Title :

Cloud-Based Hazard Analysis and Critical Control Points (HACCP) Management System for Improving Food Safety implementation and Compliance among Local Food Manufacturers

Speaker:

Dr. Noor Zafira Noor Hasnan

Institution:

Universiti Putra Malaysia, Malaysia

Universitas Brawijaya, Indonesia

Kyushu Institute of Technology, Japan

National Institute of Information and Communications Technology

Background :

- Food safety refers to the **set of practices** for **handling, preparing, and storing food** to **prevent contamination** and ensure it is **fit for human** consumption, thereby **preventing foodborne illnesses.**
- Hence, **food safety is crucial for public health** and **mandatory** to be implemented **by food processors in any countries.**
- To enable **food safety implementation** in the industry, **HACCP system or fully known as Hazard Analysis and Critical Control Points** is adopted by the **Codex Alimentarius Commission and becoming an international standard for food safety.**
- **HACCP → scientific and systematic approach for assuring food safety in a food premise.**
- It is a **globally recognized** food safety system, yet its **implementation remains a challenge** for local manufacturers in ASEAN

Food Safety Assurance System HACCP CERTIFIED Ministry of Health Malaysia

mutu international

SNI CAC/RCP 1:2011 Certificate # MCI-MS HACCP/XXX

Targets:

To deliver **a cloud based HACCP management system** tailored to **the unique needs** of local food manufacturers **(Malaysia and Indonesia),** addressing **existing challenges in implementing** food safety measures in production.

Speaker:

Dr. Noor Zafira Noor Hasnan, Universiti Putra Malaysia

Project Members :

Dr. Noor Zafira Noor Hasnan
(Food system, Manufacturing & Digitalization)
Dr. Roseliza Kadir Basha
(Food Packaging, Food Safety)
Dr. Nor Amaiza Mohd Amin
(Food & Chemical Process)

Mr. Dego Yusa Ali
(Food Engineering)

Assoc. Prof Dr. Shinya Ikeno
(Environment Conscious Chemistry and Bioengineering)

Dr. Hiroshi Emoto
(Information and Communications Technology)

Project Duration : **June 2025 – May 2027**

Project Budget: **40,000 USD (First fiscal year)**
40,000 USD (Second fiscal year)

Scientific Perspectives

HACCP is a management system in which food safety is addressed through the **analysis and control of biological, chemical, and physical hazards.**

Biological hazards

Bacteria

Mold

Worms (parasite)

Physical hazards

Ring

Glass pieces

Chemical hazards

Hormones (injected)

Food coloring

Absence of / Ineffective HACCP management system led to uncontrolled food contamination in food processing and hence, cause adverse health effect to consumers as well as outbreak

