dimension.
3. Cite consistently: use this vocabulary in standards, training and assurance documents to ensure common understanding.

Updated definition of Food Safety Culture (V2.0)

Food safety culture: *a concept existing in all food businesses relating to the deeply rooted beliefs, behaviours, values and assumptions that are learned and shared by all employees, and which integrate to impact the food safety performance of the organisation.*

The model at a glance

GFSI depicts food safety culture as a wheel of interacting dimensions arranged in two interdependent tiers.

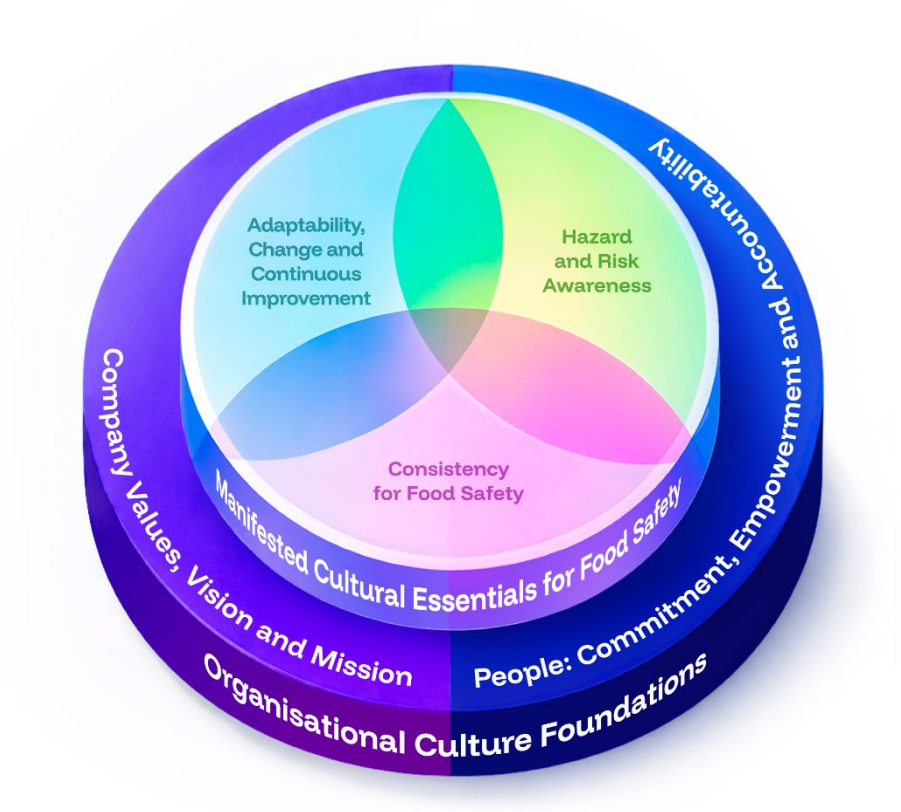


Figure 1. Dimensions of Food Safety Culture
(Wheel of interacting dimensions; see Figure 2 in main text for critical components.)

Organisational Foundations

- Company Values, Vision & Mission — Purpose, ethics and strategy that set expectations for food safety; leadership, governance and alignment flow from here.
- People: Commitment, Empowerment & Accountability — Capability and motivation to act for food safety; clear ownership, teamwork, recognition and empowered decision-making.

Manifested Cultural Essentials for Food Safety

- Hazard & Risk Awareness — Everyone can recognise hazards/risks and understand controls and escalation.

- Consistency for Food Safety — Uniform application of Food Safety Management Systems (FSMS) (e.g., HACCP, Prerequisite Programs (PRPs), OPRPs/ Critical Control Points (CCPs) and Preventive Control Measures such as Operational Prerequisite Programs (OPRPs)), supported by meaningful measurement and records.
- Adaptability, Change & Continuous Improvement — Learning, agility and crisis/problem-solving that strengthen standards over time.

Cross-reference: Figure 2 overlays these dimensions with their critical components (e.g., leadership, coordination, accountability, work pressure, communication, training & knowledge, behaviour & attitude, teamwork & collaboration, recognition & empowerment, FSMS, measurement & records, work environment).

What the evidence says (in brief)

- Built from a structured review of 2000–June 2025 literature (academic + grey); 329 records screened, more than 180 included.
- Confirms five dimensions from 2018 with refined language and structure; emphasises foundational role of Values/Vision/Mission and People.
- Highlights systems + culture working together (formal FSMS and informal behaviours) and notes Consistency and Adaptability and Continuous Improvement are comparatively under-researched.

Scope and intent

- GFSI defines 'the what' (dimensions, components, expectations) to enable alignment across the ecosystem.
- 'The how' (maturity models, diagnostics, interventions) sits with standards owners, regulators, culture experts and food companies; therefore implementation guidance is out of scope for this paper.

Why this matters

- Provides a common reference to assess, discuss and strengthen food safety culture across the global supply chain.
- Encourages systems thinking: culture does not live apart from FSMS; they should reinforce each other.

- Situates every organisation's culture within its external context (market, regulation, supply chain pressures).

Executive Summary

The Global Food Safety Initiative (GFSI) recognises that food safety culture is not a "soft" concept, but a critical determinant of food safety outcomes. In 2018, the GFSI published the first global view on food safety culture produced by a working group of industry practitioners. This second edition of GFSI's *Position Paper on a Culture of Food Safety* (March 2026) builds on the previous 2018 edition and presents a refined conceptual model grounded in a systematic analysis of academic literature, grey literature, and professional guidance spanning more than two decades.

Drawing on over 180 sources — including empirical studies, behavioural theory, organisational research, and industry standards — this edition proposes an amended five-dimension model of food safety culture. These dimensions are organised into two tiers, reflecting the distinction between foundational organisational culture drivers and cultural manifestations in food safety practice:

Organisational Culture Foundations

- *Company Values, Vision and Mission*
- *People: Commitment, Empowerment and Accountability*

Manifested Cultural Essentials for Food Safety

- *Hazard and Risk Awareness*
- *Consistency for Food Safety*
- *Adaptability, Change and Continuous Improvement*

Whilst there are clear similarities with the published 2018 dimensions, this updated dimensional framework emerged through rigorous coding and thematic analysis, guided by a structured keywords aligned with cultural attributes. Studies were clustered based on dominant themes and assessed for alignment with both the original GFSI model and current priorities.

The revised model reinforces GFSI's central premise: food safety culture is not merely the product of leadership or training, but an integrated framework of shared values, behaviours, risk awareness, and organisational learning. To be effective, culture must be measurable, actionable, and continuously improved.

The literature further highlights the dynamic interplay between formal systems (such as HACCP and FSMS) and informal cultural elements (including leadership tone, staff empowerment, and behavioural consistency). In high-performing organisations, systems and culture operate in concert to sustain food safety outcomes.

This position paper calls on food businesses, regulators, standards owners to adopt an integrated systems-culture perspective rather than evaluating food safety culture separately. It provides a shared vocabulary and structured framework, defining the dimensions and critical components of organisational culture with a food safety lens, and supporting the integration of culture into standards, training programmes, and assurance mechanisms.

Ultimately, this second edition seeks to bridge the gap between theory and practice requirements — equipping the global food industry with a food safety culture dimensional framework that can be used to transform cultural intention into consistent, measurable food safety performance.

GFSI Position Paper on Food Safety Culture V2.0

Introduction, background, and scope

The inaugural *GFSI Position Paper on a Culture of Food Safety* (1) represented a critical milestone in shaping the global discourse on the role of culture in food safety performance. It introduced a common language and core principles that catalysed engagement across the food industry, regulators, and certification bodies. As a first articulation of the concept at global scale, it provided a conceptual framework that enabled early adopters to begin integrating cultural considerations into their food safety systems and practices.

Nonetheless, as the field has evolved, so too has the understanding of food safety culture's complexity and its practical implications. Since 2018, a significant body of academic and applied literature has emerged, deepening insights into the organisational, behavioural, and systemic factors that influence cultural maturity. While the original paper was never intended to prescribe a single model, it has been noted by others that it lacked detailed guidance on implementation and that, as published, it did not include evidence from a robust empirical foundation.

An initial internal review within GFSI and insights gathered from across the GFSI community, concluded that an evidence-based review and update to the 2018 position paper was needed. The scope aimed to reaffirm GFSI's role in defining the *what* of food safety culture — the essential dimensions, characteristics, and expectations that provide a common reference point — while acknowledging that the *how* must remain adaptable to different organisational contexts and thus involves other actors outside GFSI. The latter point necessitated removal of some materials considered by GFSI to be outside scope.

This 2025 edition seeks to address the need for an updated, refocussed document through review of literature from the last twenty-five years. It presents a refined, evidence-informed model that aims to support convergence around a shared framework while empowering food businesses to tailor their cultural strategies to their unique operational realities.

This does not mean that all the valuable work from the technical working group that supported the 2018 document has been discarded. Rather, this edition represents a conceptual evolution for defining and describing food safety culture.

In line with GFSI's overarching role in the food safety standards ecosystem, this document is intended as the starting point that can be used by other actors in assessing, monitoring, and improving food safety cultures, working towards more mature cultures for better food safety performance within the global food supply chain.

Defining Food Safety Culture

Food safety culture appears to have been first mentioned in the food safety literature as 'food safety organisational culture' in Griffith's 2006 paper, *Food safety: where from and where to?* (2). This viewpoint article recommended a move from reliance on microbiology to reduce the incidence of foodborne disease to a novel model, encompassing consideration of food handler behaviour and its links with food safety organisational culture and food safety management systems (2). While no definition of 'food safety organisational culture' was provided, Griffith (2) depicted food safety as a multidisciplinary problem, where foodborne disease could occur through weaknesses in human behaviour, management systems and organisational culture, food processing and legislation, and control of microbiological and physical hazards.

