

TECHNOLOGICAL INNOVATIONS IN BATIK FASHION DESIGN: A CASE OF INDUSTRY 4.0 - BASED EDUCATION CURRICULUM

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Abstract

The existence of technological innovations is inevitable in every aspect of humans' life, including in education and fashion, which is a part of creative industry. The study aims to develop an application of Batik fashion design namely Jatic Asyik as a learning tool integrating technological innovations in industry 4.0 - based curriculum. We developed an Android and iOS - based application for the educational purpose as well as an e-commerce website for the industrial purpose. The results of this study showed that the developed application promotes easily accessible usability, exciting and fun experiences, as well as cultural experiences for users, both students and also industrial practitioners. Additionally, the accuracy this application offers enables the reduction of pre-production failure of Batik clothing, including mass production. It can be concluded that the application is relevant both in the context of education and in the context of industry.

Keywords: Curriculum 4.0, Technological innovations, Clothing mitch match, Batik fashion design learning, Local wisdom, "Jatic Asyik".

1. Introduction

Technological innovations in fashion design keeps developing rapidly in accordance with the demands from the society, advances of the most recent technologies, and even the global pandemic currently occurring. COVID-19 outbreak forces people, especially medical staff to wear personal protective equipment (hazmat suit) for their own safety. Some studies have been examining the making of this protective clothing using a variety of fabrics and models safe to those wearing it from the virus [1-3]. As technologies have been integrated in fashion designing in war [4], they have also been developed in medical use protecting the staff from hazardous pathogenic microorganisms when working in a laboratory [5] in a certain pre-set temperature [6].

Specifically, the basic steps of technological innovations in fashion design have been the concern of researchers. One of the developed technologies used in fashion designing is artificial intelligence (AI). AI is able to perform the so called clothing match process so that there will be a harmony among model, color, pattern, and even texture of the fabric used [7, 8]. In addition, smart clothing, where every step of fashion designing is carried out by digital platforms, also gives novel direction in the fashion industry. The simulation of clothe making can be controlled pre-production; starting from virtual garment developing, virtual fabric, virtual human [9], and also virtual fitting room technology [10].

Technologies in relation to fitting have been developed in various innovations; one of which is the use of robot mannequins. Robot mannequins are mannequins resembling the structure of humans functioning to try on clothes prior to mass production. The results of the fitting by robot mannequins are usually accurate, especially in measuring sizes [11]. In fashion design, body dimension - based clothing making has utilized 3d body scanner using computer aided design (CAD) applications (CAD) [12]. This concept has been frequently used in fit clothing or virtual try-on [13, 14].

The development of technology within the context of fashion design is not only adoptable by the industry, but also adaptable in learning contexts in educational institutions. The most current curriculum requires an industry 4.0 - based curriculum model where the need of utilizing technological tools is inevitable. Some of the principles of the industry 4.0 to be implemented in the curriculum are smart factory [15-17], smart manufacturing [18], and intelligent factory [19]. All the principles are closely related to smart industry which leads to smart city, smart enterprise, and smart services [20]. Therefore, learning in the era of industry 4.0 requires adequate multiplatform devices [21]. However, there are a few studies developing an application of fashion design, particularly traditional fashion such as Batik, relevant to both educational and industrial contexts.

This study aims to design batik learning tools underlining the principles of clothing mitch match. The selection of batik is due to the existence of integration between technological innovations and local wisdom as Batik is local wisdom with remarkable values owned by Indonesia.

2. Methods

The designing process of Batik learning tool development is performed with reference to the principles of clothing mitch match. The tool is developed so that those who are about to make Batik can have their own model, pattern, and mix and

match of the fabrics. The tool is then made in an application to give easy access for students to have it in several digital platforms.

The application is created in both learning application and e-commerce website for Batik trading. The application is used as a learning medium to introduce a variety of Batik model and patterns. Users, which in this context are students, can also be creative in mixing and matching the models provided in the application. The application designing is described in Fig. 1.

