



# Designing User Experience and User Interface of a B2B Textile e-Commerce using Five Planes Framework

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## ABSTRACT

Indonesian textile industry needs an e-commerce platform to facilitate purchase of textile goods and to improve connectivity between industries. The textile industry has distinct characteristics from other industry, from its supply chain characteristics to the details of goods sold. Therefore, Indonesia Smart Textile Industry Hub (ISTI) as a textile e-commerce platform needs to implement different strategy from e-commerce in general. Different strategies will affect the design of user experience or user interface in e-commerce. This paper will discuss how to design e-commerce specifically for textiles using the five planes method. The strategy plane produced the objectives and user needs of e-commerce, the scope plane produced the list of the required features, the structure plane produced detailed flow of user activities, the skeleton plane produced layout designs and information organization in the form of wireframes, and the surface plane produced the design up to the level of interface detail. The interface detail is also designed to meet eight golden rules of interface design. The output produced in this study is the design of the textile e-commerce interface on the alpha version of the website.

### Keywords:

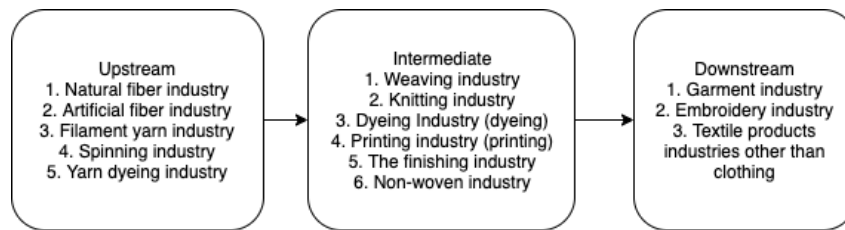
E-commerce; textile industry; user experience; interface design; five-planes framework

## 1. Introduction

The textile industry in Indonesia has experienced many challenges in recent years. In the early quarter of 2019, Indonesia recorded a growth of the textile and clothing industry up to 18%. However in the middle of 2019, Indonesia was pressured by the import of cheap fabrics which caused the domestic demand from this sector to decline sharply [1][2]. An effort to strengthen the textile industry is to improve connectivity between industries in Indonesia [3].

The textile and textile products industry in Indonesia can be divided into three main sectors: upstream, intermediate and downstream [4] as shown in Figure 1. Currently, textile companies build connection with each other by means of offline platform such as becoming a member of Indonesian Textile Association and participating in textile exhibitions. Better connectivity between industries is urgently needed, taking into account the large number and diversity of industries in the textile industry in Indonesia. Also, better connectivity can help increase local transactions. An initiative to achieve connectivity is by adopting e-commerce technology.

E-commerce allows the process of purchasing goods and services via the internet. Goods and services can be posted on the online platform to allow information to be accessed to the public. E-commerce can be applied in various business areas, including business-to-business (B2B) [5]. Various types of e-commerce have developed in Indonesia, ranging from small scale websites such as those owned by small or medium-sized businesses to the large e-commerce marketplace where basically anyone in the public can buy and sell in it. Around 86% of internet users in Indonesia in 2019 have made purchases of goods or services online [6].



**Figure 1. Structure of Textile and Textile Products Industry**

Indonesia Smart Textile Industry Hub (ISTIH) is an e-commerce application to help connect textile industries in Indonesia. The textile industry has unique characteristics compared to the e-commerce marketplace in general. E-commerce marketplace in general usually adopts customer-to-customer business model, meanwhile this textile e-commerce will adopt business-to-business business model. Therefore, a new set of strategies will need to be employed in designing ISTIH.

To ensure the success of the system, this research aims to design user experience (UX) and user interface for ISTIH [7]. User experience itself is defined by the ISO as the user's perceptions and responses that result from the use and/or anticipated use of a system, product or service [8][10]. UX emphasizes understanding of users and their needs [9]. Designing user experience of a digital product ensures that the end result actually solves user's problems and helps user reach their goal. In this study, we want to design a system that addresses what are actually the needs of textile industries to help them better connect with each other.

For most digital products, user interface takes a big portion of the user experience [14]. User interface is defined by the ISO as all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system [10]. In designing user experience and user interface for a system, an appropriate method and guidelines will be used so that the main objectives can be achieved and user needs can be met.

