Towards Developing a Food Safety Model: An Insider Research Approach

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Introduction

On the 23 June 1877, Benjamin Disraeli, then prime minister of the UK, addressed the nation stating that, "the health of a people is really the foundation upon which all their happiness and all their power as a state depend". This profound statement is equally true today from a public health and well-being viewpoint.

Insider action research is used to develop a food safety model in a business environment. The author, who is a full-time employee of Premier Dairies consumer foods, carried out research on the food safety area of the business, as an insider researcher. Premier Dairies is a consumer-driven fresh-food business with over 100 years of a proud tradition of servicing the consumer with fresh food products. The author was requested to head up the Project Hero multi-disciplined steering committee. One of the primary objectives of this project is to research the importance of food safety to the consumer. Full access for food safety information was agreed at steering-committee level and the project was driven from board level. The author was recognised as a person with management change skills in the consumer business. The company was not concerned about confidentiality, patent or copyrights for this food safety project. Premier Dairies expected competitive advantage to be obtained from a food safety and marketing perspective.

Of increasing importance to consumers are issues of food safety and traceability. Consumers have become more aware of food safety and traceability as a result of increasing public concern with Bovine Spongiform Encephalopathy (BSE), the human killer bacterium E.Coli 0157H7, salmonella in eggs and chickens, genetically modified foods, growth hormones, antibiotics and contamination with other such dangerous substances as dioxins and benzene. They now expect adequate and effective control systems in the food chain to minimise the risk of rogue proteins, pathogenic bacteria, toxins, antibiotics and

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other hazardous substances. Food safety and traceability must be clearly directed at protecting the consumer, due to consumers' growing awareness of the potential health dangers of food.

Globalisation of food companies has given rise to large centralised distribution depots, which has lengthened the food chain and further increased the risk of contamination. The advent of mass-produced convenience foods means people take less time and care in food preparation. There is an increasing demand for ready-to-go foods, resulting in non-traditional outlets, for example forecourts, serving such food products. An increasing trend of more people eating outside the home is resulting in a higher proportion of people at risk to food scare outbreaks and illness, as detailed in the Food Safety Authority Survey of 2002.

Background to Developing a Food Safety Model

Lucretius (BC, 99–55) the Roman poet and philosopher stated: "What is food to one man may be fierce poison to another". This is still a highly relevant statement, as recent food scares by dioxins, genetically modified foods, BSE and foot and mouth epidemics caused consumers to be more concerned about the possibility of being poisoned by the food they eat. From time immemorial, man has worried about mistakes and their consequences. The Babylonian king Hommurabi (about 1700 BC) heralded today's notion of product safety, when consequences of a building falling were laid down. In 1951, Juran published his first edition of *Quality Control Handbook*, which became the bible for quality control during this period. In 1956, Armond Feiggenbaum developed Juran's ideas further by introducing the concept of Total Quality Control (TQC). TQC fostered the principle of inter-functional teams that would share the responsibility for all phases of design, manufacture distribution and marketing of a product. In the late 1950s, Tauchi, a Japanese quality engineer, developed the now famous Toyota system with such concepts as Just in Time (JIT) and Quality Circles (QC). Kuoru in 1985 focused on the philosophies and principles of quality assurance in the commercial world. The International Standardisation Organisation (ISO) began operations in 1947 with the following mission:

> ... to promote the development of standardisation of related activities in the world with a view to facilitating the international exchanges of goods and services and to developing co-operation in spheres of intellectual, scientific, technological and economic activity.

The ISO released its first core series of five quality-assurance standards in 1987: ISO 9000, ISO 9001, ISO 9002, ISO 9003, ISO 9004. The ISO series was revised in 1994 to harmonise elements of quality systems and to include a customer focus. ISO 9004, Part 2 in particular, deals with service quality for business. More recently, ISO 14001 is the common environmental standard.

The Occupational Health and Safety (OHAS) 18001 standard deals with occupational health and safety requirements. ISO is now an internationally recognised standard for all areas of consumer quality assurance.