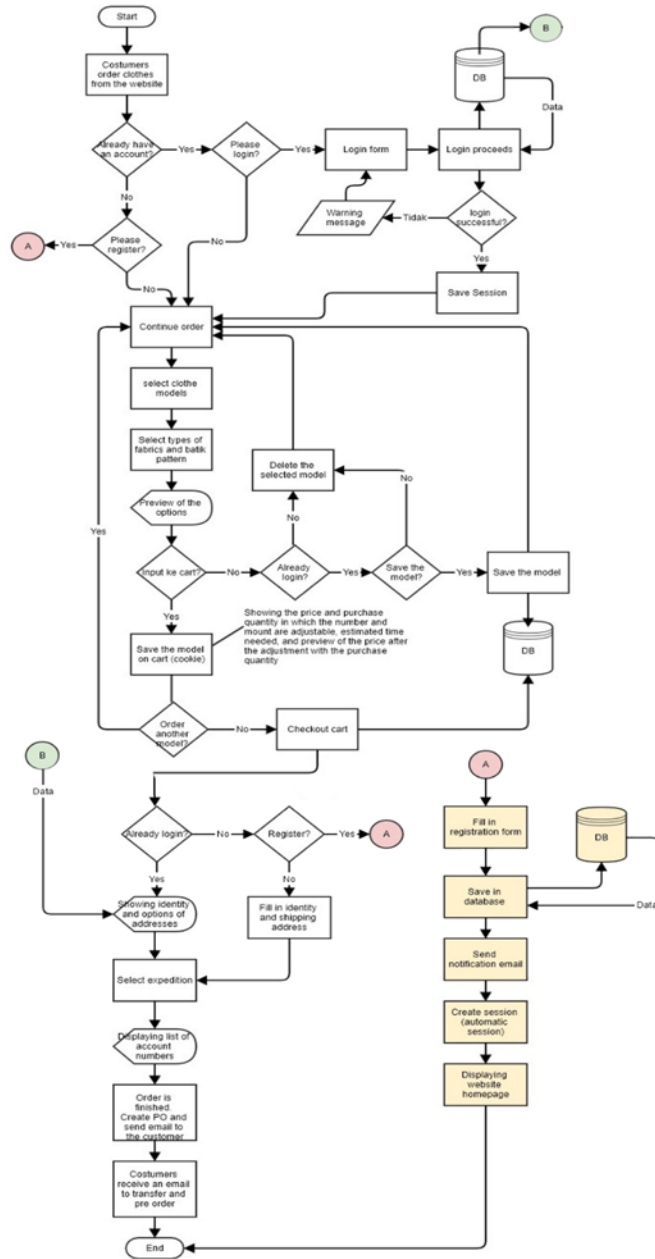


Fig. 1. The designing of application system for users/ students.

Figure 1 depicts the sequential order of the application use for students where students as users to login using their own accounts. They surely have to register to be able to have an account. The application enables the users to determine their own clothing models based on the models provided. In addition, the users can also have their own Batik pattern applied to their clothing.

The initial stage of the application designing started with determining the models and patterns to be provided in the application. Following the stage is drawing the model using an illustrating application which in this study used Affinity Designer application. The application is a vector graphic editor developed by Serif for macOS, iOS, and Microsoft Windows which is also a part of Affinity Trinity along with the other two applications namely Affinity Photo and Affinity Publisher. Affinity Designer is available for direct purchase on the company website and also on Mac App Store, iOS App Store, and Microsoft. The model drawings should be exported to *.SVG which is a picture type of file commonly used for websites.

3. Results and Discussion

The developed application in this study is namely *Jahit Batik Asyik* (Jatik Asyik) which means fun batik sewing. The first phase of the application was virtual mannequin use. Figures 2 and 3 show the worksheet of the illustrating application when making the mannequins.

The virtual mannequin making aims to create a referred model when the users/students select “create model” through the application front end. The mannequins made are displayed in both front look and back look to give the students clear description of the clothing they are about to make (fashion preview).