HOSPITALIZED

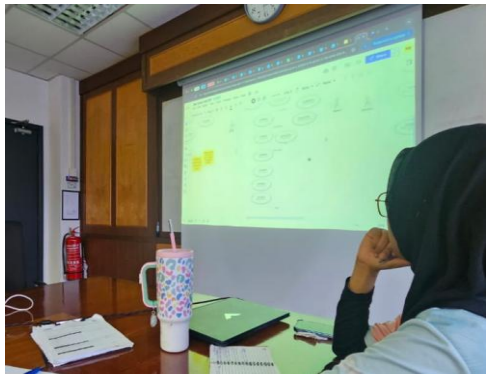
DEATH

MISCARRIAGE

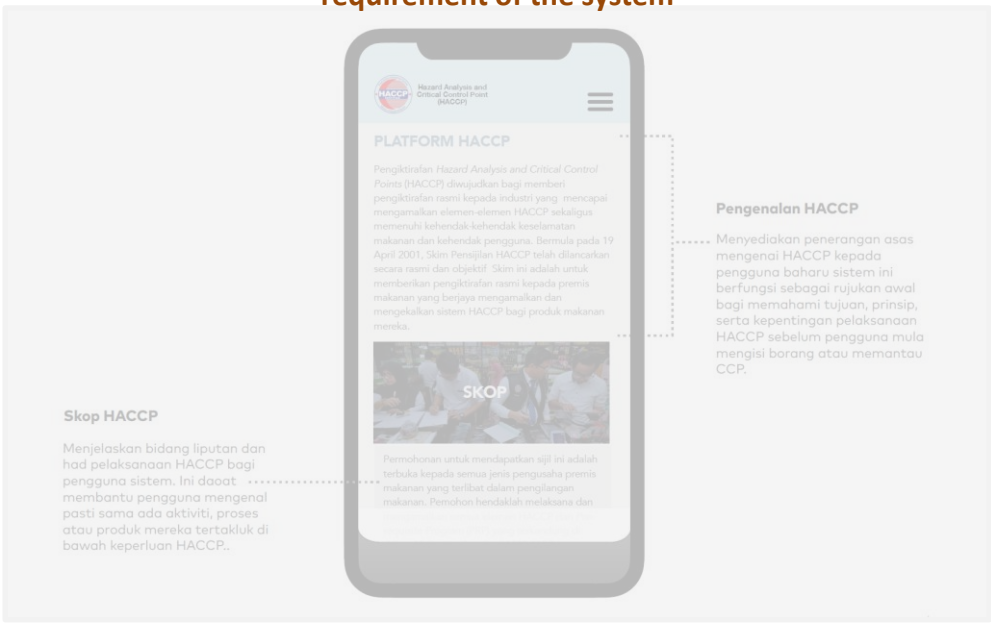
Technological Development

- **Major barrier for HACCP development, implementation and maintenance as found by our focussed group discussions from livestock and meat-based (25%), fisheries & seafood (30%), flour-based (15%), RTE (15%), beverage (10%) and snack (5%): HACCP is difficult, complex and burdensome.**

No.	Challenges
1	Lack of awareness, knowledge & understanding on HACCP guidelines
2	Lack of technical expertise and overreliance on key personnel
3	Limited reference or information sources available regarding HACCP system for different & unique food processing in the countries
4	Lack of motivation and engagement
5	Budget constraints



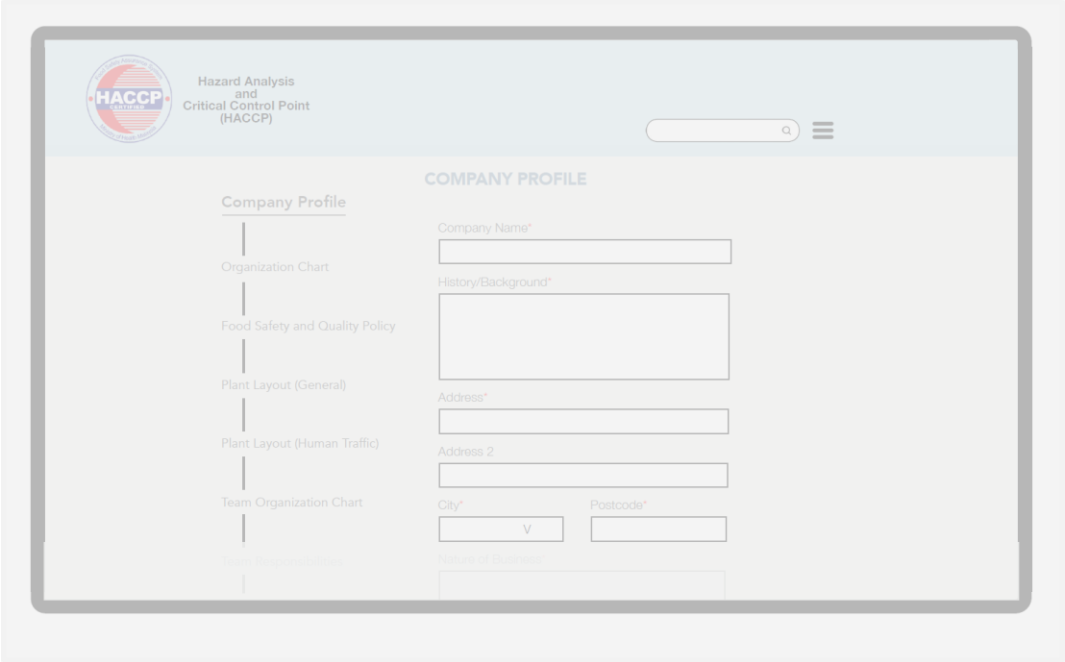
Meetings with project members and collaborators on the user requirement of the system



