The Application of Digital Module Design of East Sumba Woven Fabric on Interior Accessories

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Abstract: The motif of the fabric can be applied in a variety of product designs, one of which is the design of accessory products and interior elements that need to be customized by incorporating local characteristic of Indonesian culture. Hence, it is necessary for the design to be unique and identifiable as an Indonesian product. As a pilot project, the Indonesia's cloth chosen is the one of East Sumba, one of Indonesia's local products with unique motifs, patterns, and colors. Interior design elements have various forms and additional materials with diverse shapes and patterns. To make it easier for designers to mix and match Indonesia's fabrics with additional materials, so that a good, attractive, and localized design could be created, awebsite-based application is needed. The features in this application have been categorized according to the interior product design principles of DK Ching. The novelty of this application is that its features are equipped with East Sumba fabric motif assets appropriate to be applied to the design of accessories and interior elements. This application uses HTML 5 technology which will produce design assets combined with East Sumba fabrics. Its assets can be used to design interior spaces by using existing design applications.

1 INTRODUCTION

In Indonesia, the creative industry is defined as an industry that comes from the utilization of individual creativity, skills, and talents. The utilization to create welfare and employment is formed by producing and seeking the creation and creativity of these individuals. The focus of the Indonesian government on the creative industry began in 2006. Design is a part of the 14 sub-sectors of the creative industry. The creative industry is indicated as the most promising field in economic activity because of its potential contribution to welfare and job creation (Mellita & Erlansyah, 2014).

The characteristics of Indonesia famous for its socio-cultural diversity spread throughout the country are an inspiration and a strong supporting factor in carrying out the development of the creative economy.

Creative economy is the creation of added value based on ideas born from the creativity of creative human resources and based on the use of science,

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including cultural and technological heritage.

Certainly, local cultural heritage contains local wisdom that supports the creative industry. Exploring and developing local wisdom is one of the efforts to avoid and reduce poverty. Local wisdom contains social norms and values that regulate how to build a balance between the carrying capacity of the natural environment with lifestyle and human needs. Outside of the structuralist approach, a mosaic of local community life called collective wisdom or cultural wisdom can be found. In any society such wisdom is embedded in the recesses of their shared collective knowledge system. That is what is often referred to as local wisdom.

Experts also often call the local wisdom as local knowledge. Local wisdom was born and developed from generation to generation as if it survived and developed by itself. There seems to be no science or technology to underlie it. Local wisdom necessitates the existence of past cultural content and serves to build a longing for the life of the ancestors, which is the cornerstone of present life. Local wisdom can be used as a bridge that connects the past and present, generations of ancestors and the present generation. In other words, it can be used as a glue and a unifier between generations (Pattinama, 2009).

Indonesia's fabric, very diverse with a lot of types, is one of the results of local knowledge from the local community. Sumba's woven fabric is one of the cultural heritages resulted from local wisdom and knowledge of the region. Through the expertise of the Sumbanese, woven fabrics are created in 42 stages by using basic materials found there. This heritage has been preserved through the knowledge of the local community and developed from generation to generation, as if it survives and develops by itself. This can be seen from the ability of the weavers to create patterned woven fabrics without making sketches. It is as if there are algorithms in the weavers' brains.

East Sumba weaving, based on how it is made, is classified as ikat pakan weaving. In addition to using the ikat method, there is also a weaving method such as songket which is called pahikung weaving. Unlike the ikat (Hinggi) weaving, the pahikung weaving is sewn to form a sarong for women. The uniqueness of Sumba weaving lies in the manufacturing process, the form of the pattern, and the color (ANAS, 2007); (Ningsih & Widjaja, 2020)The weaving process, believed to be the binding rope between the living and the dead, is related to the formation of the womb: the lusi thread forms the protective skin, the pakan thread forms the body, and the tying threads that form the fabric symbolize growth to adulthood (Jay, 2014:

111). The color of Sumba's weaving is produced by the cold dyeing method. Blue comes from tarum dyes and red from noni which uses a mixture of wood and loba leaves which produces Sumba's distinctive red color (Ramone, 2013).

In the last decade traditional weaving from the East Sumba region has received a lot of attention, because of the unique patterns and processes that involve nature as well as very manual manufacturing. Sumba weaving has succeeded in attracting a number of well-known fashion designers who have chosen to use Sumba weaving in their work. Apart from fashion, Sumba weaving is also used in other lifestyle needs, such as interiors.

Interior elements need to be customized by incorporating local Indonesian cultural characteristics. This is necessary to make the design unique and to give it an identity as an Indonesian product. This is important because there is a data showing that MSME products have penetrated almost all countries in the world, such as in Asia, Africa, the Middle East, America, and Europe. MSME products that are locally based and have unique characteristics, such as handicraft and furniture, are highly competitive in the global market and would be superior products in the future. Products included in furniture and home accessories that have great competitiveness and are potential for the export market include: (1) handicrafts, including silver, copper, wood, ceramics, earthenware, natural stone, wicker (rattan, natural fibres, etc. bamboo), batik, embroidery / embroidery, traditional weaving, natural silk, etc.; and (2) furniture (modern and antique), including wardrobe products, dining chairs, guest chairs, garden chairs, gebyok, beds, wood carvings, and others. The MSME business in the fields of art, design, and craft, which is very prospective, creates a very tight competition, among others in terms of design, product diversification, and product quality, which affects business development. Therefore, entrepreneurs who do not only rely on hereditary skills, but also have additional skill to explore adequate art and design are needed to produce a wide variety of creative, innovative, and competitive products that meet the market tastes (Indahyani, 2012).

