

# Successful Hazard Analysis Critical Control Point Implementation in the United Kingdom: Understanding the Barriers through the Use of a Behavioral Adherence Model

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## ABSTRACT

Hazard analysis critical control point (HACCP), a system of risk management designed to control food safety, has emerged over the last decade as the primary approach to securing the safety of the food supply. It is thus an important tool in combatting the worldwide escalation of foodborne disease. Yet despite wide dissemination and scientific support of its principles, successful HACCP implementation has been limited. This report takes a psychological approach to this problem by examining processes and factors that could impede adherence to the internationally accepted HACCP Guidelines and subsequent successful implementation of HACCP. Utilizing knowledge of medical clinical guideline adherence models and practical experience of HACCP implementation problems, the potential advantages of applying a behavioral model to food safety management are highlighted. The models' applicability was investigated using telephone interviews from over 200 businesses in the United Kingdom. Eleven key barriers to HACCP guideline adherence were identified. In-depth narrative interviews with food business proprietors then confirmed these findings and demonstrated the subsequent negative effect(s) on HACCP implementation. A resultant HACCP awareness to adherence model is proposed that demonstrates the complex range of potential knowledge, attitude, and behavior-related barriers involved in failures of HACCP guideline adherence. The model's specificity and detail provide a tool whereby problems can be identified and located and in this way facilitate tailored and constructive intervention. It is suggested that further investigation into the barriers involved and how to overcome them would be of substantial benefit to successful HACCP implementation and thereby contribute to an overall improvement in public health.

**Historical development.** Hazard analysis critical control point (HACCP) is a system of risk management developed to control food safety. It can be described as an operation-specific, internally managed system of preventative control that identifies, evaluates, and controls hazards of significance to food safety. While it has a relatively long history, originating as a means of assuring the safety of meals produced for the first U.S. manned space program in the 1960s, it is only in the last 10 years that it has emerged as the primary approach to securing the safety of the food supply. This is reflected in recommendation of HACCP by organizations such as the U.S. National Academy of Sciences (19), the International Commission on Microbiological Specifications for Foods (14), and a Codex Alimentarius Commission (5) decision to recommend its use by both the food industry and regulatory authorities. This latter development has had a direct effect on the countries of the European Union who have since built a requirement for risk management, based on HACCP principles, into the operational activities of all food businesses (7).

**Codex guidelines—a recent history.** HACCP has been described as a philosophy in theory and a tool in prac-

tice, and as Bryan (2) suggests “it should therefore come as no surprise that there can be different opinions on how it should be applied.” Indeed, major problems with interpretation have become apparent as its use has proliferated (16, 20, 22). In an effort to produce a standard methodology the Codex Alimentarius Commission produced, through international agreement, definitive guidelines to the principles and application of HACCP for food operators in 1993 (5). This has gained widespread acceptance and is used almost exclusively by practitioners and regulatory bodies in Europe as a model for HACCP implementation (see Fig. 1).

**Adherence to guidelines—the value of behavioral research.** It has been reported that despite the wide dissemination and scientific support of its principles, successful HACCP implementation has been limited (8, 20, 22). This is of no surprise to behavioral psychologists who recognize that the mere existence of a scientifically valid system of food safety management, despite a worldwide escalation of foodborne disease (25), would not guarantee its use (10). The factors and processes that impede adherence to guidelines (and subsequent implementation) have been identified generically within the field of psychology and specifically within disciplines such as health research. Such work has facilitated the specific targeting of interventions thereby im-

