

# Building Capacity in Developing Countries: OER for Food Safety

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## Abstract

The Food Safety Knowledge Network (FSKN) was developed through the collaboration of Michigan State University and a professional network of international food industry retailers and manufacturers. The key objective of the FSKN project is to provide technical resources, in a cost effective way, in order to promote food safety in developing countries and for small and less developed companies. FSKN uses a competency based model including a framework, OERs, and assessments. These tools are being used to support face-to-face training, fully online training, and to gauge the learning outcomes of a series of pilot groups which were held in India, Egypt, and China.

## Keywords

OER, open education, resources, food safety, competency framework, online training, assessment

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# 1. Introduction

At Michigan State University, considerable effort has been directed at new ways to address global issues in agriculture, especially to improve food safety and to increase access to markets for developing countries. We have developed a model centered around open educational resources and the use of mainly open software tools that focuses on solving an issue critical to consumers, industry, and higher education. Our goal is to find a purposeful and sustainable approach to openness that targets established communities around a practice. This model directs content that is focused on the dissemination of best practices to address the growing need for individual competency understanding at the food manufacturing level.

The Partnership of Food Industry Development (PFID), located in the College of Agriculture and Natural Resources at Michigan State University, and MSUglobal have teamed with industry partners and foundations to support the Food Safety Knowledge Network (FSKN) project which focuses on training, information sharing, and capacity building in developing countries. This project is generously funded by the Hewlett Foundation and USAID.

To date, FSKN has accomplished the following activities:

- Brought together industry experts from around the world to develop a competency framework for Basic Level Requirements for Food Manufacture.
- Developed and aggregated resources aligned with the 13 key areas outlined in the competency framework. These resources have been submitted by various content partners as well as created from training events that have taken place in India, China, and Egypt.
- Developed a competency-mapping tool using Creative Commons' DiscoverEd search tool and Drupal content management system to align resources with the competencies.
- Worked with international experts to develop a bank of test items assessing the 13 competency areas. These test items were rigorously reviewed and used for pre- and post-assessments for online and face-to-face trainings.
- Piloted the model (competency framework, assessments, and resources) through online and face-to-face trainings in developing countries.

## 2. Project Details

The FSKN project is based on a competency model including a framework, OERs, and both pre- and post-assessments. FSKN gives participating suppliers the opportunity to achieve higher levels of food safety which in turn could ultimately allow suppliers to gain certification to the Consumer Goods Forum – Global Food Safety Initiative (GFSI) recognized schemes. The core of the project was initially based on a document developed by the Consumer Goods Forum - Global Markets Working Group titled “Basic Level Requirements for Food Manufacture,” that defines

characteristics food manufacturers should follow in order to obtain food safety certification. In May of 2009 members of the Consumer Goods Forum - Global Markets Working Group and MSU faculty members approved a list of 13 basic level requirements for food manufacturers called Core Level 1 (see figure 1) which captures 30 percent of the requirements outlined in the Basic Level Requirements for Food manufacture document.

## Competency Framework

The Food Safety Knowledge Network Pilot Group, jointly led by the GFSI and Michigan State University (MSU), began the development of competencies of individuals (those responsible for food safety management systems within their organizations) based on Core Level 1. From December 2008 to January 2010 stakeholders held several meetings to develop the competency statements for each basic level requirement. The stakeholder group included faculty, government representatives, and private industry experts in the area of food safety. The initial meeting was held over two days in February of 2009 in Amsterdam and included six individuals, as well as a moderator from Michigan State University. The competency statements were further reviewed by the group online. In March of 2010 the statements were again reviewed by the GFSI technical working group which consisted of industry experts.

## Learning Resources/OER

A flexible, yet sustainable approach for developing learning resources was directed by the MSUglobal team of online learning experts and instructional designers. This team developed a procedure document for developing OERs in order to streamline the content development process. One challenge for the designers was the need to develop resources that could be used as a stand-alone resource or as part of a full course of learning modules since some learners would only need to find resources on a specific topic area. The content also had to be in several formats in order to provide access to those with variations of connectivity to the Internet.

