

# IDENTIFICATION OF KNOWLEDGE MANAGEMENT SYSTEM FOR QUALITY IMPROVEMENT OF NATURAL FIBER CRAFT INDUSTRY

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## ABSTRACT

The craft industry is one of importance contributor to increase income and export from industrial sector in Indonesia. Many of craft industry is micro and small enterprises at rural area, with low bargaining power so that are needed improvement. The purpose of this study to describe profile and to elaborate problem and knowledge in order to indentify knowledge management system are needed for quality improvement craft industry. The study have done at DI Yogyakarta province as one of main producer of handycraft. Several product of handy craft industry was exported to several country such as Japan, Taiwan and the United States with total value achieve 69,8 million US\$ in 2013. There are several plant as resources of natural fiber to create many product of craft industry such as rattan, bamboo, pandanus, enceng gondok (*eichhornia crassipes*). The supply chain of natural fiber craft industry consists of the producer natural fiber, craftments, trading company, domestic distributor, local and international market. There are knowledge that important to produce and improve quality of craft are processing natural fiber, method to make wibben, design and assembling process, packaging. Using AHP to selection the critical knowledge were asked to expert are production management (0.41), marketing and communications (0.19), packaging and distribution (0.17), product design (0.15) and production process (0.07). In future are needed research for develop knowledge in detail and design of application expert management system.

*Key words: natural fiber, craft industry, knowledge management*

## 1. INTRODUCTION

The creative industry is one of contributor on Indonesia economic growth. Creative industry is usually as knowledge intensive industry, through technology, skill brought by skilled human resources in order to create goods/product that have economic value. There are 14 subsector on creative industry, one of them is craft industry.

Indonesia has many small and micro craft industries that used natural fiber of plant. The part of plant such as bambo rods, pandanus leaves, palm leaves, banana bars and other could used as natural fiber resource. The craft industry take advantage from natural fiber as wibben and convert to another handycraft product such as interior product. The scope craft industry in this study is handycraft that use natural fiber from any plant such as, bamboo, palm, enceng gondok, pandanus.

The main purpose of this study to increase comparative and competitive

advantage of craft industry that used natural fiber. Quality improvement are needed through managing knowledge was created in process craft that achieve from several plan at Indonesia. This purpose will achieve through doing reserach in order to :

- a. Identification profile and resources and product of craft industry at region as producer
- b. Identification and mapping problem to improve quality of craf industry
- c. Identification and acquisition knowledge for improvement quality.

## 2. THEORETICAL BACKGROUND

### 2.1. Knowledge Management

Knowledge is intellectual capital, it is critically important for organization. Knowledge is information that is contextual, relevant, and actionable. There are different meaning about data and knowledge. Where as data are collection of fact, measurement and statistic. Information is defined as organized or processed that are timely and

accurate. While data, information and knowledge can all be viewed as asset of organization, knowledge provide a higher level of meaning about data and information. Knowledge encompasseses the implicit and explicit restriction.

First conceptualized and distinguished knowledge between an organization tacit knowledge and explicit knowledge. Tacit knowledge is usually in the domain of subjective, cognitive, and experiential learning, where as the explicit knowledge is the procedural guides, software, document.(Turban 2001) There are so many researchers who interest in how to acquisition knowledge in various research. One of popular method to collect information and make decision among some alternatives are Analytical Hyerarchi Process.

## 2.2. Analytical Hyerarchy Process

The analytic hierarchy process (AHP) was developed by Thomas L. Saaty. AHP has been a favorite decision tool for research in many fields, such as engineering, business, ecology, health, and government. The AHP provides decision makers with a way simplicity and flexibility, technique, which constructs a decision-making problem in various hierarchies as goal,criteria, sub-criteria, and decision alternatives to transform subjective judgments into objective measures. Due to its mathematical modelling the AHP mostly used at many research.

## 3. RESEARCH METHOD

### 3.1. Collect Data

The scope craft industry in this study is handycraft that use natural fiber from any plant such as, bamboo, palm, enceng gondok (*eichhornia crassipes*), pandanus. This study have done at DI Yogyakarta province, through survey and observation at main producer in :

1. Desa Tembi, Kecamatan Timbulharjo, Kabupaten Bantul
2. Desa Brajan, Kecamatan Minggir, Kabupaten Sleman
3. Desa Salamrejo, Kecamatan Sentolo, Kabupaten Kulonprogo

Data and information are collect from producer at village, and association of craft

industry APIKRI abbreviation of Asosiasi Pengembangan Industri Kerajinan. APIKRI is foundation and cooperative institution where as doing business as trading for producer of handicraft.