## 2. Related Works

There are several works that has attempted designing or improving user experience and/or user interface of an e-commerce system. A study was conducted to solve the 39% failure in buying in an e-commerce using user-centered design website of a private company that provides hair and salon products and services [11]. This research applies user-centered design as a tool for analyzing the system and used black box testing, 5 second test and usability test to evaluate the design. Another study was done to improve user-friendliness of a B2B e-commerce using flat design [12]. A study also attempted in designing user experience of a toy e-commerce using paper prototyping [13]. Another study attempted to design an information system which include the design of user interface, using iterative and incremental method.

The related works has selected different user experience design methodologies based on their own business case and needs. Some research adopt methods while some other adopts tools for design. User-centered design was popular method among researches in designing user experience. However, within user-centered design, the first process was specifying context of use. This assumes that the purpose and strategy of the system is already clear before this method was applied. In this research's case, before getting into context of use, a strategy needs to be established. Therefore this research adopted another methodology called the five planes framework.

## 3. Research Methodology

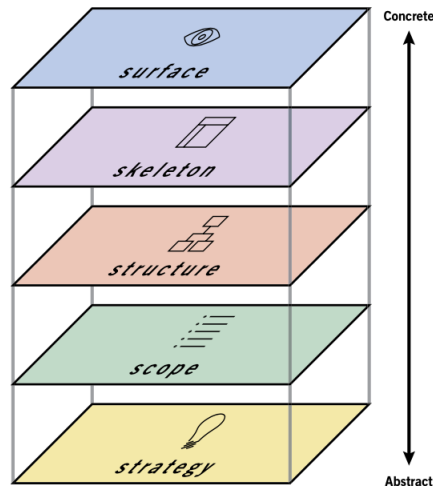
### 3.1 Overview

There are two main parts of the design methodology of this system. One part comprises of the design of the user experience and the other is the user interface. This research adopts five planes framework introduced by J.J. Garrett [15] and eight golden rules of interface design by Ben Shneiderman [16]. The two processes are not independent to each other, but rather, diffused to one another. The overall process used five planes framework, while the eight golden rules is used when designing user interface of the system.

### 3.2 Five Planes Framework

The five planes framework is a framework for describing how a user experience can be designed [15]. With this framework, a user experience of a product will be more easily explained in the form of a conceptual model, both in terms of the problem solved and the way to solve it.

The five planes framework consists of five planes: surface, skeleton, structure, scope and strategy. Each plane will depend on the plane below it, so the application should start from the lowermost plane. Generally, the lowermost plane will be more abstract and the upper plane will be more concrete, as illustrated in Figure 2.



**Figure 2. The Five Planes Framework [15]**

In the strategy plane, identification of product objectives and/or user needs is carried out. Product objectives are generally obtained from the business context in which an application is designed. However, business objectives must also be supported by knowledge of the user needs. To obtain product objectives and user needs, a focus-group discussion with system owners, users, and respective stakeholders was conducted.

After strategy has been made, we need to know how the product objectives and user needs can be satisfied. The system needs to have a definition of what functions and features will be included. This process takes place in the scope plane. Functions and features should be selected based on prioritization. Prioritization can be done by considering resources, time, and how large is the impact of this feature to achieve product objectives. In this study we use use-case diagram to describe functions and features to be built in ISTIH.

On structure plane, features and functions that were defined in the scope plane are brought together into something more cohesive and showing the system as a whole. In this part we create a conceptual model in the form of flowcharts to explain how the business processes that takes place in the system. We also show how each user role interacts with one another, having in mind that each user role has their own use cases.

After the conceptual model of the system is made clear, further explanation is needed about how users interact with the system. We need to show what visual elements are needed to allow the flow in the conceptual model to work. We need to also define how the elements are arranged in a layout of each page and how they connect one page with another. These description is outlined visually in the skeleton plane in the form of a wireframe using a prototyping tool called Figma.

Finally, on the surface plane, the wireframe that has been made is combined with respective content and aesthetics to produce a functional website that meets the requirements in the previous planes, but also has a pleasing interface. This is shown in early version of the website which is made with PHP (Laravel Framework), HTML5, and CSS.

### 3.3 Eight Golden Rules for Interface Design

The five planes framework provide a set of requirement for designing user experience. However, it does not specify in detail about how the interface design should be. In this research, besides designing user experience, user interface is also designed. In a design of a digital product, user interface takes a large part of user experience. Therefore, designing user interface must adopt a set of proven guidelines.