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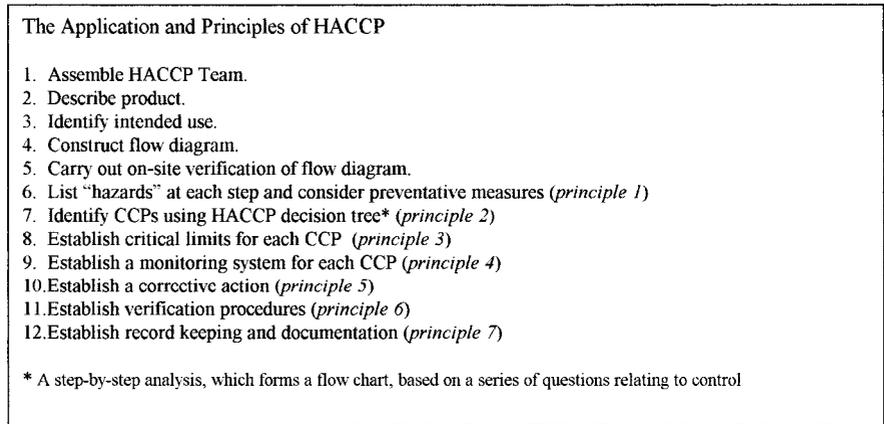


FIGURE 1. Codex guidelines (6).

proving adherence and giving positive health outcomes. This emphasizes the important contribution that behavioral research has to offer to the field of food safety management, and one that has so far been largely untapped.

**Transference of a medical model.** Medical research has identified possible types of barriers to clinical practice guideline adherence, where a barrier is defined as "any factor that limits or restricts complete adherence to a system or guideline" (3). Pathman et al. used these findings to develop an awareness to adherence model (21) in which five barriers were identified on the pathway to adherence (awareness being the starting point and adherence the target end-point). Cabana et al. (4) further developed this model, increasing the number of barriers to nine, incorporating social cognitive concepts and later setting this in the context of an educational framework. Experience of HACCP implementation problems has highlighted the potential transference of these medical models into a food safety context (24).

**MATERIALS AND METHODS**

**Awareness to adherence—development of an HACCP model: participants.** Two hundred telephone interviews were conducted with owners or managers from small businesses and technical managers (of individual sites, i.e., not group managers) from larger companies in the northwest of England during 1999.

TABLE 1. Results from telephone interviews

	Micro	Small	Medium	Large
Awareness	15	6	0	0
Understanding	37	28	4	1
Agreement	42	39	21	8
Self-efficacy	28	26	5	2
Outcome expectancy	40	46	28	15
Motivation	46	45	32	32
Cueing mechanism	7	10	13	5
Competence <sup>a</sup>	47	44	31	5
Guidelines	50	48	43	36
Environmental	1	9	30	32
External	7	10	45	40

<sup>a</sup> The figures obtained from this barrier represent the individual's perception of their competence. It is thought that this figure grossly under-reflects the actual levels of competence.

All groups of the food industry are represented within this sample: primary producers, primary converters, secondary converters, retail, and catering. The narrative interview technique was conducted with five food business proprietors: a dairy farmer, a baker, an Asian-cuisine cook-chill manager, the owner of an egg-packing business, and a meat-cutting plant manager.

**Procedure.** The telephone interviews involved 200 businesses that were categorized by size (micro [ $<10$ ], small [10 to 50], medium [51–250], and large [ $>250$ ]) (9), and a random sample was taken from each category. This serves to inform a larger study. The telephone interviews encouraged an open, narrative approach by asking the interviewees to talk freely about their experiences with HACCP and any difficulties that had emerged. The interviewer noted the occurrence of an existing barrier during the interview or added to the barriers if a new one arose (see Table 1).

Because perceptions of and attitudes toward HACCP are complex and some of the barriers identified may have implications of personal failure and be guarded against, five narrative interviews were then carried out. These were face-to-face, discovery-focused interviews based on the methodological style of Hollway (11, 12) that were aimed to create an open and trusting atmosphere, thus eliciting more in-depth results. Interview questions (see Fig. 2) were devised merely as a guide, were open to development and change, and asked for the story of the interviewees choosing so as to discover rather than prescribe areas of difficulty. At the same time they specifically mention particular times and events so as to avoid generalized or glossed over accounts of these problems. They encourage stories from the initial introduction of HACCP through to problems of implementation, to attempt to uncover barriers at all stages.

