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Terminology and the understanding of culture, climate, and behavioural change – Impact of organisational and human factors on food safety management

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3   Terminology and the understanding of Culture, Climate, and Behavioural Change –

4   Impact of Organisational and Human Factors on Food Safety Management

5

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16   Abstract

17   Background: The topic of food safety culture and climate is growing attention from industry,

18   researchers, standards owners and certification bodies. Authors use the terms food safety

19   culture and climate, however, there are no unified definitions to provide clarity on the

20   meaning of these terms.

21   Scope and Approach: The objective of this study is to analyse the similarities and differences

22   in current definitions and statements of Food Safety Culture and Food Safety Climate, and

23   provide suggested clarifying definitions for both concepts, to bring a consistent approach to

24   the field. The study evaluates the types of organisational cultures, climates and employees'

25   behaviours which provide important differences and further insights into each of these.

26   Key Findings and Conclusions: Looking back at the origins of safety culture following the

27   Chernobyl accident in the 1980's provides an understanding of how this laid the foundation

28   for safety culture and climate in the UK. Reflecting on the increasing trend in Hazard

29   Analysis and Critical Control Point (HACCP) breaches due to the increasing number of

30   incidents reported to authorities, the study suggests an increased focus is needed on

31   culture, climate, and behaviour in food businesses. A critical analysis of previous definitions,

32   statements and common words currently used to describe culture and climate in published

33   definitions is provided. New definitions for food safety culture and climate based on factors

34   shown to be important and are recommended for use by industry and researchers are

35   proposed. The study assesses different types of culture, climate and employees, and

36   suggests different employee behaviours impact the culture and climate of an organisation.

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42   Highlights:

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44   1. Provides critical analysis of published culture and climate definitions and statements

45   2. Identifies common words and factors used in published definitions

46   3. Proposes new definitions for food safety culture and food safety climate

47   4. Explores how types of culture and behaviours may impact food safety

48   5. Highlights future research requirements for enhanced food safety performance

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Introduction

According to the World Health Organisation (WHO), one in ten of the global population experiences foodborne illness annually (WHO, 2017). Incidents (e.g., product withdrawal and recalls) have occurred across a number of countries (Table 1) and there is an increasing trend in the incidents notified to food authorities, with exception from the US Federal Food and Drug Administration (FDA), who have seen a declining trend.

Table 1: Number of Incidents (e.g., product withdrawal and recalls) notified to authorities during 2 different time periods (www.food.gov.uk, www.foodstandards.gov.au, www.fda.gov, www.fsis.usda.gov)

Location/Authority	2013/14	2016/17	% difference
Australia & New Zealand/ Food Standards Australia New Zealand (FSANZ)	42	72	+70
UK/Food Standards Agency (FSA)	1567	2265	+44
USA/United States Department of Agriculture (USDA)	75	122	+65
USA/US Federal Food and Drug Administration (FDA)	3844	2847	-26

To limit the risk of foodborne illness, all food manufacturers and caterers must have a food safety management system (FSMS) in place. In addition, all businesses have a culture (organizational and food safety); however the question remains: what type of culture is prevailing and how it can be understood and used to prevent foodborne disease outbreaks. Whilst some argue that a Hazard Analysis and Critical Control Point (HACCP) plan with effective prerequisites in place is the most effective way to manage food safety (Griffith et al., 2010a; Wilcock et al., 2011), the data in Table 1 suggest that food safety breaches continue to occur, and it must be recognised that HACCP is just one tool within an FSMS, (Wallace, Sperber and Mortimore, 2018). Also, without there being a compliance culture where employees are more likely to engage in behaviours that collectively contribute to organisational compliance (Interligi, 2010), there is room to improve culture maturity. In the food safety context, this means that all reasonable precautions and all due diligence need to be completed truthfully and actioned appropriately by all personnel at all times. Where people fail to adhere to the procedures which control the hazards identified in the HACCP

76   plan, consumers and products are put at risk, which may lead to recalls or foodborne illness

77   (Powell et al., 2011; Jespersen and Huffman, 2014).

78   Whilst some preceding studies exist linking climate to (workforce) safety (e.g. Keenan, 1951;

79   Zohar, 1980), a key reference to the term safety culture followed the 1986 Chernobyl

80   accident, and subsequently this has been at the forefront of thinking with regards to health

81   and safety (people safety) in the UK (www.hsl.gov.uk, Griffith et al., 2010a; Zohar, 2000).

