Embroidery Product Characteristics Analysis Based on Customer Satisfaction as a Trial Project for Empowering SMEs in East Java (Case Study in Embroidery SMEs in Sidoarjo)

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Abstract

Sidoarjo has been known as the center of SMEs. As for embroidery product, price variable is the most dominant variable. The research that will be conducted in based on the previous research that has been conducted by the researchers regarding the customer perception of the characteristics of embroidery product.

This research in an exploratory research. The research method that will be used is qualitative descriptive which will be quantified by Quality Function Deployment (QFD) Method. The subject of this research is customers, embroidery experts, and TTG experts.

The results of the survey consist of data regarding the customer expectation on embroidery product in 4 (four) embroidery outlets in Sidoarjo. The data collected is arranged into the customer quality demand which subsequently comprised into the construct of quality performance. Afterward, the data is processed using WELCOME program and applied into an electric embroidery machine which could produce formatted embroidery pattern. Embroidery patterns that are desired by customers are flowery type such jasmine, rose, cherry blossom, and Kamboja with size in a range of 1-3 cm, which is located in a variety of places, using KESET technique, and modified into 2 dimension with beads, and the color that is preferred in secondary color such as orange, violet, and green, and the type of fabrics that is favored is cotton.

In term of the technological capability that is possessed by the crafter, all demand for the customer quality construct can be satisfied. This is possible because a meeting regarding the capability and competence of the crafter has been arranged before the survey was conducted. All crafter that is surveyed in embroidery pattern and process is still manual without the use of computerized machine with embroidery pattern software.

Key words: embroidery, QFD, customer satisfaction, and Sidoarjo.

INTRODUCTION

Background

Along this time, Sidoarjo is a centre zone which has been famous through the entire world. As a consideration of embroidery product, price variable is a most dominant variable, until it is necessary to pay attention upon consumer's image about price. If the consumers want to shop in SIK, then image which is buried on them are cheap price and good product.

Small industry centre is a crisis resistant institution, it means that with the existence of state economic problems, then SIK embroidery industry still remain survive, even develop. Therefore, suggestion or input from many kinds parties are expected for products developing.

Small industry is a proprietary enterprise where the enterprise leader is an enterprise owner. The embroidery enterprise leader has responsibility to repay in associate with bank. Level of consequence and responsibility on repay is an advantage of Small and Middle Enterprises (SMEs).

Unesa is an educational institution. It has laboratory completed with tools for workshop and multi and cross discipline expert in industry technology major. Unesa cooperates with ITS to develop embroidery small industry in Sidoarjo.

Problems Formulation

a. Research for Customers, in order to know: Customers response towards SIK's embroidery product, Customers expectation, Critic towards embroidery product, Suggestion from Customers.

b. Research for Expert I: embroidery expert, in order to know: Expert I response from the model which is expected by the customers about SIK's embroidery product, Critics toward SIK's embroidery product, Suggestion from embroidery expert, Sidoarjo SIK's embroidery specification and competency, Embroidery product developing method based on customers response (market demand) through peer group.

c. Research for Expert II: Teknologi Tepat Guna expert, in order to know, response about production technology which is used by expert II on Sidoarjo embroidery product which one is expected by the customers through peer group.

d. Research for Expert III: Industrial Engineering, in order to know: Responses (critic and suggestion) toward manufacture design (production process) on embroidery making, Effective and efficient embroidery manufacture design (production process) to be applied in SIK, then will be produced optimal product for embroidery product developing through peer group.

Research Purposes

Research purposes are explained as follows: in order to know: Craftsman response towards product developing which is offered by researcher team, Craftsman critic and suggestion toward product developing which is offered by researcher team, with expectation that the craftsman can develop the product later. Furthermore, it can be obtained suggestion from the craftsman about constraint or obstacle on product developing.

Long term purpose, which wants to be achieved is developing Embroidery Industry Centre in East Java (SIK Bordir Bangil, Pasuruan, and Gresik) by applying technology which has been model in SIK Sidoarjo.

Special target is examine about embroidery characteristics and developing from the perspectives of embroidery design and basic technique which are appropriate with market demand and it can be develop by the craftsman in SIK Bordir Sidoarjo. Furthermore, it is expected can be obtained patent right to appreciate creativity of design and basic technique of embroidery produced by SIK in Sidoarjo.

