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Organisational forgetting

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1 **Organisational forgetting: the food safety risk associated with unintentional knowledge**
2 **loss.**

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14 **Abstract**

15 **Background:** Organisational forgetting is associated with unintentional knowledge loss that
16 makes both food businesses and consumers vulnerable to a food safety incident. It is essential
17 that food businesses have strategies and processes in place to minimise unintentional
18 knowledge loss to ensure that essential knowledge is retained, maintained and stays valid.

19 **Scope and approach:** The aim of this paper is to consider the risk associated with unintentional
20 food safety knowledge loss at individual, organisational and inter-organisational levels. The
21 research approach employed was to undertake a review of existing literature to frame the
22 conceptual research. Screening of both academic and grey literature demonstrated a distinct
23 knowledge gap i.e., there is limited previous research considering the concept of unintentional
24 knowledge loss and its impact on food safety. Case study examples explore the academic theory
25 in more depth.

26 **Key findings and conclusions:** Three aspects of organisational forgetting are considered in
27 the context of food safety: organisational amnesia, organisational memory decay, and supply
28 chain déjà-vu. The first two aspects operate at the organisational level and the third at the
29 supply chain level. To overcome the risk of unintentional loss, organisational and
30 interorganisational knowledge needs to be effectively mapped and a knowledge retention

31 policy needs to be developed, implemented and maintained that addresses all types of
32 organisational and interorganisational knowledge, but especially food safety knowledge.

33 **Keywords:** knowledge, loss, risk, vulnerability, food chain, forgetting

34 **Highlights**

35 Loss of knowledge essential to manage food safety is a risk for all food businesses

36 There is a lack of previous research on unintentional food safety knowledge loss.

37 Knowledge loss can occur at organisational and supply chain levels.

38 Knowledge retention policies are a key aspect of food safety management.

39 **1. Introduction**

40 Organizational forgetting is an umbrella term encompassing the activities that lead to
41 organizational knowledge loss (Klammer & Gueldenberg, 2019). de Holan, Phillips &
42 Lawrence (2005, p.45) define organizational forgetting as “accidental or purposeful,
43 detrimental or beneficial ... [and] it can significantly affect the competitiveness of a company.”
44 Whilst knowledge loss can be involuntary and unintentional [forgetting]; other examples of
45 knowledge loss at the individual or corporate level [unlearning] are both conscious, purposeful,
46 voluntary and intentional (de Holan & Phillips, 2004; 2011; Howells & Scholderer, 2016;
47 Klammer & Gueldenberg, 2019). However, this differentiation between organizational
48 forgetting and organizational unlearning are not consistent in the literature (Kluge, Schüffler,
49 Thim, Vladova & Gronau, 2018). Intentional unlearning is not addressed in this paper, the
50 focus here is on unintentional knowledge loss. Whilst organizational knowledge loss can be an
51 intentional strategy to drive and implement change (de Holan & Phillips, 2004) in food safety
52 management practices, care is required to ensure that essential knowledge that underpins food
53 safety management, wherever it is situated (in people, systems or documentation) is
54 safeguarded and retained.

55 Involuntary or accidental organizational forgetting can reduce capability, decrease
56 competitiveness, or in the event of product or service failure, cost organisations millions of
57 dollars in revenue, especially in the event of a product recall affecting brand value, reputation
58 and company image. This research analyses organizational forgetting in the food supply chain
59 and considers the risk associated with unintentional food safety knowledge loss. It is proposed
60 in this research that unintentional knowledge loss can occur in a socio-technical food system
61 at the individual or collective level, and both within an organisation or inter-organisationally.
62 Unintentional knowledge loss can occur in both private and public food safety governance
63 systems. Robins et al. (2017) explore how policy governance is weakened by systemic amnesia,

64 as people move from job to job through organisational or inter-organisational churn. This can
65 therefore be a problem within regulators as much as private companies. Collective knowledge
66 systems i.e. where essential food safety knowledge for a given organisation is held by another
67 e.g. a supplier retains food safety knowledge that is of innate value for another organisation is
68 not explored in contemporary food science literature and is worthy of consideration here.
69 Larsson, Bengtsson, Henriksson and Sparks (1998, p.258) assert that:

70 “Alliances are volatile key components of many corporations' competitive strategies. They
71 offer fast and flexible means of achieving market access, scale economies, and competence
72 development. However, strategic alliances can encounter difficulties that often lead to
73 disappointing performance.”

74 Food safety performance is a particular aspect of supply chain performance driven by
75 strategic alliances to share knowledge, expertise and organisational memory. Organisational
76 memory is therefore a control function that has transactional properties that shape desired
77 outcomes, associated practices, behaviours and can have a political role where some actors can
78 exert influence over others (Walsh & Ungson, 1991). Walsh and Ungson (1991) suggest that
79 organisational memory is held in silos or discrete retention bins, for example within individual
80 departments or indeed held by individuals. Those individuals may be outside of a given
81 organisation but play a key role in the effective implementation of interorganisational food
82 safety management systems. If there are a lack of information networks or the sharing of
83 datasets, or if there are sudden changes in the supply base as has been seen recently in the
84 Covid pandemic, this will prohibit the ability to create a wider shared knowledge base
85 organisationally or inter-organisationally within a food supply chain.

86 Casey and Olivera (2011, p.306) consider “routines” as being a form of organisational
87 memory and “the processes through which they are created, recreated, and expanded, as
88 processes of knowledge acquisition and retention.” The strengthening of knowledge retention

89 processes at the organisational and supply chain level is mediated by the degree of knowledge
90 sharing and the power dynamics associated with information asymmetry (Manning, 2020).
91 Power relations affect how knowledge is intentionally retained (Mariano, Casey & Olivera,
92 2018), or potentially lost. What organisational knowledge is considered to be of value and by
93 who, and how this is socio-politically mediated at an organisational or supply chain level
94 influences collective organisational memory, and introduces siloing and potential bias,
95 depending on which actors 'own' the specific elements of organisational knowledge within the
96 collective memory (Casey & Olivera, 2011). Larsson, Bengtsson, Henriksson and Sparks
97 (1998, p.258) argue: "The dynamics of power, opportunism, suspicion, and asymmetric
98 learning strategies can constitute processual barriers to collective knowledge development."