82   Decades have passed since the Chernobyl accident occurred, numerous papers have been

83   published on the topics of organisational safety culture and climate and human factors

84   pertaining to safety (Schein, 1985, 2017; Denison and Mishra, 1995; Denison, 1996; Hartnell

85   et al., 2016; Reason, 2008, 2016). Where businesses operate in a high-risk environment the

86   UK Health and Safety Executive provides guidance on how to manage health and safety.

87   However, the application of organisational culture and climate in the food industry

88   regarding consumer safety rather than personnel health and safety has been more recent.

89   Regarding health and safety, Nayak and Waterson, (2017) report that there are many highly

90   regulated industries around the world, including healthcare, nuclear and automotive. In

91   China where coal mining is thought to be the riskiest industry, leadership has been found to

92   support safety behaviour (Zhang et al., 2017). Likewise, in the food industry, when senior

93   management drives a positive food safety culture, they are choosing to behave in a way that

94   has the potential to reduce food safety incidents (Yiannas, 2009). Whilst learnings can be

95   taken from other industries this study will focus on culture, climate, and behaviour with

96   respect to food safety.

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98   Culture and climate (including food safety culture and climate) have been gaining much

99   attention by researchers and practitioners with Denison (1995), Schein (1997), Griffith

100   (2010a, 2010b), Guldenmund (2000) evaluating both aspects. However, there are still no

101   consistent definitions of food safety culture and climate for use by industry practitioners

102   and researchers. Zohar was one of the first authors to discuss organisational climate in the

103   safety domain in the 1980s (Zohar, 1980); however, since this early work, published

104   research has conflicting views between the definitions of culture and climate, whether from

105   an organisational, people safety or a food safety perspective. This could potentially cause

106   confusion in organisations seeking to understand their culture and climate and further

107   research is needed to see if this has an impact on the organisation when they are in the

108   process of changing their approach to food safety. Denison (1996) debated the differences

109   between organisational culture and climate, highlighting that when people come from

110   different research backgrounds the words culture and climate mean different things.

111   Denison considered climate as a transient situation, considering the thoughts, feelings, and

112   behaviours of employees. These perceptions are subjective, a moment in time, and thus

113   management can use their power and influence to change them. In comparison, culture is

114   considered as an evolved concept which is rooted in history, is complex and adhered to by

115   all (Denison, 1996). Due to the depth that culture is ingrained within the organisation, it is

116   difficult to manipulate and change the culture. Schein (1985, p19) defines culture as "A

117   pattern of shared basic assumptions learned by a group as it solved its problems of external

118   adaptation and internal integration, that has worked well enough to be considered valid

119   and, therefore, to be taught to new members as the correct way to perceive, think, and feel

120   in relation to those problems". Jespersen et al. (2016) adopted this definition when

121   developing the theoretical framework for a food safety specific maturity model and Griffith

122   et al. (2010a) stated that Schein was probably the most influential writer in organisational

123   culture. Yiannas (2009) believes organisations can choose to create a strong food safety

124   culture, with leaders who are accountable for instigating it as they have the power and

125   influence to create a positive food safety culture. Further, where there is a good Food Safety

126   Management System (FSMS) with a positive compliance culture, it is possible to reduce the

127   risks to the consumer (Griffith et al., 2010a). This may be due to a combination of

128   leadership, communication and FSMS compliance, as illustrated in the study by De Boeck et

129   al. (2018), who found that one company with multiple food processing sites had a better

130   food safety climate than a one-site operating company. The multiple site company was

131   stronger in leadership, communication and commitment and this suggests that it could be

132   due to a larger workforce requiring a structured approach (De Boeck et al., 2018). In

133   addition, Ball et al. (2009) and Hinsz and Nickell (2015) showed predictive validity between

134   culture and behaviours, and Denison (1996) showed the same through his organisational

135   culture work. Nevertheless, the role of a leader, worker behaviour and the routes to

136   changing and strengthening food safety culture and climate towards a more effective

137   management of food safety within food businesses remain unclear.

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139 The first objective of this study is to compare and contrast current definitions and

140 statements of culture and climate (i.e. organisational, safety, and food safety) and provide

141 suggested definitions for both concepts. This will allow these two distinctly different but

142 related domains to be clarified for future research and industry applications. The second

143 objective is to review and discuss knowledge of different types of climates and cultures to

144 provide information on typologies of culture and climate, and to outline important

145 differences and further insights into the impact of employee behaviour on culture and

146 climate.

147 **Method**

148 A literature review was conducted using databases Science Direct and Emerald Insight, and

149 grey literature such as industry reports. The search used keywords to find relevant material,

150 for example; Senior management effects on food safety culture, assessment of food safety

151 culture, food safety climate, measuring food safety culture, change management,

152 behavioural change. Inclusion criteria were: (i) articles published in English, with a

153 preference for peer-reviewed articles, (ii) scope of the article includes information pertinent

154 to objectives of this study, (iii) article includes safety culture and climate definitions in food

155 and other industries, management of culture, behavioural changes.