One of the design principles that has been adopted widely is the eight golden rules of interface design [16]. It consists of eight principles that must be followed during designing user interface. The rules are as follows:

1. Strive for consistency
2. Seek universal usability
3. Offer informative feedback
4. Design dialogs to yield closure
5. Prevent errors
6. Permit easy reversal of actions
7. Keep users in control
8. Reduce short-term memory load

## 4. Result and Discussion

The following paragraph summarizes the results obtained after implementing the five planes framework in the ISTIH design process.

### 4.1 Strategy Plane

On the strategy plane, the goal is to formulate product objective and identify user need. To achieve this a focus group discussion was held. The focus group discussion was conducted with the Indonesian Ministry of Industry as the system manager and representatives of textile industry as the system user. In the focus group discussion, we discussed about what are the vision of the system and how users do daily B2B business transactions. Combining these information, we formulate three main strategies as a baseline of the system.

First, the system is intended to simplify the process of finding items in accordance with what the user wants. Large-scale business and business-to-business (B2B) transactions do not have to occur on the system. To be finally deciding to purchase, companies need direct contact with one another for price negotiations, further discussion of product details, the size of the purchase and delivery arrangement. Often to reach purchase decision take quite some time; a simple transaction in e-commerce system is not enough. In addition, the products being sold may not be ready stock, but rather order-by-request or production will start only after an order is placed. Therefore, the main role of the system is to enrich information for those who are looking for a textile product.

**Second, the system aims to make it easier for users to upload product information. Textile products have very specific set of details of product information. Buyers often needs all the details to be complete before making a purchase decision. Therefore, product information needs adjust to the details standard used in the textile market. Each product is also divided into fabric categories. There three main categories namely weaving, knitting, and garment. Variables on one product are defined specifically as explained in Table 1**  
Product Variables.

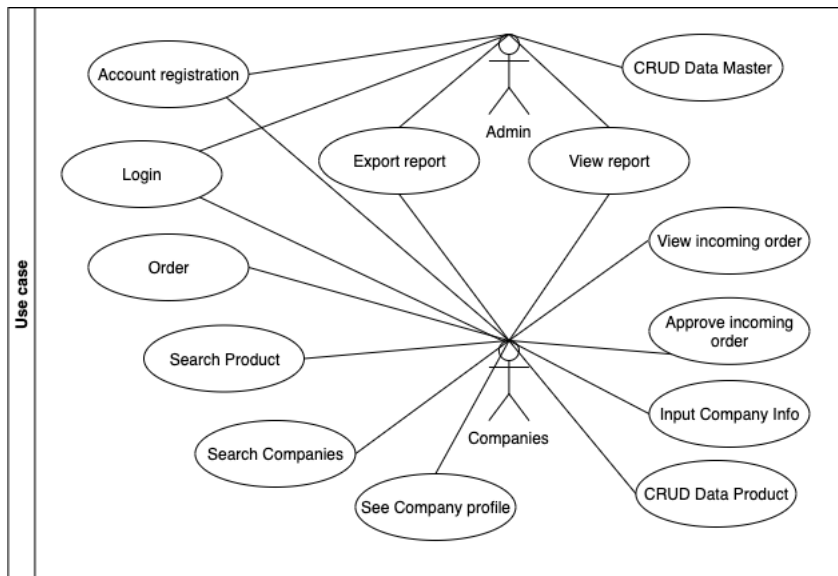
**Table 1**  
**Product Variables**

|                                                      |                                             |
|------------------------------------------------------|---------------------------------------------|
| 1. <i>Nama pasar</i> (Market name)                   | 11. <i>Konstruksi</i> (Construction)        |
| 2. <i>Merk produk</i> (Product Brand)                | 12. <i>Gramasi</i> (Gramation)              |
| 3. <i>Kategori</i> (Category)                        | 13. Handling                                |
| 4. Size                                              | 14. Quantity                                |
| 5. <i>Jenis</i> (Type)                               | 15. Stock                                   |
| 6. <i>Penggunaan</i> (Usage)                         | 16. Minimum Order                           |
| 7. <i>Warna</i> (Color)                              | 17. Delivery Order                          |
| 8. <i>Motif/ Varian</i> (Motive/Variant)             | 18. <i>Standar Mutu</i> (Quality Standard)  |
| 9. <i>Harga Jual</i> (Selling Price)                 | 19. <i>Proses Pengerjaan</i> (Work process) |
| 10. <i>Komposisi Material</i> (Material Composition) |                                             |

Third, the system can be used by the general public. However, the main purpose is still to improve connectivity between the textile industries, it is necessary to identify or differentiate which users are officially registered industries and which are not. Therefore, a strategy to verify registered industry must take place. In addition, verification process is also needed to avoid resale or claiming items that do not belong to a user.

