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

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Abstract

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

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

Key findings and conclusions: Three aspects of organisational forgetting are considered in the context of food safety: organisational amnesia, organisational memory decay, and supply chain déjà-vu. The first two aspects operate at the organisational level and the third at the supply chain level. To overcome the risk of unintentional loss, organisational and interorganisational knowledge needs to be effectively mapped and a knowledge retention policy needs to be developed, implemented and maintained that addresses all types of organisational and interorganisational knowledge, but especially food safety knowledge.

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

Highlights

- Loss of knowledge essential to manage food safety is a risk for all food businesses
- There is a lack of previous research on unintentional food safety knowledge loss.
- Knowledge loss can occur at organisational and supply chain levels.
- Knowledge retention policies are a key aspect of food safety management.

1. Introduction

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

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

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

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

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

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

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

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

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

2. Conceptual approach

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

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

3. Organisational memory

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

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

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

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

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

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

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

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

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

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

4. Organisational forgetting

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

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

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

4.1 Organisational amnesia

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

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

4.2 Organisational memory decay

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

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

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

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

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

4.3 Supply chain déjà-vu

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

3.4 Case study: European Sudan azo dye food incidents

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

Take in Table 1

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

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

Take in Table 2

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

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

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

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

5. Discussion

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

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

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

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

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

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

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

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

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

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

6. Conclusion

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

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

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

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

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				

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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