The 2018 GFSI position paper defined food safety culture as *shared values, beliefs and norms that affect mindset and behaviour toward food safety in, across and throughout an organisation*(1). This was built from previous definitions, notably using ideas from Griffith et al's 2010 (3) definition[1]. However, food safety culture is known to be difficult to change since it has developed over time and been learned by new members of a group, and the 2018 GFSI definition did not fully reflect this.

Following a review (4) of the historical development of organisational, safety and food safety culture and climate definitions/statements, which included 18 previous definitions of culture, climate or culture and climate, and included the GFSI 2018 definition, Sharman et al (4), proposed a new definition of food safety culture as *a long-term construct existing at the organisational level relating to the deeply rooted beliefs, behaviours and assumptions that are learned and shared by all employees, which impact the food safety performance of the organisation.*

This definition did not include the words 'values', which was inferred, or 'norms', which can be problematic in culture definitions because they can both influence and be influenced by organisational culture, e.g. norms can be 'enacted through official structures outlining the organisation's expectations of behaviours' or they can be 'unwritten social norms and collective beliefs about appropriate behaviours' (5). Therefore, there is a need to reconsider the GFSI definition to reflect growing understanding of the integration of cultural theory and how this impacts food safety performance.

[1] 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 (3)

In this edition the GFSI definition of food safety culture is updated to: *a concept existing in all food businesses relating to the deeply rooted beliefs, behaviours, values and assumptions that are learned and shared by all employees, and which integrate to impact the food safety performance of the organisation.* This builds on previous definitions and is an evolution of the definition proposed by Sharman et al (4).

The Dimensions of Food Safety Culture

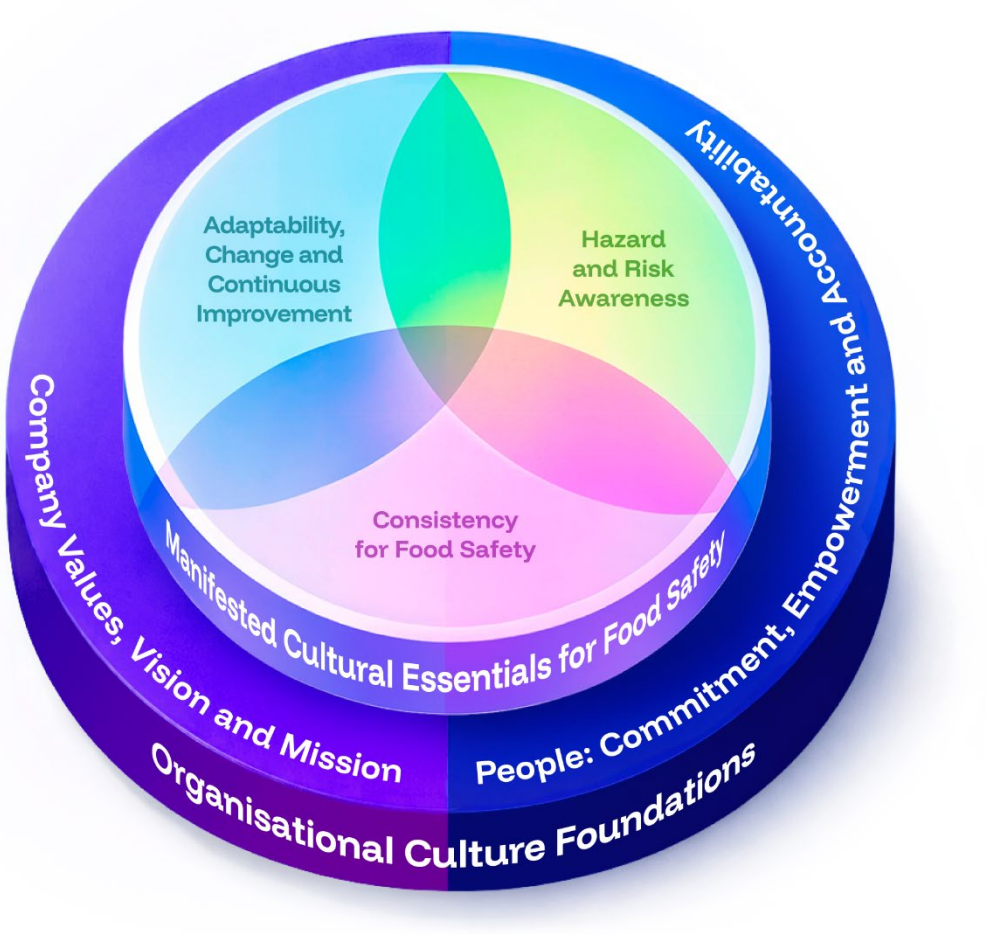
Following a systematic analysis of over 180 sources — including peer-reviewed studies, grey literature, and practitioner guidance — the five core dimensions from the 2018 position paper were largely confirmed but with some amendments in language and content. However, the interaction, overlap and intersections between the dimensions, and indeed the food business and supply chain external environment had not been clear in the original depiction of dimensions, which appeared somewhat siloed (although it is noted that a small mention of interactivity was included in the text).

Therefore, GFSI's revised model structure represents food safety culture as a wheel of interacting dimensions that reflects both the organisational foundations reflected in the organisation's cultural values and norms, and the way that these are manifested, e.g. in day-to-day food safety behaviours, communications and application of food safety management approaches.

This dual-layered approach recognises that food safety culture maturity is not only expressed through organisational culture aspects such as vision and leadership, but also realised through effectiveness of food safety operational behaviours, including responses to change.

It is important to note that whilst this model of food safety culture sits within all organisations, the organisations themselves sit with the context of their external environments and position in the food supply chain. The organisation's food safety culture is also impacted by external factors.

The model is structured into two interdependent tiers (Figure 1):



Organisational Culture Foundations

These dimensions define the internal cultural architecture that underpins food safety performance. They reflect the strategic intent, leadership tone, and workforce engagement that collectively shape organisational priorities.

- Company Values, Vision and Mission
- People: Commitment, Empowerment and Accountability

Manifested Cultural Essentials for Food Safety

These dimensions focus on how culture is enacted through behaviours, decisions, and adaptations. They provide insight into how well food safety is internalised and sustained in everyday practice.

- Hazard and Risk Awareness
- Consistency for Food Safety
- Adaptability, Change and Continuous Improvement

The Dimensions and their Critical Components

Figure 2 a and b show the clustering of themes across the two tiers of the dimensional model. It should be noted that some themes are relevant to more than one dimension and are shown as overlapping between the relevant dimensions, and also that themes sitting in the Organisational Foundations dimensions support the entire dimensional framework. In the 2018 position paper, many of these themes had been included as critical content within the individual dimensions. Here, these are renamed as critical components to underline their importance in making up elements of the culture.


Adaptability, Change and Continuous Improvement
Hazard and Risk Awareness
Adaptability & Continuous Improvement
Risk awareness
Work Environment
Achieving Consistency
Training & Knowledge
Food Safety Management Systems
Consistency for Food Safety
Manifested Cultural Essentials for Food Safety


Company Values, Vision and Mission
People: Commitment, Empowerment and Accountability
Vision and Values
Leadership
Coordination
Accountability & Commitment
Behaviour & Attitude
Training & Knowledge
Teamwork & Collaboration
Recognition & Empowerment
Work pressure
Communication
Organisational Culture Foundations

Dimension 1 Company Values, Vision and Mission

One of the two organisational culture foundations dimensions, Company Values Vision and Mission forms the starting point from the company's stated values, vision and mission which set out the expectations for food safety and the leadership, structures and governance of food safety within the organisation. The critical components in this dimension are:

D1.1 Vision and values

Business Vision and values are a foundational influence (6), the cornerstone of cultural change ((7), (4)). Culture is seen as emergent from value-system interactions (8), with the importance of clear vision and shared values ((9),(10)) and ethical commitment (11) highlighted, as well as the potential for dissonance between stated values and real practices (12). Strong links to training and internal communications ((13), (14)) allow culture to be strengthened over time (15). Culture should reflect values (16), organisational goals and commitment (15) which are integral parts of the assessed domains in many culture assessment tools (e.g. (17), (18), (19), (20), (21), (22), (23), (24), (25), (26), (27), (28)), however not all tools clearly define vision and values (29).

Culture maturity has been linked to strategic alignment with vision, with core beliefs guiding the maturity trajectory (30) and trends have shown that companies with shared values score higher in cultural assessment (31); however alignment of vision can be undermined by operational inconsistencies (12). Culture is central to food safety management system adaptability (32) and values have been identified as underlying motivators for food safety behaviours (33) and for the success of food safety management systems (34). National culture has been found to shape company food safety culture values ((35), (36), (37)) and also needs to be considered.

Culture Essentials – Vision and Values

The senior leadership team for all organisations, which depending on the nature of the business may include the business owner and board of directors, establish values, vision and purpose for the organisation. These core values transcend all aspects of the business and inform the food safety culture.

This means that food safety and consumer protection should be front and centre of the company's stated values so that they are understood as important and acted on by all personnel, whatever their role.

This will involve appropriate communication and education approaches and involvement of all personnel, as well as continuous reinforcement though living the values at all hierarchical levels. Food safety values should be reflected in the company's communications and the way that it does business in the food supply chain.