156 Titles and abstracts were reviewed for relevance based on whether they met the objective

157 and inclusion criteria. Fifty-six articles meeting the criteria from 1980 to the present day

158 were obtained and reviewed. Relevant content from each paper was categorised under

159 themes to enable comparison of the content. In addition, citations and reference lists of

160 these papers were reviewed to identify earlier seminal papers in the fields, which were also

161 obtained and reviewed.

162

163 Further categorisation of all definitions or statements was performed to enable a textual

164 analysis to compare and contrast the definitions or statements.

165 **Definitions from literature**

166 Throughout the literature reviewed the terms culture and climate are defined and applied

167 differently. Some authors believe they are intertwined e.g., Pettita et al. (2017), whilst

168   others e.g., Griffith et al. (2010a) and Denison (1995) discuss how they are different. Table 2

169   provides an overview of the historical development of culture and climate definitions or

170   statements quoted by authors working in the domains of organisational, safety and food

171   safety between 1968 and 2018.

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Table 2: Historical development of organisational, safety and food safety culture and climate definitions or statements

Construct	Definition or Statement	Field	Reference
Culture and Climate	"the relatively enduring quality of the total organisational environment that a) is experienced by the occupants b) influences their behaviour, and c) can be described in terms of the values of a particular set of characteristics (or attitudes) of the environment"	Organisation	Tagiuri & Litwin (1968, p25) cited by Denison (1996, p626)
Culture and Climate	"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".	Organisation	Schein (1985, p19)
Culture and Climate	"Belief and value structure members employ as they act in an organisation".	Organisation	Poole (1985, p101) cited by Denison (1996, p633)
Culture and Climate	"the product of multiple goal-directed interactions between people (psychological), jobs (behavioural) and the organisation (situational) situations. In particular, safety culture is the observable extent to which all organisational members put their effort in improving safety on a daily basis."	Safety	Cooper and Phillips (1995, p6)

Culture and Climate	"the relatively enduring quality of the total organisational environment that a) is experienced by the occupants b) influences their behaviour, and c) can be described in terms of the values of a particular set of characteristics (or attitudes) of the environment"	Organisation	~~Tagiuri & Litwin (1968) cited by~~ Denison (1996, p626)
Culture and Climate	"the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risk and risk control systems".	Safety	Hale (2000, p7)
Climate	"[…] a summary of molar perceptions that employees share about their work environments".	Safety	Zohar (1980, p96)
Climate	"shared perceptions among members of an organisation with regards to organisational policies, procedures and practices."	Organisation	Zohar (2000, p587)
Climate	"a Specific form of organisational climate, understood as individual perceptions of policies, procedures, and practices relating to safety in the workplace".	Organisation	Neal et al. (2000, p100)
Climate	A summary concept describing the employee's beliefs about all the safety issues.	Safety	Guldenmund (2000, p222)
Climate	"Employees' (shared) perceptions of leadership, communication, commitment, resources and	Food Safety	De Boeck et al. (2015,

	risk awareness concerning food safety and hygiene within their current work organisation".		p244)
Climate	"considered more temporal and more subject to the perception of individual employees of an organisation or company".	Organisation	De Boeck et al. (2018, p17)
Culture	"[…] a set of attributes that can be perceived about particular work organisations (maintenance, construction, and central repair shops) and which may be induced by the policies and practices that those organisations impose upon their workers and supervisors".	Safety	Niskanen (1994, p241)
Culture	Safety culture is a set of prevailing indicators, beliefs, and values that the organisation owns in safety.	Safety	Fang et al. (2006, p574)
Culture	"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."	Food Safety	Griffith et al. (2010a, p435)
Culture	Interplay of the food safety climate as perceived by the employees and the managers of a company (so called 'human route') and the context in which a company is operating, the current implemented FSMS, consisting out of control and assurance activities (so called 'techno managerial route') resulting in a certain (microbiological) output.	Food Safety	De Boeck et al. (2015, p243)
Culture	"Culture in general can be analysed at several different levels, with the term "level" meaning the degree to which the cultural phenomenon is visible to you as participant or observer.	Organisation	Schein and Schein

		These levels range from the very tangible, overt manifestations that you can see and feel to the deeply embedded, unconscious, basic assumptions that we are defining as the essence of culture or its DNA. In between these layers are various espoused beliefs, values, norms and rules of behaviour that members of the culture use as a way of depicting the culture to themselves and others."		(2017, p17)
	Culture	"shared values, beliefs and norms that affect mindset and behaviour toward food safety in, across and throughout an organization".	Food Safety	GFSI (2018, p34)

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Common words used in definitions or statements

The overview of definitions or statements found in the literature shows that many of the definitions combine culture and climate and relate to either organisation safety or food safety. Further analysis of the language used across the three fields: culture, climate or a combination; shows the top six words used in definitions are: perception (9) mainly used when defining climate, belief (7), values (5) and behaviours (5) are all seen in culture and in a combination of both culture and climate. Employees (8) are most commonly used when defining climate and finally shared (6) was evenly noted by construct. (Table 3).