LITERATURE REVIEW

The Earlier Research

The result of the research about Analysis Some Product Characteristics which Influence Frequency of SIK Product Embroidery Purchasing in Sidoarjo Regency East Java Province Surabaya (Jun Surjanti, 2000) for all respondents shows that price, design, color combination, art value, working result, quality and product appearance variables influence frequency of purchasing both partially and simultaneously, contribution towards frequency of purchase is 74.41 %, in other hand, contribution from others independent variables is 26.29 %, price variable is a most dominant variable which influence frequency of embroidery product purchasing. Price variable's contribution towards purchasing is 15.45 %.

Later research which has done by the researcher is about The Differentiation Purchasing Motives of SIK Embroidery Product shows that there is significant differentiation on purchasing motives variable of SIK Sidoarjo Regency embroidery product between housewives, career women, and adolescents segments. The purchasing motives differentiation between women segments such as below: for housewives segment, most motive priority is color combination. For career women segment, most motive priority is price. For adolescents segment, most motive priority is design.

Until this time, there are many supporting ware for product developing, both hardware and software, such as AutoCAD, CAD/CAM, and many others programming languages. But, it's always necessary new method which is more efficient, then cost and time production can be reduced, without reduce product quality. One of popular methods is Quality Function Deployment (QFD). One

of parts from the QFD method is Substitution step (I Made London, Batan in journal published by UGM: 2004), it is a basic step in designing and developing a product. From this step, then it is developed a substitution method. As an application from this developed method, an example about bicycle developing is given. Therefore, method and result from this research also can be used to develop embroidery product in the future.

Customers Decision on Purchasing

Customers purchasing decision does not take suddenly, but it is taken by several purchasing steps. Ferrel et al. (1995:185) stated that: "purchasing decision process which is taken by the customers includes problem knowing, information searching, alternative evaluation, and purchase and post purchase evaluation. Problem knowing includes analysis about needs of certain product continue with information searching through certain sources. After product has been found, consumers do alternative evaluation in order to compare product before it is bought, then decide to purchase and the last is evaluate product entirely.

Knowledge is information which is saved on memory. According to Engel et al. (1994:317), "customers' knowledge consist of 3 majors, they are product knowledge, purchase knowledge, and usage knowledge. Usage knowledge includes available information about how product is used and what are needed to use it. Customers' knowledge is presented by Peter et al. (1990:71) that are about "bundle of attribute, bundle of benefit, and value satisfaction". In a matter of purchase product, customers will pay attention on product characteristics, which are consist of product attributes abstractly and concretely. The next step is observed consequences or effects emerged by the product, which are consisting of consequences of product function itself and psychosocial consequences of product usage. The last is usage product evaluation.

Customers as a Product Developing Inspiration Centre

Customers are inspiration centre on product developing, beside their voice can be used as product marketing way, it also can be used as a base to develop product itself. Nevertheless, generally voice of customers is qualitative, whereas product designing and developing must be based on a value which can be proven and measured (quantitative).

Quality Function Deployment (QFD) method is developed to evaluate customers demand, and then it is changed into a form which has value and can be seen also proven (quantitative). QFD was introduced for the first time in Japan on around end of 1960. When it was introduced for the first time, Japan experienced rapid development on automobile industry. QFD consist of four phases that are phase 1-product planning, phase 2-part deployment, phase 3-process planning, and phase 4-production planning. In fact, practice is explained by [Akao97], although QFD looks simple, real in practice is totally different.

Many designs are finished without take customers unsure. Product is developed then introduced to customers (users), and they will evaluate, is it interesting, reasonable, or functional. If all that needs are fulfilled, then product is said appropriate with the customers want. On the other hand, QFD method is meant to know voice of customers and then evaluate it in order to be used as input for further product developing. Therefore, it always emerge problem about what customers who are can be expected to give input about product developing to industry. If there is voice of customers and then how we can translate it into product designing.

Substitution Method as a Product Developing Tool

As a part from QFD method step, substitution step is basic step of product designing and developing on designer perspective. It means that after customers want or demand is known, designer will try to translate voice of customers to be construction quality demand (a product technical specification). Substitution method which is developed consists of six steps and can be seen on table 1.

