



Journal of Arts & Humanities

Volume 07, Issue 10, 2018: 30-37

Article Received: 03-10-2018

Accepted: 13-10-2018

Available Online: 18-10-2018

ISSN: 2167-9045 (Print), 2167-9053 (Online)

DOI: <http://dx.doi.org/10.18533/journal.v7i10.1502>

Digital Modification Techniques Application on Footwear Upper Decorative Design Process

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ABSTRACT

The speed of creation in the consumer products industry is demanded to be able to offset the speed of its market demand. The needs for novelty of design and features that are part of the value component of the performance of a product have become a vital need in winning market competition. Thus, in the era of industrial digitalization as of now, the role of creativity and technology cannot be separated. Therefore, by referring to the development of this phenomenon, the involvement of digital technology in small industries in Indonesia is very important to increase its role. But among Indonesia's small-medium industries (IKM), the existence of digital technology is still not used effectively in its design and production activities so that the novelty and excellence of design that is expected to be the main initiator in market competition is difficult to find in their products. Referring to that problem, the creative development activities through digital modification techniques (DMT) developed from stylization techniques will show that footwear IKM industrialists have the opportunity to improve their creative abilities to produce more quality products. Through participatory experimental activities on footwear IKM business groups located in Cibaduyut Bandung Indonesia, shows the mapping and their potential in adopting this creative method so that it is expected that the work develops in the form of decorative designs on the footwear upper products they produce.

Keywords: Digital Modification Techniques, Design Creations, Footwear, Ornamental Variety.

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1. Introduction

As a developing country, it is natural for Indonesia to shift from a country that relies on labor-intensive industry to rely on their capital-intensive industry through increasing the role of technology on its every industrial aspect. The role of technology in industry is vital in order to be able compete with the consumption and competition speed of the today's market. Currently, the concept of comparative

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excellence has been shifted with the concept of competitive excellence, which is capital-intensive and applying high-technology (Tohjiwa, 2018). If in the past Indonesia relied on their natural resource and labor potential in order to attract foreign investments, currently Indonesia has shifted to show their competitive industrial power through the application of technology especially the digital technology expertise as Indonesia has entered the Industrial Revolution 4.0. However, in reality, Indonesia's footwear small-medium industries (IKM) are still using conventional technology, which is manual and simple. The limitation of technology is usually caused by an investment problem that is not in accordance with the business growth. For Indonesia's IKM industrialists, the utilization of conventional technology is still considered effective to overcome production problems and to develop their products. For them, the conventional technology is still considered capable to anticipate obstacles and challenge although a lot of machines have been implemented automatic systems and have been computerized to support production.

Computer is a multifunction technology that is capable to support design or production process in order to produce a maximum creation performance. Today, architects or designers, in general, are competing in creativity and uniqueness in order to create a product that is captivating, unique, and fulfilling their clients' needs (Gamadaz, 2018). It was found that IKM that implement digital technology shows a faster growth rather than those who do not (Lesmanda, 2016). It was also found that 52.5% to 60.2% surveyed IKM claim that new technology provides them with an opportunity to start or to continue revising workflow, optimizing operation, and increasing productivity.

Currently, there are several high-technologies that have been used by footwear related IKM to support their production, such as computerized embroidery machine, engraving and cutter machine, and 3D printing machine. Embroidery machine has been used to create logos and decorative designs on shoes upper. Currently, a laser technology has been developed to produce illustrations on a leather surface as a substitute for hot stamping technique. In addition, 3D printing machine that employed technology to form 3-dimensional polymer-based objects has also been developed although its application is still limited because the material is not relevant to shoe's components. The application of the technology is still limited to only create sole designs or a certain component.