99 The assertion in this research is not that food safety knowledge is easier to lose, but that
100 understanding the requirements for knowledge retention strategies for food safety knowledge
101 can provide a conceptual lens of enquiry. Future research, can use the theoretical framing
102 developed in this paper to determine the risk associated with knowledge loss and the aspects
103 of operating effective food safety management systems that can be extended to other
104 organisational knowledge systems such as people safety, and environmental protection. Risk
105 management processes associated with knowledge loss are considered in the nuclear industry
106 (Rodriguez-Ruiz, 2006; Boyles et al. 2009; Vianna et al. 2020) and more generally in the
107 research literature however, not specifically to food science, food safety and food supply chain
108 applications. Risk is a nuanced and subtle concept, the definition of which is dependent upon
109 its context. In this context, food safety risk can be described as "a function of the probability
110 of an adverse health effect, and the severity of that effect, consequential to a hazard(s) in food"
111 (EC, 1997; Manning and Soon, 2013). This research adds to the understanding of the
112 requirements for knowledge retention policies as part of a proactive food safety management
113 system. Furthermore, the research recognises the strategic and operational importance that

114 food businesses have organisational and inter-organisational strategies and processes in place
115 to map existing knowledge and where it resides, that minimise knowledge loss to ensure
116 essential food safety knowledge is retained, maintained, readily accessible and remains valid.

117 **2. Conceptual approach**

118 The approach employed in this study was to undertake a review of existing literature to
119 frame the conceptual research. The aim of this paper is to consider the risk associated with
120 unintentional food safety knowledge loss at individual, organisational and inter-organisational
121 levels. The research considers three aspects of organisational forgetting in the context of food
122 safety: these being organisational amnesia, organisational memory decay, and supply chain
123 déjà-vu. These terms have not been explored in depth previously in the food science literature.
124 This research adopts a case study approach to critique the three distinct, but interrelated types
125 of organisational forgetting, the risks associated with each type of forgetting, their impact on
126 the effectiveness of food safety management systems, and the role of organisational knowledge
127 retention policies to optimise organisational memory.

128 The case study method is an accepted approach (Yin, 1993; Fathurrahman et al., 2021) and
129 the case study was selected based on well documented food safety incidences. The case study
130 approach can be used to explain complex causal links in real-life contexts and situations where
131 a particular activity has occurred; and to describe that activity or intervention more clearly and
132 any resultant outcomes (Yin, 1994). As a result, academic theory can be explored in more depth
133 especially the need to embed processes in food safety management systems that include
134 provision for effective knowledge retention.

135 **3. Organisational memory**

136 Food safety culture, i.e., ways of doing that relate to food safety, is constantly being
137 interpreted and reinterpreted. Food safety culture, and the associated organisational memory,
138 emerges and re-emerges via social relations, within and between organisations in a food supply

139 chain. Organisational and inter-organisational memory is an evolving process of reality
140 creation that includes the generation of collective social identity, and collective memory.
141 Collective memory is created through the development of shared experiences, memories and
142 thus personal meanings, which inform food safety knowledge is applied, and information
143 interpreted (Iivari & Abrahamsson, 2002). Explicit food safety knowledge can be collective in
144 that it operates at the individual and at the group level within the organisation and can be inert,
145 or static and is embedded in written procedures, protocols and work instructions. Alternatively,
146 implicit or tacit knowledge relates to “knowhow,” and is often shared through social interaction
147 and contains inherent beliefs (Becker, 2005). Thus, explicit food safety knowledge is knowing
148 things that can be explained to yourself and others or is a key element of the formal food safety
149 management system. Implicit knowledge is “just known,” is often generated through
150 experience and may or may not be recorded in the documented food safety management system
151 that operates within an organisation or across a given food supply chain. Shin (2004)
152 differentiates between three kinds of organisational knowledge:

- 153 • Codified Knowledge – knowledge that is formally codified with appropriate context
154 (formal knowledge, symbolic knowledge)
- 155 • Instrumental Knowledge- knowledge that is created by and resides with the
156 individual (tacit knowledge, automatic knowledge); and
- 157 • Social knowledge – knowledge that is created by social links and accepted as a
158 shared value (informal knowledge, social knowledge, embedded knowledge).

159 Explicit knowledge develops over time as an individual learns more within their practices and
160 role, shapes an individual’s thinking and learning (Becker, 2005), and informs the food safety
161 decisions made by individuals within organisations. Food safety knowledge in the individual
162 is thus mediated by experience, but this is situational, and knowledge is influenced by other
163 factors such as the type and quality of training (McIntyre, Vallaster, Wilcott, Henderson &

164 Kosatsky, 2013; Brown et al., 2014; Osaili, Obeidat, Hajeer & Al-Nabulsi, 2017) and how
165 learning is reinforced (Martins, Hogg & Otero, 2012). McIntyre, Vallaster, Wilcott, Henderson
166 & Kosatsky (2013) found that knowledge retention reduced over time if there is insufficient
167 refresher training. The knowledge loss was gradual, but significant over a fifteen year period.

168 Organisational knowledge is embedded both culturally and technologically and can take
169 many forms in terms of organisational objects (de Holan, Phillips & Lawrence, 2005). These
170 objects that contain embedded organisational knowledge can be physical e.g., equipment
171 (machines and their associated software and algorithms) or databases, or social i.e., the
172 routines, values and beliefs, cultural symbols and artefacts that contain both formal and
173 informal institutional knowledge. Whilst data and information have a specific value in terms
174 of how it can be used to inform decision-making; knowledge has a wider set of attributes and
175 values for the organisation. Knowledge can wain or grow at the individual and community
176 level, and simultaneously can become obsolete, outdated or useless as situational factors or the
177 business environment changes (Hedberg, 1981; Zhao, Lu & Wang, 2013). In busy work
178 environments too, individuals can unintentionally forget to complete documentation or follow
179 hygiene procedures (Eves & Dervisi, 2005; Milios, Drosinos & Zoiopoulos, 2012; Grujić,
180 Antić, Brenjo & Pavlović, 2013), and this can lead to a food safety incident. Food safety
181 management systems need to be developed and implemented recognising these
182 interrelationships that affect organisational memory. Some management controls are deep
183 practices which are culturally framed i.e., they are influential, embedded, and enduring, and
184 can exist alongside shallow practices that are incidental, happen by chance or are short-lived
185 (Sewell, 1992; Ahrens, 2018). However, deeply embedded knowledge and entrenched
186 practices that have lost their relevance or their efficacy can act as a barrier to new learning,
187 innovation and adaption within the organisation. In summary, there is both an element of
188 fluidity and of constancy in terms of organisational memory. The knowledge within the

189 organisational memory can be formally recorded within the food safety management system,
190 or can be simply “known” by individuals within the business. The latter situation presents a
191 risk if that individual(s) then leaves the business, or fails to impart that knowledge to others.