The narrative interviews were fully transcribed and analyzed by first taking notes of what was being said in each sentence and then section of speech. These could then be used to develop de-

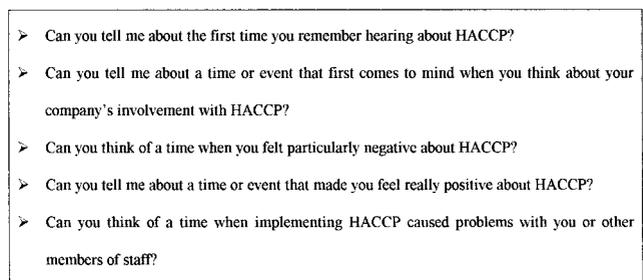


FIGURE 2. Interview questions.

TABLE 2. *Barriers experienced by the five interviewees*

Farmer	Baker	Asian-cuisine	Egg packing co.	Meat cutting co.
Awareness	Cueing	Outcome	Understanding	Understanding
Understanding	Mechanism	Expectancy	Self efficacy	Agreement
Agreement	Environmental	Guidelines	Outcome	Self-efficacy
Outcome	External	Environmental	Expectancy	Outcome
Expectancy			Motivation	Expectancy
Motivation			Competence	
Environmental			Environmental	

scriptive pen portraits of each interviewee, identify and expand upon the main ideas and themes that emerged, and locate all of the barriers involved. The value of using in-depth qualitative methodologies, e.g., narratology, within adherence research has been identified as an insightful progression toward improved data collection, given that other methodological approaches have reportedly “left the adherence problem unsolved” (15).

## RESULTS

The results from the telephone interviews can be illustrated as follows (Table 1), and confirmation from the in-depth narrative interview is seen in the summary of barriers that these elicited (Table 2). These barriers were then formed, with the use of a framework, into a model.

The proposed HACCP awareness to adherence model illustrates 11 key barriers that prevent successful HACCP system adherence (Fig. 3). These barriers are the following: a lack of awareness, understanding, agreement, self-efficacy, outcome expectancy, motivation, presence of a cueing mechanism, and competence; and negative environmental

factors, guideline factors, and external factors. Although these barriers may not be exhaustive and could be categorized or subdivided differently, they serve to emphasize the complex process through which effective food safety management (HACCP) adherence is achieved. Problems with adherence could occur at any one of these barriers or could involve a combination of them. In this way the model provides a framework through which barriers can be identified and used to develop tailored intervention strategies to eliminate the barriers preventing successful HACCP implementation. The 11 barriers are described below in more detail and illustrated with quotations taken from transcriptions of the research interviews.

### 1. Lack of awareness: “HACCP? What’s that?”

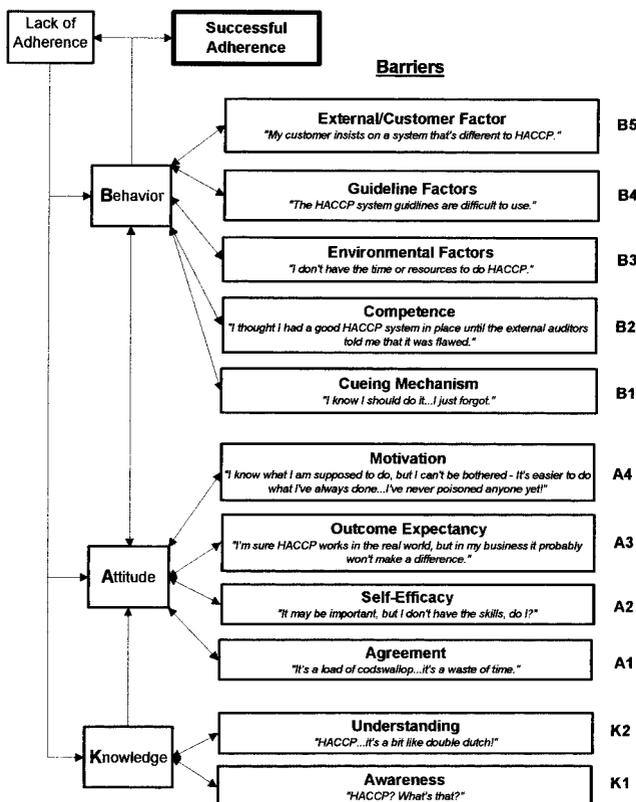
HACCP is a relatively new system and despite widespread dissemination of government literature, the efforts of enforcement officers and pressure from customers there is still evidence that some food businesses are unaware of the HACCP system. Interview responses such as “I haven’t heard of HACCP” or “Nobody has talked about it before” confirm that 7 years after legislative change, HACCP awareness has not yet spread to every food business in the United Kingdom. Indeed recent research suggests that over half of food businesses questioned did not find it easy to get information on HACCP (16).