D1.2 Leadership

Leaders shape culture through expectations, modelling and systems ((38), (14)) but gaps have been identified in leadership commitment and role modelling which influenced employee food safety behaviour (37). Nevertheless, leadership is a driver of culture change and maturity ((39), (40), (41)), found to correlate with food safety culture maturity levels (28), and leadership support is crucial for the success of change agents (42). Leadership style is an expression of organisational values, with transformational leadership linked to better hygiene (43). Leadership engagement and commitment are cited as a key success factor across multiple studies (e.g. (44), (6), (40), (39), (45)) and the leadership role and behaviour is pivotal to both food safety management system compliance and food safety culture ((10), (44)) but in small and micro businesses leadership commitment has been found to be variable, although a critical success factor ((46), (47), (48)). Poor leadership, with the absence of values and standard procedures, builds an environment that normalises poor food safety behaviours and allows food safety violations to occur in food safety incidents (49).

Culture Essentials - Leadership

This critical component highlights both the essential role of senior leaders in setting the direction and tone for a company's food safety culture, and the importance of consistent, engaged food safety leadership throughout the company's organisational structure. Leaders' roles are essential to driving culture change and maturity, including demonstration of leadership commitment, defining acceptable and unacceptable behaviours, and modelling and communicating expectations regarding safe food production and processing so that they cascade through the entire organisation.

D1.3 Coordination

The need for greater integration across functions, disciplines and processes was highlighted right at the start of development of the food safety culture concept ((2), (50), (51)) and coordination across businesses via shared frameworks was also called for around this period (52). Coordination was also described early on as necessary to sustain food safety culture (53) when considering how to reduce rates of foodborne illness and failed interagency coordination was identified as a key contributor in outbreaks (54).

Many of the references reviewed in this study give little focus to coordination and it is noted as a 'weakly addressed construct' (53) but it has been reported as stronger in firms with higher levels of food safety culture (55), to improve with culture maturity (30), and to be strengthened in crisis response (56).

Coordination was also reported as needed between researchers and policymakers (57), between regulatory agencies ((58), (59)), teams and leadership ((60), (33)) and across functional and sub-cultural (61) and departmental boundaries (35). Articles also emphasise intersectoral and transnational coordination and integrated food chain responsibilities ((62), (63)).

Culture Essentials – Coordination

Coordination is the alignment of roles, responsibilities, and communication across departments, shifts, and sites to support safety outcomes. Alignment of goals across departments is important and this is fostered through collaborative sessions, cross-functional project teams and effective communication. It is important to note that coordination with internal and external food safety governance structures and integration with supply chain partners also support this critical component.

D1.4 Accountability and Commitment

Accountability and commitment are key mediators between knowledge and behaviours (45,64) and key factors in maturity changes and their impact ((39,65,66). Role clarity, regular monitoring and team targets reinforce commitment (67). Accountability has been described as a shared outcome of participatory decision-making (68) and employees can be given ownership of change processes (42), with managers expected to model accountability (69).

Accountability and commitment can be tracked through policy adoption and behavioural ownership (66) but they have been found lacking in low-performing plants (70) and studies have found limited formal accountability structures in SMEs and microbusinesses (48). In an outbreak context, weak accountability has been highlighted in non-compliant establishments (71). Some tools attempt to quantify organisational commitment, but accountability metrics lack consensus across tools (29).

Culture Essentials – Accountability and Commitment

Members of the workforce need to be accountable for food safety outcomes that fall within their remit. This requires effective coordination, communication and education to engender the necessary understanding and commitment as well as awareness of work pressures and resourcing within the organisation.

D1.5 Work Pressure

Work pressure is recognised as a barrier to food safety culture, behaviour change and food safety culture intervention uptake (e.g. (39–41,65,66,72). It is one of the environmental stressors contributing to errors (71), which may lead to incidents. High work pressure, e.g. during seasonal peaks or busy times of day can lead to procedural shortcuts (72).

Stress of work pressure has been particularly noted in high-throughput facilities where there is low automation (70) and it has also been mentioned as a constraint in lower culture maturity companies (66). Work pressure is reported to be increased by audits and compliance burdens (73). High pressure and multitasking often leads to rule bypassing in small and micro-businesses (48). Work pressure can also impact fear of reprisal and suppress reporting of issues (74).

Resistance and inertia are also forms of work pressure that can impact individuals and organisational culture change (42). Burnout and job stress were identified as central mediators of one culture model (75); however, many studies do not explicitly include or address work pressure.

Culture Essentials – Work Pressure

Work pressure can be managed through planning, scheduling production and ensuring adequate resources at all times, including personnel, equipment, ingredients and materials. Consideration needs to be given to the impact of external factors such as audits and external visits on workloads and work pressures and plans made to overcome challenges and barriers.

D1.6 Communication

Virtually all the literature analysed mentioned communication and its importance in some way. Communication was central to new food safety strategy (56) an essential part of education strategies (76), stated as embedded in cultural and organisational systems (57), a critical factor in food safety culture implementation (77) as a moderator of cultural norms (4), identified as a factor through factor analysis (78) and correlated with food safety culture levels (28,55). Some tools profiled maturity in communication (79), finding feedback loops and transparent communication to be maturity indicators.

Nevertheless, some studies did not measure communication, some found it not central to findings, some felt that communication was less influential than other dimensions (80) and some observed it as weak and inconsistent (81), with formal structures lacking (82). Communication has also been identified as a key gap in organisational safety systems (60) and breakdown between shifts and roles (83) across cultural groups has been studied (61). It is also noted that bias can distort perceived openness in communication (84) and that communication needs to be a feedback-driven process (7).

Culture Essentials - Communication

Communication needs to be open, proactive and two-way, with checking of understanding through two-way feedback loops an integral part of the process. It is important to consider language, use of appropriate tools and materials, appropriate communication channels and how to overcome communication barriers and establish trust. To ensure effective communication, top down, bottom up, and across organisation, communication needs to be planned and designed as well as communication methods and channels with external stakeholders. Safe, confidential communication channels are also needed.

Dimension 2 People: Commitment, Empowerment and Accountability

D2.1 Leadership

The Leadership critical component is shared with Dimension 1 Company Values, Vision and Mission – see section D1.2 For details.

D2.2 Coordination

The Coordination critical component is shared with Dimension 1 Company Values, Vision and Mission – see section D1.3 For details

D2.3 Accountability and commitment

The Accountability and Commitment critical component is shared with Dimension 1 Company Values, Vision and Mission – see section D1.4 For details

D2.4 Work Pressure

The Work Pressure critical component is shared with Dimension 1 Company Values, Vision and Mission – see section D1.5 For details

D2.5 Communication

The Communication critical component is shared with Dimension 1 Company Values, Vision and Mission – see section D1.6 For details

D2.6 Training and Knowledge

Comments about Training and Knowledge were reported in the majority of articles reviewed, which generally found that training was important but there was often a lack of detailed information relevant to the situation. Training and knowledge were positioned as both an indicator and a driver of culture maturity (30).

Training was a central mechanism for cultural transformation efforts (4,15) and emphasised as one of the most critical change levers (27) and foundational for culture maturity (35). Studies mentioned knowledge gaps and training needs (85) whilst others used measurement of training frequency and impact as part of culture measurement (23).

Some studies identified deficiencies in training (58) while others found that formal training was evident but there were gaps in practical knowledge transfer (12) or training inconsistencies that affected performance (83). Recently a study reframed training as cocreation and iterative learning (68) and co-development of training with employees using participatory design has also been recommended (86).

These approaches could prove effective in assuring effective knowledge transfer to different audiences but more research on the success of these initiatives would be helpful for industry organisations interested in this approach.

Culture Essentials - Training and Knowledge

Training and Knowledge efforts are essential to support both culture and FSMS initiatives. Specific training interventions need to be effectively planned to meet the needs of the trainee groups and one-size-fits-all should be avoided.

D.2.7 Behaviour and Attitude

Accepted behavioural norms among the workforce are a determining factor in food safety (49) and multiple sources found that improper food handler and business behaviours which became accepted as norms were leading causes of cross contamination in food safety incidents (49). Similarly, non-compliance has been normalised in some workplaces as 'necessary adaptation' (87). However, it is recognised that behaviours can be targeted through structured, strategic interventions and feedback (41,67) and culture shift can be achieved by embedding behavioural nudges and visual reinforcements (86).

Attitudes to HACCP include it often being treated as bureaucratic rather than practical (47) which is not helpful in improving application, and staff attitudes to FSMS and FSC differed significantly between compliant and non-compliant facilities (70). Attitudes are sometimes positive in intention but inconsistent in action (48).

Culture Essentials – Behaviour and Attitude

Positive attitudes to food safety and food safety culture are important and mismatches between attitudes and behaviours need to be avoided. Food safety culture interventions and food safety training can provide positive effects on attitude and behaviours, but all interventions should be monitored to establish effectiveness. Continuous engagement is necessary for sustained and consistent engagement and to drive internal culture change.

D2.8 Teamwork and collaboration

Although not investigated or mentioned in all studies, the importance of team dynamics was understood right at the start of food safety culture concept development (2) and culture was described as a shared enterprise between staff at all levels (50) that promotes cross-company collaboration via best-practice sharing (52). Through collaboration on culture-based interventions interdepartmental alignment improved (56) and coworkers support with regard to practicing safe food handling in the workplace was noted (88).

