Technology Assessment To Determine Total Contribution Of Coefficient, Technoware, Humanware, Inforware, And Organware In Metal Industry Of Creative Community

Wahyu Susihono*

*Department of Industrial Engineering, Engineering Faculty,
University of Sultan Ageng Tirtayasa, Cilegon, Banten, Indonesia
pmy_wahyu@yahoo.co.id or wahyu.susihono@ft-untirta.ac.id

Abstract — **Community creative industry based on metal as the raw material recently has been growing rapidly, for example manufacturing of farming equipment such as hoe, sickle, knife, or others household equipment. The capacities of these creative industries are depended on ability of industry in providing raw material and ability in adopting technology. The higher adopting technology, then industry will have much opportunity to compete in global market. Even though these industries have ability to compete in global market, most of these creative industries have not understand about the mapping of technology adoption developed. This condition make them difficult in determining strategy of short term or long term business development. This condition will affect to profit that will be earned.In this research, there will be survey to five metal industries by using questionnaire, those are: (A) Technometric, that is assessment of sophistication of technoware, humanware, inforware, and organware. The weighting of each component is determined by state of the art rating, while normalization and calculation of total contribution are by making map of relation of each component. (B) data compilation of pair weighted comparative, consistency ratio of each respondent, and geometric average calculation. Data processing is using "pairwise comparison" approach. The result shows that Score of five metal industries for Technology Contribution Coefficient (TCC) Technoware, Humanware, Inforware dan Organware consecutively are: A=0.415; 0.465; 0.41; 0.40, B=0.474; 0.414; 0.41; 0.45, C=0.488; 0.42; 0.38; 0.42, D=0.481; 0.34; 0.37; 0.38, and E=0.479; 0.41; 0.37; 0.37. A industry has excellence in Organware-Inforware, C industry has excellence in Technoware – Humanware – Organware, D Industry has excellence in Technoware, while E industry has excellence in Humanware.**

Key words: ***coefficient contribution, metal industry , creative community***

I. INTRODUCTION

Some of former industries of steel generally creating product only based on their ability. They have not attempted to cluster their products so they will have a high selling value. Products in category result of small or micro industries as known as creative industries relatively have a low selling value because adoption of technology in creative industries are minimum. In the other hand, there are some products resulted by creative industries actually in category middle market. So far industries in middle category still have not attempted to give opportunity to small industries to make backward or forward partnership. The industries in these two categories still run by their selves. This condition occurred because there is no map of ability in adopting technology of each industry using metal waste.

Metal wastes are potential to be recycle into new product. Some products from raw materials of scrap are Sickle, Hoe, Hammer, Knives and Machetes. Own production are performed by home industries, so it could be ascertained that it using simple technology, relying on human power, and still not orienting to optimizing profit and needs and willingness of market share, and not guaranteeing quality of product. Based on those problems, product innovation is needed to meet market needs.

There are 800.000 units of creative industries in Banten Province. This numbers have a big potency to decrease number of unemployment and poverty. Product resulted by creative industries are sell in form of work in process and only small numbers performing beneficiation process with better quality. This condition occurred because of limitations of some aspects such as minimum adoption of technology, limited access information, and limited education, and simple organization of industry which blending between business and household.

a. *Urgency research*

Metal industries are in big numbers and giving big opportunity in attempt to utilize product waste. Since by product resulted each day are in big numbers, it require creative industries to utilize waste to be a high value product. In real condition, existing creative industries are still minimum in technology and human resources, so map of technology adoption is needed. An integrative research is needed to gain comprehensive conclution to determine potential derivative product that can be sell in national market sustainably.

b. *Research purposes*

1). Encompassing consumen vote in determining needs and product development and character.
2). Redesigning product based on funtion, ability of industry and need of product in the market
3). Forcing agent on creative industries to perform product innovation orrienting to consumer needs and willingness.
4). Creating map of ability of Teknoware, Organware, Humanware dan Inforware in creative industries
5). Forming rating of weaknesses, strength, and opportunity of internal and external development to make derivative product

c. *Formulation of the problem*

1). What is the value of Technology Contribution Coefficient (TCC) THIO in Five Creative Industries?
2). Which industry is in top position of Technoware, Humanware, Inforware and Organware?
3). What kind of product to be developed based on recommendation of RULA Score and Total Coefficient Contribution (TCC)