Hazard analysis is a critical assessment of all potential risks associated with the food chain to protect human consumption from the primary producer to the consumer. The pathway to the Hazard Analysis and Critical Control Point (HACCP) system started in 1959, when the Pillsbury Company was asked to produce a food that could be used under zero gravity conditions in the space capsule. NASA required Pillsbury to keep adequate records to ensure that all the raw materials could be traced back to source. HACCP is the systematic study of ingredients, processing, handling, packaging, storage, distribution and consumer use. This analysis enables us to identify the process flow together with critical areas that might contribute to a safety hazard. Information of this nature allows us to determine the Critical Control Point (CCP) of the food chain under investigation (Pierson and Corlett, 1992). The definition of a CCP is "any activity in the food chain from raw material to finished product where the loss of control can result in an unacceptable food safety risk". Particular areas of concern are pathogens, toxins, antibiotics, dioxins, heavy metals, prions, pesticides and other hazardous chemicals in food products. The HACCP method has been used by the US National Academy of Sciences to promote food safety and traceability principles since 1985.

The generic HACCP system consists of seven principles that outline how to establish, implement and maintain a HACCP plan for any operation under examination. The following is a summary of the seven HACCP principles:

1. conduct a hazard analysis;
2. determine the CCP;
3. establish critical limit(s);
4. establish a system to monitor control of the CCP;
5. establish corrective action to be taken when monitoring indicates that a CCP is not under control;
6. establish proper procedures for verification to confirm that the HACCP system is working effectively;
7. establish documentation concerning all procedures and records appropriate to these principles and their application.

It is vital that a HACCP team be assembled consisting of experts in food production who are well informed on food safety and traceability measures.

Total Quality Management (TQM) is a comprehensive approach to improving competitiveness, effectiveness and flexibility through planning, organising and controlling each activity. Gavin (1970) proposes a list of seven critical dimensions of quality that serves as a useful framework for strategic analysis: performance, reliability, conformance, durability, serviceability, aesthetics and perceived quality. TQM requires a mindset change starting with top management, where a total commitment to quality needs to be demonstrated

with each individual playing their respective role (Porter and Rayner, 1992). TQM is concerned with changing attitudes, behaviour and skills so that the very culture of the organisation becomes one of preventing quality failure and doing the right thing right – first time, every time. Oakland (1993) outlines five principals of TQM: customer, culture, commitment, communication and process. Cullen and Halligum (1987) detailed the continuous improvement cycle for TQM systems. Consumer focus is clearly the primary driver for developing and improving products in the food business.

Good Manufacturing Practice (GMP) is based on the principle of continuous improvement, simplicity, the elimination of waste, minimising process variation and producing safe products. All employees are potential problem solvers, if adequately trained and focused to identify problems and implement improvements in the food chain. Plant and office layouts should be kept compact and safe to ensure low inventory. This will facilitate productivity and effectiveness in the business (Huge and Anderson, 1988). In 1986, Shonberger stated, "GMP is not merely arranging resources in order to produce goods and services, but it is marshalling resources for continual improvement". Clean production and waste minimisation is imperative in any good manufacturing operation. Premier Dairies launched a World Class Manufacturing (WCM) continuous improvement programme in January 1997 to obtain a best practice operation for the consumer products business unit.

The Elements of a Food Safety Model

The key components or features of a food safety model are traceability, hygiene, food legislation, managers' decision-making process, health and safety in the workplace, consumer culture and new product development.

Traceability

Traceability is defined as "the ability to trace both products and activities as core entities in the food chain system" (Kim et al., 1995). Traceability and adequate labelling of food products is now an essential element of food safety, because of the increase in genetically modified foods, food additives and food scares. When food is processed, it is necessary to identify the source of raw materials used in the manufacture of the batch. A practicable way to check a food chain system is to take samples of finished product and carry out a systematic audit back to the raw materials and packaging. Moe (1998) described traceability as the "ability to monitor a product through the total food chain". Liquid milk, for example, has the following food chain cycle: primary dairy farm, milk assembly, processing, distribution, retailing and consumer.