Table 1:
Substitution Method Steps

Step	Description
1	Voice of Customers Inventorying
2	Voice of Customers Evaluation
3	Translation of Voice of Customers into Product Quality
4	Establishment of Product Quality Demand
5	Optimizing The Product Quality Demand Technique
6	Design of Developed Product Component

In order to make systematically definition of substitution method easier, then flowchart diagram is made, like shown on picture 1 such as below:

The earliest step from this method is voice of customers inventorying. Voice of customers can be known by various ways, for example by questionnaire, field survey or interview both direct and indirect interview, etc. Questionnaire is designed properly so customers are not confused to answer and fill the answers. Step 2 is voice of customers evaluation. Evaluation can be done by measuring total of voice of customers towards product quality.

The most voice of customers must be noticed by designer as the same as further voice of customers, as can as possible should be fulfilled by designer. Step 3 is translation of voice of customers into construction quality. Generally, voice of customers is qualitative [Batan03]. Designer often face difficulty when translate qualitative voice of customers into quantitative one. It means that designer can not work alone but he/she must have a team which is called product designing and developing team, in order to do benchmarking. As a result of team work, then construction quality demand of a product can be

established (step 4). As a follow up, it will be done optimizing the construction quality demand technique (step 5). For this purpose, it needs a document which contains technical specification of an available product or product which will be developed. Optimizing is product designing and developing centre [Batan03]. This step must be balanced with the product designing and developing team's want in fulfilling voice of customers entirely. Performance of next product is very determined by this step. Output of this step is detail product technical specification. Based on that designing, component of product is designed (step 6). Component designing is very important, because on this step mechanical material characteristic, like strength, and tenacity is tested, do those variables fulfill the designing requirements.

As a part of designing purpose is product making. Component/product design can be evaluated, does design can be manufactured or design must be changed. This step is important in product developing. By manufacture evaluating, it can be known do the component can be made, and how much cost of production.

Sidoarjo's Embroidery Characteristic

Researcher observation on Sidoarjo's embroidery product shows that it has characteristics such as below:
a. Design, embroidery motif design which is often used on household linen dress is flora motif on pattern flower and leaves from nature.
b. Ornament setting, many ornament setting of embroidery motif or embroidery ornament pattern used side ornament pattern and corner ornament pattern. Side ornament pattern often used on cut of outskirt blouse, collar shirt, outside of tablecloth, underside of blouse. On the other hand, corner ornament pattern often used on tablecloth, pillow cloth, bed cover, and top of kebaya on front side.
c. Textiles, various textiles are used, for household it use cotton, satin, etc. Cotton, chiffon, ero, and organdy are used for dress.
d. Color, bright color of thread contrast with color of textiles is often used.
e. Techniques of embroidery, technique of embroidery used are setik, setik loncat/full, kerancang.

Quality and beauty of embroidery can be determined by:
a. Tools, it means that embroidery machine must be on well condition, smooth on usage until it can produce nice embroidery.
b. Professional human resources, there are two kinds of professional who are involved on embroidery processing, embroiders and embroidery designers.
c. Professional processing technique, it means that result which is obtained appropriate with embroidery setting and technique, composition of threads is tight, orderly neat with motif design pattern, design motif of embroidery

is actual, original, creative and innovative. In addition, design must be harmonic and dynamic, artistic on composition of thread color and relatively fast and brief of time processing.

Good embroidery standards according to Suharsono 92004:107) are:
a. Motif design appropriate with needs and accepted by all segments.
b. Compositions of embroidery thread color match with basic material and motif entirely.
c. Motif design appropriate with design principles such as repetition, alternation, radiation.
d. Embroidery must be always actual, original, innovative and progressive with the fashion world.

RESEARCH METHODS

Method used is qualitative descriptive method which is quantified with Quality Function Deployment (QFD) method. It consists of four phases, they are phase 1-product planning, phase 2-part deployment, phase 3-process planning and phase 4-production planning.
1. Targeted result produce new discovery of embroidery model from the perspective of embroidery design and technique which is based on customers satisfaction. On this research, it is also developed production management system which can be applied in SIK Sidoarjo, which is processed with QFD method.
2. Other involved institution: Tata Busana Program Engineering Faculty Unesa (embroidery expert and design developing), Mechanical Engineering Program Engineering Faculty (TTG expert), Industrial Technology Program ITS (industrial management system expert).
3. Result of this research is expected to be model for developing embroidery small industry centre in East Java region, for example Bangil, Pasuruan and Gresik by giving them Hibah Tahap II program and Vucer Multi Tahun program on next period.