### 4.2 Scope Plane

With the strategies that have been prepared in the strategy plane, the scope plane will discuss the main features and functions of the system with a use case diagram. As shown in Figure 3, there are two types of users: admin and company. Admin has the main task of managing the master data and approve new company data. While companies can play a dual role as buyers and sellers of textile products. Companies can input their company information, manage products, receive and approve orders. Both types of users will also have the right to register and view reports.



**Figure 3. Use-Case Diagram**

### 4.3 Structure Plane

In the structure plane conceptual models are made in the form of flowcharts. The first flow chart is a general flow system consisting of four stages: registration, product entry, order and reporting. To facilitate the need for only industry with official permission to sell textiles, a registration flow is needed in which there is verification of company data by the admin as described in registration flow. After a company is verified, the company can begin entering data on products to sell as described in product entry flow.

The main process occurs in the order flow where users can search for products to be purchased, then put in a shopping cart and make an order. After an order is made, the receiving company will check the incoming order to determine whether this order will be accepted or not. In this part, the company may have offline contact before making an order.

Then after the process has been running for a while, the user and admin can see the report of sales. This report can be applied filter based on time or other variables contained in the order information. Then sales reports can be exported in CSV document format. The whole flow is explained in Figure 4.

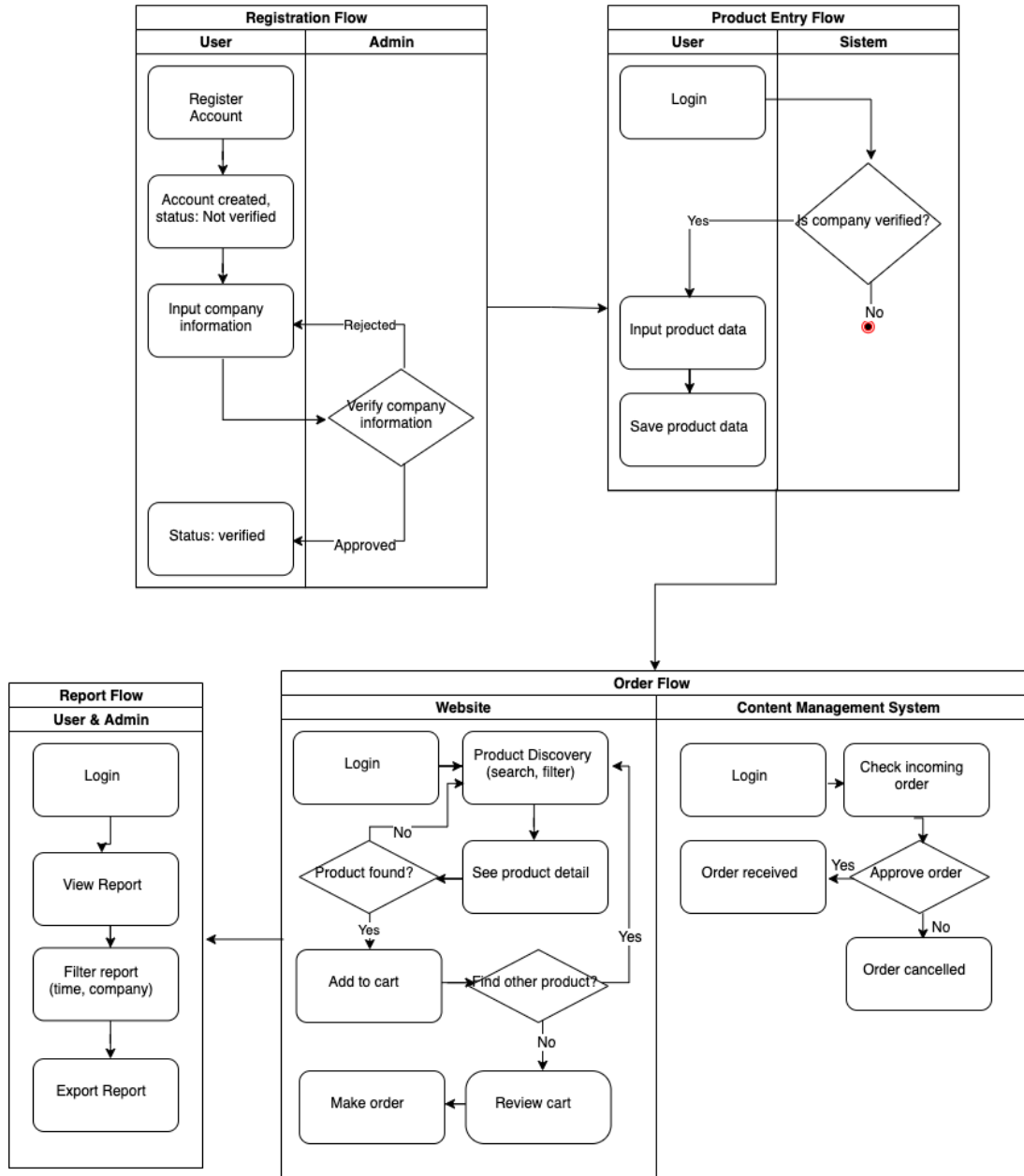


Figure 4. Flowchart of ISTIH business processes

#### 4.4 Skeleton Plane

In the skeleton plane, about 20 pages of the textile e-commerce website interface are made in the form of a wireframe using the Figma tool. At this stage, the wireframe, as can be seen in Figure 5, is made more focused on the details of what each page must contain, how the layout of navigation, buttons, titles, images, links and other content, and how to flow from one page to another page with reference flow in the structure plane. Wireframe is formed with a minimalist aesthetic: there are only few colors used, one type of font, and a few images.