192 Levitt & March (1988, p. 319) define organisational memory as “how organisations encode,
193 store, and retrieve the lessons of history, despite the turnover of personnel and the passage of
194 time.” In addition, Stein (1995) sees organisational memory as a mechanism to retain and move
195 information from past to future employees of the organisation. Organisational memory is a
196 combination of formal organisational ontology and information ontology linked to the specific
197 organisational data repositories (De Vasconcelos, Gouveia & Kimble, 2016). Organisational
198 memory serves an informational role whereby the informational content retained by the
199 organisation will contribute to and inform efficient and effective decision-making.
200 Organisational memory contains schemata i.e., both intangible elements such as mental models
201 and tangible elements including standard operating procedures (Paoli & Prencipe, 2003;
202 Becker, 2005). Schema in this context are forms of arrangement, or the active organisation of
203 experiences, behaviours, reactions or response either singularly or in combination and schema
204 are considered in the context of remembering (Bartlett, 1932). Schemas organise belief systems
205 and frame communication, such as food safety messaging and this process is mediated by prior
206 knowledge and whether that prior knowledge is objective or subjective (Jin & Han, 2014). In
207 supply chains, organisations may rely on the organisational memory of other businesses
208 (suppliers, service providers etc.) to inform their food safety management system and their
209 food safety decision-making. This knowledge repository can contain a range of schemata that
210 are both explicit and verifiable and otherwise implicit and hidden during some verification
211 activities when seeking to determine the capabilities of a food business to produce safe and
212 legal food (Gilbert-Wood, Kerridge, Manning, & Treacy, 2021). House et al. (2004)
213 differentiate in this regard between subjective knowledge, i.e. the individual’s perception of

214 how much they think they know, compared to objective knowledge being what they are shown
215 as actually knowing.

216 Organisational forgetting is therefore, the unintentional eradication of given knowledge,
217 collective memory, or specific behaviour(s). Organisational forgetting does not preclude the
218 initial individual and organisational learning process; it merely reduces the likelihood that
219 knowledge, individual or collective organisational or inter-organisational memory will inform
220 behaviour in certain situations and contexts across a time continuum (Becker, 2005). Business
221 factors such as turnover, and the degree of openness (communication) and formalisation
222 (documentation) are said to have a significant impact on the loss of organisational memory
223 (Globerson, 1987).

224 **4. Organisational forgetting**

225 de Holan, Phillips and Lawrence (2005) create four typologies of organisational forgetting
226 based on the source of the knowledge (established/embedded or new) and the mode of
227 forgetting (accidental/unintentional or intentional). These typologies are *unlearning*
228 (intentional loss of existing knowledge); *memory decay* (accidental loss of existing
229 knowledge); *failure to capture knowledge* (accidental loss of new or innovative knowledge)
230 and *avoiding bad habits* (intentional loss of new or innovative knowledge). Organisational
231 memory is dynamic with coexisting timescales of intentional learning, unlearning, relearning
232 and forgetting. These processes are continually driving compliance, innovative and competitive
233 practice or entrenching behaviours. These interactions are of great importance to food
234 organisations as they underpin and frame food safety management practices, food safety culture
235 and wider organisational resilience. Three aspects of organisational forgetting are considered,
236 in the context of food safety: organisational amnesia, organisational memory decay, and supply
237 chain déjà-vu. The first two aspects operate at the organisational level and the third at the inter-
238 organisational supply chain level. Two research propositions are posed here:

239 Proposition 1. There is an inter-relationship between organisational amnesia, organisational
240 memory decay, and supply chain déjà-vu.

241 Proposition 2. A knowledge retention policy is an essential element of a food safety
242 management system.

243 **4.1 Organisational amnesia**

244 Organisational amnesia is a severe form of organisational forgetting associated with food
245 safety knowledge retained in people (Kransdorff, 1988). Organisational amnesia occurs as a
246 result of factors such as staff mobility, absenteeism (Hall & De Raffaele, 2013); organisational
247 churn (Stark, 2020), poor induction or refresher training processes, or a lack of mechanisms to
248 transmit information to new staff (Simion & Radu, 2009). Organisational amnesia can occur
249 when implementing rapid change without engaging with how the organisation operated in the
250 past, leading to weaker governance and management structures (Wettenhall, 2011).
251 Organisational amnesia also results when key individuals leave an organisation and their
252 knowledge, especially tacit knowledge, is not captured during this exit process (Klammer &
253 Gueldenberg, 2019), or instrumental knowledge, automatic knowledge or social knowledge
254 around “ways of doing,” especially if this is not captured within knowledge artefacts (Shin,
255 2004). This inability to retain and communicate knowledge within the organisation (Sadat &
256 Lin, 2018) creates operational incapacity if an organisation fails to recall experience (time-
257 based) or communicate lessons from one part of the organisation to another (space-based)
258 (Othman & Hashim, 2004; Sadat & Lin, 2018); or between one organisation and another. Food
259 safety risk can arise if there are insufficient records of how, and why decisions were made on
260 the validation, monitoring and verification of critical controls points (CCPs) in the food safety
261 management system especially if the original members of a hazard analysis critical control
262 point (HACCP) team have left and it is not possible to such tacit knowledge. In the food safety
263 context, gaining more knowledge as an individual has been associated with lower stress and

264 anxiety levels amongst food handlers (da Cunha, Cipullo, Stedefeldt & de Rosso, 2015) and
265 less absenteeism. This is important because a vicious circle can occur if there are high levels
266 of absenteeism in an organisation, which leads to organisational amnesia and can overstretch
267 remaining food handlers, increasing their personal workload and ultimately affecting their
268 decision-making and the organisation’s food safety performance (da Cunha, Stedefeldt & de
269 Rosso, 2014). Indeed, others argue that absenteeism can be a warning signal or precursor of
270 non-compliant, negative or even illegal or toxic organisational culture (Ambrose, Seabright, &
271 Schminke, 2002; Gruys & Sackett, 2003; Alias, Mohd Rasdi, Ismail, & Abu Samah, 2013;
272 Manning, 2020).