Table 3: Common words used in definitions or statements and number of occurrences.

Common words	Culture and climate	Climate	Culture	Total
Influences	1		0	1
Behaviour	**2**		**3**	**5**
Values	**3**		**2**	**5**
Employees, workers, members, people	**1**	**5**	**2**	**8**
Characteristics/Attributes	1		1	2
Attitudes	2		1	3
Pattern	1			1
Shared	**2**	**2**	**2**	**6**
Assumptions	1		1	2
Perceive, Perceived, Perceptions	**2**	**5**	**2**	**9**
Belief	**2**	**1**	**4**	**7**
Norms	1		2	3
Policy		2	1	3
Procedures		2		2
Practices		2	1	3
Leadership		1		1
Communication		1		1

Commitment		1		1
Hygiene		1	1	2
Learned	1		1	2

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211 Comparisons between culture and climate definitions or statements provided in Table 3

212 illustrate the complexity and potential for confusion. Phrases such as a 'shared set of

213 assumptions, beliefs or attitudes' are common themes in the culture and climate definitions

214 (Schein, 1985; Hale, 2000; Zohar, 2000; De Boeck et al., 2015; Niskanen, 1994; Fang et al.,

215 2006; Griffith et al., 2010a; GFSI, 2018).

216

217 Niskanen (1994, p241) states that culture is "a set of attributes can be perceived about

218 particular work organisations", the much earlier work by Tagiuri & Litwin (1968, p25)

219 contributes "the values of a particular set of characteristics", and the Schein (1985, p19)

220 definition mentions, "a pattern of shared basic assumptions".

221 Hale (2000) and Cooper and Phillips (1995) both intertwine culture and climate in their

222 definitions. Hale (2000, p7) refers to safety culture as "attitudes, beliefs and perception

223 shared by natural groups as defining norms and values", whereas Cooper and Phillips (1995,

224 p6) define culture as "the product of multiple goal-directed interactions between people,

225 jobs, and the organisational situations". Fang et al. (2006, p574) singularly defines culture

226 and also refers to "a set of prevailing indicators, beliefs and values that the organisation

227 owns in safety."

228 Some of the safety climate definitions also reference shared perceptions in relation to the

229 working environment, rather than the deep-rooted values and beliefs seen in the culture

230 definitions (Zohar 1980, 2000). Nayak and Waterson (2017) suggest culture can be

231 considered as how people behave and climate is more about how they feel.

232

233 **Working towards a definition of food safety climate**

234 The summary of the definitions or statements detailed in Table 2 provides some insight into

235 the evolution of safety climate. The terms used to define safety climate have themes around

236 behaviours in the working environment, people, procedures and policies. Authors such as

237 Zohar (1980, 2000) and Neal et al. (2000) contribute definitions specifically for safety

238 climate: Zohar (2000) and Neal (2000) have similar definitions that focus on the organisation

239 and how the employees perceive the policies, procedures, and practices. Neal et al. (2000)

240 specifically link the definition to safety in the workplace but Zohar (2000) suggests it's for

241 every member of the organisation. Tagiuri and Litwin (1968) refer to the whole organisation

242 considering how the climate is experienced by others and influences behaviours. Poole's

243 (1985) definition refers to how members act in an organisation, whereas Schein's (1985)

244 definition waits until a system has worked multiple times so it can be considered as valid,

245 which is then seen as the correct way to perceive, think and feel in those situations. Hale

246 (2000) has a similar definition: once attitudes, beliefs, and perceptions are shared it will

247 "determine how they act and react to risk and risk control systems." A common thread in

248 these climate definitions is perception and its role in how individuals act and interact.

249 Denison (1996) argues that unlike organisational culture, organisational climate is less

250 concerned about the evolution of social systems over time and more concerned with the

251 impact that organisational systems have on groups or individuals. Organisational climate can

252 also be considered in relation to the organisation's basic values and behaviour, which can be

253 objectively measured through observable practices in the organisation (Schein, 1985).