II. STUDY LITERATURE

Research of Nainggolan (2009) is development of derivative product concept with Green Quality Function Deployment approach. Result of this research are characteristic of product quality based on Quality House so it can be made category of product impact to environment based on Green House, and cost of production based on Cost House. Implementation of product innovation model using Desain For Production (DFP) approach to develope shoes product in CV.X, Yunirma (2009). End of result show that product classification based on product life cycle is different. It depends on trend of product development in some periods, unless for shoes with marketable branded and planning of product developmnet strategy bsed on product life cycle.

Susihono(2008), innovating manual tools of cassava cutter into semi automatic. This research is a learning process to creative industries in developing and adopting technology to increase productivity.

Susihono (2005),innovating tools of beans planter using single operator. Development of this tool is empower some farmers from Bantul. Researcher used technology as means of learning to show that by adoting technolgy, activity of beans planting can be finished faster with comparison of time 1:15. Susihono (2005) performed assessment using technometric in five creative industries in Yogyakarta which resulting recommendation that industries with highest TCC is chosen to be representative of industries in Yogyakarta and short term and long term plan of creative industries.

Implementation of product innovation model using Desain For Production (DFP) approach to develope shoes product in CV.X, Yunirma (2009). End of result show that product classification based on product life cycle is different. It depends on trend of product development in some periods, unless for shoes with marketable branded and planning of product developmnet strategy bsed on product life cycle.

This research will assess adoption of technology, human resource, and information and management of organization. Modeling UKM using technometric approach to gain description about opportunity of export product from local resource. Model gained could be contribution form of strategy to accelerate adoption of technology in order to resulting product with high competitiveness in Teknoware, Inforware, Humanware and Organware.

Technometric term is used in some analysis to show measurement of technology aspects. Forth basic components those are technoware, humanware inforware and orgaware change input into output with different variety and complexity. Those fourth basic components are complementary each other and simultaneously needed in each process of transformation. Tecnometric model is used to measure contribution combination of those fourth technology components to complexity of technology. Result gained from using of this model is Technology Contribution Coefficient (TCC).

III. RESEARCH METHODS

a. *Research Design*

This research is descriptive case control study. Target population are all of creative industries in Banten Province with affordable population some creative industries located in Serang and Cilegon.

b. *The Scope or object*

This research performed in four creative industries processing raw material of metal which have been randomly chosen. The chosen creative industries are : creative industry of Sickle, creative industry of Hoe, creative industry of Hammer, creative industry of Knives, and creative industry of Machetes

c. *Data Collection Techniques*

Data needed in this research are taken by methods:

1). Interview: collecting data by questioned and answered to some parties of companies about object of research and other related data that is needed

2). Observation and questionnaire, direct observation to five companies
3). Literature study: collecting data from some related reference

Data compilation is divided into:
1). Primary Data: Data gained from original source by direct observation and record. In this research data gained by giving questionnaire to five industries as the research subjects. Data gained are:
   (a). Scoring technology components from each creative industry, including: 1) organization assessment, 2) production and operation system, 3) human resource, 4) information system, order system from consumers, raw material order system, production process and marketing system, financial information and human resource system.
   (b). Organization System: 1) Organization orientation, 2) Employment Autonomy, 3) Research and development
   (c). Hierarchy formulation based on relative interest rating to determine comparative spouse.
2). Secondary data: data gained from some related reference or literature

d. *Analysis Technique*

At analysis used is descriptive analysis by considering data distribution (outliers). When it is needed, data transformation will be performed to assess basic data structure and consistency of internal data.

IV. Result and Discussion

In this reserach, analysis is using RULA (Rappid Upper Limb Assessment) about use of some product to work posture in creative industry. Objective of this analysis is to knowing fuction of comfot work of metal product.

1. Sickle

Body posture bent, L5/S1 injure, exhausted of work in category need of repairement immediately. RULA score is 7 which means that it need to be repaired in order to gain comfort and ergonomic condition. Redesigning product is needed to minimize postural stress.