The first learning resources were derived from a workshop offered in Chennai, India on food safety. The presenters in the workshop offered the pre-assessment, presentations on each competency area for Core Level 1, and a post-assessment. The lectures were recorded using the software programs of Camtasia and Relay allowing for immediate output types including PowerPoint, video, and an audio file. The PowerPoint slides were made available as PDF files and open office documents. Training manuals and transcripts were also developed from the workshop resources. The resources were initially produced in English but were later translated into Mandarin Chinese and Arabic for specific pilot groups.

Additional content for supporting the competencies was researched by the MSUglobal team and reviewed by food safety experts. Resources were found from other universities and non-governmental organizations that aligned with the Core Level 1 competencies. The search for additional content is ongoing.

## Assessments

Test items were created for each competency statement for Core Level 1. Four industry experts were trained by a Michigan State University researcher on how to develop quality test items. They developed at least four test items for each competency statement. Once a first draft of the test items were created, they were internally reviewed and randomly selected for a pre- and post-assessment. Each assessment consisted of approximately 130 test items in addition to 10 demographic questions.

Members of the FSKN team held a face-to-face training in September of 2009 where lectures were given based on the competencies for Core Level 1. The first draft of the pre- and post-assessment were administered to the participants. After the workshop the items were analyzed and modifications were made to any test items that did not fit the criteria of the FSKN team. Based on the results, changes were also made to the lectures.

## Competency Mapping Tool

While the competencies and assessments were being developed, another team including individuals from MSUglobal and the Michigan State University Virtual University of Design and Technology (vuDAT) were designing the technical aspects of the project including a central web site. Together they created an online framework to support the learning resources and competencies, which was based on open source technology. The goal of the site was to map OER resources to the competency framework and also integrate the Creative Commons DiscoverEd search tool. The FSKN site is found at: <http://foodsafetyknowledgenetwork.org>.

Drupal was selected as the content management software package for developing the FSKN site since it has a large community of developers and many custom applications to choose from. However, Drupal did not offer a way to map the learning resources to a competency mapping tool. As a result, programmers from vuDAT created an open source module that allows users to correlate content to specific competency in a framework: <http://foodsafetyknowledgenetwork.org/correlate>. The competency framework module was designed so that a team of subject matter reviewers could easily view any learning resources that would need to be correlated to a specific competency.

The FSKN team envisions the Food Safety Knowledge Network site as a long-term training solution to challenges found in specific sectors of the food industry in relation to food safety. As the project continues to evolve, additional resources will be mapped to the competency framework. In order to improve the findability of resources, the Creative Commons' DiscoverEd open source search tool was built into the site. The DiscoverEd tool allows users to have advanced searching capability allowing for search results from selected curators. It also allows for specific metadata to be shown with the results. Custom code was developed in order to integrate DiscoverEd and Drupal and required both an RSS feed and Open Architecture Index (OAI) tools which pull resources from web sites that support specific competencies. For any organization that does not want to implement OAI on their site, MSUG will upload the content to a site that does use OAI.

## Pilot Groups

Five pilot groups collaborated with the Food Safety Knowledge Network for training resources and assessments. The pilot groups allowed the FSKN team to develop content, test the pre- and post-assessment instruments, and also introduce the competency framework to the food safety industry. The pilots used both face-to-face and online materials and allowed for the translation of some resources into Mandarin Chinese and Arabic.