273 **4.2 Organisational memory decay**

274 Organisational memory decay is the involuntary reduction of existing knowledge (de
275 Holan, Phillips and Lawrence, 2005), knowledge structures, and inherent knowledge
276 objects/artefacts that are stored in organisational memory. Decay can be a form of knowledge
277 or data retrieval failure due to system breakdown, a wider failure in the knowledge retention
278 strategies within the organisation or that the knowledge retained has over time experienced an
279 erosion of its value and contemporary meaning (Hendriks & Vriens, 1999). Debenham, (2000)
280 argues that knowledge ‘decay’ is a measure of the degradation of knowledge integrity.
281 Knowledge integrity as a characteristic reflects the degree of organisational confidence in the
282 validity of the organisational memory, and whether knowledge in that memory can be
283 maintainable, or is inconsistent (Debenham, 2007), even invalid. Therefore, knowledge and its
284 associated present day value needs to be effectively managed as it is often a source of
285 competitive advantage in food supply chains especially where leveraging knowledge is
286 essential for particular operations (Shin, 2004). This is the case particularly when implementing
287 effective and consistent food safety management practices that retain their integrity over time
288 in order to prevent food safety incidents from occurring especially through product

289 reformulation or process change. Unintentional memory decay can be incremental and may
290 occur over an extended period (long-term memory decay) and may often go unnoticed within
291 an organisation especially if such knowledge is not accessed or used frequently (Andreu &
292 Sieber, 1999). As organisational knowledge underpins competitive advantage, organisations
293 need to be able to codify and share past experiences in a usable form with future employees
294 otherwise, the knowledge stock contained within the organisational memory will be susceptible
295 to ongoing incremental loss (Boone, Ganesan & Hicks, 2008).

296 Erosion of food safety practices can occur if future generations of workers in the
297 organisation are unaware of past behaviours (McCarthy et al., 2007) or past incidents. A high
298 turnover of staff in a food organisation, especially where knowledge is not proactively
299 maintained and/or inconsistencies set in, will only exacerbate this problem.

300 From an accounting viewpoint, depreciation means the reduction in value of a tangible asset
301 over a period of time to the point of having little value or being obsolete. Thus, in instances of
302 a rapidly changing market environment, organisational knowledge can lose value as it becomes
303 less relevant and less representative of changed and emergent industry practice. Knowledge
304 depreciation is a social value loss associated with inherent knowledge, skills and experience
305 embedded in an organisation (Kim & Seo, 2009). The rate of knowledge depreciation can vary
306 between food supply chains linked to the speed of change within an organisation or market
307 sector (Jong, Wu & So, 2020). The degree of knowledge erosion can be mitigated through a
308 knowledge retention policy that includes organisational and inter-organisational memory
309 reinforcement and knowledge infusion (Watson, 2020) This requires organisations to develop
310 a range of internal procedures and processes that reinforce knowledge retention e.g., refresher
311 training, staff updates and verification so that group organisational memory structures are
312 reinforced. Management of knowledge assets is crucial to prevent knowledge decay (Hendriks
313 & Vriens, 1999) especially proactively developing a knowledge repository that remains valid

314 and reliable as well as being an integrated process of recruitment, training and acquiring of
315 organisational skills and knowledge (Hafeez & Abdelmeguid, 2003). In summary,
316 organisations should develop monitoring and verification programmes that consider the degree
317 of knowledge retained by employees and if behaviours have moved practice away from
318 normative standards (Soon, Baines & Seaman, 2012). If this occurs, they assert that refresher
319 training and targeted programmes should be developed and implemented to prevent food safety
320 incidents.

321 **4.3 Supply chain déjà-vu**

322 Repeat accidents or incidents can be linked to high levels of overconfidence, complexity
323 and complacency, for example, aerospace accidents, nuclear, offshore drilling, maritime,
324 aviation and railway accidents (Dimitroff, Schmidt & Bond, 2005; Le Coze, 2013; Årstad &
325 Aven, 2017), or arise because the feedback loops that drive both knowledge retention, learning
326 and dissemination of knowledge function poorly (Peerally et al., 2017). Supply chain déjà-vu
327 is the overwhelming sense of familiarity that embedded collective, inter-organisational food
328 safety knowledge has failed to prevent an incident from re-occurring (Manning, 2018). Low &
329 Thériault (2008) describe returning to the same problems repeatedly with little resolution, as
330 the déjà-vu discourse. It is this reoccurrence of a given food safety issue at the supply chain
331 level that lies at the heart of the food safety risk associated with instances of supply chain déjà-
332 vu. Supply chain complacency and resistance to change can also stifle innovation, and food
333 safety incidents can occur if organisations fail to invest in risk management (Enyinda, Anaza
334 & Hamouri, 2013; Min, 2019). The challenge is to retain corporate memory and capturing new
335 knowledge from activities and incidents, inside, and external to the organisation, processing
336 both into the organisational memory (Mellin & Bond, 2000). A case study is now used to
337 consider the risk associated with unintentional knowledge loss at the organisational or supply
338 chain level.