Data primer were collected using quitioner, deep interview and focus group discussion. In order to describe these industries profile, the secunder data are collected from Central Statistitical Agency.

### 3.2. The step of research

These research are conducted with literature survey, observation, descriptive analysis and identification knowledge using focus group discussion and Analytical Hyerarchy Proces. The first step is description of profile and structure of industrial craft are used natural fiber. The second step is knowledge acquisition from expert to elaborate process, knowledge in order to identify knowledge needs to be developed in the form of knowledge management software system. The software have planned for the next phase of research.

## 4. RESULT AND DISCUSSION

### 4.1. Product and source of natural fiber

There are many plant would be use as source of natural fiber. The fiber will process to create webbing, and than it convert to another craft industrial product such as plaited mats, screen, tissue boxes and others. Some of popular plant are rattan, banana stem, pandanus, pineapple leaves, enceng gondok and bamboo.

Based on research have done in DI Yogyakarta Province, have found the village which special craft industry product. Tembi village has producing craft based pandannus webbing, Brajan village has producing bamboo craft like lampshade, matt, fruit basket. In other village especially Salamrejo using enceng gondok that plant as gulma inland waterways.



Figure 1. Pandannus plant

A wide variety of products produced from woven fibers selected plants such as mats, bags, screen, baskets, tissue boxes, lampshades and others. One of favourite craft product from pandanus such as woman bag (Figure 2). Woven mats can be produced from a variety of plants, with attractive colors used for various purposes. Woven bag with various colors and designs that relatively many produced by craftsmanship.



Figure 2. The bag and mats from woven pandanus

#### 4.2. Export of Craft Industry

Production of craft industry from Indonesia mostly exported to many countries. Based on data from Central Statistical Agency with coding SITC 89974000- 89974071 the weight and value export from craft industries are use bamboo, rattan, material and others plant describe in Table 1.

Rattan is a natural fiber which has the highest export value. Craft produced from rattan has strength characteristics that much preferred by consumers.

Based on these data the export of handicrafts from various natural fibers showed the largest export value derived from the results of rattan in the form of Basketwork, wickerwork & Other Articles with a value of US \$ 41.9 million or 60% of total exports overall. Handicraft export value of bambo reached 10% in the same product category.

Although rattan is the largest contributor to exports, development of rattan products have problems considering the amount of cane crop is relatively limited in the tropical forests of Indonesia. This study focused on the potential of various plants underutilized and abundant availability as bamboo, pandanus and water hyacinth. The handicraft products with the raw material of the plant is very widely produced in the province of Yogyakarta.

The supply chain of natural fiber craft industry consists of the producer natural fiber, craftsmen, trading company, domestic distributor, local and international market.

#### 4.3. Identification of Knowledge

This research is a preliminary study in order to design applications using knowledge management system approach. To determine the needs of quality improvement have done focus group discussions to analyze the needs of the stakeholder who concerned with the craft industry. All of stake holder in this industry must synchronised, through system approach. The main stake holder are 1) supplier plant 2) processor (craftsmen), 3) agency/distributor and 4) government. Result of discussion are arranged at Table 2 as analysis of needed.

The needed analysis is the way to collect information based to arrange the AHP. Every stakeholder have different interest that potentially to be conflict. Many expert are involve in this research to explore of knowledge.

Tabel 2. The Needed Analysis by stakeholder of handicraft industry

Stakeholder	Requirement
Supplier of plant	<ol style="list-style-type: none"> <li>1. Stability of production and price</li> <li>2. Guarantee purchases</li> <li>3. Increase income and welfare</li> <li>4. Guidance to increase production</li> </ol>
Processor (craftsmen)	<ol style="list-style-type: none"> <li>1. Quality of material</li> <li>2. Scheduling of order</li> <li>3. Labor availability</li> <li>4. Information and innovation of design</li> </ol>
Agency/ Distributor	<ol style="list-style-type: none"> <li>1. Increase omset</li> <li>2. Profit margin highly</li> <li>3. Supply of craft product</li> <li>4. Quality and consistency of product</li> </ol>
Customer	<ol style="list-style-type: none"> <li>1. Price and supply stability</li> <li>2. Quality product</li> <li>3. Information acces</li> </ol>
Government	<ol style="list-style-type: none"> <li>1. Increase export</li> <li>2. Increase welfare of craftmen</li> </ol>

Supply chain of craft industry are used based natural fiber are the system that have element dependently to other. Analyst using

input output diagram are used to find linkage of all element. The result of deep interview with expert to elaborate uncontrollable input – output and controlable input-output and environmentally aspect are describe in Figure 3. The diagram explain interlinkage in

order manage of supply chain of craft industry. Beside this step are neede the strong and weakness, opportunity and threat since the conclusion about competitive strategy are definitely.