2. Hoe

Position of handle which are too short make body position bent, worker can not be maximizing power because it centered in hand. RULA score is 7 which means that it need to be repaired in order to gain comfort and ergonomic condition. Redesigning product is needed to minimize postural stress.

3. Hammer

Power of hammer should be in top or head. Use of hammered should be less power. It found that there are some denger condition in using hammer, that is fumble. It because hammer handle is not designed by considering power when it is used. RULA score is 3 and 4 whic means that hammer does not need special attention.

4. Knives and Machetes

Power of knife to be use in stressing need comfort position and finger stressing that can give force. It need andle taht can minimize some danger conditions. While matcehes, generally use by stressing to hand power and ability to break big things. RULA score is 7 which means that it need to be repaired in order to gain comfort and ergonomic condition. Redesigning product is needed to minimize postural stress.

a. Level sophistication technology

Scoring to determine sophisticated of technology

TABLE 1.
ASSESSMENT OF SOPHISTICATED FROM EACH TECHNOLOGY COMPONENT

Com.	I.K A		I.K B		I.K C		I.K D		I.K E	
	Uti	Lti	Uti	Lti	Uti	Lti	Uti	Lti	Uti	Lti
Technoware										
Machine	4	2	4	2	4	2	4	2	4	2
Location	3	1	3	1	3	1	3	1	3	1
Tools	3	1	3	1	3	1	3	1	3	1
Tools type	3	1	3	1	3	1	3	1	3	1
Skill tk	3	1	3	1	3	1	3	1	3	1
Number tk	3	1	3	1	3	1	3	1	3	1
Humanware										
worker	5	3	6	4	6	4	5	5	5	3
Pmlk	7	5	7	5	8	6	6	5	6	4
Inforware										
Tk.Ind.	4	2	4	2	4	2	3	1	3	1
Organware										
Tk. Ind	4	2	5	3	4	3	3	2	3	2

Tk;labor, Pmlk; owner, Tk.Ind ; Levels of industry

b. *State of the art components*

TABLE 2.
STATE OF THE ART OF EACH COMPONENT

K-T	Industri Kreatif				
	A	B	C	D	E
STi – a	0.567	0.6	0.6	0.93	0.6
STi - b	0.650	0.650	0.683	0.76	0.683
STi - c	0.733	0.733	0.733	0.733	0.733
STi - d	0.567	0.567	0.567	0.60	0.567
STh – e	0.525	0.525	0.525	0.525	0.525
STh – e	0.30	0.26	0.30	0.30	0.26
SI	0.343	0.347	0.214	0.180	0.2
SO	0.312	0.547	0.764	0.470	0.351

K-T; Industry Criteria, a; materials and delivery, b;Process, c; finishing, d; Quality guarantees, e; labor f; owner

c. *Map the relationship between components*

Ability of creative industries is influenced by it fourth former components. Contribution of components from each

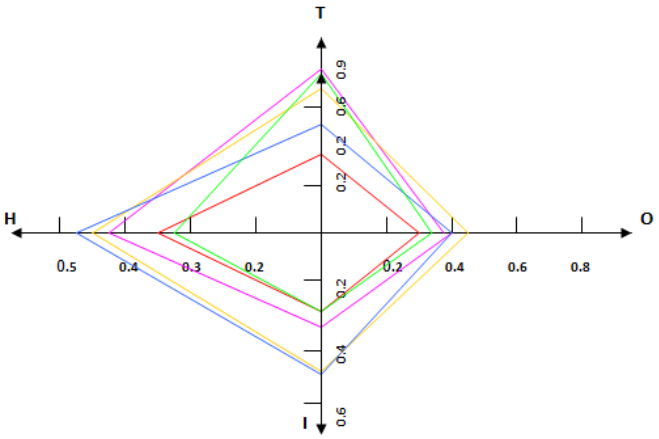
creative industry compare to contribution of component of each item of technoware, humanware, inforware and organware. Score showed among creative industries are based on ability of industry in adopting technology. Rank of Five creative industries researched are based on contribution of component technoware, humanware, inforware dan organware (THIO).