Teamwork and collaboration were reported as stronger in formalised operations (89) and from around 2015-16 was considered part of overall cultural assessment in assessment and profiling tools (79,90,91) and as crucial for improved outcomes and sustained food safety improvement (19). However, it was noted that there was fragmented treatment of teamwork and collaboration across food safety culture evaluation systems (92) and that it was disconnected across food system nodes (73). Indeed, the importance of cross-agency and company responses to bridge food safety culture with national recall system responsiveness was highlighted (93) but teamwork and collaboration was found to be poor in a socio-technical systems analysis of the handling of two earlier E. coli O157:H7 outbreaks (54).

The impact of family-run dynamics on collaboration was also identified as an issue in ethnic restaurants, highlighting the blind spots of one-size-fits-all interventions (94) and fragmented relationships along supply chains leading to exclusion of smallholders were also noted (73). Cultural differences and subcontracting arrangements in supply chains were also noted to hinder collaboration (9). Numerous studies identified improvements in practice and culture through teamwork and collaboration (e.g., (18,19,35,42,95,96)) while others noted that teamwork and collaboration improved as culture matured (e.g., (30,31,97,98)).

Trans-national studies highlighted that teamwork and collaboration varied across regions and was linked to national culture dimensions, e.g. individualism versus collectivism (37). Recent studies suggest that teamwork and collaboration can be encouraged through team-based learning and participatory methods (14,27) and that it is a factor influencing food safety behaviour across job roles (27).

Siloed working, blame cultures and unstable economic situations were found to weaken collaboration (12,99). Interest in teamwork and collaboration as a core element of culture-shift strategies remains (42) but caution on the approach to measurement has been raised as it is often included but hard to validate psychometrically (29).

Culture Essentials – Teamwork and collaboration

There is no doubt that collaboration and teamwork are important to food safety culture, and it has been reported that each impacts the other. Organisations need to develop plans to strengthen teamwork and collaboration through food safety management and culture initiatives. Team-based learning and participatory methods can help to inculcate improved teamwork and working together with other critical components of food safety culture across the dimensions, such as Training and Knowledge, Communication Coordination, Behaviour and Attitude, Recognition and Empowerment, Risk Awareness, and understanding of Work Pressures supports an environment for effective teamwork and collaboration.

D2.9 Recognition and Empowerment

Recognition and empowerment were identified as important at the beginning of food safety culture concept development (2) and the role of recognition in encouraging and motivating positive behaviours and creating ownership, change and engagement has been regularly noted (e.g., (3,4,7,50,53,60,96,100,101). However, few early studies explored or provided much information on how recognition and empowerment were measured. Staff were empowered to report issues in the follow-up to a major Listeria outbreak (56) and training was recommended to empower safe practices (76).

Recognition and empowerment became embedded in food safety culture measurement tools, e.g. as part of people engagement (79), but was only partially addressed in some tools (92) and the need for metrics and overcoming implementation gaps was also highlighted (19). Recognition was found to be stronger where autonomy was encouraged (18,102,103) but some studies noted exclusion of voices in supply chain

food safety culture studies, with particular reference to small businesses (73,82) and others noted challenges with top-down management models, e.g. in a decentralised agricultural sector (9). Recognition and empowerment were strong in high-performing organisations (31) and leadership empowerment was a key driver of culture improvement and return on investment (30). Training intervention studies found that recognition and empowerment through staff motivation linked back to training feedback systems (14,15,27) and people in structured change agent roles felt empowered to initiate and sustain change (42).

In outbreak settings and investigations, and in economic crisis situations, it has been noted that operators lacked empowerment to challenge norms and become demoralised (54,99). Similar challenges have been identified in case studies where, although on the surface there was food safety compliance, underneath there were food safety culture weaknesses and staff felt underappreciated and excluded from decision-making (12). With respect to intercontinental, trans-national or intercultural studies, recognition and empowerment were more present in collaborative cultures and limited in hierarchical systems (37) and linked to retention and morale, especially in multicultural teams (104).

Since the publication of the previous position paper in 2018, there have been calls for more empowerment strategies in sectors such as foodservice (11) and for local food handlers, e.g. in Nigeria (58) and for a 'just culture, that promotes open dialogue due to safe, open reporting and learning (105). Recognition and empowerment are included in some newer culture assessment tools but not always validated (29), and this is still felt to be an area with limited direct focus (39) that needs further work.

Culture Essentials – Recognition and Empowerment

Recognition and empowerment are positive factors impacting food safety culture development and approaches including training and employee/team participation have been highlighted as important. Some tools are available to assist with understanding the current level of autonomy so that strategies for increased empowerment can be developed. Promoting safe, open dialog and recognising employees who step forward are key to building more empowered teams.

Dimension 3 Hazard and Risk Awareness

Awareness of hazards and risks is critical for making food safely and the prevention of food safety incidents. This essential dimension for the global food supply chain is what differentiates food safety culture from broader organisational culture. Knowledge and ability to recognise actual and potential hazards, understand the risks they pose and identify effective control mechanisms are essential not only to food safety management systems such as HACCP but also to building and sustaining a strong food safety culture.

While specialist technical information may be the remit of specific roles, basic scientific and technical information needs to be accessible and understandable to everyone. This, accompanied by effective training and education allows all staff to understand their roles in food safety, including what to do if they believe there is a food safety risk.

At a company level, it is essential to keep up to date on the latest intelligence regarding supply chain hazard issues, food safety incidents relevant to the sector and changes to food safety requirements, e.g. from legislation. Horizon scanning for issues as well as identifying new technology and advances in control and monitoring approaches are foundational elements to understanding hazards, risks and necessary control systems.

D3.1 Risk Awareness

Literature findings in the risk awareness theme report that risk awareness is a fundamental cultural attribute that can boost vigilance (106) but suggest that a lack in risk awareness is often identified as a contributing factor in repeated incidents (71). In some cases a basic awareness is present but not deeply embedded (47).

Some articles describe what is done to promote and maintain awareness, e.g. daily hazard checks and awareness talks (47), use of design thinking activities (86), roleplay (107) and much discussion of education campaigns (43,70,108) and audits (108) or reflection on near misses (42). Studies have also found that where risk awareness is low the culture is often reactive (48), and that a progressive increase in risk awareness comes with maturity growth (66) or that risk awareness is an outcome of a mature food safety culture.

Culture Essentials - Risk Awareness

It is clear that risk awareness is central to both effective control of food safety hazards through food safety management systems and programmes, and that this both supports and may be the outcome of a mature food safety culture. Organisations need to take steps to assess the level of risk awareness in their workforce and apply appropriate education and communication tools to maintain and increase risk awareness suitable for the product sector where they operate.

D3.2 Work Environment

The Work Environment critical component is shared with Dimension 4 Consistency for Food Safety and Dimension 5 Adaptability, Change and Continuous Improvement – see section D4.3 for details.

D3.3 Training and knowledge

The Training and Knowledge critical component is shared with Dimension 2 People: Commitment, Empowerment and Accountability and Dimension 4 Consistency for Food Safety – see section D2.6 for details.

In the context of the Hazard and Risk Awareness Dimension, this will include foundational information for understanding and assessing hazards and risks and the need to verify hazard and risk awareness at all levels of the organisation. Essential training and knowledge here relate to hazards and risks relevant to the business and being managed through the food safety management systems, and the specific methods being used to control and monitor CCPs, PRPS and preventive control measures (e.g. OPRPs).

In particular people need to know, understand and be accountable for their specific role and any related procedures – what to do to maintain control and what to do when monitoring indicates loss of control (potential uncontrolled hazards).

Dimension 4 Consistency for food safety

As mentioned in the 2018 position paper, the consistency dimension is where the consistent and effective application of a food safety system is assured. It is having the appropriate culture that allows this to be done effectively, but the collaborative work in consistently doing the right thing for food safety can also reinforce the culture. Consistency needs to flow through all food safety related decisions, actions and behaviours within the organisation, from top management through all roles and should always tie in with organisation food safety values and mission.

The consistency dimension interacts strongly with the implementation and maintenance of food safety management systems, including HACCP, Preventive Controls, Prerequisite Programmes, GHPs and Safe Product Design arrangements as well as additional systems targeting Food Defence and Food Integrity (109). All of these approaches rely on the consistent behaviour and actions of staff in line with defined requirements.

D4.1 Food safety management systems (FSMS)

The FSMS can be used as scaffolding for cultural improvement (66) or as a framework for operationalising food safety culture (6,40,42). Culture assessment tools are often independent of the formal FSMS (29) but FSMS are more successful when cultural interventions are embedded alongside (39,110). Some studies report integration of the FSMS into broader culture-building strategies (39,104) and that this correlates with higher maturity (28), while others suggest that cultural practices are embedded into existing FSMS protocols.

In the outbreak context failures in formal systems often co-occur with poor cultural elements such as poor “shared hygiene behaviours” and problematic “accepted behavioural norms” leading to foodborne outbreaks/recalls (49). In many cases the food businesses had existing formal systems, but they were not implemented and used to support and embed desired behaviours (49); in other cases, systems like HACCP were in place but undermined by cultural weaknesses (12). What is clear is that there is interaction between systems and culture and this needs to be harnessed to strengthen both elements. Integration of food safety culture within formal FSMS frameworks, e.g. 3rd party audit standards may help to achieve this, but more research is needed to fully understand the interactions. FSMS alone are insufficient and must be integrated with human factors (10).

Culture Essentials - Food safety management systems (FSMS)

The FSMS needs to be well designed and developed and effectively implemented and maintained. The importance of interactions between FSMS with food safety culture has become better understood as more work and understanding of cultural dimensions has developed through research. Emphasis on planning how the approaches will support each other in any improvement project or cycle will allow appropriate actions to be taken.