254 Denison cited Litwin & Stringer (1968) who consider the way in which social environment is

255 experienced by others and how climate encompasses both organisational conditions and

256 individual reactions, whereas Schein (1985) considers there to be more emphasis on how

257 the social environment is created by others. Denison (1996, p624) builds on this stating

258 climate "portrays organizational environments as being rooted in the organisation's value

259 system" and considers climate to be temporary due to the members of an organisation and

260 how they perceive the social environment. Denison (1996) argues there are three distinct

261 approaches to study climate which consider 1) the perceptual measurement of individual

262 attributes, 2) perceptual measurement of organisational attributes and 3) the multiple

263 measurements of organisational attributes combining perceptual and objective measures.

264 Thus, perception is a key factor of organisational climate as people's perceptions may

265 change based on information and other conditions around them. The first approach

266 considers the psychological climates, through studying the individual's perception of their

267 working environments, whereas approaches two and three are more targeted to the climate

268 within the organisation.

269

Working towards a definition of food safety culture

The summary of the definitions or statements detailed in Table 2 provides some insight into the evolution of culture. Schein defined culture as three layers considering the surface, intermediate layer and deep-rooted, where the surface is represented by artefacts and symbols that can be seen, the intermediate layer consists of values and beliefs, and the deepest culture is considered as the core assumptions (Schein 1997). Culture can be considered as what distinguishes one group or organisation from another (Nyarugwe et al., 2016; Hofstede, 2001).

Organisational culture is the beliefs of an organisation, its values, attitudes and how they drive safety standards throughout the business (Pettita et al., 2017). Griffith et al. (2010a) use similar language, defining culture as "the aggregation of the prevailing, relatively constant, learned, shared attributes, values and beliefs".

Schein (1997) discusses how culture is built on an evolution of social systems over time. Thus, to understand the deeply rooted people's viewpoint from within an organisation, i.e. the culture, researchers need to ascertain a deep understanding of the underlying assumptions and not just perception at a given point in time.

As discussed earlier, if we consider culture as values, beliefs and core assumptions and climate as regarding the impact that the organisation's systems have on people, it can be seen that the definitions detailed in table 2 for culture and climate often are intertwined, focusing on the organisation's systems and how employees should adhere to them. Whereas, De Boeck (2015) defines culture by linking it with climate, and Griffith et al. (2010a) defines culture but by linking this with hygiene behaviours, the latter could be part of the organisation's systems, thus introducing an element of climate.

Through the review and analysis of culture and climate definitions found in literature it can be said that culture and climate differ in three areas; time, sociology, and psychology (Table 4). As there are many cross-overs in definitions between food safety culture and climate, the analysis of the common words used in definitions, the three factors of culture and climate definitions was considered to be an appropriate route to creating proposed new definitions that would differentiate between food safety culture and climate in order to encourage clarity for research and industry application.

302 *Table 4: Three factors of culture and climate definitions*

	Time	Sociology	Psychology
Climate	Temporary	Individual	Attitude, perception
Culture	Long term	Group, organisation	Belief, behaviour, assumption

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304 **Proposed Definitions for food safety culture and food safety climate**

305 Based on the literature review and analysis, the following definitions are proposed:

306   Food safety culture is defined as a long-term construct existing at the organisational

307   level relating to the deeply rooted beliefs, behaviours and assumptions that are

308   learned and shared by all employees, which impact the food safety performance of

309   the organisation.

310   Food safety climate is defined as a temporary construct existing at the individual

311   level, relating to the perception and attitudes of individuals and how they influence

312   others in an organisation to adhere to the food safety management systems and

313   practically apply these in their working environment.

314

315

316 **Establishing typologies for culture and climate and the impact of employee behaviour on**

317 **food safety.**

318 The behaviour of others is driven by how the management commit to demonstrating the

319 values and following the rules (Wilcock et al., 2011). There are some thoughts that the

320 management's approach to food safety behaviour could influence the food safety climate at

321 work or the employees' food safety behaviour (De Boeck et al., 2017; Griffith et al., 2010a;

322 Jespersen et al., 2016). Pettita et al. (2017) proposed five different types of organisational

323 cultures, each typified by a particular behaviour (Table 5).

324 *Table 5: Types of organisational cultures and behaviours typically demonstrated by leaders*
325 *and/or employees (adapted from Pettita et al., 2017)*

Type of organisational culture	Description of behaviour
Autocratic	Direct superior/leader, is the source of safety instructions and directions for employees

Bureaucratic	Each employee follows the safety standards set by the top-level bureaucratic leaders
Co-operative	Where all employees work together to ensure they all achieve the safety outcomes
Technocratic	Where employees are focused on results because they are measured by the results
Clan-patronage	This operates with two groups, one who the dominant 'in-group' and the other who tries to be in the in-group are the 'out-group'

326   *Autocratic leaders* would give direction about the delivery of safety directives and provide

327   feedback on non-conformances highlighting errors to avoid. This would be a good quality to

328   have, as it ensures they are meeting standards and identifying errors in their system. A

329   hierarchical business is more likely to have *Bureaucratic leaders* who set the safety

330   standards that each employee will follow, therefore there is less reliance on supervisors to

331   enforce the rules as employees are compliant. Conversely, *Co-operative leaders* rely on

332   supervisor enforcement to ensure all employees work together to achieve safety standards.