### 2. Lack of understanding: “HACCP ... it’s a bit like double dutch!”

(The term double dutch is a colloquialism for difficult to understand.) The jargon and complexity associated with the HACCP system makes understanding difficult, thus creating a barrier to successful adherence. Educational studies have shown information dissemination without training or other intervention is not sufficient to develop understanding (26). The fact that within the 600,000 U.K. food premises, less than 5,000 individuals have attained a recognized HACCP qualification (18) makes interview comments like “It’s too difficult to understand” predictable.

### 3. Lack of agreement: “It’s a load of codswallop ... it’s a waste of time.”

(The term codswallop is a colloquialism for nonsense.) A main barrier to successful guideline adherence can arise from disagreement with the principles of HACCP evoking statements from interviewees such as: “It’s just a bureaucratic stamp” or “excessive paperwork.” Disagreement can also arise from a lack of credibility of the HACCP developer; for example, a trade organization that interprets HACCP principles for its members or gov-

FIGURE 3. *HACCP awareness to adherence model.*

ernment departments who set standards based on HACCP principles for different sectors of the food industry. The interviewees highlighted the antagonism felt toward HACCP developers with responses such as “They don’t have a damn clue what they’re talking about,” obviously resulting in a significant barrier to adherence. Guideline developers must “first gain credibility and earn trust,” if they intend to achieve agreement among their target audience (17).

**4. Lack of self-efficacy: “It may be important, but I don’t have the skills, do I?”** Self-efficacy is a belief or perception that a person has the capability to organize and execute a course of action. It is a psychological concept advocated by Bandura (1) as one of the main determinants of behavior change; he proposes that individuals may avoid tasks that they perceive as exceeding their capabilities. A great deal of businesses, especially small- and medium-sized enterprises, are discouraged from implementing HACCP due to the belief that it will be too difficult for them. This was illustrated by an interviewee who dismissively commented that: “I can’t do HACCP, I don’t know enough about food microbiology and advanced stuff like that.”

**5. Lack of outcome expectancy: “I’m sure HACCP works in the real world, but in my business it probably won’t make a difference.”** Outcome expectancy is having the vision or belief that carrying out certain behaviors will actually lead to the achievement of a target outcome. It is another psychological concept proposed by Bandura (1) as a determinant of behavior change. A great number of businesses seem to feel that implementing HACCP in their business will have no real impact on overall food safety. As one business manager asserted: “if our supplier sends us pig feed with dioxin in it . . . I just can’t see how any HACCP in the world’s going to help.”

**6. Lack of motivation or inertia of previous practice: “I know what I am supposed to do, but I can’t be bothered—It’s easier to do what I’ve always done . . . I’ve never poisoned anyone yet!”** The successful implementation of HACCP often requires businesses to change the process of their production. Yet without sufficient motivation to change, people will continue to perform past behaviors because they require less mental effort. This phenomenon is known as inertia of previous practice and refers specifically to the inability to overcome the habit of previous practice due to the lack of desire to change. The motivation to implement HACCP is further impinged upon by feelings among some food workers that their existing system is equally as good as HACCP or at least adequate to produce safe food. This point was raised by one of the interviewees who argued that: “. . . to get good performance you need to be doing it half right anyway” and further that changing to a new system “. . . is just an extra burden on us.” Teamwork and involvement in the development of the HACCP system is another important aspect of motivation. For all people involved, having ownership

of the system, in effect empowering the workforce, serves to encourage a greater level of motivation.