Research Steps
1. Explorative Model Research
2. Procedure, it is held research about product characteristic and its developing by using customers responses, expert, TTG expert and embroidery technology developing.
3. Subject of Research
   a. Customers
   b. Embroidery Expert
   c. TTG Expert
4. Data Collecting and Data Analysis Technique

Method used is descriptive qualitative and quantitative method by using qualitative descriptive statistic with percentage analysis and QFD method (to determine industrial technology management system of embroidery product).

RESULT AND DISCUSSION

Description of Research Result

This explorative model research is aimed to explore customers want on needs fulfilling of embroidery textiles from perspectives of kind of embroidery, size of embroidery, ornament setting, embroidery technique, embroidery combination, and embroidery color. This research started at May 2nd, 2007 and ended at November 10th, 2007. This research involves six field workers from university students. Data collecting is held on four enterprises and embroidery showroom, such as:

Table 2
Locations of Research

Enterprises	Name of Entrepreneur	Address
CV Indah Bordir	Mrs. Naila Nadin	Jl. Yos Sudarso 7 Sidoarjo
M. BA Bordir	Mrs. Muhamad	Jl. Yos Sudarso 8 – 8A Sidoarjo
Hasta Indah Bordir	Mrs. Hj. Husnah	Jl. Raya Kludan 4 – 6 Sidoarjo
CV Mapan	Mrs. Hadiah	Jl. Raya Tanggulangin Sidoarjo

Source: Data of Research

Procedure, it is held research about product characteristic and product developing by using responses from:
a. Customers, data of customers are collected by using research questionnaire method which is filled by customers after they do purchase. Customers who are selected to be respondent are the one who have ever, interested and understand about embroidery product. With this background, it is expected that customer as a respondent can evaluate the embroidery and as end-user of embroidery.
b. Expert, it has mean opinion of designer, embroidery expert and entrepreneur. Resulted model is discussed on peer group to translate result of research from the customers, then processed it by using QFD method and apply it be model with design and technique which is approached with customers expectation.

c. TTG expert, it can be obtained from TTG expert about possibility of TTG which will be applied to apply pattern obtained from result of peer group for further research.

d. Embroidery technology developing expert, apply customers want which is obtained in a form of responses by peer group from result of qualitative descriptive research which is continued with application on QFD model.

ANALYSIS OF RESEARCH RESULT

Based on the research result, it is obtained data that costumers from 4 companies and embroidery store, those are Indah Bordir, MBA, Hasta Indah, and Mapan as follows:

1. Qualitative research data from respondents, which are embroidery customer, they are still sporadic from customers' necessity identifications.

2. The next activity is arranging *House of Quality* (HQD) matrix to show all of customer' necessity in a form *Voice of Customer (VOC)* or is called PKC Customer Quality Demand.

Mapping activity of necessity in House of Quality can be seen in this picture below:
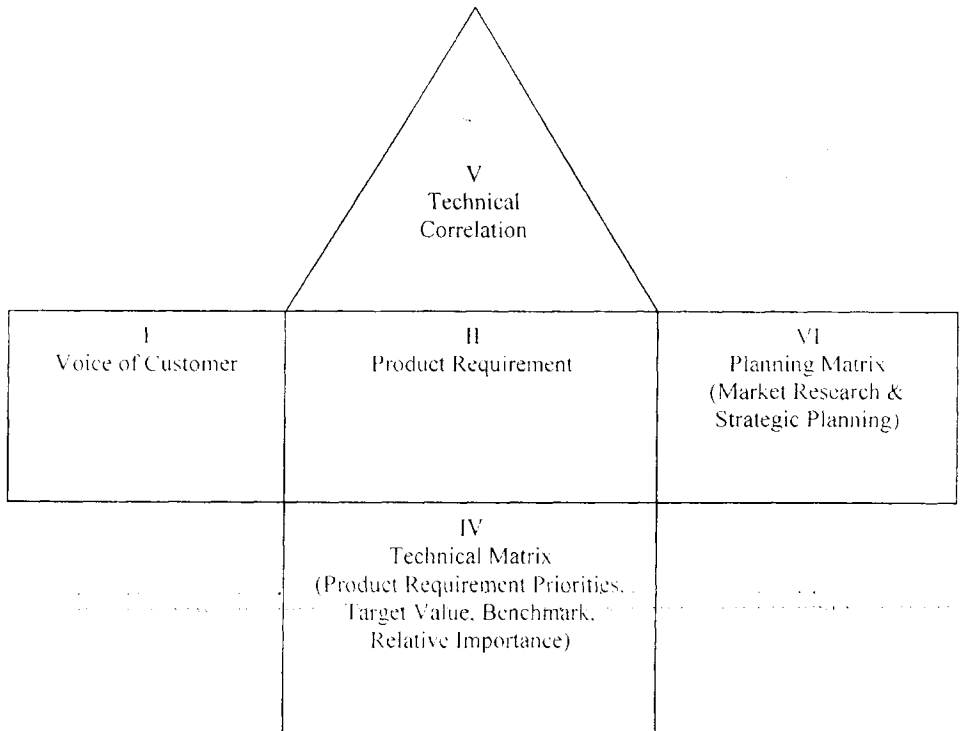
Picture 2: House of Quality Development