339 **3.4 Case study: European Sudan azo dye food incidents**

340 Sudan dyes are banned in many countries as a food ingredient (colourant) because they are
341 a category 3 carcinogen (Oplatowska, Stevenson, Schulz, Hartig & Elliott, 2011) and genotoxic
342 (EFSA, 2005). The dyes of interest here are Sudan I, Sudan II, Sudan III, Sudan IV, Para Red,
343 Rhodamine B and Orange II (EFSA, 2005), amongst others. Sudan dyes are illicitly added
344 (adulteration) to chilli and other spices to enhance colour (Haughey, Galvin-King, Ho, Bell &
345 Elliott, 2015) and they are a known, recognised food safety risk across a wide range of foods.
346 Sudan I became a concern in Europe in 2003 when in France it was first identified as being
347 present in an Indian-sourced chilli powder (Patra, Roy, Madhuri & Sharma, 2017) see Table 1.
348 Following this incident, all chilli powder imported into Europe had to be certified free of Sudan
349 I. However, in 2004, there was a specific incident with widespread European Union (EU) Rapid
350 Alert System for Food and Feed (RASFF) original notifications (n=69) associated with the
351 presence of Sudan IV in palm oil from Ghana and to a much lesser extent from Nigeria and
352 other “unknown origins” (RASFF, nd). Although this adulteration is illegal in Ghana, its illicit
353 use in palm oil is widespread (Omari, Frempong & Arthur, 2018). These two incidents show
354 that this is a known food safety risk, illicit use of Sudan azo dyes in food. However, annually
355 RASFF notifications continue for multiple Sudan dyes in palm oil from Africa, and a range of
356 other foods (Table 1).

357 **Take in Table 1**

358 Between April 2005 and December 2006, there were fifty-four official notifications for the
359 identification of para red in spices and seasonings and then four subsequent notifications in
360 2008, 2009, 2018 and 2019 (Table 1). These non-conformances are commonly linked to food
361 batches connected with the Russian Federation and Georgia. In recent years, emergent illicit
362 azo dyes have also been identified, but this may be a factor of the development of new test
363 methods used by regulatory and private laboratories rather than that these dyes had not been

364 present previously. These azo dyes include Sudan 7B (linked with Guinea and Ghana), Sudan
365 Red B (Mexico) and Red G (Senegal, Georgia and the Russian Federation), and Sudan Orange
366 G, Fast Garnet, and Acid Yellow 36 with links to India, Turkey. Rhodamine B has been
367 particularly linked to its use in sliced pickled turnips from the Lebanon as well as more widely
368 with spice mixes from a variety of countries (Table 1). The use of azo dyes is still evident
369 leading to product destruction, supply chain withdrawal, and recall requirements. This risk is a
370 known known, what Marshall et al. (2019) describes as a risk that is known both abstractly, in
371 relation to events that may have happened to someone else and as a concrete risk exposure for
372 an individual business where the potential impact(s) can be described using available evidence
373 (Manning, Birchmore & Morris, 2020). In February 2005, a food scare associated with Sudan
374 I occurred in the United Kingdom (UK) involved around 575 retail and wholesale products
375 from ready meals to sauces (Johnson Quick, Parry & Parry, 2010). The background to this
376 incident is summarised in Table 2.

377 **Take in Table 2**

378 The supply chain level knowledge repository regarding this incident is limited. Indeed, the
379 only source identified in this research, a media source, signposts to a review led by Professor
380 Douglas Georgala (Reville, 2007), but the review report was not found to be still publicly
381 available. The recall reportedly cost £100 million (Davies, Baines & Turner, 2005) and at the
382 time was the largest food recall in UK history (Lofstedt, 2010). Huber (1991) proposes four
383 elements of knowledge management that can be considered here: *knowledge acquisition* (the
384 process by which knowledge is obtained); *information distribution* (the process by which
385 information from different sources is shared at the individual or collective level and the
386 activities that lead to new information or understanding); *information interpretation* (the
387 process by which given information is interpreted individually or collectively by members of
388 the organisation) and *organisational memory* (the means by which knowledge is stored for

389 future use). This case study highlights the requirement for information distribution via
390 traceability systems, and the embedding of knowledge acquisition, information distribution,
391 information interpretation and organisational memory retention within product recall protocols.
392 Managerial preparedness to prevent organisational forgetting, as part of a knowledge retention
393 policy is essential. Therefore, it is important to recognise and learn from failure and maintain
394 experience based knowledge within the organisational memory (Akkermans & Van
395 Wassenhove, 2018; Manning, Birchmore & Morris, 2020).

396 After the incident, additional regulations were implemented in the EU and member
397 states were required to monitor high risk products and provide analytical reports for the
398 presence or absence of Sudan dyes as an emergency measure (Galvin-King, Haughey & Elliott,
399 2018). European Commission Decision 2005/402/EC was subsequently repealed by European
400 Commission Regulation (EC) No. 669/2009 to a less intensive testing regime for Sudan dyes
401 (Galvin-King, Haughey & Elliott, 2018). Food businesses can be purchased or merged with
402 others and organisational amnesia or knowledge decay may occur. New organisations are
403 always entering the market and they may not have access to the collective knowledge that exists
404 at the supply chain level, especially if it is held in explicit rather than implicit knowledge
405 repositories. Ongoing induction and refresher training is critical to retain organisational
406 memory associated with the food safety management system. Indeed, Kvenberg, Stolfa,
407 Stringfellow & Garrett (2000) assert that differentiated knowledge circumstances, new staff,
408 new processes, new procedures etc. may require a range of training needs and approaches to
409 ensure essential knowledge is retained and food safety risk is reduced. The critical knowledge
410 that is required to ensure food safety management systems are designed, implemented and
411 effectively applied needs to be defined and then knowledge management procedures adopted
412 may reside in the individual, the group or increasingly be embedded in artificial intelligence
413 applications in the manufacturing process. The contribution to the literature of this paper is to

414 recognise this situation, where vulnerabilities can occur and identify ways in which
415 organisations can address knowledge retention policies with particular emphasis on food safety
416 related knowledge

