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Kansei Engineering for Quantification of Indigenous Knowledges in Agro-industrial Technology

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Abstract

The term of indigenous knowledge refers to specific local knowledge in consumer/user which should be incorporated by agro-industry to compete in a globalized worlds. This research highlighted Kansei Engineering as a potential approach to quantify indigenous knowledge in agro-industrial technology. The research objectives were: 1) To review the quantification tools of indigenous knowledges in agro-industrial technology using Kansei Engineering; 2) To characterize indigenous knowledges in Indonesian agro-industry. Case study was demonstrated in Indonesian food product, services and ergonomic technology. Quantification was characterized using widely developed quantification tools for indigenous knowledges. The research results concluded some indigenous knowledges which could be incorporated in indigenous knowledge-based innovations.

Keywords: *Agro-industry, Ergonomic technology, Product, Services, Technical parameters*

1. INTRODUCTION

The ASEAN policy blueprint for SMEs Development (APBSD) 2004-2014 has described the framework to support SMEs-based Agro-industry development (Anonym, 2008). One of its objectives is enhancing the competitiveness and dynamism of ASEAN industry by facilitating their access to agroindustrial market, human resource development, skills, finance, and information technology (Anonym, 2008).

Agro-industry is a fundamental type-industry to challenge the ASEAN Economic Community (AEC). AEC challenged agro-industry to increase the performance and professional qualifications. Globalization in economy and information has been forcing agro-industry to pursue continuous innovation. Innovation in agro-industry should be supported by exploring more indigenous knowledges in agro-industrial technology.

The term of indigenous knowledge refers to specific local knowledge in consumer/user which should be incorporated by agro-industry to compete in a globalized worlds. Ushada *et al.* (2010) stated that knowledge is a statement of knowledge that a consumer knows, or could know, or might know about a product.

Some researches were pursued related to indigenous knowledges in Asian Country as beach seine fisheries management in Srilanka (Ashoka Deepananda *et al.*, 2015) and medicinal plants in Pakistan (Ishtiaq *et al.*, 2015). However, none of them were related to indigenous knowledges in agro-industrial technology.

Kansei Engineering is a potential method to quantify indigenous knowledges. It can be used to assist human identifying the needs, preference or achieving satisfaction for work system/product (Nagamachi, 1995). Ushada and Murase (2009) has utilized Kansei Engineering to quantify prior knowledge to affective design of greening material.

This research highlighted Kansei Engineering as an potential approach to quantify indigenous knowledge in agro-industrial technology. The research objectives are: 1) To review the quantification tools of indigenous knowledges in agro-industrial technology using Kansei Engineering; 2) To characterize indigenous knowledges in Indonesian agro-industry.

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2. MATERIALS AND METHODS

The indigenous knowledges were quantified based on the secondary data of case studies in Indonesian food product, services and ergonomic technology. Four scopes for product design and development were evaluated as greening materials (Ushada and Murase, 2009; Ushada *et al.*, 2012), human preference reasoning (Ushada and Murase, 2008), nata de cassava (Sari, 2011) and pickle packaging (Sari, 2015).

Subsequently, four scopes for services design and development were evaluated as food outlet (Hidayah, 2011), layout of supermarket (Rusmawan, 2013), in-flight menu (Hidayat, 2015) and food menu (Fiantini, 2013).

Finally, four scopes for ergonomics technology were evaluated as portable dining table and chairs for the beach (Restantin *et al.*, 2012), job satisfaction (Risqi *et al.*, 2015), capacity constrained worker (Zuriwiatma *et al.*, 2014) and KESAN (Kansei Engineering-based Sensor for Agro-industry) (Ushada *et al.*, 2015a;2015b).

3. RESULTS

The review analysis were pursued to area of product, service and ergonomic technology, as defined in Tables 1, 2 and 3 respectively:

Table 1. Quantification of indigenous knowledges in product design and development