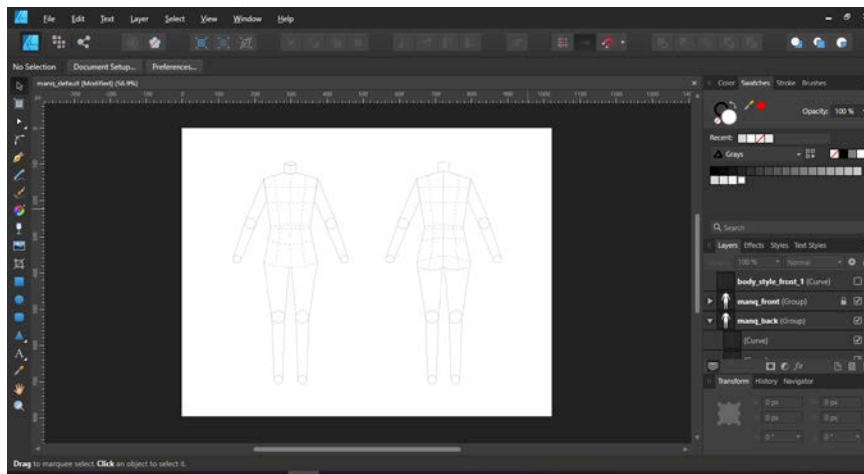


Fig. 2. Mannequin making.

The next process is the dress pattern making consisting of basic components of dress pattern including body, sleeve, collar, and pattern. Each of the basic components are also made in either front look or back look in separate *.svg files. This is to make the picture component management easier to apply in programming codes (in this project, the codes are noted as hardcore in CSS).

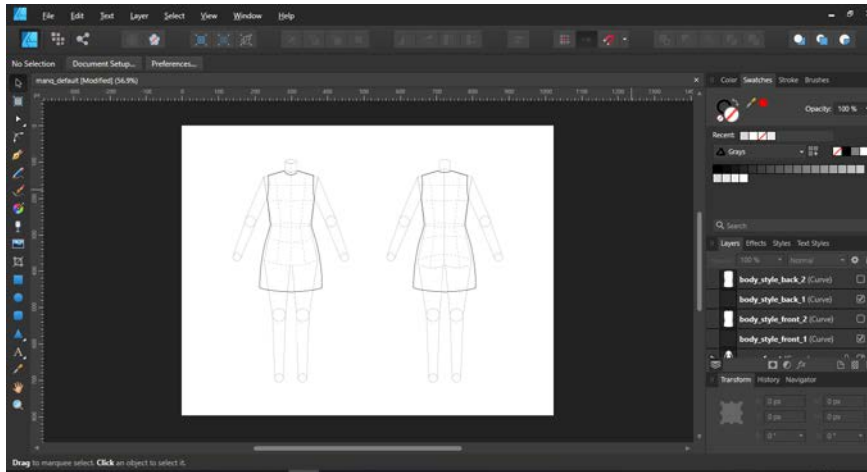


Fig. 3. Pattern component making.

The model components on Fig. 3 would be grouped into three divisions resulting in *.svg cuttings as shown in Fig. 4.