333   When a *Technocratic organisational* climate is predominant, i.e. a results-driven climate, it

334   could drive behaviour which creates short-cuts, hides errors or skips safety steps. *Clan-*

335   *patronage leaders* could have ways of working on a day to day basis which may differ from

336   the behaviour during a specific day, e.g. a visit/audit. Clan-patronage are neither positive

337   nor negative safety climates and are not associated with being compliant. This type of

338   behaviour can be dangerous as they display the Hawthorne effect when they are being

339   observed: they appear on the outside to be compliant yet when the external person leaves,

340   the business returns to poor practices which may affect the safety of the products (Pettita

341   et al., 2017). The authors argue that certain cultural types (autocratic and bureaucratic) can

342   suppress the effect of safety climate, as it weakens the relationship between direct

343   supervisor enforcement and employee compliance. Because of this strong management

344   approach, a positive safety culture and high levels of compliance are seen regardless of

345   supervisor enforcement. Pettita et al. (2017) also state that cooperative organisational

346   climates create a positive safety culture, however, in contrast, technocratic organisational

347   climates are associated with negative safety climates and are found to have less compliance.

348   Kapp (2012) showed that with a positive safety climate, employee safety compliance

349 behaviours improve. Within other industries, such as nuclear, where safety is critical

350 Martinez-Corcoles et al. (2011) reviewed how safety culture was affected in a nuclear plant.

351 The research found that plant safety behaviours had a direct impact on the general safety

352 behaviours, which is no surprise in this industry because not following the correct safety

353 behaviour could result in a catastrophe. Similarly, Pettita et al. (2017) claim that supervisor

354 enforcement is significantly related to employee safety compliance and the overall safety

355 climate has a direct effect on employee compliance. If rules were not consistent for all

356 workers' then workers would revert to old habits. (Wilcock et al., 2011).

357

358 **Types of culture and behaviours**

359 Some authors report that new employees will normally adopt the dominant behaviour of

360 others which can have a positive or negative effect depending on what type of culture is

361 dominant (Griffith et al., 2010a; Yiannas, 2009). This suggests that it is important for a

362 business to recognise which behaviours each employee exhibits, so that when new

363 employees join the organisation, they are learning from those who show an appropriate

364 understanding and attitude; however, further research is needed in this field.

365 In addition to the types of climates identified by Pettita et al. (2017), Denison and Mishra

366 (1995) and Hartnell et al. (2016) provide behavioural traits for different types of

367 organisational cultures (Table 6).

368 *Table 6: Types of organisational cultures and behaviours typically demonstrated by leaders*
369 *(adapted from Denison and Mishra (1995) and Hartnell et al. (2016).*

Type of organisational culture	Description of behaviour
Mission culture	Provides a purpose and meaning, and a host of noneconomic reasons why the organisations work is important. Defines the appropriate course of action for the organisation and its members. Focuses on the dynamics of external adaptation. Indicators of integration, direction and vision, and predictors of profitability.
Involvement cultures	Focus on the dynamics of internal integration.

	Flexible, open, responsive and strong predictors of growth.
Task-oriented cultures	Facilitating task accomplishment by defining role relationships among group members, by clarifying expectations and performance standards, and by encouraging the use of standardised rules and regulations to enhance consistency and predictability.
Relationship-oriented cultures	Emphasize interpersonal support and positive relationships by encouraging group members' involvement in decision making, implementing group members' suggestions, demonstrating respect for group members, and treating group members as equals.

370

371   Denison and Mishra (1995) identified that when an organisation demonstrates both a

372   *mission culture* and *an involvement culture* this will have a positive impact as it creates and

373   develops the skills of a team. Hartnell et al. (2016) reviewed the different organisational

374   culture profiles and concluded that all typologies of organisational cultures promote *task-*

375   *oriented* or *relationship-oriented* values. In relationship cultures, individuals influence their

376   colleagues by working as a team to generate ideas, make decisions and communicate well

377   with each other (Hartnell et al., 2016).

378   To embed a food safety culture a combination of these cultures and values would be the

379   preferred team, thus, this could be useful in food safety performance, but more research is

380   needed to understand the interrelationships of culture types.

381

382   **Types of commitment employees exhibit and behaviours**

383   Having discussed types of culture and climate and how they impact employee behaviours, it

384   is also necessary to consider how employees may impact culture, climate, and behaviour-

385   change initiatives. A key factor linking employees to the organisation is commitment

386   (Meyer and Allen, 1991) and a wide body of research exists in this area, although not

387   directly linked to food safety culture and climate. Whilst it is outside the scope of this paper

388   to review in detail, it is useful to consider commitment concepts that may play a role.