417 **5. Discussion**

418 Understanding how unintentional organisational memory loss is prevented at the
419 individual, organisational or inter-organisational supply chain level is critical to the delivery
420 of effective food safety governance from field to fork. Organisations from regulators, third
421 party certification companies and businesses operating in the supply chain need to ensure that
422 knowledge is retained within the organisational and inter-organisational memory so food
423 safety risk is effectively managed. Collective, socially embedded knowledge must be valued
424 by the organisation as a key asset and is a mitigation strategy to overcome the risk associated
425 with localised memory loss where knowledge is retained in one individual or a siloed dataset
426 or knowledge repository. Knowledge management comprises elements of organisational
427 learning, knowledge manufacture and knowledge collation and curation arrangements and
428 interfaces with, and is informed by, organisational culture. Codified knowledge, linked to food
429 products and ingredients is embedded in specifications, procedures and protocols that must
430 remain contemporary and extant. Instrumental knowledge reside with given individuals that
431 have received previous training or had experience of non-compliance in the past, either within
432 the organisation, across food safety governance structures or the wider supply chain. Treleaven
433 and Sykes (2005, p.353) argue that “situated and heuristic organisational knowledge is
434 vulnerable to marginalization, and hence loss, as organisations seek to codify knowledge into
435 generalisable abstractions.... these losses of organisational knowledge are the effects of re-
436 organising around corporate managerialism without attention to multi-vocality and differential
437 evaluations of worth.” Furthermore, where organisational knowledge resides in single

438 individuals, organisations need to recognise that such knowledge may fade over time or lose
439 its value as supply chain practices change and evolve i.e., organisations need to recognise that
440 memory decay can occur and if this is not prevented, it will result in organisational amnesia.
441 To reduce the risk of knowledge loss through organisational amnesia, knowledge management
442 systems must be in place that include a knowledge retention policy. The policy must consider
443 people related factors such as age, health, sufficiency of holiday or sickness cover, and the
444 willingness of the individuals concerned to share their knowledge as they all mediate
445 organisational knowledge retention (Jennex, 2009; Jennex & Durcikova, 2013). Levallet and
446 Chan (2019) suggest that memory loss is inevitable if appropriate information technology (IT)
447 and non IT knowledge transfer mechanisms are not in place, i.e., if knowledge retention relies
448 on the individual and their willingness to share, and their ability to be consistent in their
449 practices, so such practices is vulnerable to human error. Therefore, effective IT assessment
450 processes need to be implemented by food organisations especially where information is
451 retained on individual off-line systems or stand-alone equipment.

452 Organisations should conduct knowledge mapping exercises at regular intervals,
453 working across the organisation and with their supply base to confirm the explicit knowledge
454 defined and captured in formal food safety management systems is valid and appropriate.
455 When undertaking a food safety knowledge audit, knowledge assets (knowledge, data,
456 information) aspects of the internal and external environment, organisational culture and
457 values, organisational politics and organisation policies, should be reviewed and a gap analysis
458 and system weakness assessment completed (Ayinde, Orekoya, Adepeju & Shomoye, 2021).
459 Ayinde et al. (2021, p.93) assert that a knowledge audit “investigates, diagnose, analyses the
460 current corporate knowledge, and identifies the gaps in the corporate knowledge and provide
461 future solutions to the knowledge gaps in order to achieve the organisational objectives and
462 also add value to the organisation.” Further, there needs to be organisational and employee

463 recognition that tacit food safety knowledge arising from observation and experience of both
464 good and bad performance in the past may have been internalised, and be hidden especially if
465 it is linked to power dynamics (Wipawayangkool, & Teng, 2016). Implementing protocols to
466 invest in people and team-building, ensure job satisfaction and implement processes to reduce
467 stress or burnout will aid tacit knowledge retention and dissemination (Wipawayangkool &
468 Teng, 2016; Manning, 2020), and reducing staff turnover will reduce the risk of organisational
469 amnesia.

470 In summary, for organisations to retain explicit and implicit knowledge they need to
471 develop appropriate practices whereby organisational staff feel able to identify, codify and
472 share their experiences, including instances of previous system and product failure and the
473 associated organisational knowledge that was gained as a result. This means the organisation
474 must adopt a knowledge management and retention approach that destigmatises failure (Marsh
475 & Stock, 2006), and sees instances of food safety non-compliance if they occur in the business,
476 at their supplier or within food supply chains as a knowledge acquisition and learning
477 opportunity. This paper has presented a case study that shows repeated incidents of a known
478 food safety concern, the presence of Sudan dyes in food. Stemm, Bofinger, Cliff & Hassall
479 (2018) argue that “the recurrences of the same or similar incidents suggest a failure to learn
480 from previous events,” what is described in this paper as supply chain déjà-vu. Two
481 propositions were proposed in this research:

482 Proposition 1. There is an inter-relationship between organisational amnesia,
483 organisational memory decay, and supply chain déjà-vu.

484 Proposition 2. A knowledge retention policy is an essential element of a food safety
485 management system.

486 There is an inter-relationship between organisational amnesia, organisational memory
487 decay, and supply chain déjà-vu and all actors in the supply chain need to recognise these
488 vulnerabilities and implement effective risk management processes. The use of knowledge
489 audits will help organisations to assess the organisational and inter-organisational risk they face
490 and support appropriate mitigation strategies to be employed. A knowledge retention policy
491 will be supported by regular food safety knowledge audits.

492 Organisational approaches that promote the interpretation of existing knowledge
493 considering emergent market and organisational conditions means that organisational
494 knowledge and memory is less likely to be lost, decay or fade (Marsh & Stock, 2006). Effective
495 knowledge retention policies have three stages: effective defining of the scope of the retention
496 policy [for example, food safety management systems or wider knowledge within the
497 business]; formal planning, documenting and implementing the policy, and then a critical
498 reflection stage (the knowledge audit) that allows knowledge to be integrated back into the
499 organisational memory to retain best practice and adaptability (Levy, 2011). One event where
500 a knowledge retention policy may need to be reviewed and changes implemented is during
501 downsizing to retain critical skills, capabilities, experience and knowledge within the
502 organisation and to prevent a loss of service or product quality or a reduction in productiveness
503 and efficiency (Schmitt, Borzillo & Probst, 2012). Examples of downsizing or pivoting of food
504 businesses are when there are supply chain shocks such as COVID-19. Supply chain shocks
505 impact on businesses causing them to shed staff in key positions and ill-health can cause staff
506 emergency absence (with the risk of organisational amnesia especially with tacit knowledge)
507 and labour shortages more generally leading to increases in overtime, reducing cover of key
508 posts or alternatively reducing hours of working (Hailu, 2020; Gilbert-Wood et al., 2021).
509 Sitlington (2012) asserts that whilst managers implementing downsizing perceive that formal
510 knowledge sharing has the primary role and that informal social networks have a lesser role for

511 the employees affected, the opposite is the case, i.e., social knowledge (Shin, 2004) is of
512 significant importance in maintaining organisational performance. The limitation to this paper
513 is that it provides a conceptual rather than an empirical exploration of the research propositions,
514 however, the research provides a theoretical framework to undertake such empirical work.