Table 1. Indonesia Export of craft industry are used natural fiber, 2013

	COMMODITY	SITC	WEIGHT (KG)	FOB VALUE (US\$)
1	Mats, matting and screens of vegetable materials of bamboo	89.974.000	38.224	67.264
2	Mats, matting and screens of vegetable materials of rattan	89.974.000	275.505	2.713.479
3	Oth mats,matting & screens of vegetable vegetable of material	89.974.000	463.019	3.718.719
4	Plaits and similar products of plaiting material of bamboo	89.973.000	75.223	75.984
5	Plaits and similar products of plaiting material, or not assembled of	89.973.000	88.209	673.069
6	Plaits and similar products of plaiting materials,whether of vegetable	89.973.000	5.212	21.439
7	Other of other vegetable material	89.979.000	339.389	509.011
8	Basketwork, wickerwork & other articles, of vegetable material of bamb	89.971.000	2.833.582	6.743.961
9	Basketwork, wickerwork & other articles, of vegetable material of rattan	89.971.000	12.251.376	41.914.123
10	Oth than basketwork, wickerwork & other articles, vegetable material	89.971.000	2.952.250	13.389.557
	TOTAL		19.321.989	69.826.606

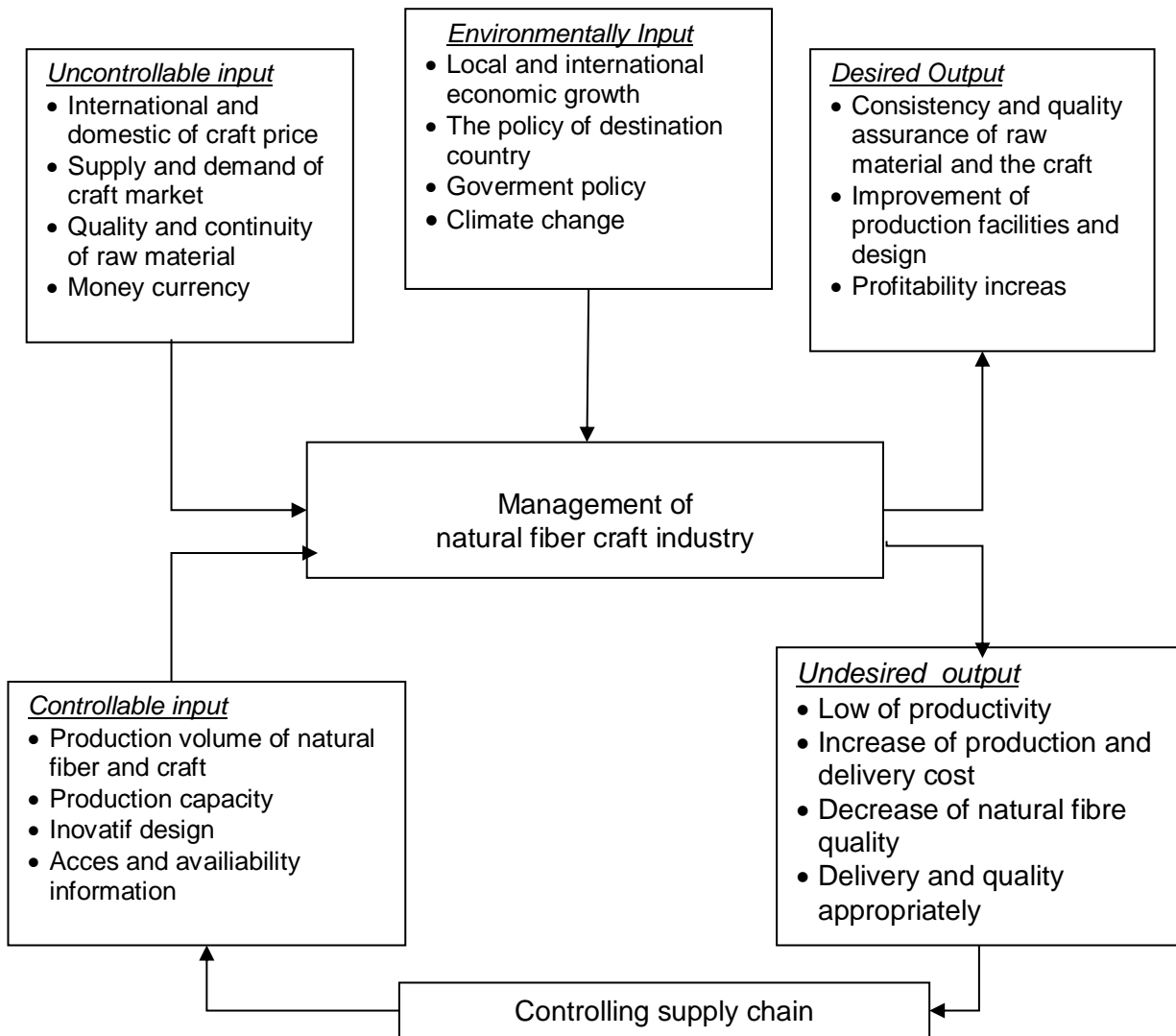


Figure 3. Input and Output Diagram of Supply Chain natural fiber craft industry

#### 4.4. Knowledge acquisition and selection

Based on deep interview using system approach the next step is acquisition knowledge and selection. The analytical hierarchy process (AHP) was used to selection the critical knowledge in order improvement competitive advantage in craft industry. Following the component of AHP consists of goal, actor, criteria and alternatives. The goal is selection the critical knowlegde to increase quality of craft indstry. Actor who will select the decision :

1. Craftsmen who produce webbing and produce some product based on webbing material
2. Agency/Distributor
3. Academics/researcher that concern to study the craft industry