TABLE 3.
THIO IN FIVE CREATIVE INDUSTRIES

Kom.	I.K A	I.K B	I.K C	I.K D	I.K E
T	0.415	0.474	0.488	0.481	0.479
H	0.465	0.414	0.42	0.34	0.41
I	0.41	0.41	0.38	0.37	0.37
O	0.40	0.45	0.42	0.38	0.37

d. *Pairwise Comparison Weights*

"Pairwise comparison"method should be met by consistensy ratio (CR) less than 10% or 0, 1 for each industry. So whenever there is inconsistent quastionere or CR more tahn 10%, it will be repeat unstil CR score is less than 0,1. Average calculation of geometric using "pairwise comparison" method showed score of 1,6% which means that five creative industries atre consistent between each other.



Pig 1. THIO in Five Creative industries
Note : A ; B; C;
D ; E;

V. CONCLUSIONS

a. *Conclusions*

1). Result shown that Technology Contribution Coefficient (TCC) THIO score from five creative industries are Creative industry A 0.415; 0.465; 0.41; 0.40, 0.415; Creative industry B 0.474; 0.414; 0.41; 0.45, Creative industry C 0.488; 0.42; 0.38; 0.42, Creative industry D 0.481; 0.34; 0.37; 0.38, and Creative industry E 0.479; 0.41; 0.37; 0.37.

2). Industry A is superior in position Humanware-Inforware, Industry B is superior in position Organware-Inforware, Industry C is superior in position Technware-Humanware-Organware, Industry D is superior in position Technnoware, and Industry E is superior in position Humanware.

3). Product developed considering RULA and Total Coefficient Contribution (TCC) score. Product to be developed is Sickle to increase profit are by modifying or redesigning Sickle by optimizing it function.

ACKNOWLEDGMENTS

Utterance thanks to DP2M DIKTI Republik Indonesia which have funding this research by program Penelitian Hibah Bersaing. Utterance thanks to Lembaga Penelitian dan Pengabdian Masyarakat (LPPM) Sultan Ageng Tirtayasa University for the support, and to creative industries in Serang and Cilegon which have given data for this research.

REFERENCES

[1] Budiman. Santi. 2003. Implementation of Technometric to improve competitiveness of company, case study in PT Parahyanga . Opini Ekonomi dan Bisnis Aktual (OPTIMAL). Jurnal Volume 1 Nomer 1. Sekolah Tinggi Ilmu Ekonomi Isti Ekatana Upaweda. Yogyakarta.

[2] Cagan, J. and Vogel CM. 2002. Creating Breakthrough Products – Innovation from Product Planning to Program Approval. Prenctice Hall. New Jersey

[3] Cohen, Lou. 2005. Quality Function Deployment : How to Make QFD Work for You. Addison – Wesley Publishing Company. Massachusetts

[4] Gunawan. Herawati L. tt. Application of Scoring with AHP in modellin Leranng System ; Case Study in Industrial Engineering Major. Property of M. Arif Darmawan. Universitas Surabaya.

[5] Kroemer, K.H.E. 1994. Ergonomics: How to Design for Ease and Efficiency. Prentice Hall. New Jersey

[6] Nurmiyanto, Eko. 2001. Ergonomic, Basic Concept and Its Application. Gunawidya

[7] Pulat, B.M. 1992. Fundamentals of Industrial Ergonomics. Prentice Hall Internasional. Englewood Cliffs-New Jersey

[8] Ramdhani, Ali. 2000. Supporting Decission System: A Discource of Structural Idealism and Implementation of Decission Making Concept, Cetakan ke-dua. PT Remaja Perdakarya. Bandung.

[9] Susihono, Wahyu. 2008. Redesigning Strecher Matress By Addition of Facility Considering Ergonomic an Optimizing function. Jurusan Teknik Industri;FT Untirta. Cilegon.

[10] Sutjana, I.D.P, Adiputra, N. Manuaba, A. Neill, O.D, 1999. Improvement of Sickle Quality through

Ergonomic Participatory Approach at Batunya Village Tabanan Regency. Journal of Occupational Health. P. 41: 131–135
[11] Ulrich, KT. and Eppinger.1995, Product Design and Development. McGraw Hill. Inc New York
[12] Widodo, D. 2003. Product Design and Development UII Press Indonesia. Yogyakarta
[13] Wignjosoebroto,S.1995." Ergonomy Motion and Time Study". PT Candimas Metropolis. Jakarta.