The stages in arranging House of Quality:

1. First Stage (Matrix I)
    Data processing of research result based on each group of PKC and then arranging each group by rank according to customer necessity. Data rank is shown in enclosure.

2. Second Stage
    Make a matrix table of relation importance comparison in each PKC. Matrix table of relation importance comparison in each PKC is shown in enclosure.

3. Third Stage (Matrix II and Matrix IV)
    Arrange a Consideration of Construction Quality Performance (PKK) or embroidery design, in this stage a consideration is based on each PKC until it is expected that the target of PKC can be fulfilled as same as the true condition. Formation in PKK table is still can not be fulfilled in a quantitative manner. It is because of there is something still depending on the taste of designer such as: flowers and leaves arrangement, color combination of embroidery, combination of embroidery color and cloth, and compositions of embroidery ornaments and etc. Although not all of PKK is measured; however in this stage, designers can make sample of their product based on the trend of PKC in that time (it is the target research of first stage).

4. Fourth Stage (Matrix III)
    Arrange table matrix of the correlation forces relationship between each PKC and PKK. This table is used for knowing and measuring the main priority, until we can tell which one needs attention for the production process later on (second stage research). Table of the relationship between each PKC and PKK is shown in enclosure.

5. Fifth Stage (Matrix V)
    Arrange matrix of correlation relationship of each PKK and the way of optimizing treatment for each PKK, which one must be minimized, maximized, or optimized. This matrix is used for knowing the correlation relationship between each PKK and the way of quality and the quantity treatment of each PKK. This matrix is very useful on second year research where UKM produce a research product.

6. Sixth Stage (Matrix VI)
    This stage are doing market research and planning strategy. This stage can be doing after we have done all stage before and have known the type of marketing in UKM before. For that reason, it is having not can be shown.

Based on result of peer group is obtained discussion result about embroidery specifications which will be design by designer above is going to

discussion again to see the resemblance and after the discussion we get data as follows:

a. Design, based on the peer group discussion result between entrepreneur and expert is decided that flower type which is customers favorite are jasmine, rose, cheery and frangipani. Geometric star and unformed shape is not included in choice criteria because they have less interested customer.

b. Embroidery size, based on the peer group discussion result between entrepreneur and expert was found data that small size and medium size about 1-3 cm is most costumers favorite.

c. Embroidery ornament setting, based on the peer group discussion result between entrepreneur and expert was found data that the most favorite embroidery setting are combination, in the chest, under the blouse, and in blouse cut.

d. Embroidery technique, based on the peer group discussion result between entrepreneur and expert was found data that favorite basic embroidery technique is full loncat, "hole" embroidery technique is kerancang. the most favorite kerancang technique is jala-jala, and embroidery application which become favorite are 2 dimension and 3 dimension application. Wool, "pecah kopi", and combined is not include in this criteria because they have less interested customer.

e. Combinations, based on the peer group discussion result between researcher, entrepreneur, and expert was found data that color of cloth and thread which become favorite if there is a harmony between the color of cloth and thread. The ornament which becomes favorites is payet. Cloth without ornament must be noticed too.

f. Embroidery color, based on the peer group discussion result between researcher, entrepreneur, and expert was found data that favorite color are secondary color (orange, purple, green) and primary color (red, yellow, blue). combination between complementary color and contrast. Color intensity must be considered. Embroidery elements use cotton, siphon, satin and silk.

g. Critics and Suggestion. there are some critics and suggestions based on customer opinion such as variation of embroidery (39 respondents). better quality (23 respondents). reasonable cost (14 respondents), and services (13 respondents). Critics about variation of embroidery and better quality are more than other critics above based on customer opinion. Services factor is must be noticed too. Another factor which not include in this research can not become a parameter because they have less interested customers.

