Use of Food Safety and Quality Measurement Data to Determine the Food Safety Culture within a Food and Drink Manufacturing Business: An Historical Analysis.

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Introduction

Food-safety culture (FSC) is increasingly important within the food and drink manufacturing and processing (FDMP) industry and forms underlying foundations of a food safety management system (FSMS)[1]. Measurement and improvement requirements have now been introduced into legislation, customer requirements and Global Food Safety Initiative recognised certifications[2,3].

All FDMP businesses regardless of size are required to assess FSC with the addition of FSC into the Codex Alimentarius[4]. Pre-developed and/or commercial measurement mechanisms may be costly and inaccessible for all businesses. An alternative approach for FSC assessment in the diverse food industry has been the development of bespoke measurement approaches. Such bespoke measurement strategies developed within FDMP businesses are increasingly commonplace, however, there are limitations associated with this, including appropriate expertise and resource for FSC measurement, research and data analysis.

Research suggests to achieve a better understanding of FSC, an in-depth analysis of multiple data types alongside quantitative questionnaire data[5] is required for a holistic understanding of the baseline FSC in a business[6]. Various FSC measurement models have been developed; some relying on a systems approach and others triangulation methodology[7].

Aims

Assessment of the baseline FSC of a low-risk FDMP business using existing historical FSMS metrics to identify of strengths and areas for improvement associated with FSC dimensions.

Methodology

- Historical business FSMS metrics were collated, including customer complaints, exceptions, non-conformances and stock on holds.
- Each metric was linked to FSC categories and dimensions[6].
- Descriptive statistics were used to identify frequencies in each output category associated with FSC dimensions and parameters.
- Ethics approval obtained from the Healthcare and Food Ethics Committee at the Cardiff School of Sport and Health Sciences (Ethics reference number: PGT-4360). Informed consent was granted from the company to conduct this study.

References

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Results and Discussion

Existing business FSMS metrics were collated including company documentation relating to food safety management. Business strengths and areas for improvement, in relation to the FSC parameters and dimensions[6], were identified as part of this analysis. In addition, areas for focussing business improvement have been determined.

Complaints

Complaints metrics include contacts from end consumers regarding quality or food safety issues. Findings from customer complaints indicate key insights into potential food-safety issues and provide often the sole feedback obtained post-production. Monitoring and analysis of complaints demonstrated consideration of key FSC dimensions. A gradual upwards trend was noted in the ratio of complaints to sales. It was noted from analysis of the annual complaints reports that ***targets*** were clearly documented, but there was a lack of a clear, communicated improvement ***strategy***. With increasing sales in the business, emphasis on efficiency and outputs could lead to a decrease in food safety and quality standards, indicating need for improvement of ***control*** associated with FSC. A lack of clear ***strategy*** for improvement may affect the achievability of the ***targets*** set by the business.

Associated FSC Dimensions
Teamwork
Consistency
Targets
Strategy
Awareness

Exceptions

Exceptions metrics are documented times that the business has deviated from specification during manufacturing. Frequencies were calculated for each department over the past four years (see Table 1). Variation was determined between departments and in the past year, there has been a decrease in exceptions created from all departments. This demonstrates a recent increase in ***consistency*** of food safety and quality standards. The business should aim to maintain these levels.

Associated FSC Dimensions
Empowerment
Control
Consistency
Strategy
Foresight

Table 1. Annual frequency of exceptions per Department, 2018-2021.

	Dep 1	Dep 2	Dep 3	Dep 4	Dep 5
2018	18	10	4	14	7
2019	10	1	0	18	13
2020	18	0	0	9	12
2021	3	0	0	1	3

Non-Conformances

Non-conformances are issued and recorded internally as a result on non-compliance and externally as part of customer and certification audits.
Non-conformances accounted for 22% of collated FSMS metrics. Frequent non-conformances were analysed in alignment with key FSC dimensions. Non-conformances relating to ***investment*** and ***training*** accounted for 36% of non-conformances for the past 13 years.

Associated FSC Dimensions
Training
Communication
Systems
Premises
Learning
Foresight

Frequent non-conformances related to certain FSC dimensions indicates an area for improvement within the business e.g. Out of specification product due to lack of adherence to business quality procedures may indicate a need to investigate ***training*** within the business. Consistent issues relating to dimensions would also demonstrate a lack of ***control*** and ***learning***.

Stock on Holds

Associated FSC Dimensions
Training
Empowerment
Control
Strategy
Foresight

Stock on hold metrics include records of all raw materials, work in progress or finished goods that have been placed on hold due to potential food safety, integrity or quality issues. The frequency of stock on holds were analysed per year. Food safety related stock on holds were identified and in the past two years (2020-21), the percentage of stock on holds relating to food safety and quality standards had increased.

This not only implies a need for improvement within the ***premises***, ***training*** and ***systems*** dimensions of FSC as these could relate to machinery failures, improper systems or training in place, but also a need to improve ***learning*** and the adoption of this within the business' FSMS.

FSC Strengths

Awareness, Proactivity: FSMS proactively manages food safety risks within the business.

Metrics: Availability of FSMS measurements, used to improve food safety standards within the business.

Co-ordination, Consistency: Ensuring food safety and quality issues are managed consistently.

FSC Areas for Improvement

Investment, Training, Systems: Resource allocated to food safety and quality improvement.

Control: Ensuring FSMS is capable of controlling food safety and quality hazards.

Learning: Using past experiences to develop the business' FSMS.

Conclusions

- **Cumulatively, an evaluation of existing metrics in a low-risk FDMP business has identified FSC strengths and areas for improvement.**
- **Targeted food safety interventions related to specific FSC dimensions and parameters will contribute to ongoing development of a positive FSC within the business.**
- **Evaluation of business metrics data will contribute to the development of a mechanism used to evaluate FSC improvement in the business using existing data and documentation.**

Munich GERMANY 4-6 May 2022 IAFP'S EUROPEAN SYMPOSIUM ON FOOD SAFETY
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