Every goal have been value using pairwise comparison method using 1 to 9 scale according to AHP principle by Saaty. The criteria are used :

1. Increase income of craftsmen and processor
2. Community development
3. Market expansion
4. Increase added value

In order to select the knowledge are arrenge some knowlege as alternatives. Every alternative have compared using criteria. The alternatives of knowledge are :

1. Knowledge of processing craft
2. Design dan variation of product
3. Marketing and communication
4. Packaging and distribution
5. Production management.

After elaborate the element for structuring AHP, the hierarchy are structure that shown at Figure 4. The hierarchy are used to select alternative in order to select goal using criteria. These structure is based to do pairwise comparison. The comparison using quitioner are constructed. Every actor as an expert gives their opinion in numerical scale 1-9. Some pairwise

comparison have done by many expert. There are 3 group of actor (craftsmen, distributor, researcher) are involved in order assessing goal.

Each of the groups of actors, consisting four experts. The value of pairwise omparison between actors are given in Table 3.

Table 3. Pairwise comparison between the actors

	Craftsmen	Distributor	Researcher
Craftsmen	-	3	5
Distributor	1/3	-	3
Researcher	1/5	1/3	-

To obtain a single value of the entire must be calculate the aggregation value. All of value from expert must be aggregation using geometric mean. The result of agregat calculation shown on Table 4.

The aggregation is the weight of value to choice every criteria and alternatives. All of processing data are used software Expert Choice.

Table 4. Aggregation value of actor toward goal

Goal	Expert 1	Expert 2	Expert 3	Expert 4	Aggregation
Craftsmen	0.637	0.614	0.637	0.731	0.6533
Distributor	0.258	0.268	0.105	0.188	0.1922
Academic	0.105	0.117	0.258	0.081	0.1266