**7. Lack of cueing mechanism: “I know I should do it. . . I just forgot.”** Cueing mechanisms are reminders to prompt appropriate action, and given the complexity of HACCP plans it is inevitable that they are needed for successful implementation. In the busy environment of a food business, with staff often having to carry out many tasks simultaneously, aspects of HACCP or its prerequisite hygiene practices are often forgotten or overlooked. While critical control points (CCPs) provide an inherent cueing mechanism through their requirement for documented monitoring, observers often note that monitoring lapses still occur. A typical example comes from a small business manager who had identified cleaning as a critical mechanism to prevent cross-contamination between product runs; he admitted “I’d been preparing sausage rolls and forgot, I got sidetracked and one of the boys came in and started making egg custard on the surface I’d had raw meat on.”

**8. Lack of competence: “I thought I had a good HACCP system in place until the external auditors told me that it was flawed.”** Lack of competence in this setting refers particularly to the skill or ability of the HACCP user to carry out HACCP according to its guidelines. Many food industry workers have been doing what they believed to be correct HACCP for several years, and it is only when somebody with expertise in HACCP assesses their system that mistakes are noticed. A recent trainee emphasized this point when interviewed after an HACCP course: “I thought I knew HACCP, but now I’ve realized I don’t know it at all . . . the HACCP we’re doing is nowhere up to standard . . . it’s not Codex HACCP or anything like that.” Quite often this problem is further complicated by the fact that enforcement officers and external auditors are also misguided in their attempts to identify or enforce HACCP; one of our interviewees was quoted as saying “My environmental health officer thinks HACCP is a waste of time.” Moreover, problems concerning competency can be further perpetuated by overconfidence among HACCP implementers whose HACCP systems have been identified as incorrect. If people remain convinced that what they are already doing is correct, they will lack the receptiveness required to make modifications in line with HACCP guidelines.

**9. Negative environmental factors: “I don’t have the time or resources to do HACCP and I can’t imagine being reimbursed for the time and resources spent on doing it.”** Negative environmental factors such as those relating to time, resources, and organizational structure were frequently identified as being causes of nonadherence to HACCP system guidelines. For smaller businesses in particular, insufficient time, money, and staff cause a notable barrier, and this was highlighted during the interview of a small business owner who claimed that “In a large company there’s more chance to take people out, send them on HACCP training courses. We haven’t got the funds to do that, and we can’t spare the people.” Interestingly however, the environmental limitations that are seen to impede

the initial implementation of a new system are the very aspects that can ultimately be improved. Implementing HACCP can work to streamline a once overburdened system and eventually save time and resources.

**10. Negative guideline factors: “The HACCP system guidelines are difficult to use.”** HACCP guidelines appear simple at first glance; 12 straightforward, sequential steps. However, difficulty arises from the fact that the guidelines are generic and thus that each of the 12 steps cannot be successfully used without first being appropriately interpreted, adapted, and applied. Indeed a common complaint expressed in the interviews was that the guidelines did not provide an exact framework for every product within every business. As one owner-manager commented: “There is no one definitive procedure . . . you know it would be really good if someone said to me, you have to do this, this, this and this. Then I could do that, but there are no proper set guidelines like that.” What food businesses really want is a quick fix, but the HACCP guidelines offer only a problem-solving tool that requires a great deal of work that can only be done within the business.