- Based on the above findings → the design and development of a cloud-based HACCP Management System must deliver the followings:
  1. Representation of a complete HACCP system as required
  2. Simplified HACCP development, operation audit and review
  3. Reduced dependence on experts
  4. Provision of adequate and clear resources
  5. Able to enhance user motivation
  6. Low implementation cost

Technological Development (continued)

The system requirements are clearly defined…
However, the key question remains :
How can these requirements be effectively delivered to the end user?



Current we are developing the cloud-bases system that should meet the following criteria:

1. Access to correct HACCP modules online
2. Step-by-step module
3. Automated guidance that serves as tutor
4. Digital templates that enable staff learn by doing
5. Provision of scientific database support, interactive and smart assistance for development, analytical and evaluation tasks
6. Centralized resources that serve as references
7. Built-in-tool for easy-tracing of administrative procedures
8. Support role-based access
9. Automation for repetitive tasks
10. Scalable

Field Testing

- Planning in progress for pilot testing in key food subsectors (processed meat and chicken, frozen food, fish-based products, beverage) on Month 16 to Month 21
- Objective: evaluate usability (user-experience), functionality (HACCP compliance), and food safety performance of the Cloud-Based HACCP System in real industry settings (hazard monitoring).
- Field testing to commence after prototype completion and internal validation.
- Current activities include mapping food industry challenges, readiness and preparing system validation checklists.

Industry collaborators for field testing of cloud-based HACCP system

R&D results

- Since the project has only been kick-off after CRDA completion , we do not yet have a complete R&D results.
- At present the following R&D activities have been started and are actively on-going and the results are progressively being analysed

Analysis of Food Hazards in Non-Certified and Poorly Managed Food Processing Facilities*

- **Objective**: Identify and measure biological, chemical, and physical hazards present in food processing facilities
- **Activities**: Sampling of products, swab surfaces, water and air monitoring in selected food factories (meat, fish and seafood)
- **Results**: Focuses on understanding the relationship between absence/poor HACCP management practices and the prevalence of food safety risks.

*Supported by other grant led by Project Leader

Analysis of HACCP Implementation Challenges Based on Standard Criteria with HACCP-aware industries**

- **Objective**: A qualitative and technical assessment to identify key challenges faced by industries that are aware of HACCP but struggle to achieve full implementation.
- **Activities**: Focused group discussions, On-site observation & sampling, Interviews with HACCP team members, Review of existing HACCP documents in selected food factories
- **Results**: Compliance gaps arising from inefficient, fragmented, or poorly functioning system elements

**Supported by ASEAN IVO Grant 2025

Scientific Contribution

Publication

No:	Paper title:	Author names	Affiliation	Journal name:	The date of the publication	The DOI of the publication
1.	Comprehensive analysis of global challenges and key factors in national food control systems	Saud Almutairi (first author) Noor Zafira Noor Hasnan (corresponding authors)	Universiti Putra Malaysia	British Food Journal (BFJ) – Q1	26/08/2025	https://doi.org/10.1108/BFJ-10-2024-1006

- The findings highlight **a widening digital gap that continues to undermine the effective implementation of food safety** systems, leaving lagging entities plagued by inconsistency, inefficiency, and poor compliance performance.
- In Malaysia, cultural factors and hierarchical power dynamics influence how policy guidelines and instructions are interpreted, often leading to misunderstandings, confusion and inconsistent implementation.
- Inconsistent food safety implementation, especially in Indonesia, where limited awareness and understanding of requirements make HACCP adoption challenging and costly for small manufacturers.
- Cultural dynamics strongly influence how policy knowledge is communicated and understood.