It is expected that the application of digital technology could incite IKM productivity and competitiveness so that their products could penetrate the export market (Kemenperin, 2018). The creation process that employs formal design procedure such as research and development process in industrial and design educational institutions has involved various digital and computerized technology. The development of computer-aided design (CAD) and its application must be conducted based on a complete understanding of cognitive design process (Bonnardel & Zenasni, 2010). However, digital technology solemnly exists as a tool to support productivity. The creativity of the industrialists to find novelty in their products is more important than the development of the industry. The existence of digital software for graphic design, 3D modeling, spatial planning, animation, and digital applications could stimulate creativity development of many people. Every person could invent something new, in accordance with their own personal taste, individual characteristics, and interest (Velev, 2004). Therefore, a digital application as a "creation tool" should provide a stimulus to increase its users' creativity in accordance with their own character potential.

In the beginning of Industrial Revolution (1750-1850), production system shift from a handcraft and creative-based production to machine production system that based of efficiency and effectivity had changed the production character from exclusive to mass, series, and standardize. The products orientation of Industrial Revolution 2.0 and 3.0 that show effectivity and efficiency are still influencing human creativity to invent novelty in their products. However, with the rapid development of new digital technology today, the limit of human creativity has been expanded. Now, the technological aspect that originated from Industrial Revolution 4.0 has defined the meaning of "mass production", which is the existence of unique values that are obtained from design process using production logic orientated from mass production.

2. Methodology

The study on creativity enhancement strategy of footwear industrialists could be adopted from the creativity patterns that have been proved that it can be implemented in the traditional batik industry. The study method of developing idea starts from the process of imitating an object in order to

understand its visual element characteristics, which consists of dots, lines, and shapes. The process of decorative design starts from documenting visual objects into a visual data in a form of clip art library that will be developed through certain modification methods, such as scaling, mirroring, and flipping in addition to determining visual proposition and composition (Kudiya, 2017). Compilation and modification are the simplest processes in a design process that creates novelty. For several artists, the design process is hard to begin, but through understanding and mastering design hardware and software technology, it could be utilized as design methods.

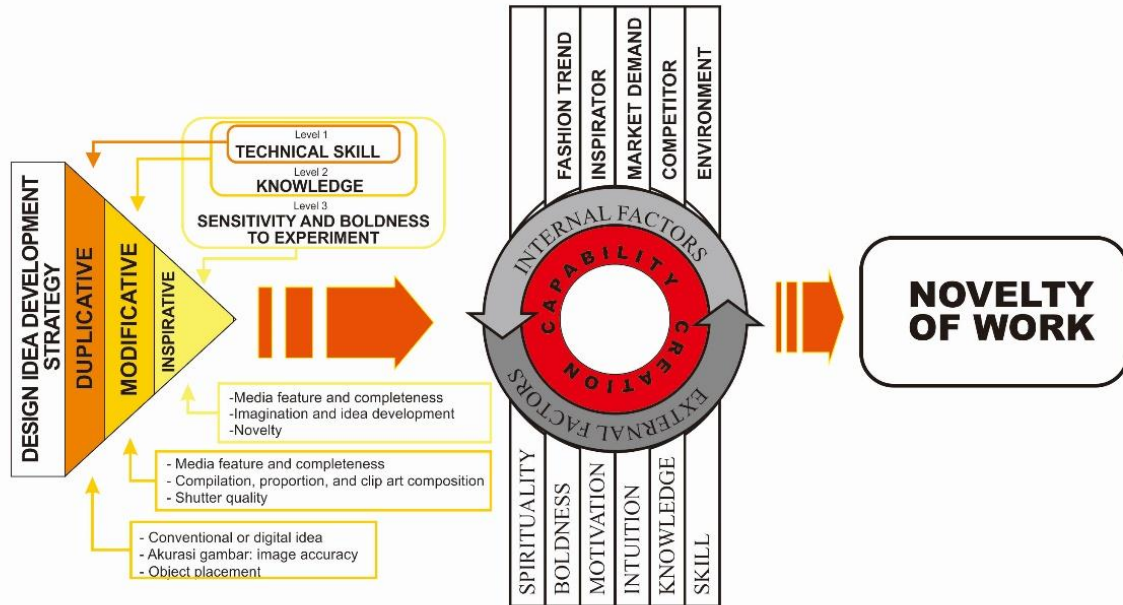


Figure 1: IKM creativity development scheme

As it is shown by the above scheme, in the “duplication” process, accuracy in imitating object is used as a parameter. Meanwhile, in the “modification process”, there is a process of shape modification in order to create a minor change novelty. The current design software has been equipped with several features that could support the modification process, but the abilities to create and the sensitivity to develop image composition and proportion has to be conducted by a process of continual practice. According to Kudiya (2017), a practice to develop the ability to create could be conducted for two to three months and then, it will take to higher step.