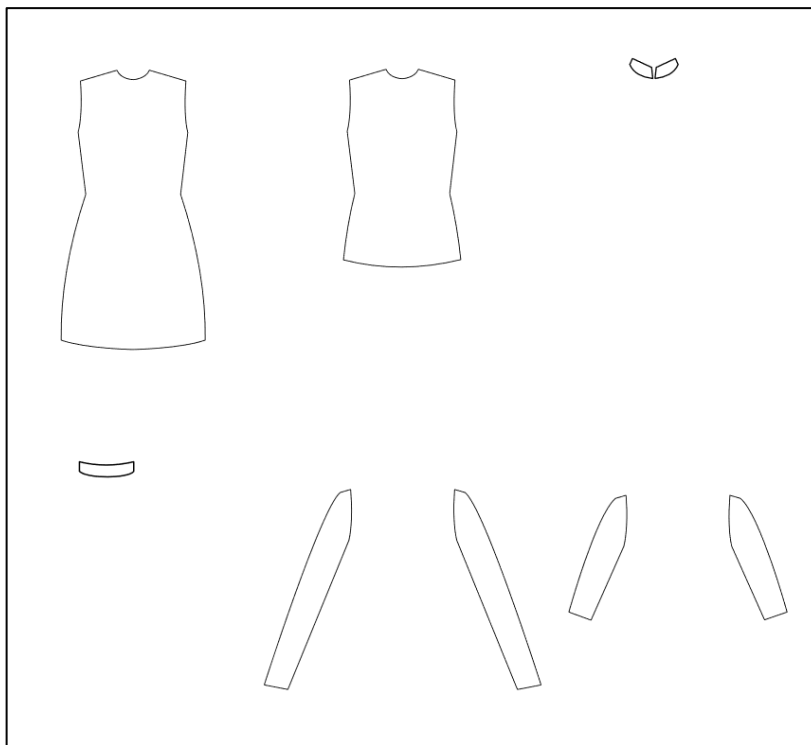


Fig. 4. Cuttings with *.svg file extension.

The cuttings from Fig. 4 are then applied to CSS coding as follows.

```
.body-1{
```

```
-webkit-mask: url(../img/manequin/model/body_1.svg) no-repeat 50% 50%;
mask: url(../img/manequin/model/body_1.svg) no-repeat 50% 50%;
-webkit-mask-size: contain;
mask-size: contain;
background-color: #eee;
display: inline-block;
width: 100%;
height: 600px;
position: absolute;
left: 0;
top: 0;}
```

The preview of CSS codes are presented in clearer preview in Fig. 5. In the meantime, the preview results of the coding are shown in Fig. 6.

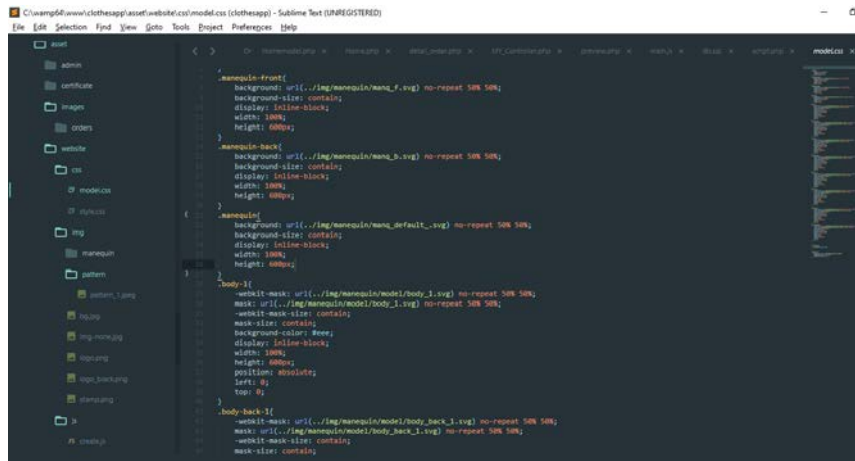


Fig. 5. CSS code preview of model and pattern components.



Fig. 6. Preview of the CSS coding results and .SVG picture.

After the CSS coding results are previewed, the next step is developing a website to integrate it with the learning medium. Figure 7 shows the login page of the Jatik Asyik application. Meanwhile, Fig. 8 presents the selection of the clothing models and Fig. 9 shows the size determination of the clothing.

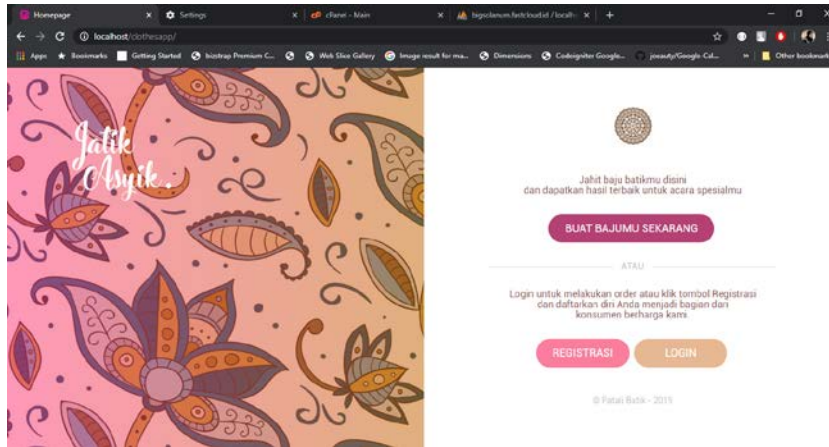


Fig. 7. Jatik Asyik application login page.