D4.2 Achieving Consistency

Achieving Consistency relates to the need for consistent correct behaviour and actions of the workforce. This in turn interacts with *Training and Knowledge* which spans the Consistency for Food Safety Dimension and the Hazard and Risk Awareness Dimension. Studies highlight the need for consistent communication and training (83), and disparities in leadership, training and accountability (111). Variability is noted in how firms adapt based on leadership and structural support in unstable economic contexts showing that it is difficult to maintain food safety culture levels when faced with resilience challenges (99).

Disparity between formal food safety goals and actual practices indicate a lack of consistency of application (55,112) with leadership and structures becoming key influences on food safety culture outcomes (55) but FSC is also seen as a practical enabler of consistency (4). Embedding shared FSC principles internationally was found to be complex due to resourcing and governance differences (113).

Culture Essentials – Achieving Consistency

Consistent and correct food safety behaviours are essential at all levels. Additional important aspects are *Performance Measurement*, *Documentation* and *Records Systems* and their use in *Trend Analysis*. *Performance measurement*, e.g. through monitoring CCPs, allows the business to check that it is meeting defined food safety requirements as well as to acknowledge good performance and identify performance issues. Metrics need to be carefully chosen and will normally include both lagging (reactive) and leading (proactive) measures.

Appropriate Records Systems are needed for results, which should be transparent and communicated within the organisation. The need for documentation and/or online *Records Systems* needs to be considered and these need to be suitable for allowing *Trend Analysis*, which will enable input to continuous improvement as well as providing useful information for training and supporting the food safety culture.

D4.3 Work Environment

This critical component overlaps with the Hazard and Risk Awareness and Adaptability, Change and Continuous Improvement Dimensions. Work environment relates to the suitability of the environment for achieving food safety and supporting the workforce members in their food safety roles. The work environment frames behaviour (60,114) and the layout and workplace conditions impact food handling and hygiene behaviours (2,3,9,96,115–117) and have been observed to affect compliance (3,116) and support or hinder food safety culture (3,4,24,28,33,48,49,58,61,88,94,104). Indeed, facilities with better organised environments have been correlated with higher culture scores (30,55); however, impacted by organisational norms and values, the lack of good work environment standards has also been linked with poor food safety prioritisation and lack of risk awareness in outbreak settings (49).

Culture essentials – Work Environment
The work environment needs to be of a good hygienic standard with facilities and finishes that support food safety practices and allow the workforce to do their jobs effectively and comfortably. Literature confirms that the environment impacts behaviours, compliance and culture and the lack of good environmental standards had been linked to culture in outbreaks.

Dimension 5 Adaptability, Change and Continuous Improvement

D5.1 Adaptability and Continuous Improvement

Fewer research studies have investigated the Adaptability, Change and Continuous Improvement Dimension than the other Dimensions. Adaptability has been identified regarding crisis resilience, e.g. in the COVID 19 pandemic, where working though the pandemic constraints was highlighted as important to adaptive food safety behaviours and strengthening food safety culture (110). Similarly, the challenges of maintaining

food safety culture in unstable economic contexts have also been reported and variability was found in how firms adapted based on leadership and structural support (99). Theoretical studies have called for adaptive food safety management systems frameworks (100).

Culture Essentials - Adaptability and Continuous Improvement

The critical component *Adaptability and Continuous Improvement* can be further broken down into several essential topics. *Agility and Adaptability* are linked concepts; agility is the ability to react, move and change quickly and easily in response to a stimulus, while adaptability is about considering all the options and opportunities, and planning the way ahead. Both are important to an organisation's ability to respond and adapt to changing circumstances and this ability can impact food safety culture. *Problem Solving* and *Crisis Management* are also essential topics that are particularly important in crisis resilience but can also be preventative tools when used information on near misses. *Continuous Improvement* of food safety culture enhances culture maturity and food safety performance.

D5.2 Work Environment

The Work Environment critical component is shared with Dimension 3 Hazard and Risk Awareness and Dimension 4 Consistency for Food Safety – see section D4.3 for details.

Culture Essentials – Work Environment

In the context of adaptability, change and continuous improvement, the quality of the work environment, including finishes, tools, equipment and services necessary for food safety are necessary not just for adherence to food safety requirements but also for engendering a culture of continuous improvement.

Culture and Maturity

It has long been recognised that food safety culture exists on a spectrum of maturity from weaker to stronger, and this has been described as from negative to positive (3), less mature to more mature (79) or reactive to proactive (18,27,27). Whatever measurement system or scale is used, it is important to be able to profile the existing culture of an organisation in order to understand where strengths and weaknesses lie across the dimensions, and to develop a programme of interventions to strengthen the organisations food safety culture.

Because of GFSI's role, it is outside the scope of this document to provide tools such as maturity models and intervention tools and guidelines. Nevertheless, it is understood that to move the needle forward on culture, continually improving and strengthening tools and guidelines is important.

Conclusions and Recommendations

GFSI individual dimensions from the 2018 report are largely confirmed and updated; however, this research has found that the dimensions are not equal in terms of influence in the literature as shown by the clustering of themes as critical components.

The new circular dimensional structure both emphasises the interaction between all dimensions and their critical components and demonstrates the foundational focus of the People and Company Values, Vision and Mission dimensions in supporting the other dimensions. Research on Consistency, and Adaptability and Continuous Improvement dimensions is lacking in food safety culture literature.

Since these dimensions are known to have originated from organisational culture (118) and were determined in the previous research on culture assessment methods (92) that informed the 2018 GFSI position paper it might be expected that they would have been studied more than was evident. It is recommended that more research should focus on these areas.

Food safety standards owners should encompass the dimensions and critical components in defining and describing food safety culture in their standards. Assessment of food safety culture should span its dimensions, utilising appropriate techniques to pinpoint an organisations maturity and establish where more work is needed to strengthen food safety culture.

References

1. Global Food Safety Initiative. A Culture of Food Safety - A Position Paper from the Global Food Safety Initiative [Internet]. Global Food Safety Initiative; 2018. Available from: https://mygfsi.com/wp-content/uploads/2019/09/GFSI-Food-Safety-Culture-Full.pdf

2. Griffith CJ. Food safety: where from and where to? von Holy A, Lindsay D, editors. Br Food J. 2006 Jan 1;108(1):6–15.

3. Griffith CJ, Livesey KM, Clayton DA. Food safety culture: the evolution of an emerging risk factor? Br Food J. 2010 Jan 1;112(4):426–38.

4. Sharman N, Wallace CA, Jespersen L. Terminology and the understanding of culture, climate, and behavioural change – Impact of organisational and human factors on food safety management. Trends Food Sci Technol. 2020 Feb 1;96:13–20.

5. Chua R, Zhao N, Han M. Cultural tightness in organizations: Investigating the impact of formal and informal cultural tightness on employee creativity. Organ Behav Hum Decis Process. 2024 Sep 1;184:104338.

6. Spagnoli P, Jacxsens L, Vlerick P. Towards a food safety culture improvement roadmap: diagnosis and gap analysis through a conceptual framework as the first steps. Food Control. 2023 Mar 1;145:109398.

7. Kane K, Taylor JZ, Teare R. Reflections on the theme issue outcomes. Worldw Hosp Tour Themes. 2018 Jan 1;10(3):391–6.

8. Nayak R. Food safety culture: A systems approach.

9. Frankish EJ, McAlpine G, Mahoney D, Oladele B, Luning PA, Ross T, et al. Review article: Food safety culture from the perspective of the Australian horticulture industry. Trends Food Sci Technol. 2021 Oct 1;116:63–74.

10. Griffith CJ, Motarjemi Y. Chapter 43 - Human Factors in Food Safety Management. In: Andersen V, Lelieveld H, Motarjemi Y, editors. Food Safety Management (Second Edition) [Internet]. San Diego: Academic Press; 2023. p. 919–41. Available from: https://www.sciencedirect.com/science/article/pii/B9780128200131000541

11. da Cunha DT. Improving food safety practices in the foodservice industry. Curr Opin Food Sci. 2021 Dec 1;42:127–33.

12. Watson D, Nyarugwe SP, Hogg R, Griffith C, Luning PA, Pandi S. The exotropia food safety cultural conundrum: A case study of a UK fish high-risk processing company. Food Control. 2022 Jan 1;131:108431.

13. De Boeck E, Jacxsens L, Mortier AV, Vlerick P. Quantitative study of food safety climate in Belgian food processing companies in view of their organizational characteristics. Food Control. 2018 Jun 1;88:15–27.

14. Zanin LM, Luning PA, Stedefeldt E. A roadmap for developing educational actions using food safety culture assessment – A case of an institutional food service. Food Res Int. 2022 May 1;155:111064.

15. Zanin LM, Stedefeldt E, da Silva SM, da Cunha DT, Luning PA. Influence of educational actions on transitioning of food safety culture in a food service context: Part 2 - Effectiveness of educational actions in a longitudinal study. Food Control. 2021 Feb 1;120:107542.

16. Manning L. Triangulation: Effective verification of food safety and quality management systems and associated organisational culture. Worldw Hosp Tour Themes. 2018 Jun 11;10(3):297–312.

17. Taylor JZ, Rostron KI. The development of a safety and quality culture assessment tool from a longitudinal, mixed-method research journey. Worldw Hosp Tour Themes. 2018 Jun 11;10(3):313–29.