Hygiene

The word hygiene is Greek in origin and comes from *Hygeia*, the Greek goddess of health. Since the earliest times, hygienic codes of practice have been in operation to ensure the safe production of food. Codes of practice (COP)

have a major role to play in helping the food industry to protect the consumer and comply with our food regulations (EU Hygiene and Foodstuffs Regulation 2000). The EU food policy is built on stringent food safety standards which serve to protect and promote the health of the consumer. The EU Commission's White Paper on Food Safety (2000) advocates "[a] co-ordinated and holistic approach towards hygiene as an essential element of food safety". The EU Council Directive 93/43/EC outlines the rules for hygiene of foodstuffs and the procedures for verification and compliance with these rules. However, the primary responsibility for food safety rests with industry. Primary producers and suppliers must operate self-checking quality-control procedures. Codes of practice protect the consumer by providing safe products and enables industry to optimise on scarce resources. Continuous improvement hygiene programmes ensure that codes of practice are reviewed on an ongoing basis in the interest of food safety and traceability.

Food Legislation

Food legislation is documented and reviewed by Doyle and Smith (1989), O'Rourke (2001) and in Food Safety Facts 2003, with a particular focus on food safety and traceability. The Food Safety Authority of Ireland was established in January 1999 to enforce legislation and to promote a greater awareness of the issues involved in food safety. The Food Safety Promotion Board was set up under the Belfast Agreement on the 2 December 1999. This board provides information and advice on food safety matters and runs public awareness programmes on the importance of food safety. The European Food Safety Authority (EFSA) came into operation through the EU 178/2002 Directive on the 28 January 2002. The main aims of EFSA are safety risk assessment and communications on the Rapid Alert System (RAS) to consumers and industry.

Decision-Making Process for Managers

Managers spend much of their time solving problems and making decisions. Problems occur as a result of dynamic change in the business environment. The decision-making process involves evaluating, selecting and implementing a course of action for problem solving. Decision making is defined as making a choice between alternatives (Churchman, 1968). Simon (1960) viewed decision making as a three-stage continuous process, beginning with intelligence, followed by design and choice. A typical decision-making situation has three potential outcomes: certainty, risk and uncertainty. Very few decisions are made with perfect information, because obtaining such information is attempting to control future events, which is impossible. Successful management depends on the ability to predict and control human behaviour in a given environment and thus optimising on positive cash flows and profits.

More than ever, insight into the future of business is the difference between success and failure. Decision-making analysis concentrates on the value of information and the cost of obtaining such information. The purpose of a

decision model is to provide decision makers with insights regarding the decision-making process in such a way as to enhance their overall intuitive decision-making ability. Decision models are important for food safety risk assessment and the development of quality safety systems. Lindbloom (1957) postulated the "muddling through" decision-making process in an organisational environment. Decision models should have a manageable number of variables, reflect reality and should not be over-simplified. Executive decision-making styles need to be included in the development of the model by the researcher. The decision model should be viewed as one of many possible inputs into the eventual decision. Gorry and Morton (1971) outlined three decision-making types: structured, semi-structured and unstructured for operational and management controls and strategic planning. Byrd and Moore (1982) have reviewed the application of the following models in a business environment: mathematical models, materials requirement planning, regression models, critical path method, project evaluation and review technique, decision tree, probabilistic simulation models, deterministic simulation models, linear programming and strategic models. The decision-making process may be viewed in terms of normative (prescriptive) and descriptive models based on the concept of rationality. The normative model defines how a decision maker should act to make decisions, while the descriptive approach describes how decisions are actually made. The objective of this research is to develop a descriptive food safety model based on rationality and practical business experience.

Health, Safety and Welfare

Safety, health and welfare in work are well documented by Byrne (2001). There is now a need to ensure health, safety and welfare in the workplace operates at the highest level consistent with technical development and economic social progress. There are now requirements that a health, safety and welfare policy mission statement is agreed by the business and fully implemented by safe codes of practice. It is essential that EU and Irish health, safety and welfare legislation be adhered to at the highest practicable level to create a safer workplace environment (Safety, Health and Welfare Act, 1989). The operation of working partnerships between employers and employees on health and safety management systems helps to prevent injuries and ill health in the workplace and contributes to improved work practices. Animal health and welfare is based on the principles of humane care and use. This necessitates the provision of essential food, water shelter and healthcare, together with the alleviation of pain and suffering. Consumers feel happier about meat and meat products coming from well-cared-for animals and birds. MAFF Codes of Practice (1991) detail the five freedoms for farm animals as freedom from hunger, thirst, stress, movement and access to shelter. It is important that the best codes of practice are operated, which will satisfy the consumer and produce a quality food product.