Digital media features have an important part in increasing the acceleration of image creation. Ideas will rapidly develop when the process of modification or creation towards an image object is conducted. It is possible because digital media has a capability to provide feedback after the creation processes were taken place. Referring to the qualitative observation results on footwear industrialists’ creative ability employing object imitation and modification technique, 69% of them were not capable to find novelty, 25% of them showed elements of novelty, and 6% of them were capable to produce uniqueness that could be considered as novelty of design (Waskito, 2017).

The chart above shows that the creation process of footwear of small-medium industry (IKM) related was still low and they were not used to prioritize novelty values as their product advantages. It was found that there was only a few of IKM footwear related that were already implementing their design

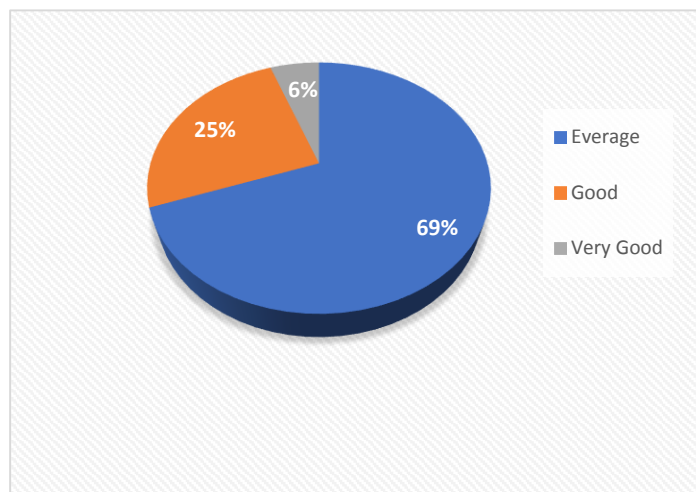


Figure 2: Footwear IKM creation ability using conventional object modification technique

product advantages of its uniqueness that was obtained through a creative process. On the other hand, from the participative experiment of the same study, it was found that the ability to modify the elements of design that possess uniqueness and novelty values could only be conducted by 25% of respondents and only 6% of them had potential to produce design elements with good originality qualification.

The design process in industry is a transformation process of an idea into a design object that is realized by an individual who possesses a certain level of skill (Kudiya, 2017). The creative ability qualification score of the IKM design practitioners that were examined from their product development results can be observed in the following table.

Tabel 1: Creative ability of design worker

Skill level	Skill description	Creative workforce proportion in the industry
Level 1	<ul style="list-style-type: none"> ▪ Ability to imitate image module shape of an object ▪ Ability to operate basic features of a basic digital program (creating line, shape, irregular curve, tracing, copying object) 	10 %
Level 2	<ul style="list-style-type: none"> ▪ Basic skill as the level 1 ▪ Ability to develop module composition/layout module on a specific area ▪ Ability to modify image module (flipping, scaling, rotating, and stretching) ▪ Ability to operate digital program features to obtain new clip art modules 	60 %
Level 3	<ul style="list-style-type: none"> ▪ Ability to develop image module as the level 1 ▪ Possessing creative imagination to produce new image module without tracing or imitating a certain object ▪ Able to develop new image modules composition on a certain image area 	30 %