18. Nyarugwe SP, Linnemann A, Nyanga LK, Fogliano V, Luning PA. Food safety culture assessment using a comprehensive mixed-methods approach: A comparative study in dairy processing organisations in an emerging economy. Food Control. 2018 Feb 1;84:186–96.

19. Emond B, Taylor JZ. The importance of measuring food safety and quality culture: results from a global training survey. Worldw Hosp Tour Themes. 2018 Jun 11;10(3):369–75.

20. De Boeck E, Jacxsens L, Vanoverberghe P, Vlerick P. Method triangulation to assess different aspects of food safety culture in food service operations. Food Res Int. 2019 Feb 1;116:1103–12.

21. Wiśniewska M, Czernyszewicz E, Kałuża A. The assessment of food safety culture in small franchise restaurant in Poland. Br Food J. 2019 Aug 16;121(10):2365–78.

22. Fujisaki K, Akamatsu R. Food safety culture assessment scale development and validation for use in school foodservice. Br Food J. 2020 Feb 20;122(3):737–52.

23. Wu ST, Hammons SR, Silver R, Neal JA, Oliver HF. Retail deli managers and associates have better food safety culture in stores with lower Listeria monocytogenes contamination. Food Control. 2020 Apr 1;110:106983.

24. de Andrade ML, Stedefeldt E, Zanin LM, da Cunha DT. Food safety culture in food services with different degrees of risk for foodborne diseases in Brazil. Food Control. 2020 Jun 1;112:107152.

25. Ruez G, Domingues J. Contributions To The Development Of An Evaluation Model Of The Organizational Culture Of Food Safety. In: Proceedings of the 4th ICQEM Conference, University of Minho, Portugal, 2020 [Internet]. University of Minho, Portugal; Available from: https://publicacoes.riqual.org/wp-content/uploads/2021/06/icqem_20_293_320.pdf

26. Nyarugwe SP, Linnemann AR, Ren Y, Bakker EJ, Kussaga JB, Watson D, et al. An intercontinental analysis of food safety culture in view of food safety governance and national values. Food Control. 2020 May 1;111:107075.

27. Zanin LM, Luning PA, da Cunha DT, Stedefeldt E. Influence of educational actions on transitioning of food safety culture in a food service context: Part 1 – Triangulation and data interpretation of food safety culture elements. Food Control. 2021 Jan 1;119:107447.

28. Spagnoli P, Vlerick P, Jacxsens L. Food safety culture maturity and its relation to company and employee characteristics. Heliyon. 2023 Nov 1;9(11):e21561.

29. Nyarugwe SP, Jespersen L. Assessing reliability and validity of food safety culture assessment tools. Heliyon. 2024 Jun 30;10(12):e32226.

30. Jespersen L, Butts J, Holler G, Taylor J, Harlan D, Griffiths M, et al. The impact of maturing food safety culture and a pathway to economic gain. Food Control. 2019 Apr 1;98:367–79.

31. Taylor JZ, Budworth L. Patterns and trends from a quantitative analysis of the Culture Excellence assessment program. Worldw Hosp Tour Themes. 2018 Jun 11;10(3):330–44.

32. Manning L, Luning PA, Wallace CA. The Evolution and Cultural Framing of Food Safety Management Systems—Where From and Where Next? Compr Rev Food Sci Food Saf. 2019 Nov 1;18(6):1770–92.

33. Fujisaki K, Shimpo M, Akamatsu R. Factors related to food safety culture among school food handlers in Tokyo, Japan: a qualitative study. J Foodserv Bus Res. 2019 Jan 2;22(1):66–80.

34. Everhart S. Factors Surrounding the Implementation of Food Safety Management Systems and Their Impact on Food Safety Culture. [Internet] [PhD Thesis]. North Carolina State University; 2019. Available from: https://www.proquest.com/openview/177abbe82730bbf9ce7237a41c31b344/1?pq-origsite=gscholar&cbl=51922&diss=y

35. Tomasevic I, Kovačević DB, Jambrak AR, Zsolt S, Dalle Zotte A, Martinović A, et al. Comprehensive insight into the food safety climate in Central and Eastern Europe. Food Control. 2020 Aug 1;114:107238.

36. Nyarugwe SP. Influence of food safety culture on food handler behaviour and food safety performance of food processing organisations [Internet]. [Wageningen University]: Wageningen University; 2020. Available from: https://research.wur.nl/en/publications/influence-of-food-safety-culture-on-food-handler-behaviour-and-fo

37. Nyarugwe SP, Linnemann AR, Ren Y, Bakker EJ, Kussaga JB, Watson D, et al. An intercontinental analysis of food safety culture in view of food safety governance and national values. Food Control. 2020 May 1;111:107075.

38. Bjelajac ŽĐ, Filipović AM. THE ROLE OF THE MEDIA IN THE AFFIRMATION OF THE CULTURE OF FOOD SAFETY. Econ Agric. 2020 Jun 24;67(2):609–22.

39. McCallion S, Beacom E, Dean M, Gillies M, Gordon L, McCabe A, et al. Interventions in food business organisations to improve food safety culture: a rapid evidence assessment. Crit Rev Food Sci Nutr. 2025 Sep 28;65(26):5066–84.

40. Liggans G, Kim SR (Sally). How Food Safety Culture Is Operationalized for Retail Food Settings: A Systematic Literature Review. Sage Open. 2024 Jan 1;14(1):21582440241236585.

41. Spagnoli P, Vlerick P, Pareyn K, Foubert P, Jacxsens L. Portfolio of interventions to mature human organizational dimensions of food safety culture in food businesses. Food Control [Internet]. 2025;168. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85206136731&doi=10.1016%2fj.foodcont.2024.110937&partnerID=40&md5=a660d525fb7d0f2fb937555d0d7ce05f

42. Olsen AM, Møller AM, Lehmann S, Kiethon AV. Mechanisms linking individual and organizational culture change through action research: Creating change agents for organizational and food safety culture development. Heliyon. 2023 Feb 1;9(2):e13071.

43. Taha S, Zanin LM, Osaili TM. Studying the perception of leadership styles and food handlers' hygienic practices in food businesses: The role of commitment and job satisfaction as mediators. Food Control. 2024 Mar 1;157:110148.

44. de Andrade ML, Stedefeldt E, Zanin LM, Zanetta LD, da Cunha DT. Unveiling the food safety climate's paths to adequate food handling in the hospitality industry in Brazil. Int J Contemp Hosp Manag. 2021 Feb 11;33(3):873–92.

45. da Cunha DT, Prates CB, Canuto IG, Stedefeldt E, Luning PA, Zanin LM. The relationship of food safety culture elements: A serial mediation model. Food Control. 2025 Mar 1;169:111022.

46. Lee JC, Neonaki M, Alexopoulos A, Varzakas T. Case Studies of Small-Medium Food Enterprises around the World: Major Constraints and Benefits from the Implementation of Food Safety Management Systems. Foods. 2023;12(17).

47. Dzwolak W, Anim B. Barriers hindering maintenance of standardised HACCP-based food safety management systems in small Polish food businesses. Food Control. 2025 Feb 1;168:110849.

48. Joomun ABZ, Wallace CA, Aumjaud B, Ramful-Baboolall D. Food safety culture and climate prevailing in micro and small food manufacturing enterprises in Mauritius and Rodrigues. Int J Food Sci Technol. 2024 Feb 1;59(2):685–702.

49. Wu ST, Wallace CA. Food safety culture contributory factors in foodborne illness recalls and outbreaks, 2001–2022. Trends Food Sci Technol. 2025 Sep 1;163:105132.

50. Yiannas F. Food Safety Culture - Creating a behavior-based food safety management system [Internet]. Springer; 2009. Available from: https://doi.org/10.1007/978-0-387-72867-4

51. Griffith CJ, Livesey KM, Clayton D. The assessment of food safety culture. Br Food J. 2010 Apr 20;112(4):439–56.

52. Robinson J, Heidolph B. Food Safety—A Current Perspective for Stakeholders: Creating a Food Safety Culture Through Audits and Best Practice Sharing. Cereal Foods World. 2009;54(6):248–52.

53. Powell DA, Jacob CJ, Chapman BJ. Enhancing food safety culture to reduce rates of foodborne illness. Food Control. 2011 Jun 1;22(6):817–22.

54. Nayak R, Waterson P. 'When Food Kills': A socio-technical systems analysis of the UK Pennington 1996 and 2005 E. coli O157 Outbreak reports. Saf Sci. 2016 Jul 1;86:36–47.

55. Wisniewska M, Zamojska A. Food Safety Culture Assessment Exemplified By Two Companies. ŻYWNOŚĆ Nauka Technol Jakość 2015. 2015;2(99):197–207.

56. Jespersen L, Huffman R. Building food safety into the company culture: a look at Maple Leaf Foods. Perspect Public Health. 2014 Jul 1;134(4):200–5.

57. Nyarugwe SP, Linnemann A, Hofstede GJ, Fogliano V, Luning PA. Determinants for conducting food safety culture research. Trends Food Sci Technol. 2016 Oct 1;56:77–87.

58. Onyeaka H, Ekwebelem OC, Eze UA, Onwuka QI, Aleke J, Nwaiwu O, et al. Improving Food Safety Culture in Nigeria: A Review of Practical Issues. Foods. 2021;10(8).

59. van Asselt ED, Hoffmans Y, Hoek- van den Hil EF, van der Fels-Klerx HJ. Methods to perform risk-based inspections of food companies. J Food Sci. 2021 Dec 1;86(12):5078–86.