Consumer Culture

Culture is the collective memory of society and is continually evolving. Culture has a rich intellectual background involving the wisdom, knowledge, beliefs, customs and skills that are available to members of a society or group. Culture has been defined by Kluckholm and Kelley (1945) as a distinctive way of life of a group of people – their complete design for living. It is a learned and shared way of thinking and acting of a group of people. Consumption choices cannot be understood without considering the cultural context in which they are made.

Culture is the "prism" through which people view products and try to make sense of their own and other people's consumer behaviour. In a consumer culture, a clear focus is given to provide a quality product or service on a consistent basis to the consumer. The objective is to protect consumer health by ensuring that the food consumed meets the highest standards of food safety and hygiene. The people consumer culture philosophy is providing the consumer with a product and service of "quality second to none".

There is a relationship between technological innovation and a changing culture in the area of food safety and traceability. Consumers purchase for the purpose of individual household consumption. They now have more power, because they are in a position to make choices about their individual purchases. There is considerable consumer information available on the range of price and quality of products by using traditional sources as well as the Internet. Healthy, wholesome, pure food and a healthy lifestyle are important for both the consumer and society. Healthy people require less healthcare provision and have a lower frequency of absence from work. Since "the consumer is regarded as king", the action-research approach ensures that the consumer's views are fully taken into consideration in developing a food safety model.

New Product Development (NPD)

The economics and technology of new product development were reviewed by Desrosier and Desrosier (1971). Allen (1993) developed a guide to successful new products for people carrying out NPD work. This approach involves a structured approach from the product concept to commercialisation of the product in the marketplace. Product development involves cross-functional managers from marketing, quality assurance, finance and business development operating as a team. Systematic innovation requires a willingness to look on change as an opportunity. Food safety and quality assurance requirements need to be built into the product under development from the concept stage of the NPD process. Continuous quality improvement is essential in an NPD product cycle to ensure that consumer requirements are achieved from a food safety and hygiene viewpoint.

Research Methodology

Insider research is described by Coghlan and Brannick (2001) as academic research carried out by full-time employees on a particular topic in their own

organisation. Effective insider research conforms to high standards of intellectual rigour, which can be undertaken in the three main research traditions of post-positivism, hermeneutics and action research. Insider research enables the researcher–manager to carry out research on a food safety topic of particular interest to the company. The research, which I will be carrying out in Premier Dairy food business, will be using action research as the main methodology. Action research links methodology, theory, people and practice. Action research is a participative process, where all the members involved in the study participate in the iterative cyclical process. The objectives of action research are about taking action and creating theory about that action (Coghlan and Brannick, 2001; Reason and Bradbury, 2001). The development of theory in action research is achieved by going through a cyclical iterative research process. There are two action research cycles: one is core action research of planning, taking action and evaluating the action taken; the other involves reflecting on the action research of the first cycle. Action research involves participation by people, which ensures a better commitment from everyone involved in the study, together with an invaluable learning process for the company. Action research is a simple basic research-structured approach and gives a better insight as to what organisations are really like (Krim, 1988; Bartunek et al., 2000). Action research combines the notion of academic and practitioner knowledge, together with action about action. Action research approach is a sea change from the more familiar hypothetico-deductive research method previously used by this author.

The author had previous experience as the sole insider researcher (Doyle, 1978) using the more traditional hypothetico-deductive research methodology. The insider researcher used well-equipped company laboratories to investigate the factors affecting somatic cell counting in the biochemistry area of bovine mastitis control. The author made a research paper presentation to the chairman of Shannonside Co-Op and his board on the application and benefits of the research work to the co-operative. The chairman's response was "that this was a well-structured piece of research, which could be used in a practical way to improve the quality of milk supplied to the co-operative" by its milk shareholders. In due course, the research findings were implemented to the benefit of both the co-operative and the member milk suppliers.