Source: Interviews with IKM Batik Tulis Komar

The proportion of a creative group within an industry basically is varied. However, in industries that rely on the creative process as its main weapon to develop its business, creative individuals play an important role. Think tank or design conceptualist whose task is to produce novelty ideas is carried out by 30% of human resources that are related to design activity. The task is generally conducted by personnel that is trusted to determine the harmony between corporate identity and the design element character of its products. Meanwhile, design reproduction and its implementation on the products are conducted by around 60% and 10% of creative workforce with various tasks and level of skill. The qualification percentage of a workgroup that is related to a design process is depended on a business concept of an industry. In an industry that is based on production, the design workforce percentage would be lower compared to industries that rely on creativity because production effectivity and efficiency are their main priority. On the other hand, in the creative industry, the percentage of the design workforce would be higher because idea productivity to produce high-quality products with novelty values is the main target.

3. Results and discussion

The observation on the ability to develop design and work quality produced by IKM worker shows several data related to their real condition. Several workers whose role are designers in IKM show that creative process in their workplace is relying on several internal and external processes (see Table 1), which are creative individual ability and the design development strategy of the related industry. Usually, the modification is conducted on the pattern cut and the ornament graphic, which become product's identity such as decorative design, ornament, and logo graphic.

The ability to produce design elements requires more effective skill development strategy through a creative method that is not only easy to learn, but also easy to implement so that the design

production speed and quality would be better. In this study, a creative method is developed based in modification techniques applied using digital technology in order to produce work effectivity.

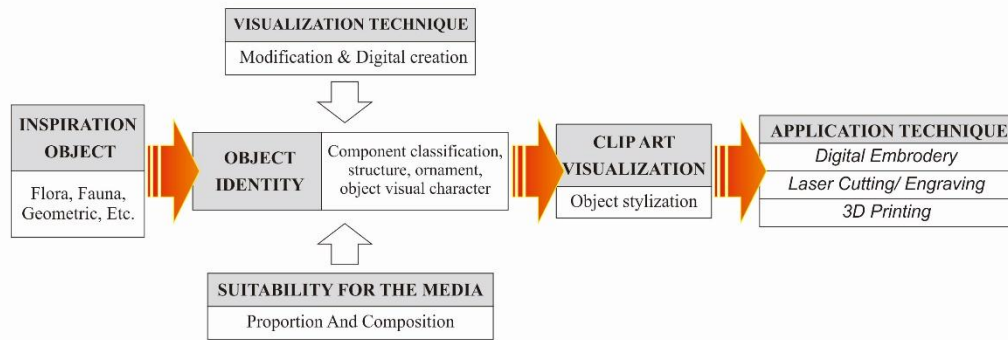


Figure 3. Decorative design elements creation process using digital modification techniques/DMT scheme

Design modules that have the possibilities to be an element in a design development require an inspiring object that could be found around us. Like aesthetic ornaments in general, “inspiring objects” can be found on flora, fauna, geometric, traditional ornaments, or natural objects. Basically, these objects can be found around where human live and doing their activities. So, it is often that shape, type, and characteristic that become inspiration are objects that regularly affect their daily life.

As a case study, the experiment on shoemaker creation capability was conducted through creating a decorative design object. Borneo black orchid, which has its own unique form and has a potential to be a promotion media for Indonesia flora wealth, was employed as the object.



Figure 4: Inspiration objects from nature

Digital modification technique is an application of the object simplification (stylization) method to produce new decorative design modules using inspiration objects by utilizing digital technology as a media to reconstruct. In this decorative design module creation, a visual object in a form of *momen opname* (momentary image) and still life digital photos are required as the inspiration objects. Then through digital duplication and simplification techniques, new objects that are composed of certain elements in accordance with the original object construction are produced (Step 1).