1. **India :** The first pilot program was part of a three-day food safety training in Chennai, India in September of 2009. The workshop consisted of 74 participants from 25 companies and 6 public sector organizations. Participants completed a paper version of the pre-assessment. After the pre-assessment they listened to two days of lectures specifically developed to coincide with the Core Level 1 competencies. At the end of the workshop the participants completed a post-assessment. The assessment forms were brought back to Michigan State University for scanning and analysis. The lectures from the workshop were electronically captured using Camtasia and Relay in order to create online resources that supported the competency framework. The resources from the workshop were made available online: <http://fskntraining.org/training/basiclevelchennai>.
2. **India:** A large, private wholesale food retailer in India, Metro Cash and Carry, was the source for the second pilot program. This pilot consisted of a completely online training program. Participants were required to take the pre-assessment online within a two week time frame. Next, they had two months to review resources relating to the specific competencies. The learning content consisted of recorded lectures from the first pilot in Chennai, India and the lectures were uploaded in a linear framework to a content management system. Participants were able to choose which resources they needed to review and resources were available in a variety of formats including flash video, audio, PPT, and PDF. Participants could also request a CD of the resources. At the end of the pilot the participants had two weeks to complete the online post-assessment. This training was held from September 2009 through December 2009 and included 63 participants.
3. **Egypt:** The third pilot, located in Cairo, Egypt, was a face-to-face training session of 36 participants in November of 2009. This training session was held in partnership with the United National Industrial Development Organization and Macro with the goal of educating potential suppliers for Macro. This pilot included a train-the-trainer approach where eight trainers were taught by one subject matter expert. At a later date, the trainees gave the lectures to the workshop participants. For this training, the learning materials from the workshop held in Chennai, India were translated into Arabic.
4. **India:** The fourth pilot was held completely online for TaTa Tea which is the world's second largest distributor of tea. This pilot was run similarly to the Metro Cash and Carry pilot however; it was used as an internal training program for their employees. The pilot consisted of 29 individuals.
5. **China:** The fifth pilot was a face-to-face training held in Shanghai, China in November of 2009. It was a four-day program developed by FSKN team members for Coca-Cola employees which included bottlers, suppliers, and sub-suppliers. The training consisted of the same learning materials and assessments as previous pilots; however, the content was translated into Mandarin Chinese. The training also included additional lectures on Good Manufacturing

Practices (GAP), Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCP), Food Safety Management Systems (ISO 22000:2005), and PAS 220:2008. There were 142 participants in the training. All of the resources were recorded and made available online. Participants were encouraged to introduce their co-workers and employees to the FSKN program so they would have the option of going through the content at their own pace (<http://fskntraining.org/training/coca-colafoodsafety09>).

All of the pilot programs demonstrated effectiveness of the nearly 90 training resources developed through the FSKN pilots. There was a 6-16% increase in score between the pre and post-assessment. The pilot members did vary by experience, education level, and previous training. Those with the lowest scores on the pre-tests showed the most improvement. The online learners preferred the audio files resources when compared to video. Since the materials were developed in an open format they were easily adaptable into different languages. Currently, the resources are freely available and are being used by individuals in the food industry.

### 3. Discussion

Over the past two years the FSKN team has made significant progress in improving the availability of online, open resources relating to food safety. Some achievements include the development of over 100 competency statements, the creation of over 90 OERs relating to food safety, and the development of assessment instruments based on the Core Level 1 competency statements. Five successful pilot programs were launched with nearly 350 participants.

Even with the amount of success, there were challenges during the project such as gaining a high number of additional learning resources. Working with additional content partners proved to be difficult with a limited amount of staff. Even though most organizations saw the value of the FSKN program, they were hesitant in giving the time to put together new resources or change their web site in order to allow for the OAI feed. It takes a considerable amount of time to recruit content partners, explain OERs, and review content.

One difference between academic institutions and the organizations involved in pilot programs is that private organizations have certain legal restrictions which affect the FSKN project. European law will hold food companies liable for any illness or injury that is caused by their products. They are also liable for the work performance of their employees. Due to these liability issues these organizations cannot have their organizations labeled on FSKN materials.

Another challenge is the availability of experts to develop the resources. Subject matter experts were needed in developing and reviewing the competency statements, resources, and assessments. The subject matter experts on the FSKN team consisted of two faculty members from Michigan State University and an industry expert. These experts had to give a lot of their time in developing the project. Capturing the lectures at the initial pilot project proved to be an efficient way to develop a learning resource and face-to-face meetings were important as the experts were internationally located.