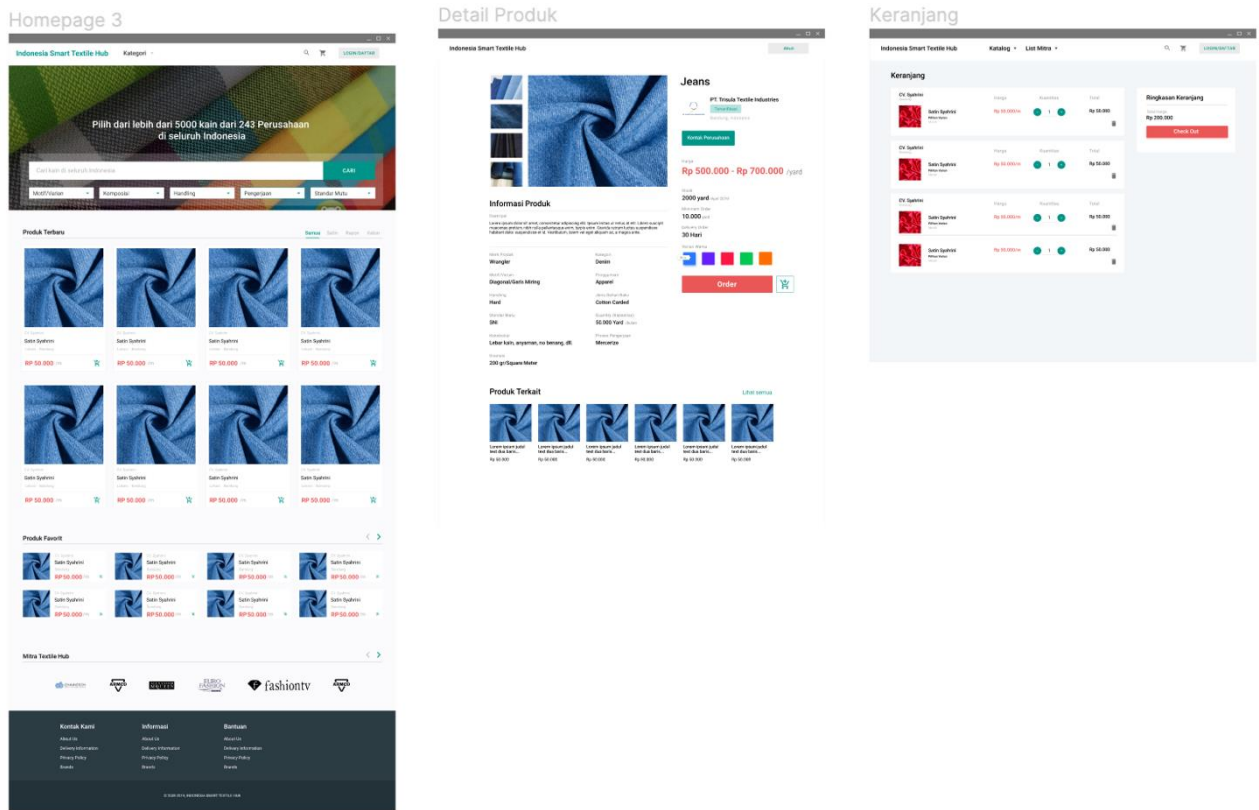


Figure 5. Sample pages of ISTIH Wireframe in Figma

#### 4.5 Surface Plane

At the last stage, surface plane, conversion of wireframe into PHP, HTML and CSS code is carried out. The choice of green color is adjusted to the color of the Ministry of Industry as the owner and manager of the system. Green becomes the primary color which is also used in the main navigation and main buttons. Green color combined with white as a backdrop that is comfortable to look at and creates a clean impression. The red color is used in price information so that it is easily distinguished from other information and gives the impression of being cheap.

The main display as in Figure 6 is focused on showing the categorization of detailed products with three main categories namely weaving, knitting and garment, and also showing the ability to further filter using motifs, composition, usage, models, and types. The search feature is displayed by taking a large place according to what is formulated in the strategy plane. Product shown in the main page helps to show the range of products being sold. Since this was a prime area, which means items shown in the homepage has higher chance to be seen by user, so the products shown are changed regularly.

Meanwhile, the display the content management system as shown in Figure 7 is made as straight to the point as possible. Menus are arranged on the sidebar so it allows user to switch between menus easily. The rest of the page is used to display the content in the menu. The large area for content is required so that users are more free to do their main activities in the available window and easily find the menu they need in the sidebar.