389   Meyer and Allen (1991) proposed a three-component model of commitment in

390   organisations; affective, normative and continuance commitments, of which employees

391 might display one or a combination of commitment types. Affective commitment is

392 displayed where employees want to remain within a business, their attendance is high, they

393 complete tasks to their best ability and will do extra tasks to support the business. In

394 normative commitment, employees attend work as they feel they are obliged to and that it

395 is part of their duty. Employees exhibiting continuance commitment are aware of the costs

396 of leaving the organisation and are thus continuing to work in the business because they

397 need to do so, usually for financial gain. This means that they may do the bare minimum

398 required to remain employed (Meyer and Allen, 1991; Meyer and Herscovitch, 2001;

399 Herscovitch and Meyer, 2002). This research identified that affective and normative

400 mindsets were more susceptible to behavioural changes. Herold et al. (2008) conducted

401 research based on the model developed by Meyer and Allen (1991); although not applied

402 specifically to the food industry it did look at organisations' general workforce and argued

403 that affective commitment represents a positive attitude to change. However, whilst the

404 different types of commitments may provide greater insight into the types of people

405 working in food manufacturing factories, these factors are not working alone and would be

406 further influenced by factors such as personal, job and organisational characteristics,

407 demographic factors and leadership. This illustrates the complexity of the integration of

408 culture, climate, and behaviours at the individual level. Whilst there is some research

409 investigating the moderating role of burnout and job stress in food safety climate and

410 behaviour (De Boeck et al., 2017) and indications of differences between workgroups and

411 roles at different organisational levels (Jespersen et al., 2016), the impact of employees,

412 roles and sub-cultures such as workgroups on food safety culture and climate is largely

413 unstudied.

414 In practice, when there are significant changes to a Food Safety Management System

415 (FSMS), for example a review of HACCP implementation or changes to procedures, this can

416 be a challenge to implement especially when managers/supervisors need to break old

417 habits and create new ones. Their behaviours when implementing change are important so

418 that they set a good example for the workers (Wilcock et al., 2011; De Boeck et al., 2017).

419 Any lack of motivation amongst the management will impact on the employees, potentially

420 resulting in poor food safety culture. (De Boeck et al., 2017; Nayak and Waterson, 2017).

421 Zohar and Tenne-Gazit (2008) also discuss how behaviours change when employees are

422   under pressure to meet production orders and supervisors change their behaviour and

423   ignore safety procedures. Safety Compliance is driven by training and how management

424   behaviour commits to demonstrating the values and following the rules (Wilcock et al.,

425   2011). Griffith et al. (2010a) claim that workplace culture affecting employee behaviour is

426   largely ignored in the food industry, but widely used in other industries such as aviation and

427   nuclear. Thus, when any changes are required in the food industry these need to be

428   frequently monitored through internal audits to ensure old habits are broken and the

429   changes are implemented.

430   **Future Research Requirements**

431   Where there is a positive organisational climate it may enhance the relationship between

432   safety leadership and employee safety behaviours (Kapp 2012; Probst, 2015; Pettita et al.,

433   2017, Yiannas, 2009;). This may result in a positive attitude from the employees that could

434   contribute to improved food safety compliance and the strengthening of food safety culture

435   and climate. This may, in turn, impact the business' complaints and prevent any incidents

436   that would create a product recall; however, there is no data to suggest this. Further

437   research is needed to provide a greater understanding of how this positive culture and

438   climate can be created.

439   Where different mindsets are identified, e.g. affective, normative and continuance

440   employees described by Meyer and Allen (1991), Meyer and Herscovitch (2001) and

441   Herscovitch and Meyer (2002), employees' approach to work and adapting to any changes

442   may be a challenge, such that food safety behavioural changes and food safety

443   management systems initiatives may be impacted. Further work could determine how each

444   group benefits using different change management techniques, because what works for one

445   group may not work for the others. This could then lead to tools and interventions that help

446   the continuance group to be as motivated as the affective group and overcome potential

447   resistance or poor engagement with change activities.