Scope	Indigenous knowledges	Quantification tools	Technical parameters
Greening Material (Ushada *et al.*, 2009; Ushada *et al.*, 2012)	• Surrounding season such as autumn, summer, fall and winter, influenced the consumer preference • Water content influenced the surface attractiveness of greening material	Bird swarm algorithm	• Japanese prefers wet greening material and Indonesian prefer semi dry • Affective design
Human Preference Reasoning (Ushada and Murase, 2008)	• Consumer decision to buy a product was influenced by some conditional reason as agreement, prior knowledge and familiarity • Consumer knew that customized product is preferable to match his or her unique preferences.	Conditional probability co-occurrences matrix of texture analysis	These reasoning can be extracted to statitical features of grey level co-occurrences matrixes as Energy, Contrast, Local Homogeneity, Correlation and Entropy
Nata de cassava (Sari, 2011)	• Consumer did not know the difference between nata de cassava and nata de coco • Price of nata de cassava was cheaper than nata de coco	Kansei words and value engineering	Consumer knows the attribute differences between nata de cassava and nata de coco so it can support nata de cassava as substituted product
Pickle packaging (Sari, 2015)	• Certain customer segmentation preferred the pleasurable needs than functional and usability needs • Local wisdom to support consumer habits in consuming pickled by togetherness	Kansei words, Principal Component Analysis (PCA), Quantification theory Type 1, Interval Type 2 Fuzzy Sets (IT2FS)	An affective design for pickle packaging of ‘standard-attractive’ image

Table 2. Quantification of indigenous knowledges in service design and development

Scope	**Indigenous knowledges**	**Quantification tools**	**Technical parameters**
Food outlet (Hidayah, 2011)	• Consumer preferred the seller who can speak the local languange • Consumer preferred to see clearly the cooking processs while communicating with the seller	Kansei words and Quality function deployment	• Capability of seller to communicate using the local javanese languange • Outlet design using transparancy glasses
Layout of supermarket (Rusmawan, 2013)	• Straightly-typed of consumer who want to directly buy the preferred products • Comfort-typed of consumer who like to enjoy spending longer shooping time	Quantification Theory Type 1	Design of layout which can be adjusted based on consumer preference
In-flight meal services (Hidayat, 2015)	• Consumer segmentation using social media • Variety seeking • Neophobia • Variety seeking selective	Pillar K-mining Quantification Theory Type 1	Various types of service design based on consumer segmentation
Food menu (Fiantini, 2013)	• Consumer knew the wide-range menu consist of combination of selective food and drink	Quantification Theory Type 1	Various types of food menu based on image

Table 3. Quantification of indigenous knowledges in ergonomic technology

Scope	**Indigenous knowledges**	**Quantification tools**	**Technical parameters**
Portable dining table and chairs for the beach (Restantin, 2012)	• Consumer knew that the beach is surrounded by open space of pine trees • Consumer preferred “Lesehan” (Seat at the sand)	Integration of Ergonomic, Value Engineering and Kansei Engineering	Protoype of semi-customized portable dining table and chairs
Job satisfaction (Risqi *et al.*, 2015)	Worker preferred more job sati sfaction and less workload	Linear regression	Worker performance was affected by job satisfacti on and workload by 44. 1%
Capacity Constrained Worker (Zuriwiatma *et al.*, 2014)	Workers had overwork more than their actual capacity to achieve the production target and wages	Buffer management	Workload improvement in the work system
Sensor (Ushada *et al.*, 2015a; Ushada *et al.*, 2015b)	Worker performance can be classified to Capacity constrained worker (Over work), Over capacity worker (Underwork) and normal	Artificial neural network and arduino	KESAN (Kansei Engineering-based Sensor for Agro-industry)

4. DISCUSSIONS

Table 1 indicated some research related to product design and development. Most of indigeous knowledges were characterized by attributes consumer preference since product performance is tangible. The external factors as environment and price strongly influenced the consumer decision to buy product. The quantification tools varied from artificial intelligence as bird swarm, statistical patterns as conditional probability, systematical approach as value engineering and hybrid method for pickle packaging.

Table 2 indicated some research related to service design and development. Most of indigenous knowledges were characterized by complex consumer segmentation since service performance is intangible. Most of the quantification tools are related to statistical aprroach and hybrid method.

Table 3 indicated some research related to application of ergonomic technology. Most of indigenous knowledges are characterized by the work system. The quantification tool is widely developed from statistical, theory of constraint and sensor.

CONCLUSIONS

This paper has reviewed the application of Kansei Engineering to quantify the indigenous knowledges in agro-industrial technology. Up to date, Kansei Engineering indicated the promising progress to quantify indigenous knowledges in agro-industrial technology. Indigenous knowledges can be characterized to the wide range-type of product, services and ergonomic technology. Besides, there were widely developed available quantification tools for indigenous knowledges. These knowledges could be incorporated to support indigenous knowledge-based innovations in agro-industry.

This review suggested the futher amenities of Kansei Engineering to solve the macro problems as corporate social responsibility and health insurance in agro-industry.

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