## 4. Summary

The FSKN project drew together higher education and private industry in the development of a model for providing educational resources for those who may not have access to quality materials. The model brought expertise to developing countries and increased the knowledge base of several organizations. Future plans for the project include additional pilot programs and the expansion of the FSKN model to the next level of food safety competencies (Core Level 2).

## Figures

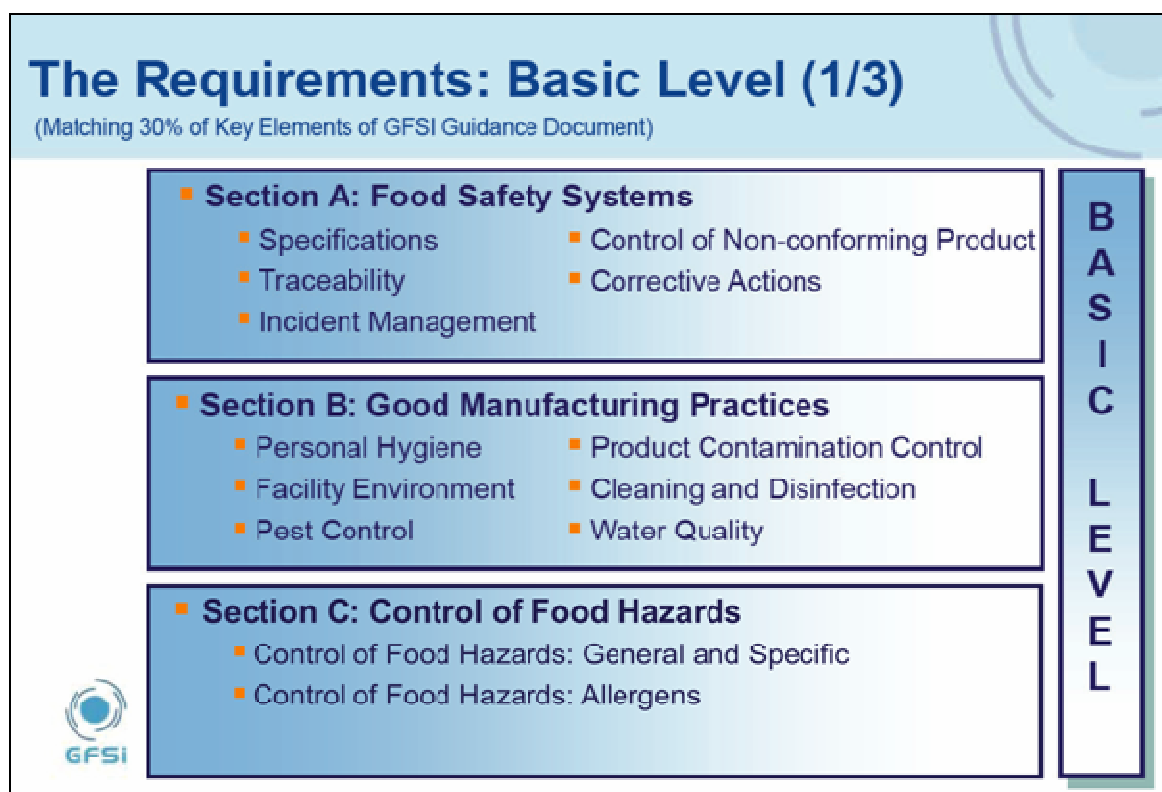


Figure 1. The 13 Basic Level Requirements for food manufacturers

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Gwyn is the Senior Instructional Designer and a Project Manager at MSUglobal. She has over 10 years of experience in higher education focusing on instructional design, program evaluation, organizational development, training, and project management. Also, she has teaching experience as an adjunct faculty member at a community college in the area of communication. Gwyn has worked on a variety of projects in the areas of technology and agriculture such as managing an online teaching certification program for faculty at a community college, assisting faculty in the development of online courses, and currently developing credit and non-credit learning opportunities.

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