448   Whenever any business wants to enable any changes, there needs to be 'buy-in' from the

449   employers and employees. A company needs to make the decision to change and how this

450   is managed will affect the workforce. Herscovitch and Meyer (2002) discuss that many

451   employees and employers can find change stressful and recognise that the connection

452   between commitment and coping could be more complex. De Boeck et al. (2017)

453   investigated the effects of job stress and burnout in the relation between food safety

454   climate and food safety behaviour but did not examine how change can affect the

455   workforce. They concluded that burnout and job stress did not affect food safety climate

456   and food safety compliance (De Boeck et al., 2017) but, as this was only conducted for two

457   vegetable processing plants with a small sample size (n=85), further research with a large

458   sample size at various food manufactures may show different results. For example, perhaps

459   the job stress at a ready meals factory may be higher than at a vegetable processing plant

460   due to the multiple number of processes that are involved to create a complex product with

461   different components that all need to be assembled at the correct time, whereas in a

462   vegetable processing plant they may have one process and one raw material to pack.

463   Therefore, the inherent risks with process complexity as well as the product food safety risk

464   will likely be different, and it would be beneficial to explore whether the results on the

465   impact of job stress and burnout on climate and behaviour may differ.

466   Where businesses have installed CCTV to monitor the employees' behaviours this has been

467   found to have a rapid effect on changing behaviours (Powell et al., 2011; Powell et al.,

468   2013), because when employees are observed it can improve safety compliance and can

469   restore customer confidence if there has been an ongoing issue (Powell et al., 2011; Powell

470   et al., 2013). This may also be due to 'The Hawthorne Effect' defined by Elton Mayo, where

471   staff follow the procedures in areas when they know they are being observed (Hsueh, 2002)

472   and positive effects can be seen due to close supervision. However, Evans and Redmond

473   (2018) reported on video observation of handwashing and showed both positive and

474   negative behaviours, suggesting that participants may have forgotten that they are being

475   observed or that they do not understand the required behaviour or fail to comply for other

476   reasons. Further research using this technique would be beneficial to gain data on

477   employee behaviour as part of food safety culture and climate.

478   To ensure the climate remains stable and consistent during a period of change, all

479   communications should be delivered to a team and be clear and frequent, otherwise this

480   will create confusion and may impact the climate of the business negatively, instead of

481   promoting a positive climate change. The research conducted by Zohar and Polachek (2014)

482   found that when messages were frequently delivered by supervisors to a team it had a

483   positive effect on employees' safety climate and team related behaviours. Similar results

484   were identified by Wilcock et al. (2011) who found ways to communicate with the teams to

485   make effective changes in a process. Zohar and Polachek (2014) argue that it does not

486   matter what type of climate is in a business but when managers' priorities are set, they

487   should improve the climate by changing employee understanding of the kinds of behaviour

488   that would be supported or rewarded at the workplace. Further research is required to

489   establish the most effective methods of communication and whether employees will be

490   more willing to change if there is a benefit or reward to the employee to comply.

491

492   Whilst this paper has considered the culture and climate of the business, future research

493   should consider national culture and how this can impact on behaviours and ultimately the

494   organisational culture. This may be particularly relevant in businesses with a multicultural

495   workforce. Many studies from the safety culture and climate fields have been useful in

496   developing an understanding of food safety culture and climate. However, the topic of

497   safety culture is normally associated with health and safety of employees and is thus dealing

498   with an immediate and visible risk within the business. In food safety, the risk of harm is to

499   the consumer who may be detached from the food business employees due to the temporal

500   and physical distances of the food supply chain. It is not known whether this distance has

501   any impact on food safety culture and behaviour and, therefore, further work would be

502   beneficial.

503

504   **Conclusion**

505   Whilst HACCP breaches continue to occur, and the trends indicate that the reported

506   incidents notified to the authorities are increasing, organisations need to understand what

507   is causing this to happen. This requires an understanding of food safety culture and climate,

508   which has been problematic because of the lack of accepted definitions.

509   Common words used in existing definitions and statements were found to be perception,

510   values, employees, shared, belief and behaviours. Using the word analysis, the three factors

511   involved in culture and climate definitions were identified as: time, sociology and

512   psychology. New definitions have been proposed to provide consistent use of language for

513   both industry and academia, as follows:

514   Food safety culture is defined as a long-term construct existing at the organisational

515   level relating to the deeply rooted beliefs, behaviours and assumptions that are

516   learned and shared by all employees which impact the food safety performance of

517   the organisation.

518   Food safety climate is defined as a temporary construct existing at the individual

519   level, relating to the perception and attitudes of individuals and how they influence

520   others in an organisation to adhere to the food safety management systems and

521   practically apply these in their working environment.

522

523   Further, the study discussed different types of organisational cultures and behaviours

524   typically demonstrated by leaders and employees, and how this influences the rest of the

525   workforce. In reviewing different types of organisational cultures and climates, it was

526   identified that an ideal team would include a combination of mission and involvement

527   cultures together with task and relationship cultures. A team with all these behaviours and

528   styles would influence, communicate well, develop the skills of the team and keep them on

529   track so that their goals are achieved.

530

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534

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