Two data-generated techniques were used: consumer focus groups and the Nominal Group Technique (NGT). Consumer focus groups consist of up to twelve suitable people convened to participate on a chosen topic using a facilitator (Greenbaum, 1993). The consumer focus group approach encourages uninhibited spontaneous ideas to be presented by the individuals participating in the group. The consumer focus group sessions are more effective when held in a room with circular seating and a microphone for recording (Hoffel, 1994). Consumer focus groups are a good methodology to explore why people have views and concerns on particular issues, for example food products. When interpreting the results of focus groups, emphasis should be placed on ideas, themes and relationships. The author has had the experience of using consumer

focus groups in Premier Dairies (1999) for idea generation and concept testing in developing new food products. The purpose of involving consumer focus groups was to obtain a detailed insight into issues and concerns of consumers to food safety and traceability (Doyle, 1999).

Individual members participating in the consumer focus groups were randomly selected from an ABCD1 consumer panel (Kotler et al., 1996). A pilot session of a consumer focus group was carried out involving 10 consumers with an age profile of 16 to 75 years. Three separate consumer focus groups involving 9 to 10 consumer participants per session took place on 3 consequent mornings. Each group session convened for up to 2 hours and 40 minutes. The total time duration for the 3 separate group sessions was 8 hours and 25 minutes. The room seating arrangement was semi-circular and tea/coffee was made available to the participants. The main issues and concerns raised at each group session were recorded by the facilitator on a flip chart and further discussed for any clarifications. The following statement was made by the facilitator at the start of each consumer focus group and the purpose of the session was explained: "Identify and define the issues and concerns of consumers on food safety".

The NGT method was used to develop a food safety assurance model involving a multi-disciplined expert group. The NGT was developed by Fox (1989) to obtain benefits from group participation in problem solving in a structured way and controlling dominant personalities. The NGT uses structured rules to generate and prioritise ideas. It involves up to twelve experts participating as individuals in a group session with defined rules to generate a solution to a "nominal question" (Doyle, 1998). The facilitator of the group organises the participants into a semi-circular seating arrangement and encourages ideas and views in writing from them in rotational order. This structured layout ensures that the author-facilitator of the NGT meetings alternates in a clockwise/anti-clockwise rotation with the participants. A flip chart is used by the facilitator to identify and record the main elements of response to the subject under research. The recruitment and selection process of the individual experts for the NGT project focused on both the academic and practical experience required for the food safety research project.

The individuals of the NGT group were selected to include all the relevant necessary disciples of operations, technical, sales, quality and marketing areas of the food business. The functional and industry experience of the management expert group is given in Table 5.1.

This NGT approach ensured optimum input from all the expert participants. It also initiated a learning process for the individual members. The multi-disciplined expert team outlined in Table 5.1 has 171 years of experience in the food business. Each member of the expert group had a third-level degree qualification in one of the following areas: food, agriculture, technology, marketing, quality assurance, sales and food business. The implicit experiential knowledge of the expert group was captured on a real food safety topic in a Premier Dairies environment. Premier Dairies as a company has over 100 years experience in the food business directly serving the consumer.

The "nominal" task set by the author-facilitator at the start of the NGT group session was to "develop and prioritise the essential elements of a food safety model". The members of management who participated in the NGT group meetings were also briefed on the information obtained from the consumer focus group sessions. The purpose of this approach was to ensure that the development of the food safety model was driven with a consumer focus.

Table 5.1: Multi-Disciplined NGT Expert Group

Function	Years' Industry Experience
Procurement Director	28
Operations Manager	14
Quality Assurance Manager	26
Milk Assembly Manager	32
Milk Quality Manager	12
Farm Adviser	10
Milk Quality Adviser	11
Milk Technologist	22
Marketing/Sales Manager	16
Total Years	**171**

Results and Discussion

The first section presents the findings from the consumer focus groups and the final section looks at the findings from the NGT.

Food Safety Issues

The following food safety issues were identified by the consumer focus group sessions:

- mass-produced convenience foods where people take less time and care in food preparation and production;
- increased growth in ready-to-go foods being served from non-traditional retail outlets;
- increased eating outside the home, which gives rise to higher food safety risks;
- higher risk to more people, due to the "greying" population;
- increase in the food chain from production to the consumer;
- increased shelf-life of fresh food products;
- best codes of practice not always followed in the food chain;
- more virulent strains of food-borne bacteria are evolving;
- animal welfare is becoming more important in the primary production of food;
- increased focus on the protection of the environment in food production;
- perception that genetically modified foods are unsafe;

- lack of trust of commercial food scientists, who have a vested interest;
- increased awareness of chemical residues in food;
- awareness of food safety has increased due to awareness programmes;
- emphasis on supplying below-cost food to the consumer, leading to unsafe food;
- perception that a wholesome raw material gave a quality final product.