ANALYSIS OF PRODUCT DESIGN

Based on table 2, it can be analyzed according each group of PKC such as:

a. Group of Embroidery Pattern

This group is consist of flower pattern, fruit pattern, and leaves pattern. Both of these types are known well by embroidery designer until PKK thought that it was no problem for designer to get the motif. Floral and leaves arrangement is according to designer.

b. Group of Embroidery Size

Research result shown that PKC have an intention for embroidery sizes are under 1 cm and about 1-3 cm so it was automatically became PKK but in real condition is depending on operator skill and the machine. In this case, most of UKM use sewing machine JUKI type so there is no obstacle to make a pattern of embroidery with this size.

c. Group of Embroidery Ornament Setting

Embroidery ornament setting which dominate PKC is combination setting. But on the other hand, one position still becomes a choice. Based on the data, combination setting is stronger trend whereas combination setting is depend on designer appreciation.

d. Group of Embroidery Technique

Some of embroidery technique is suitable with the pattern of embroidery and their arrangement until in one embroidery arrangement is not only use one type embroidery technique. This is interesting to design an embroidery pattern and their arrangement. Embroidery design can have variation even though using a same type, but embroidery technique can be different. So embroidery type and embroidery technique have strong relationship and trough this, embroidery designers can patent their design. This is a target from this research to make cooperation with embroidery designer to get patent rights.

To make embroidery using some embroidery technique above, UKM use sewing machine JUKI type because operator in UKM know how to use this machine. Embroidery UKM in Sidoarjo have not has a machine which is automatically work supported by computer which support with embroidery design program software like in UNESA.

e. Group of Embroidery Variation

Two dimension of embroidery variation is more dominate than three dimension of embroidery variation. To fulfill this PKC, operator skill and embroidery machine JUKI type can overcome this.

f. Group of Addition Ornament

Ornament addition here means whether the ornament addition is given or not in embroidery. Embroidery with "payet" addition dominate PKC wants.

to fulfill this PKK consider about adding an ornament which is suitable with the motif and still depending on designer appreciation.

g. Group of Embroidery Color

Whatever of thread color and combination that PKC wants is depending on designer when they combined the color and still consider about material availability in market.

h. Group of Cloth Color

To fulfill the color that PKC wants is still depending on designer ability to combine the color.

i. Group of Embroidery Cloth Material

Embroidery cloth material that suitable with PKC wants can be fulfilled by material availability in market and about the material cost is must be considered too.

From all of PKK's analysis, UKM can fulfill all PKK wants above. It is because this research was done based on ability of embroidery UKM in Sidoarjo and its environs. Henceforth, from the same table we can make sample of embroidery design from customers demand using "Welcome" software program, like shown in picture 3 and 4. Another design can be seen in enclosure.

1. The next step is applying peer group discussion result in embroidery pattern through *welcome program*, this program is used for making embroidery design based on certain specification. The steps are:
    a. Input A, is used for drawing unordered pattern
    b. Input B, is used for drawing ordered pattern
    c. Input C, is used for making lines or side
    d. Complex fill/values, fill with selected embroidery technique by customers
    e. Lettering, is used for making letter shape in embroidery.
2. Basic embroidery pattern which is expected by customers printed on a paper in enclosure.
3. Furthermore, the design is applying on cotton which became a priority of costumer want.