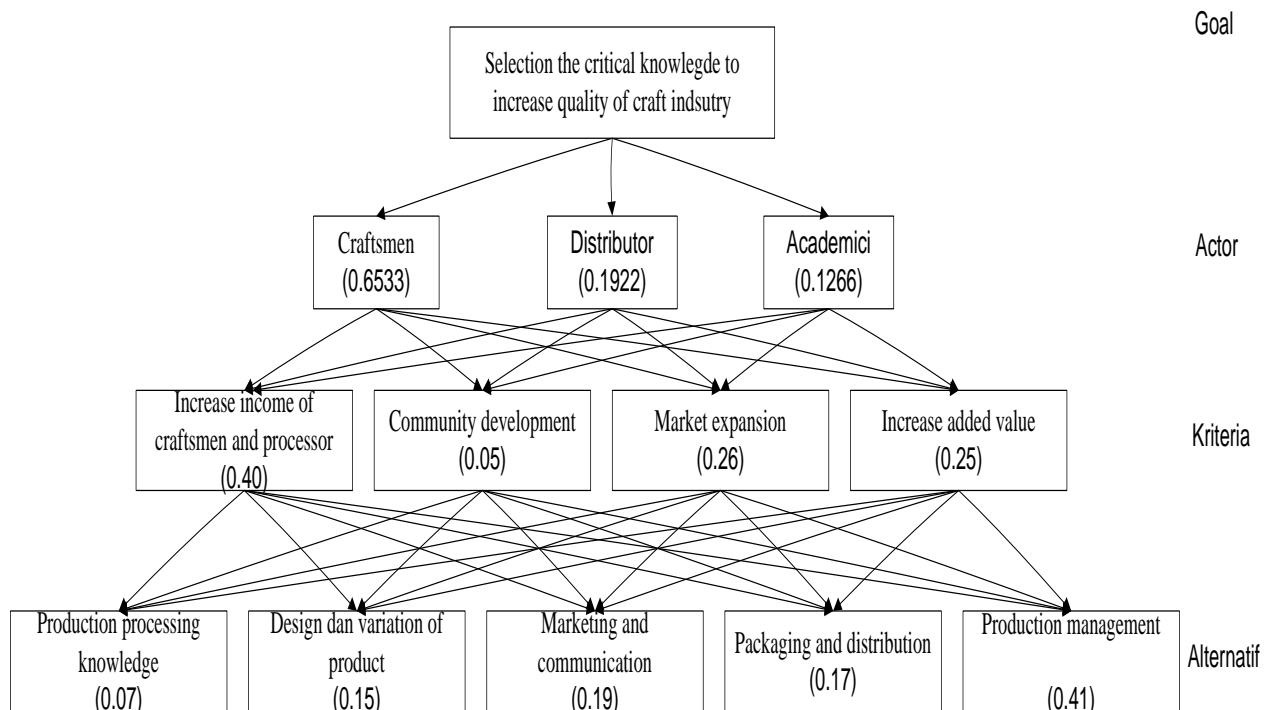


Figure 4. Result of AHP to select knowledge are needed

After follow the AHP step have gain the result proportion of knowledge, that shown at Figure 4. The conclusion shown that the critical knowledge to improving quality of craft industry are , production management (0.41), marketing and communications (0.19), packaging and distribution (0.17) design and variation product (0.15) and production process (0.07). The next research are design the software to structure the detail knowledge and data base. Research for develop knowledge in detail are needed in order to design of application expert management system.

## 5. CONCLUSION

In order to gain competitiveness in the marketplace, the small-micro enterprise of craft industry should maintain a continuous improvement. Several product of handy craft industry was exported to several country such as Japan, Taiwan and the United States with total value achieve 69,8 million US\$ in 2013. There are several plant as resources of natural fiber to create many product of craft industry such as rattan, bamboo, pandanus, enceng gondok (*eichhornia crassipes*). The supply chain of natural fiber craft industry consists of the producer natural fiber, craftments, trading company, domestic distributor , local and international market. The first problem to be identified was the knowledge structure that is found not well structured. There are needed some knowledge to improve quality such as production management, marketing and communication, design and variation of product, method and process weaving, packaging and distribution.

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## 7. REFERENCES

- (a) Agrawal, Sharma, Kumar. 2010. IT Based KM Framework for improving Research and Methodology Process in Technical Education *Journal of Engineering, Science and Management Education/Vol 2, 2010/17-22*
- (b) Badan Pusat Statistik. *Statistik Industri Manufaktur*. 2013. Badan Pusat Statistik, Jakarta.
- (c) Howkins, John. 2001. *The Creative Economy*. Penguin, London
- (d) Marimin, 2007. *Aplikasi Teknik Pengambilan Keputusan dalam Manajemen Rantai Pasok*. PT. Penerbit IPB Press Bogor
- (e) Yoshiyuki Oshita. 2009. An analysis of Creative Industries Policy: Creativity and Design in the Context of Policies. *Quarterly Journal of Public Policy & Management*. Vol.3.
- (f) Widiastuti, R. 2012. *Membedah Industri Kerajinan Berbasis Serat Alam Non Tekstil Di Daerah Istimewa Yogyakarta*. *Disertasi*. UGM. Yogyakarta.

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