Societal Impact (as of 2025)

Empowering Foodpreneurs (especially SMEs)

- Provides accessible food safety tools for small/local food businesses that lack resources.
- Increases confidence and competitiveness esp. women foodpreneurs by enabling them to meet food safety standards.

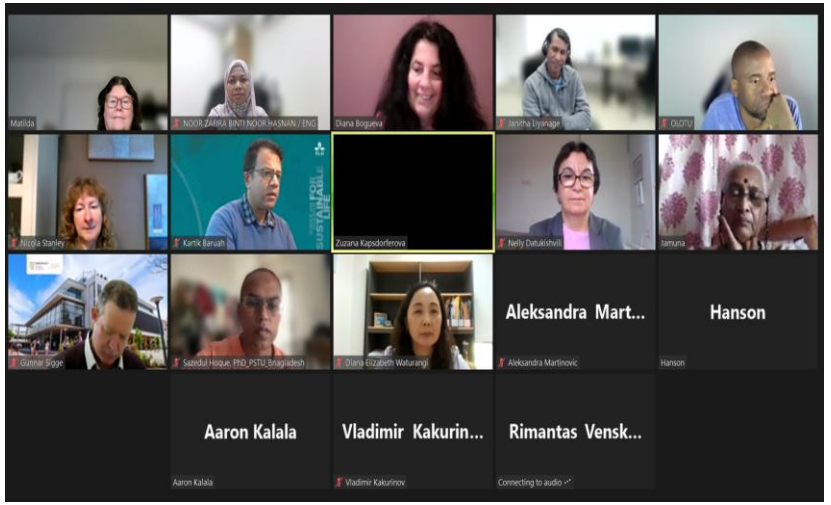
Digital Inclusion & Capacity Building

- Offers training opportunities and knowledge sharing, bridging the gap between traditional practices and modern digital systems.
- Promotes digital literacy among next generation and local food manufacturers that have the motivation to grow.

Societal Impact

Policy & International Collaboration

- Facilitates global collaboration by contributing knowledge that informs international food safety standards
- Enabler of cross-border research partnerships
- Provides a model that could be replicated in other ASEAN countries



Conclusion

- This project aims to digitalize the development and operation of HACCP system.
- Such digitalization is expected to empower local manufacturers with knowledge on food safety sciences, principles, own practices and eventually sustainable culture within their premise.
- **Approaches:**
  - Analysis of food hazards in uncertified food factories based on biological, chemical and physical hazard monitoring and their relationship with failure of food safety system/practices
  - Comprehensive analysis of HACCP challenges based on national standard requirement with HACCP aware group via focussed group discussion, production observation and sampling, interview and document reviews
  - Development of cloud-based HACCP system to address the found challenges
  - Field testing and validation

Expected Outcome:

This project is expected to demonstrate that digital transformation of food safety is not only achievable but essential → enabling safer food while supports ASEAN's movement toward smarter, more sustainable food systems

Current Progress, Future works and Budget Consumption

No.	Months	Year 1												Year 2									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May
1	Literature research and communication with local health authorities		Completed													(USD 12,600.00 Week 4)									
2	Site visits, sampling and interviews with local food manufacturers					In progress						(USD 8,400.00 Week 1)												(USD 2,700)	
3	Cloud-based HACCP system design and development									In progress															
4	Field trial and testing																Future work								
5	Recommendations and final project report																						Closing		

(USD 15,367.77 Week 4)

(USD 23051.65 Week 3)

(USD 2,000 Week 4)

(USD 3,500 Week 4)

(USD 3,500 Week 4)

Others:
- Travel expense, small instruments and sampling activities during Activity 2,3 and 4= USD 8,575.00
- Progress meeting = USD 720.00

Total :
USD80,000.00

Project Member Activities

Activities	Project Member Involvement	Status
Literature research and communication with local health authorities	UPM and UB	Completed
Site visits, sampling and interviews with local food manufacturers	UPM and UB	On-going
Cloud-based HACCP system design, development and testing	UPM , UB and Kyutech	On-going
Field trial and testing	UPM and UB	Pending
Recommendations, way forward and final project report	UPM , UB and Kyutech	Pending

TERIMA KASIH

THANK YOU

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