515 **6. Conclusion**

516 Whilst the “who, what, when and how” of food safety management is often strongly
517 defined in food safety plans, and associated food safety management systems, the “why” aspect
518 of food safety management is less strongly emphasised. The knowledge associated with historic
519 validation processes and the development of tacit “know-how,” as a result of previous food
520 safety compliance, or incidents, can become much less tangible over time. A failure to capture,
521 share and utilise this knowledge, or maintain its contemporary value is a risk to individual
522 organisations, and to wider public health. This paper has considered aspects of unintentional
523 knowledge loss, sought to characterise the problems and highlight the beneficial roles of food
524 safety knowledge management systems, knowledge retention policies and the role of
525 knowledge audits to reduce food safety risk. This research is of value to industry and
526 researchers as they consider knowledge management and knowledge retention policies in the
527 future and in the current transition from paper based, and human based repositories to
528 increasingly digitised, curated and shared knowledge repositories. The role of third party
529 certification processes is also important to verify that such knowledge management systems
530 are in place and are effective. Research in this area needs to consider how such knowledge
531 management and knowledge retention strategies can effectively mitigate for and where possible
532 eliminate the risk of unintentional organisational forgetting. More research could be undertaken
533 to identify best practice for knowledge mapping and associated knowledge audits in food
534 businesses and how they can be effectively verified by first, second and third parties. The use

535 of storytelling techniques to capture tacit food safety knowledge is still in its infancy, but is
536 worthy of further research exploration so that knowledge management tools can be developed
537 for food organisations to minimise unintentional knowledge loss.

538

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835 **Table 1. Sudan azo dye related notifications in the RASFF database (2001-2009)**

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Year	No. of original notifications	No. countries affected	Countries	Potential sources	Sudan dye
2001	1	3	Austria, Germany, United Kingdom (O)	chilli	Sudan I
2002	(no notifications)				
2003	119	68	Albania, Austria, Australia, Bangladesh (O), Belgium, Bosnia and Herzegovina, Bulgaria, Cameroon, Canada, Chile, China (O), Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Finland, France, Gambia, Germany, Ghana, Gibraltar, Greece, Hong Kong, Hungary, Iceland, India (O), Ireland (O), Israel, Italy (O), Japan, Latvia, Lebanon, Lithuania, Luxembourg, Malaysia (O), Malta, Mexico, Moldova, Morocco, Netherlands, Nigeria, Norway, Pakistan (O), Portugal, Poland, Portugal, Romania, Serbia and Montenegro, Seychelles, Sierra Leone, Singapore (O), Slovakia, South Africa (O), Spain, Sudan, Sweden, Switzerland, Tanzania, Taiwan, Thailand (O), Turkey (O); Ukraine, United Arab Emirates (O), United Kingdom (O) United States, Venezuela (O)	chilli, paprika, pepper, masala (mixed spice),	Sudan I; Sudan IV
2004	270	63	Angola, Australia, Austria (O), Bangladesh (O), Belgium (O), Burkina Faso, Canada, Cape Verde, China (O), Colombia, Croatia, Cyprus, Czech Republic (O), Denmark, Djibouti, Dominican Republic, Ethiopia (O), Estonia, Egypt (O), Finland, France (O), Germany (O), Ghana, Greece, India (O), Iraq, Ireland, Italy (O), Japan, Jordan (O), Latvia, Lebanon (O), Lithuania (O), Luxembourg, Malaysia (O), Malta, Mexico, Morocco (O), Netherlands (O), New Caledonia, Niger, Nigeria (O), Norway, Pakistan (O), Poland (O), Portugal, Republic of North Macedonia, Réunion, San Marino, Saudi Arabia, Sierra Leone (O), Slovakia (O), South Africa (O), Spain (O), Sweden (O), Switzerland, Syria (O), Turkey (O), Ukraine, United Arab Emirates (O), United Kingdom (O), United States (O), unknown origin (O)	Chilli, curry powder, palm oil, paprika, pepper, masala (mixed spice), sumac, turmeric	Sudan I; Sudan IV
2005	187	68	Albania, Andorra, Angola, Austria, Bahamas, Bahrain, Belgium, Bermuda, Bosnia and Herzegovina (O), Brazil, Canada, Cape Verde, China (O), Côte d'Ivoire (O), Cyprus (D), Czech Republic, Denmark, Falkland Islands, Finland, France (O), Gambia (O), Germany (O), Ghana (O), Gibraltar, Greece (O), Grenada, Hungary, Iceland, India (O), Indonesia, Ireland, Israel, Italy (O), Latvia, Lebanon (O), Lithuania (O), Luxembourg, Malawi (O), Malaysia (O), Malta, Mauritius (O), Mozambique, Netherlands (O), Nigeria (O), Norway, Pakistan (O), Poland (O), Portugal, Russia (O), Serbia and Montenegro, Sierra Leone (O), Singapore, Slovakia, South Africa, Spain (O), Sudan (O), Sweden, Switzerland, Syria (O), Tanzania, Togo (O), Turkey (O), Ukraine (O), United Arab Emirates (O), United Kingdom, Uzbekistan (O), United States, unknown origin (O), Vietnam	Chilli, curry powder, palm oil, paprika, pepper, masala (mixed spice), turmeric	Sudan I; Sudan IV; Para Red
2006	50	30	Austria, Belgium, China (O), Cuba (O), Cyprus, Czech Republic (O), Denmark, France, Germany (O), Ghana (O), Greece (O), Hungary, India (O), Italy (O), Lebanon (O), Netherlands, Nigeria (O), Norway, Pakistan (O), Republic of North Macedonia (O), Romania (O), Russia (O), Slovakia, Spain, Sweden, Togo (O), Turkey (O), United Arab Emirates, United Kingdom (O), unknown origin (O)	Chilli, curry powder, palm oil, paprika, pepper, masala (mixed spice), turmeric	Sudan I; Sudan III; Sudan IV; Sudan 7B; Sudan Red G; Para Red
2007	31	24	Bangladesh (O), Belgium, Cameroon (O), Denmark, Egypt (O), Germany (O), Greece (O), Egypt (O), France, Ghana (O), Italy, Jamaica (O), Jordan (O), Lebanon (O), Malaysia (O), Mexico (O), Netherlands, Russia (O), Spain (O), Sweden, Syria (O), Tanzania (O), Turkey (O), United Kingdom, unknown origin (O)	Chilli, curry powder, palm oil, paprika, pepper, mixed spice, turmeric	Sudan I; Sudan IV; Sudan Red B
2008	25	24	Albania (O), Bangladesh (O), Belgium, Chile (O), China (O), Egypt (O), France, Germany (O), Ghana (O), Greece, Guinea (O), India (O), Ireland, Italy, Latvia, Netherlands (O), Nigeria (O), Poland (O), Russia (O), Senegal (O), Spain, Togo (O), Turkey (O), United Kingdom	Chilli, curcumin, curry powder, palm oil, paprika, pepper, mixed spice,	Sudan I; Sudan IV; Sudan Red G; Sudan Orange G; Para Red
2009	25	20	Belgium, Bolivia (O), Denmark, Germany, Georgia (O), Ghana (O), Greece, India (O), Ireland, Lebanon (O), Nigeria (O), Norway, Pakistan (O), Portugal (O), Senegal (O), Spain, Switzerland, Turkey (O), United Arab Emirates (O), United Kingdom	Chilli, curry powder, palm oil, paprika, pepper, saffron.	Sudan I; Sudan IV; Para Red
2010	20	23	Austria (O), Belgium, China (O), Denmark, France, Germany, Georgia (O), Ghana (O), Greece, India (O), Ireland, Kosovo (O), Lithuania, Luxembourg, Netherlands, Nigeria (O), Pakistan (O), Senegal (O), Spain (O), Turkey (O), South Africa (O), Switzerland, United Kingdom	Chilli, curry powder, palm oil, paprika, pepper, mixed spice,	Sudan I; Sudan III; Sudan IV