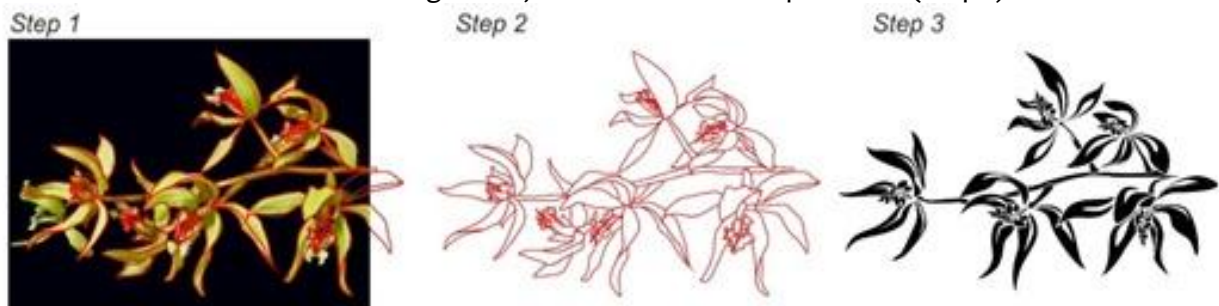


Figure 5: The early steps of digital modification technique to develop decorative design

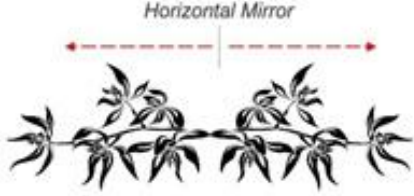



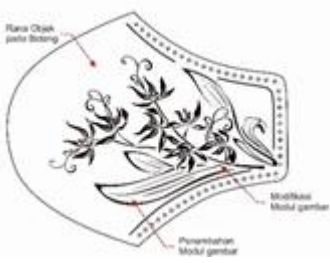
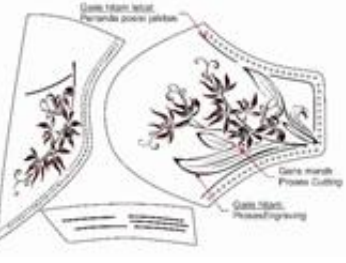
The tracing process of the image object using digital technology provides a better possibility to accelerate the development of idea compared to the conventional tracing technique. Moreover, by using a digital technology, a person can modify a visual element with its variation in a large amount and within a short time (step 2 and step 3).

CorelDRAW 2D design software, which is well-known in the world of design, was employed in this study. CorelDRAW was also employed in this study in hope that with its popularity as a digital design

software, IKM individuals who wish to develop their design ability can use this software as a learning and development media. This software includes several basic instructions that could be implemented as simple instructions to produce several decorative design module shape configurations. These design module creation and modification instructions have various degree of complexity starting from “easy/simple”, which only requires knowledge to operate the software, to “hard/complex”, which not only requires knowledge to operate, but also require its user to possess aesthetical sense to preserve the desired visual quality.

Several instructions that are considered as the basic techniques to develop decorative design modules are classified in the following table:

Table 2: Development & operational process

	
<p>1. Position change that forms elongated composition without complex action. According to the observation result, the craftsmen were able to understand the flip/horizontal mirror technique quickly.</p>	<p>2. Radial module composition change through modification (repetitive) with low complexity action.</p>
	
<p>3. Module structure proportion change through the object's elements modification. This action has higher complexity because the modification is conducted nearly in every element and structure of the decorative design module.</p>	<p>4. Proportion and composition changes that are conducted through object position modification towards its other elements.</p>
	
<p>5. Composition and proportion changes using operation techniques are more complex because it requires judgments of the object position towards its application media, in this case, a pattern for a shoe upper.</p>	<p>6. The application of decorative design on shoes upper pattern.</p>

From the digital modification process of the inspiration object, a new object in form of new decorative design modules with various configuration was produced. Basically, the variety of decorative design module shapes and compositions that are produced will be the start of a creation that can be produced at a high speed. The produced design will be influenced by the composition of shape and in the case of footwear decorative design, it will be influenced by the footwear upper design pattern cut.