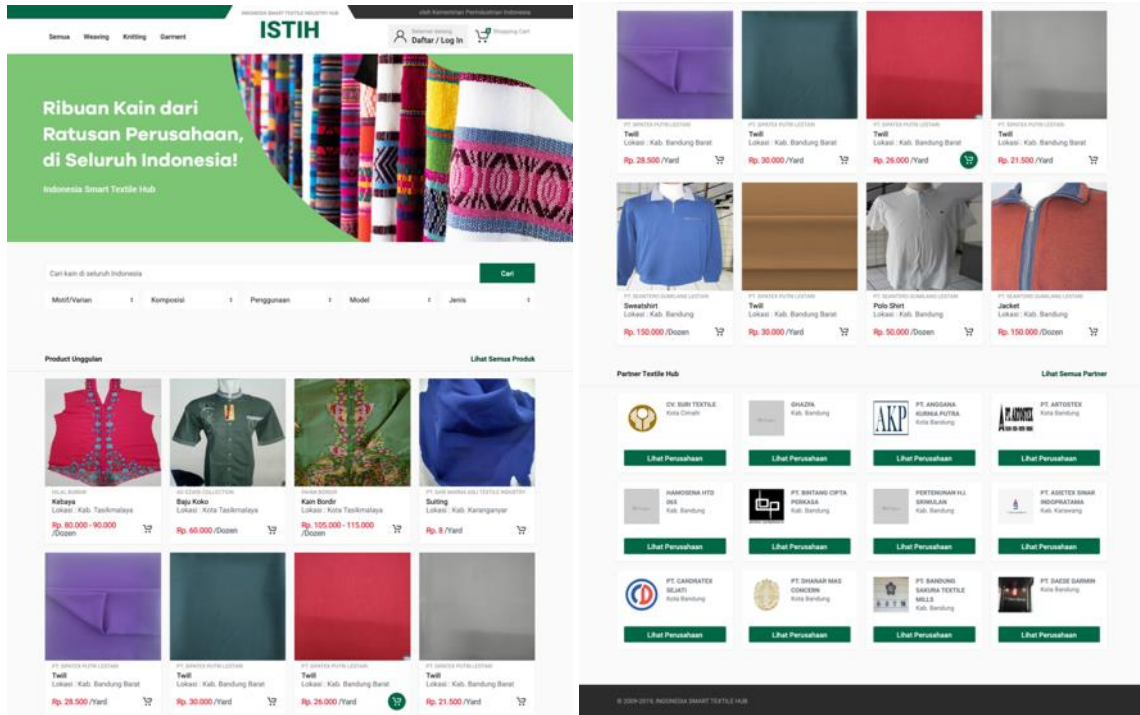


Figure 6. ISTIH Website Interface



Figure 7. Content Management System Interface

#### 4.6 User Interface Compliance to Eight Golden Rules

To ensure that the interface being build is according to the eight golden rules of interface design, the following Table 2 is a table showing each principle and how it is being applied in the ISTIH’s interface design. Here it is shown that all eight rules has been applied in the interface design.

Table 2  
Eight Golden Rules Implementation in Interface Design

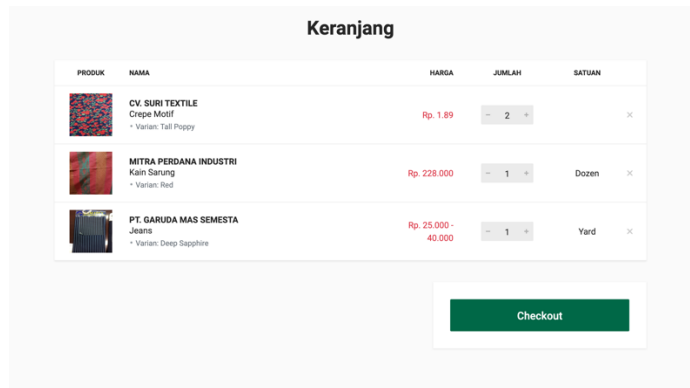
| No | Principle              | Feature/Description                                                                                                                                                                                                                                                        | Screenshot |
|----|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1  | Strive for consistency | <p>1.1. Top Navigation</p> <p>Top Navigation provides consistent access to main menu. This navigation is present in all pages user is currently accessing and the menu being presented is the same. This provide easy access to the most important menu from any page.</p> |            |