Food Safety Concerns

The following food safety concerns were identified by the consumer focus group sessions:

- BSE in beef;
- use of illegal substances in livestock production;
- virulent bacterium e.coli 0157h;
- listeria bacteria in soft cheeses and pate;
- inadequacy of food labelling;
- false health claims for some functional food products;
- antibiotic residues in meat and milk products;
- salmonella bacteria in egg and poultry products;
- the development of antibiotic resistance in some human bacteria;
- dioxin levels in food products;
- pesticide residues in food;
- perceived increased food safety and health risks;
- risk of bio-terrorism in the food chain;
- the "people culture" of providing safe wholesome food to the consumer;
- foot and mouth disease in cattle, sheep and pigs;
- poor hygienic food production practices.

Consumer Typology

The following are consumer typologies that were identified from the consumer focus group sessions.

Dismisser

Those in this consumer group have traditional food values, and are defensive about their eating habits and critical of health and safety matters. They are dismissive of health scares and food safety issues:

- "You can take health scares too far."
- "If you took notice of everything that's bad for you, you wouldn't get out of bed in the morning."
- "You would eat nothing if you knew everything that was in the food."

Pragmatist

Consumers in this group are educated and prepared to moderate their habits based on a food scare. They are selective in what foods they eat and keep themselves well informed on any new relevant food innovations.

- "You have to think about these issues, but don't lose sleep over them."
- "You hear about a food scare such as BSE, salmonella or dioxin, you think about it and then change what you have to do."
- "You keep yourself informed on food safety matters and respond accordingly."

Worriers

This group is made up of consumers who are anxious and scared about eating any kind of food and feel doomed with all the food safety issues. They are frightened by health scare issues and are quite particular as to what they eat.

- "It is terrible really, we could all be poisoned and we wouldn't know."
- "You can't take a chance with anything you eat these days."
- "We will all end up with foot and mouth disease."

The NGT expert group which subsequently developed the food safety model took the views of the three consumer groups into consideration. After 3 hours and 20 minutes of the NGT session, a vote was taken to rank the nine elements identified by the group members for the food safety model. This food safety model was clearly driven with a "consumer focus" from the primary producer to the consumer.

The nine elements, Consumer Culture, Health, Safety and Welfare, Traceability, Hygiene, Hazard Analysis Critical Control Point (HACCP), Total Quality Management (TQM), International Standards Organisation (ISO), Environmental Control and World-Class Manufacturing (WCM) are ranked in order of importance and are shown in Figure 5.1.

Figure 5.1: Prioritised Elements of Food Safety Model

The expert group and author-facilitator decided to assemble a further NGT session, which took 2 hours and 45 minutes. This gave individual participants time to reflect on the nine-element model generated in the first session. The

group then established essential sub-elements of the model. The second NGT session took place within two weeks of the first and the results of the sub-elements of the food safety model are detailed below:

Consumer Culture
Food safety statement, food taste, nutritional values, growing consumer awareness, lifestyle changes, changing eating habits, consumer service.

Health, Safety and Welfare
Public health awareness, ageing population, growth of obesity, human health and welfare, human well-being, animal health, animal welfare, food bio-terrorism, pro-biotic foods.

Traceability
Raw material ingredients, safety risk analysis, food training programmes, final product ingredients, food chain length and traceability of raw materials.

Hygiene
Quality control, food preservation, prevention of food spoilage, good hygienic practices, shelf life of product, pest and vermin control, good personal hygiene, good food preparation.

Hazard Analysis Critical Control Point
Good process control, optimum food storage, identifies food intolerances, use of functional foods, and identify critical control points and food hazards.

Total Quality Management.
Continuous quality improvement, effective quality assurance programme, total quality management strategy, management quality circle team.

International Standard Organisation
Food legislation protection, good codes of practice, food inspection procedures, maintenance of the storage cold chain, good food control systems, food conformance analysis, food legislation compliance, consistent quality food.