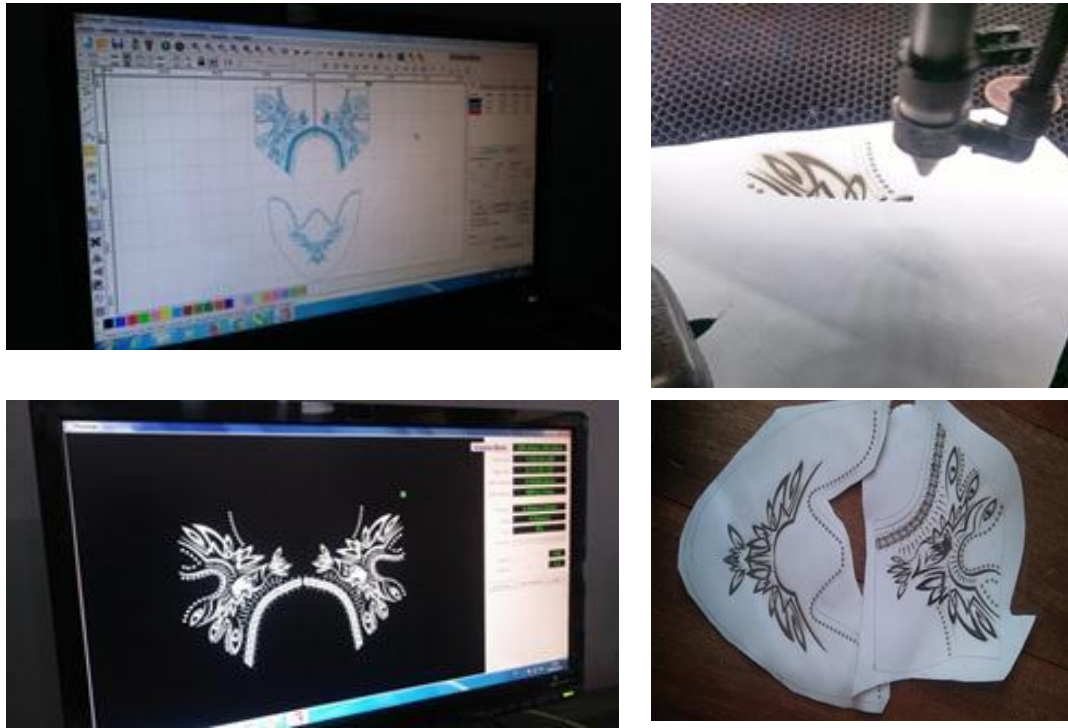


Figure 6: Execution process using production machines which in this case use laser machines (Laser Cutting / Engraving Machine)

Decorative designs (motifs) applied to shoe patterns will provide potential opportunities for small/medium industry players to produce design variants from the products they produce. The design that is the result of this experimental activity is able to show that the method of developing decorative designs can be studied by people who do not have a design education background and can be learned relatively easily. Figure 7 shows the end result of shoe products with various decorative designs uses the DMT method and the application uses a laser technology machine. This creative method can also be applied to other production machines based on digital technology including Digital Embroidery Machine & Digital Printing machines.



Figure 7: Experimental products, application of the DMT method on footwear production

4. Conclusion

The development of 2D object design using digital modification technique provides an opportunity to increase the production of IKM in terms of creating a new design, especially decorative design objects. The implementation of digital technology also assists the craftsmen to be able to document and to produce their decorative design works with more speed, accuracy, and variation, compared to the conventional technique of image modification. Therefore, the creative development method has a high opportunity to be used as a basic technique to develop individuals design that are limited by their struggle to visualize an idea and to develop their own creation

Digital application program or design software that has been developed in the current Industrial Revolution 4.0 is capable to integrate with various manufacture devices, which are commonly equipped with information, digital, and computerization technology. Therefore, the ability to use digital technology as a tool to design and produce has to be a part of every industrial process including in Indonesia's IKM.

5. Acknowledgment

This study on practical creation with digital modification technique was supported by Directorate of Research and Social Service, Ministry of Research and Technology and Higher Education of the Republic of Indonesia (*Kementerian Riset, Teknologi, dan Pendidikan Tinggi Republik Indonesia*) that had provided financial support so this study can be accomplished. Also, gratitude is given to the interviewees, respondents, and provider of facilities.

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