### 1.2. Primary Button

Every page has one button that has green solid background. This shows that the button is the primary button. For example the primary button in home page is “search”, in cart menu is “checkout”.

Cart page

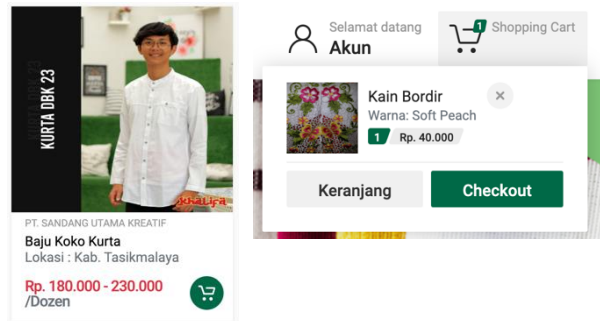


Homepage Search



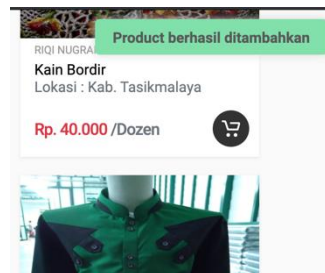
2 Seek universal usability

2.1. Concept and Icon Usage  
To ensure universal understanding about how the system works, ISTIH is using the already widely understood concept of e-commerce. One of this is to universal concept and icon for cart. Cart is a concept for storing items that users are interested to buy. The icon is a shopping cart as we know in supermarkets.



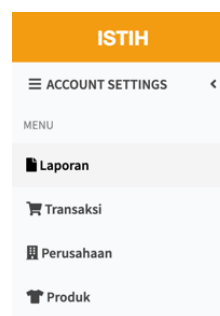
3 Offer informative feedback

3.1. Add-to-cart response  
When a user adds a menu to the cart, system gives notification on the top right corner that the product is successfully added to the cart.



### 3.2. Active menu

When user selects a menu on the sidebar, the page corresponding to the menu is opened. Then the particular menu becomes active menu, so user knows that they are currently accessing that menu.