60. Nayak R, Waterson P. The Assessment of Food Safety Culture: An investigation of current challenges, barriers and future opportunities within the food industry. Food Control. 2017 Mar 1;73:1114–23.

61. Manning L. The Influence of Organizational Subcultures on Food Safety Management. J Mark Channels. 2017 Oct 2;24(3–4):180–9.

62. Cavelius LS, Goebelbecker JM, Morlock GE. Legal and normative requirements for food safety culture – a consolidated overview for food companies within the EU. Trends Food Sci Technol. 2023 Dec 1;142:104222.

63. Vågsholm I, Belluco S, Bonardi S, Hansen F, Elias T, Roasto M, et al. Health based animal and meat safety cooperative communities. Food Control. 2023 Dec 1;154:110016.

64. Ko WH. Food suppliers' perceptions and practical implementation of food safety regulations in Taiwan. J Food Drug Anal. 2015 Dec 1;23(4):778–87.

65. Frankish E, Ross T, Bowman J. Food Safety Culture. In: Smithers GW, editor. Encyclopedia of Food Safety (Second Edition) [Internet]. Oxford: Academic Press; 2024. p. 664–70. Available from: https://www.sciencedirect.com/science/article/pii/B978012822521900023X

66. Spagnoli P, Vlerick P, Heijse L, Engels A, Jacxsens L. A multi-case study exploring the effect of interventions on food safety culture maturity. Food Res Int. 2024 Dec 1;197:115286.

67. Takashi Matsumoto. Fostering a food safety culture and strengthening quality assurance at food manufacturers. Jpn Soc Food Sci Technol. 2024;71(11):427–40.

68. Prates CB, Stedefeldt E, Ferreira ICM, Saccol AL de F, Scheffer PA, Fonseca RZD, et al. Is design thinking a support decision approach in different food safety contexts? Trends Food Sci Technol. 2024 Jun 1;148:104503.

69. DiPrete L, Garza T, Spinrad M. Focus groups among retail food establishment staff and management reveal obstacles and promoters of good food safety culture. Food Humanity. 2023 Dec 1;1:880–6.

70. Woreta TM, Worku AF, Tenagashaw MW, Yemata TA, Mamo FT, Damtie DG. Performance assessment of food safety systems (FSMSs and FSC) in water bottling factories in view of their contextual characteristics. Discov Appl Sci. 2024 Oct 6;6(10):529.

71. Holst MM, Salinas S, Tellier WT, Wittry BC. Environmental Antecedents of Foodborne Illness Outbreaks, United States, 2017–2019. J Food Prot. 2024 Jul 1;87(7):100293.

72. Wiśniewska M. Just culture and the reporting of food safety incidents. Br Food J. 2022 Mar 24;125(1):302–17.

73. Baur P, Getz C, Sowerwine J. Contradictions, consequences and the human toll of food safety culture. Agric Hum Values. 2017 Sep 1;34(3):713–28.

74. Motarjemi Y. Chapter 55 - Whistleblowing: An Essential Element of Public Health and Food Safety Management. In: Andersen V, Lelieveld H, Motarjemi Y, editors. Food Safety Management (Second Edition) [Internet]. San Diego: Academic Press; 2023. p. 1089–107. Available from: https://www.sciencedirect.com/science/article/pii/B9780128200131000255

75. De Boeck E, Mortier AV, Jacxsens L, Dequidt L, Vlerick P. Towards an extended food safety culture model: Studying the moderating role of burnout and jobstress, the mediating role of food safety knowledge and motivation in the relation between food safety climate and food safety behavior. Trends Food Sci Technol. 2017 Apr 1;62:202–14.

76. Griffith C, Redmond E. Risk Analysis: Food Safety Training and Health Education: Principles and Methods. In: Motarjemi Y, editor. Encyclopedia of Food Safety [Internet]. Waltham: Academic Press; 2014. p. 142–51. Available from: https://www.sciencedirect.com/science/article/pii/B9780123786128000433

77. Ko WH. Food suppliers' perceptions and practical implementation of food safety regulations in Taiwan. J Food Drug Anal. 2015 Dec 1;23(4):778–87.

78. Zabukosek M, Jevsnik M, Maletic M. Analysis of dimensionality of food safety culture: An empirical examination of a Slovenian food processing company. Int J Sanit Eng Res. 2016 Dec;10(1).

79. Jespersen L, Griffiths M, Maclaurin T, Chapman B, Wallace CA. Measurement of food safety culture using survey and maturity profiling tools. Food Control. 2016 Aug 1;66:174–82.

80. De Boeck E, Jacxsens L, Bollaerts M, Uyttendaele M, Vlerick P. Interplay between food safety climate, food safety management system and microbiological hygiene in farm butcheries and affiliated butcher shops. Food Control. 2016 Jul 1;65:78–91.

81. Griffith CJ, Jackson LM, Lues R. The food safety culture in a large South African food service complex: Perspectives on a case study. Br Food J. 2017 Apr 3;119(4):729–43.

82. Wiśniewska M, Czernyszewicz E, Kałuża A. The assessment of food safety culture in small franchise restaurant in Poland: The case study. Br Food J. 2019 Jul 19;121(10):2365–78.

83. DiPrete L, Garza T, Spinrad M. Focus groups among retail food establishment staff and management reveal obstacles and promoters of good food safety culture. Food Humanity. 2023 Dec 1;1:880–6.

84. Jespersen L, MacLaurin T, Vlerick P. Development and validation of a scale to capture social desirability in food safety culture. Food Control. 2017 Dec 1;82:42–7.

85. Jevsnik M, Raspor P. The Human Factor as A Trigger of Food Safety Culture Within Food Networks: The Review. Acta Microbiol Bulg. 2020;Vol.36(4):115–31.

86. Miguez Ferreira IC, Zanin LM, Prates CB, Thimoteo da Cunha D, Stedefeldt E. Design thinking: An effective strategy to evolve food safety culture? Food Control. 2025 May 1;171:111093.

87. Curro S, Balzan S, Saccarola V, Fontana F, Novelli V, Fasolata L. Behind the scenes of taste: an exploratory study of non-compliance in Italian artisanal bakery and pastry laboratories. Ital J Food Saf [Internet]. 2024 02 [cited 2025 Jan 10];13(4). Available from: https://doi.org/10.4081/ijfs.2024.12235

88. Ungku Fatimah UZA, Strohbehn CH, Arendt SW. An empirical investigation of food safety culture in onsite foodservice operations. Food Control. 2014 Dec 1;46:255–63.

89. Faour-Klingbeil D, Kuri V, Todd E. Investigating a link of two different types of food business management to the food safety knowledge, attitudes and practices of food handlers in Beirut, Lebanon. Food Control. 2015 Sep 1;55:166–75.

90. Taylor J, Garat JP, Simreen S, Sarieddine G. An industry perspective. Eunice Taylor D, editor. Worldw Hosp Tour Themes. 2015 Jan 1;7(1):78–89.

91. De Boeck E, Jacxsens L, Bollaerts M, Vlerick P. Food safety climate in food processing organizations: Development and validation of a self-assessment tool. Trends Food Sci Technol. 2015 Dec 1;46(2, Part A):242–51.

92. Jespersen L, Griffiths M, Wallace CA. Comparative analysis of existing food safety culture evaluation systems. Food Control. 2017 Sep 1;79:371–9.

93. Winters C, Wilcock A, Farber J. Food Recall System Effectiveness: Industry And Government Perspectives Within Canada. Food Prot Trends. 2017;37(3):161–9.

94. Harris K. Culture and theory: Considerations for the ethnic restaurant and food safety culture. Athens J Tour. 2016 Dec;3(4):263–72.

95. Abdelhakim AS, Jones E, Redmond EC, Griffith CJ, Hewedi M. Evaluating cabin crew food safety training using the Kirkpatrick model: an airlines' perspective. Br Food J. 2018 Jan 1;120(7):1574–89.

96. Caccamo A, Taylor JZ, Daniel D, Bulatovic-Schumer R. Measuring and improving food safety culture in a five-star hotel: a case study. Worldw Hosp Tour Themes. 2018 Jan 1;10(3):345–57.

97. Nouaimeh N, Pazhanthotta RT, Taylor JZ, Bulatovic-Schumer R. Measuring and improving food safety culture in a large catering company: a case study. Worldw Hosp Tour Themes. 2018 Jan 1;10(3):358–68.

98. Harris KJ, DiPietro RB, Line ND, Murphy KS. Restaurant employees and food safety compliance: motivation comes from within. J Foodserv Bus Res. 2019 Jan 2;22(1):98–115.

99. Nakat Z, Tayoun V, Merhi S, Bou-Mitri C, Karam L. Food safety culture in food companies amid the Lebanese economic crisis and the Covid-19 pandemic. Heliyon [Internet]. 2023 Sep 1 [cited 2025 Oct 15];9(9). Available from: https://doi.org/10.1016/j.heliyon.2023.e19885

100. Manning L. The value of food safety culture to the hospitality industry. Worldw Hosp Tour Themes. 2018 Jan 1;10(3):284–96.

101. Clark J, Crandall P, Reynolds J. Exploring the influence of food safety climate indicators on handwashing practices of restaurant food handlers. Int J Hosp Manag. 2019 Jan 1;77:187–94.

102. Tomei, Patricia AmeLia, Russo, Giuseppe Maria. Food safety culture maturity index [FSCMI]: Presentation and validation. Ibero Am Strategy Mag. 2019;18(1):19–39.