From this research, we get pattern or model as follows:
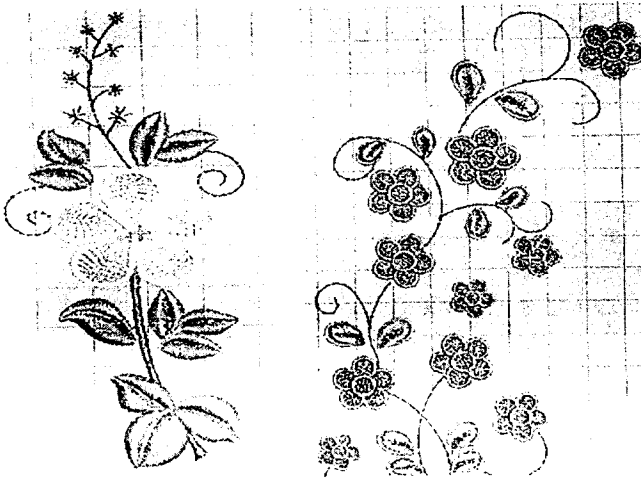
Picture 3: sample design of jasmine embroidery using software welcome
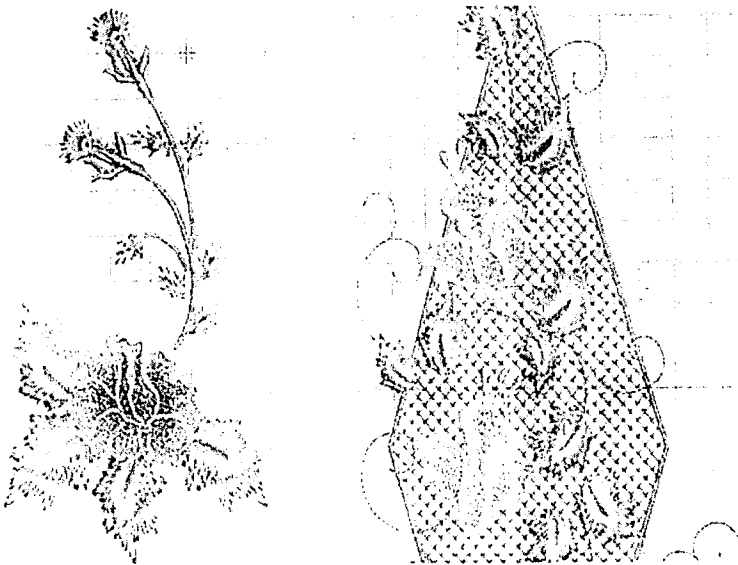
Picture 4: sample design of frangipani embroidery using software welcome

CONCLUSION AND SUGGESTION

Based on data collecting, processing, and analyzing, it can be concluded and suggested:

Conclusion

1. Through field survey to get customer response and expectation about embroidery product in 4 (four) embroidery showroom in Sidoarjo, we get a PKC data in table 4. It is expected that this data can be used as a guideline to develop embroidery product based on customer want. Pattern of embroidery which become customers favorite such as: flower pattern (jasmine, rose, cherry, and frangipani), with size about 1-3 cm, in variation setting, made by esesk/keset technique, and it is made variation become two dimension and there is a payet adding, secondary color (orange, purple, green) and cotton cloth become favorite.
2. Based on PKC data, suggestion from the embroidery expert through peer group for developing embroidery product is given by PKK consideration and it is shown in table 5.
3. The craftsman still can fulfill PKC demand. It was observed from the craftsman ability in embroidery technology. It is because of, before doing this survey, there was a meeting with the craftsman for talking about their ability in embroidery technology. All of craftsman who become object in this research, when they design or process embroidery still using manual process. It is not like UNESA who has automatically machine with computer support which is use embroidery software design.
4. The craftsman have ability to control all of production process to produce embroidery design from research, so research III (manufacturing design expert) only give a suggestion how the production process can work optimally for the later research in second year.

Suggestion

1. Later research in second year is expected that customers have participation in deciding quality of embroidery product based on their characteristic. It is expected that the customers give their true suggestion, because it would influence the basic pattern which researcher produce.
2. The craftsman, researcher and expert need to synchronize PKC and PKK for later research in second year.
3. It is need to make cooperation with UNESA especially in designing embroidery motif because all of embroidery craftsman in Sidoarjo still using manual process when they design and produce embroidery. With this cooperation is expected to produce more variation of embroidery design in order to fulfill costumer satisfaction. It is according to critics and suggestion from customer who want more variation of embroidery design.

4. The ability to use manual machine still can produce embroidery which have a certain quality, but in next time the craftsman need to know better knowledge about technology of embroidery making.

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