4 Design dialogs to yield closure

4.1. Success Page

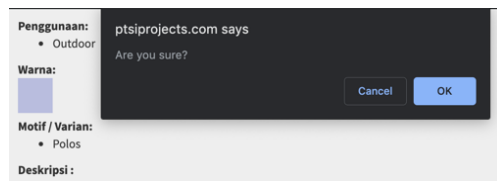
A closure or a finish line upon a purchase is successfully placing an order to the seller. To give user the understanding that a closure has been made, we have a page after an order is made to let users know that their action is a success. This page also lets user know what will happen next.



5 Prevent errors

5.1. Prompt upon deletion

When a user is viewing a product from content management system, user is able to delete a product. To prevent accidentally deleting a product, we created a dialog prompt to confirm the deletion.



5.2. Pre-filled input form

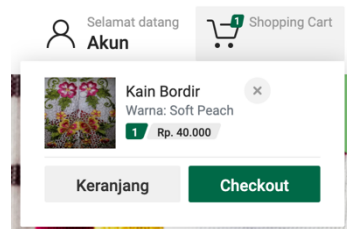
When inputting the product, there are many fields that needs to be filled, each field must be filled a certain type of data. Users may not always remember what kind of data is right. To make sure the right type of input is entered, the field are pre-filled with example.



6 Permit easy reversal of actions

6.1. Delete Product

In case the user accidentally added wrong product into the cart or change their mind about getting a product, it is possible to delete it right away from the cart dropdown menu.



6.2. Top navigation

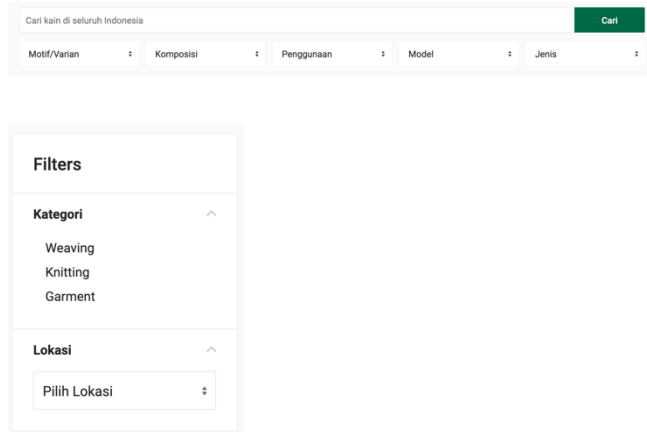
When a user is browsing deep into the product list of product, user can easily come back to homepage or main menu using top navigation



7 Keep users in control

7.1. Search and Filter

To find products that they want, users can chose whichever path they want to take. If they know already the specific items name, they can use the search box. If they do not, they can use the filter to narrow down products they want to find. There is no specific timing when user must do this so user is in control on what they want to do.



7.3. Pagination

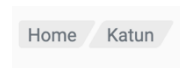
Users also need to be in control when moving through the product pages, they can jump forward or go back one page. This is possible by using pagination feature.



8 Reduce short-term memory load

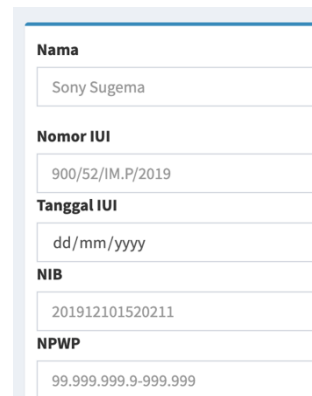
8.1. Breadcrumbs

As users browse in the website, they might be deep inside the website that they forget what is their position. Breadcrumbs helps in identifying users position. This breadcrumbs are present in all pages.



8.2. Pre-filled form

Pre-filled input form also helps in reducing short term memory load, so that users don't always have to remember what the right input should be.



## 5. Conclusion

In this research, user experience of ISTIH system has been designed using the five planes framework and user interface is designed following rules from eight golden rules of interface design. From the results obtained, the main purpose of website development from a strategic level is successfully reflected in the interface. In every plane, there are important elements that build up the website interface. The bottom plane as the starting plane has shown to be the most abstract concept, while it gets more concrete as we move upwards.

From this research it can be concluded that it is very important for a design process to adopt a method or user experience framework in the process, so that the final design is in accordance with the needs of its users. The five planes framework has been proven to be good in answering user needs and meet the objective of the product. The eight golden rules also help to ensure that user interface is designed as user friendly as possible. This research only presents the design part of the system. Further research should be done to prove the performance of the design through user or software testing.

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