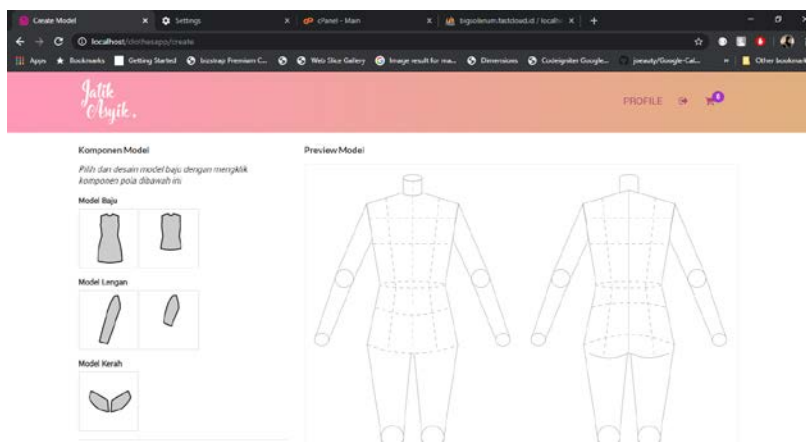


Fig. 8. Display of clothing model selection.

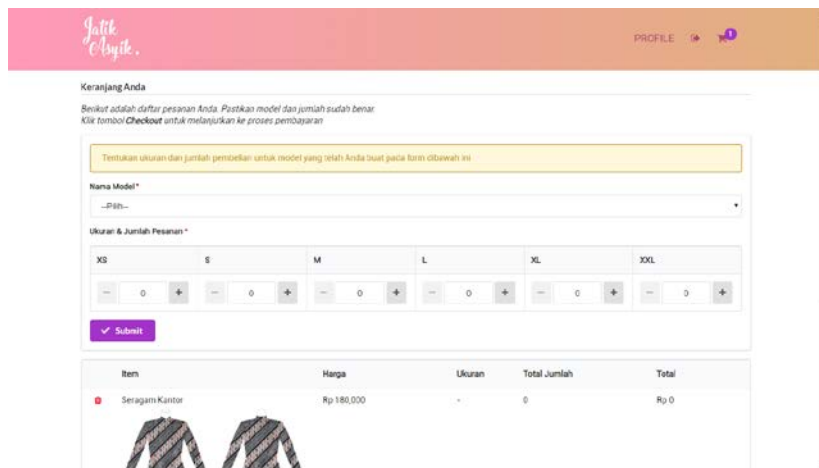


Fig. 9. Display of size measurement.

Jatik Asyik application can be an alternative of fashion designing with more effective and efficient processes and bigger possibility of failure prior to production, especially mass production [12]. Additionally, the application can also minimize customer dissatisfaction since they can choose their own models, designs, and mix and match of the fabrics [9]. In the context of teaching and learning process, this application is able to save up practicum budget since everything is administered digitally. This is just another important thing necessary for Indonesian education since equality in education has not met.

The application designed and developed in this study is actually in line with the industrial development implementing the principles of smart industry. It is commonly known that one of the characteristics of the industry is cyber physical system (CPS) which is the integration between machines and humans [22-24]. CPS manages all the components involved in the industry to be an integral part, interconnect to one another, either among workers, tools, machines, or even customers. This kind of connection is a smart factory takes place real time so that acceleration in designing, producing, and delivery system exists [25, 26]. For the context of Indonesian industry, this application is also helpful so that small enterprises in fashion design, especially in Batik sector, can save up their budget or allocate it for other urgent necessities.

4. Conclusion

The development of a fashion designing application namely Jatic Asyik in this study is implemented for students' learning. However, Jatic Asyik is also applicable in within the garment industry especially when producing clothing since the application is able to avoid mass production failure. The primary principle of the application development is clothing mitch math where customers can select their own designs, models, Batik patterns, and mix and match of the fabrics. In addition, the process of using the application also promotes cultural experiences since there are a lot of local wisdom values in the application. Designing and sewing clothes appears to be more exciting and fun as well as less time and energy consuming and less costly.

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