103. Jevšnik M, Hlebec V, Raspor P. Food safety knowledge and practices among food handlers in Slovenia. Food Control. 2008 Dec 1;19(12):1107–18.

104. Pai AS, Jaiswal S, Jaiswal AK. A Comprehensive Review of Food Safety Culture in the Food Industry: Leadership, Organizational Commitment, and Multicultural Dynamics. Foods. 2024;13(24).

105. Wiśniewska M. Just culture and the reporting of food safety incidents. Br Food J. 2022 Mar 24;125(1):302–17.

106. Evans EW, Bulochova V, Jayal A, Haven-Tang C. Attitudes towards using artificial intelligence to determine real-time hand hygiene compliance in the food sector. Food Control. 2023 Mar 1;145:109439.

107. Passanun Yeamchamphai, Supattra Pranee, Chompoo Saisama & Jomkhwun Suwannarak. Food Safety Culture and the Creation Model of the Demonstration Schools Operated by Public University. J Multidiscip Soc Sci. 2024;20(1):70–7.

108. Li Q, Zhang B, Dai Y, Zhang H, Liu P. Progress Analysis of International Food Safety Culture Construction and Its Enlightenment to China. Sci Technol Food Ind. 2024;45(9):218−224.

109. Wallace CA, Sperber WH, Mortimore SE. Food Safety for the 21st Century - Managing HACCP and Food Safety throughout the Global Supply Chain. Second Edition. Oxford: Wiley; 2018. 461 p.

110. Wisniewska, M, Czernyszewicz E, Grybek T. Food Safety Culture Assessment: SARS-CoV-2 Perspective. Int J Qual Res. 2022;17(2):485–500.

111. Boutros BA, Roberts KR. Assessing Food Safety Culture: A Comparative Study Between Independent And Chain Mexican And Chinese Restaurants. Food Prot Trends. 2023 Jan;43(1):61–80.

112. Griffith CJ, Jackson LM, Lues R. The food safety culture in a large South African food service complex. Br Food J. 2017 Jan 1;119(4):729–43.

113. Pan J, Huang S, Wan Y. Identifying Constraints, Mechanisms, and Resources in Harmonized International Food Safety System between the Asia Pacific Region and U.S. Int Conf Agric Risk Food Secur 2010. 2010 Jan 1;1:417–22.

114. Griffith CJ. Do businesses get the food poisoning they deserve? Br Food J. 2010 Jan 1;112(4):416–25.

115. Clayton DA, Griffith CJ. Efficacy of an extended theory of planned behaviour model for predicting caterers' hand hygiene practices. Int J Environ Health Res. 2008 Apr 1;18(2):83–98.

116. Lubran MB, Pouillot R, Bohm S, Calvey EM, Meng and J, Dennis S. Observational Study of Food Safety Practices in Retail Deli Departments. J Food Prot. 2010 Oct 1;73(10):1849–57.

117. Johnson M, Tennant B, Newsome J. Food Safety Culture Systematic Literature Review [Internet]. US FDA; 2022. Available from: https://www.fda.gov/media/163588/download?attachment

118. Denison DR, Haaland, S, Goelzer P. Corporate Culture and Organizational Effectiveness. Adv Glob Leadersh. 2003;3:205–27.

119. Jespersen L, Wallace CA. Triangulation and the importance of establishing valid methods for food safety culture evaluation. Food Res Int. 2017 Oct 1;100:244–53.

120. Kotter JP, Heskett JL. Corporate Culture and Performance. New York: The Free Press; 1992. 214 p.

Appendix 1 Methods

Search Strategy and Selection Criteria

A structured literature review was conducted to identify peer reviewed publications, grey literature and industry publications relevant to food safety culture. The initial search drew upon academic databases (e.g. Science Direct, Scopus, Emerald), professional guidance documents and industry standards. Additional grey literature was sourced from books, industry white papers, regulatory bodies and certification programmes. Snowballing methods were also used, in which reference lists of included articles were reviewed to identify further relevant publications. The search covered publications from 2000 to June 2025 and was limited to English-language sources. Preliminary searching was done using the term 'food safety culture' to identify articles mentioning this in the title and/or abstract and/or keywords and this was supplemented by targeted searching for 'organisational culture' publications that were known to have influenced the development of the food safety culture field.

Screening and Selection Process

Sources were screened in stages. Titles and abstracts were first assessed for relevance, followed by full-text screening of retained publications. Inclusion criteria required that publications addressed food safety culture either directly (e.g., through concepts, frameworks, interventions, or measurement) or indirectly (e.g., through related concepts such as behaviour, risk perception, organisational learning, or leadership in food safety contexts). Opinion pieces and those without relevant food safety or identifiable cultural content were excluded.

The initial search identified 329 records. After removing 92 duplicates and 71 irrelevant titles/abstracts, 168 academic sources were screened in full. Of these, 166 publications were deemed relevant and included in the final synthesis. The review was supplemented with a further 18 grey literature sources.

Table 1 Areas of Primary Focus of the identified articles

Group	Primary Focus	Number of Papers
0	Maturity Models and Frameworks	22
1	Training, Attitudes, and Behaviour	25
2	Safety Compliance and Implementation Practices	53
3	Organisational Culture and Transformation	45
4	Safety Climate and Measurement Tools	28
5	FSMS and Subcultures in Complex Systems	52

Data Extraction and Coding

Each publication was coded using a structured, thematic framework that integrated both established cultural theory and food safety-specific constructs. The 15 thematic areas within this framework (Table 2) were informed by prior literature on organisational culture and food safety, (e.g. (12,27,57,119) and were extended where relevant topics did not fit any of the initial themes. This ensured comprehensive coverage of the organisational, cultural, behavioural, and systemic elements understood to be part of or to influence food safety culture.

Table 2 Thematic Areas of Food Safety Culture

Thematic Area	Description	Numbers[2]
Vision and Values	The extent to which an organisation's core mission, ethics, and strategic goals prioritise food safety and embed it into corporate identity.	163
Leadership	The role of leaders in modelling, resourcing, and reinforcing food safety behaviours; including their visibility, tone, and consistency.	165
Training and Knowledge	The scope, relevance, and behavioural focus of training programmes, including knowledge retention and critical thinking.	167
Communication	How clearly and consistently food safety expectations are conveyed, including upward, downward, and cross-functional communication.	165
Accountability and Commitment	The clarity of roles and responsibilities, ownership of food safety outcomes, and perceived fairness in accountability.	168
Teamwork and Collaboration	The quality of team and cross-functional cooperation in achieving food safety objectives and supporting mutual responsibility.	161
Work Pressure	The influence of production demands and staffing constraints on adherence to food safety protocols and safe practices.	160
Work Environment	The physical and organisational setting where food is handled, including cleanliness, ergonomics, and accessibility of tools.	162
Behaviour and Attitude	Observable food safety behaviours and underlying beliefs or mindsets held by staff toward safety practices.	167
Recognition and Empowerment	The extent to which staff feel encouraged, rewarded, and trusted to act in the interest of food safety.	154
Coordination	Alignment of roles, responsibilities, and communication across departments, shifts, and sites to support safety outcomes.	158

[2] Numbers of times this theme is discussed across the 166 academic articles.

Thematic Area	Description	Numbers[3]
Risk Awareness	Understanding and proactive identification of hazards and risks at individual and organisational levels.	165
Food Safety Management Systems (FSMS)	The effectiveness of formal systems such as HACCP and certified FSMS programmes and how well they are integrated into daily practice.	161
Adaptability, Change and Continuous Improvement	How well the organisation learns from experience and applies improvements in a structured and proactive way.	39
Consistency	The stability and uniformity of food safety behaviours and decisions across time, roles, and operational settings.	31

These thematic areas were used to design an Excel-based data extraction tool. For each included literature source reviewers recorded metadata, study type, coding results and an overall summary. Relevant grey literature[4] was coded using the same thematic categories. Where the same themes were mentioned more than once in an article but in different context then they were each counted.

This approach supported both quantitative comparison regarding the numbers of articles discussing themes relevant to each keyword and qualitative insights on themes across the dataset. To ensure consistency and reliability, the coding process was discussed and agreed by reviewers and ambiguous or borderline cases were discussed collaboratively. These inter-rater discussions contributed to a more rigorous and coherent interpretation of the data.

Table 2 also includes the numbers of times each theme was discussed in different articles. There was a relatively even spread of mentions (between 154 and 168 times) for most theme areas suggesting good agreement within the literature for these themes being important aspects of food safety culture. However, the two themes adaptability and continuous improvement, and consistency were discussed much less (39 and 31 times respectively). This was surprising as these were both dimensions in the 2018 edition, named as adaptability and consistency. Since these are both established aspects of organisational culture (118,120) that were adopted as also important

[3] Numbers of times this theme is discussed across the 166 academic articles.
[4] Literature from non-peer-reviewed sources, e.g. industry guidelines

dimensions in food safety culture, then more discussion in the food safety culture literature might be expected and it appears that these areas may be under-researched.

Thematic Clustering

Following coding, the thematic literature data was grouped into logical clusters, considering fit with the existing GFSI dimensions (1) and necessary additions or amendments to accommodate research findings. Thus, common lines of inquiry and discussion in the literature were used to structure the synthesis into the revised dimensional model. It is important to note that several of the themes are relevant to more than one dimension in the 2018 model and, indeed, in the evolved model that is presented here. This underlines the interactivity between dimensions and has influenced the dimensional structure of the evolved model. The evolved model was then populated with critical components based on the fit of theme areas from the literature and the output of this work is described in the following section of this document.