**11. Negative external factors: “My customer insists on a system that’s different to HACCP.”** In a food business, barriers to successful HACCP may occur externally as well as within the company itself. For example, it is not uncommon to find that customers (such as large supermarket chains) insist upon their own HACCP methodology that may not explicitly follow the HACCP guidelines. For example, in a family-owned meat-cutting plant a competent quality manager, after implementing HACCP, recounted a problem with a customer audit. The retailer involved was insistent that the three microbiological CCPs identified in one particular process could not possibly represent a thorough HACCP study. The bottom line was “Before the next visit I had to find more CCP’s or they threatened to terminate our contract.” Working with and maintaining a bond with the customer is likely to be a priority over strictly following HACCP guidelines, and as one interviewee asserted: “We do what our customers want . . . money comes first.” In addition to this, auditors and enforcement officers are at times recommending and enforcing a system that is not in line with HACCP guidelines, and costly advice from food consultants is also often inappropriate (13). Food operators rely heavily on suggestions and recommendations provided from such sources and would not be likely to doubt what they are told. In this way they are unwittingly and often unknowingly failing to implement HACCP successfully as a consequence of these negative external factors.

**Changing knowledge, attitudes, and behavior—the mechanism of action.** The 11 barriers can be further organized around a knowledge, attitude, behavior framework (Fig. 3). This kind of structure has been described as an ideal general mechanism for the adherence to guidelines (4). It is established that through the sequential inclusion of each of the three stages (knowledge, attitude, and then behavior) more sustainable changes or adherence to those

changes can be achieved. Should an attempt be made to simply modify behavior alone, without knowledge or attitude being affected, the impact would be less effective (21, 26). Highlighting the relevance of such an approach, a recent review of food safety training effectiveness pointed out that “the outcome of training should be that participants think, feel and behave differently . . . or it has failed” (23).

As Figure 3 illustrates, the first stage in the journey toward a positive outcome is the attainment of knowledge; this requires awareness and understanding (K1 and K2). The second necessary stage, attitude, comprises agreement, self-efficacy, outcome expectancy, and motivation (A1 through A4). Following these the behavioral aspects, namely cueing mechanisms, competence, and environmental, guideline and external factors (B1 through B5). The fourth stage of the model identifies the outcome of the process so far; success or failure would be identified at this point. In the case of the latter, a feedback loop is incorporated to enable the identification of the step(s) where problems exist. Appropriate interventions can then be instigated, allowing progression along the model until successful adherence is finally achieved.

## DISCUSSION

The successful adherence to and subsequent implementation of HACCP guidelines is considered vital to global improvements in food safety. However, not all HACCP users find the system simple or user-friendly, and practical experience soon shows that many are struggling or failing in their attempts to adhere to it. By taking a psychological approach and utilizing practical experience and a theoretical knowledge of HACCP, this study has identified 11 key barriers. It has further organized them around a knowledge, attitude, and behavior framework that paves the way for effective intervention. The proposed model therefore acts as a diagnostic tool, identifying progressive stages to successful HACCP guideline adherence. This should be of significant help to those offering advice and guidance to food operators undertaking HACCP implementation. For those who fail to succeed, the feedback loop facilitates targeting interventions based on recognition and understanding of the specific problem areas.

**Validation of model.** The HACCP awareness to adherence model has been created with a recognition of the value of drawing on existing medical models and use of evidence-based information to assist in the formulation of new barriers. However, the existence and explanation of a barrier in one setting may be very different to another. While having been based on and then confirmed by specific interview research, the current model requires further testing and review to ensure completely successful transference and validation of the newly established barriers.

More work is needed to establish the comparative weighting of each barrier, the sequence in which they occur, and the emergence of additional barriers requiring inclusion within the model. Further research could also determine the different problems encountered by large, medium, and small businesses, the differing perspectives of food opera-

tives compared to supervisors or managers, and variation of problems in different types of business: primary producers, primary converters, secondary converters, retail, and catering. Certain barriers may be more prevalent than others depending on such categorizations, and the experiences involved within individual barriers could also be different depending upon the category.

By applying the awareness-to-adherence model we are able to move beyond the simplistic assumptions made about food businesses that fail to implement HACCP. It is then possible to offer a structured diagnosis and a targeted intervention strategy that should be of considerable help to all those involved in this challenging approach to food safety management.

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