Environmental Control
Minimise waste disposal, reduce packaging, encourage organic food production, reduce and recycle packaging, energy conservation, sustainable food production, non-pollution of water, land, air and sea.

World-Class Manufacturing
Good manufacturing practice, effective efficient production, high care manufacturing and benchmarking of manufacturing operation.

Conclusion

Insider research is seldom used effectively in commercial or service organisations. The objective of this research is to use insider action research to develop a food safety model in a business setting. A descriptive food safety model is developed as an effective aid to decision makers of quality assurance food safety systems. A food safety research topic was selected by the strategic steering committee of Premier Dairies. A multi-disciplined expert group of full-time Premier employees was involved in the development of the food safety model. With insider research, a full-time employee carries out academic research on a topic of interest in the business. Action research is the main feature of this research project, which interlinks people, theory, methodology and practice. Consumer focus groups and the NGT are used as data generation techniques.

Insider researchers need to have a good understanding of the principles of research in order for the research project to be sufficiently rigorous and effective. The academic supervisor needs to have a clear insight into the research topic and be capable of bridging both theory and practice. My academic supervisor Dr T. Brannick focused me on the importance of the research methodologies and data generation techniques of the project and not just on the results. The author is of the view that the insider research approach opens up rich sites of untapped research in a business environment. The right balance needs to be obtained between academic theory and the operational practice of the business for the particular research topics under investigation.

Consumer focus groups identified important issues and concerns of food safety and traceability. Three consumer typologies of dismissers, pragmatists and worriers were also identified from the consumer focus group research. The information received from the consumer focus groups gives a particular insight into the "psyche" of the consumer and gave a real consumer perspective in the development of the food safety model.

The NGT expert individual member participants were fully briefed on the cyclical iterative nature of action research in developing the food safety model in Premier Dairies. The author was aware of his dual role as senior manager and researcher in the commercial setting of the organisation and at all times attempted to remain impartial and focused. The action research approach was a significant change from the more traditional post-positivism approach previously undertaken by this author and the company, as an insider researcher. The NGT involved twelve multi-disciplined experts participating in a structured group session with defined rules to generate answers to a "nominal question". The members participating in the NGT group session had collectively 171 years' experience in the food industry and each member had the minimum qualification of a third level university degree in their respective discipline. The author-facilitator of the NGT group sessions encouraged ideas and views in writing from the members participating in a structured way to the topic being addressed. The following are the main elements of the food safety model in sequential order: consumer culture; health, safety and welfare; traceability;

hygiene; hazard analysis; critical control points; total quality management; international standards organisation; environmental control; and world-class manufacturing.

The manager/researcher was a direct employee of Premier Dairies as an executive director for 25 years. During this employment period, the author would have obtained an insight into the consumer culture of the business across all the functional departments. However, the manager/researcher was required to use his executive director negotiating skills to obtain marketing information from the Marketing Director necessary for this project. Role duality of manager/researcher needs to be carefully managed to achieve a more rigorous detailed food safety research project. The researcher role was required to achieve academic rigour in the research methodologies used in contrast to business-driven projects. Some research experience is important to ensure that adequate focus is given to action research, consumer focus groups and the NGT. The capturing of tacit experiential knowledge from the employees participating in the research is effective in these research projects.

The nine-element food safety model together with the sub-elements detailed above embrace all the essential components of a broad food model. It is proposed to investigate the effectiveness of this model with the intention to develop and implement food safety strategies and systems in the consumer food business.

Consumer training programmes in the food industry need to be developed on an ongoing basis in a formal structured way. This programme should consist of a training plan with a focus on consumers' need. This planned programme requires implementation and completion within a defined time-frame. The effectiveness of the training should be understood and assessed at clearly defined intervals of not more than one year. Necessary information on employee education, training skills and consumer service should be adequately maintained by the business.

The author found the traditional hypothetico-deductive research method more structured in an insider research environment than the action research approach. This research methodology contrasts with the action research method, which is more iterative and reflective in nature. The action research method is more process focused than content specific with the eventual outcome less clear. Evidently, further research practice is required by the manager/author in the critical reflective action research process of a business environment. The use of insider research, action research, NGT and consumer focus groups research techniques in this research was clearly a learning experience for the author, the participants and Premier Dairies consumer business.

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