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2011	18	22	Austria, Belgium, British Virgin Islands (O), China (O), France, Georgia (O), Germany (O), Ghana (O), Greece, Guinea (O), Ireland, Italy, Latvia, Netherlands, Pakistan (O), Russia (O), Spain, Sweden, Switzerland, Tunisia (O), Turkey (O), United Kingdom	adzika sauce, chilli, curry powder, paprika, pepper, sumac, spices, tomato sauce, turmeric	Sudan I; Sudan IV; Sudan Red G
2012	5	19	Austria, Belgium, China (O), Denmark, Finland, France, Germany, Ghana (O), Latvia, Lithuania, Mali (O), Mauritius (O), Netherlands, Poland, South Korea (O), Spain, Sweden, Switzerland; United Kingdom	Curry, palm oil, spices	Sudan I; Sudan IV
2013	3	12	Belgium, Finland, France, Germany, Ghana (O), Italy, Netherlands, Portugal, Senegal (O), Spain, Sweden, United Kingdom	Palm oil, powder seasoning	Sudan I; Sudan II; Sudan IV; Orange II
2014	5	16	Austria, Belgium, France, Gambia, Germany (O), Ghana (O), Greece, Guinea (O), Hungary, Ireland, Lebanon (O), Luxembourg, Netherlands (O), Spain, Sweden, Switzerland	Chilli, curry, palm oil	Sudan I; Sudan IV
2015	11	18	Austria, Belgium, Denmark, Finland, France, Germany, Ghana (O), Greece, Iran (O), Ireland, Italy, Luxembourg, Netherlands, Nigeria (O), Spain, Sweden, Switzerland, United Kingdom	Palm oil, sumac	Sudan I; Sudan IV
2016	3	4	Belgium, France, Guinea (O), Senegal (O)	Palm oil	Sudan III; Sudan IV
2017	12	23	Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Ghana (O), Greece, Iceland, India (O), Ireland, Italy, Netherlands, Nigeria (O), Poland, Portugal, Spain, Sweden, Switzerland, Ukraine, United Kingdom	Chilli, egg powder, palm oil,	Sudan I; Sudan IV; Fast Garnet; Orange II; Rhodamine II; Acid Yellow 36
2018	11	12	Belgium, Estonia, France, Finland, Georgia (O), Germany, Ghana (O), Guinea (O), Netherlands, Switzerland, United Kingdom, unknown origin (O)	Chilli, palm oil, spice mix	Sudan I; Sudan III; Sudan IV; Para Red; Sudan Red G
2019	14	30	Austria, Australia, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Georgia (O), Ghana (O), Guinea (O), Guinea-Bissau (O), Ireland, Italy, Malta, Netherlands, Nigeria (O), Norway, Poland, Portugal, Senegal (O), Spain, Sweden, Switzerland, Turkey (O), Ukraine, United Kingdom, unknown origin (O).	Palm oil, pepper, spices	Sudan I; Sudan IV; Para Red
Total	810				

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850 **Table 2. Case study details for the 2005 Premier Foods Incident**

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Incident	Details
Identification	In February 2005, a food scare associated with Sudan I was initiated in the UK involving around 575 retail and wholesale products from ready meals to sauces (Johnson Quick, Parry & Parry, 2010). A Worcestershire sauce produced by Premier Foods through one of its ingredients (chilli powder) was shown, following testing in Italy, to be contaminated by Sudan I (Dani & Deep, 2009). The recall reportedly cost £100 million (Davies, Baines & Turner, 2005) and at the time was the largest food recall in UK history (Lofstedt, 2010).
Investigation and recall	Investigations highlighted that in September 2002 a British importer, East Anglia Food Ingredients, sold off a consignment of the chilli powder to flavourings firm Umbar Rothon who then at some point sold the chilli powder to Premier Foods (Irish Times, 2005). In 2003, East Anglia Food Ingredients issued a product recall notice for some batches of chilli from a consignment that were found to contain Sudan I (BBC, 2005a, 2005b). However, some batches of this chilli powder had been used in food processing including the batch(es) that went to Premier Foods. An investigation ensued and this led to the subsequent recall including at least 12 official notifications within the RASFF database (RASFF, nd).

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