Advances in technology can facilitate the additional skill needed, especially for future generations. They will be needed to accelerate the exploration process of art and furniture design that has creative, innovative product variations and has differentiation of products with local Indonesian content.

As a pilot project, the application features with

local content are fulfilled by applying unique patterns, colors, and patterns to the East Sumba cloth, one of Indonesia's local products.

Interior design elements have various forms and additional materials with diverse shapes and patterns. In order to make it easier for designers to combine East Sumba fabrics with additional materials in interior design, a website-based design application is needed to mix and match them, so that a good, attractive, and localized design of accessories and interior elements can be created. This application will generate accessories assets and interior elements that can be used by designers to design interior spaces.

2 METHOD & DATA ANALYSIS

2.1 Application Design Methods

The design of this application uses the research steps described by Sugiono, in Research and Development Model from Borg & Gall (1983) and added to the socialization and dissemination process (Rasagama, 2011), which includes **(1) Need Analysis -** At this stage a need analysis is carried out, which includes literature studies, field surveys, and similar products. **(2) Initial product development -** At this stage the initial product is made according to the result of the need analysis that has been carried out**. (3) Expert validation -** After the product is made, then expert validation is implemented, to both content and construction, then product refinement is performed**. (4) Field trials -** At this stage extensive trials are carried out on users. **(5) Product revision -** At the end, final product refinement is executed according to the result of extensive trials. **(6) Dissemination and implementation.** (Rasagama, 2011). Currently, the design has just reached stage two: a website-based application prototype.

This application is designed by implementing the following interior design process:

a. Balance

It is an arrangement of elements for visual equilibrium. Balance is important in interior design because every interior is composed of various shapes, colors, lines, patterns, textures, and light. Existing functional requirements will determine how an interior is designed, but in the end all comfortable environmental compositions must be created.

b. Harmony

It is the suitability of each part to the other parts and to the whole arrangement/ composition.

c. Rhythm

It is the repetition of elements in an orderly and harmonious pattern. The repetitions of form and space can be organized in the following ways:

- organized radially or concentrically to a point
- organized by size in linear order
- organized randomly but related to the closeness of function and similarity of form

d. Focus

In interior design, it is sometimes necessary to emphasize certain objects or spaces to show that an object is more important than the others, so that a hierarchy is created. A space where the objects have the same importance will tend to be monotonous and boring. Emphasis can be done in several ways:

- Important objects can be placed as the center in the middle of other objects
- An object that is considered important can also be emphasized by means of color, size, shape, texture, or in other ways that can create contrast between the object and its surroundings.

e. Contrast and Variation

It is a way to get an understanding of the difference between one object and another object, creating a level of importance, and creating attractiveness in an environment.

f. Proportion

It is a relationship between one part of the object. Composition of one part with another part and with the whole composition. The relationship between one element and another. The proportions in interior design are highly dependent on the three-dimensional relationship between objects and spaces (Ching, 2015).
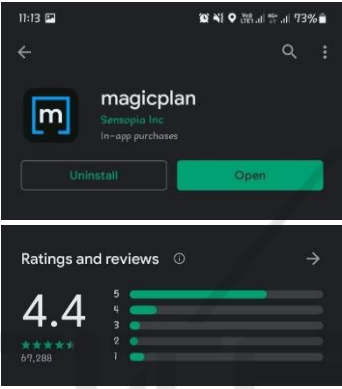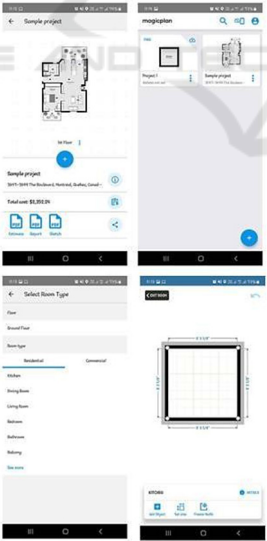
The application will be created based on a website by considering the principles of interior design, namely harmony, rhythm, focus, contrast, and variation. The principle of balance and proportion has not been applied because it is related to the room as a whole. The focus of this application is how to provide an application that can help a designer visualize the combination of accessories and interior elements with East Sumba fabrics.

2.2 Data Analysis

Before designing this application, this section contains the first stage in the applied research method called Need Analysis. The research team conducted

an analysis on several applications selected based on the category of accessory features and interior design elements that will be included in the application features that will be designed: (1) the applications to design floors, (2) the applications for wall design, namely through paint colors, (3) the applications which brings together architectural, contractors and interior designers with homeowners. The analysis was carried out on the User Interface (UI), the technology used, the advantages, and the disadvantages associated with UX. The explanation is as follows:

Table 1: Application Analysis Data for designing floors.

MAGIC PLAN	
User Interface (UI)	 The UI is well displayed. There is a "specific" button for the interior.
	The design can use white and blue accents.
Technology	2D/3D floor plans & AR measurement

UX related advantage	• Users can select a floor plan with different functions. • Users can set their own size in creating the room. • Users get a report on the total cost and sketch in PDF format. • Applications have mobile application options for the Android and iOS platforms. • Users can import ideas through photos. • Users can add a project site address that will be used. • The application has 3D view feature on Land Survey. • The application must be used by an interior designer or an architect. • It is better and easier to use the apps at TAB than at HP. • The design looks simple.
UX related disadvantage	• Application must be used by an Interior Designer or Architect. • Better and comfortable to use on a tablet than on a cell phone.

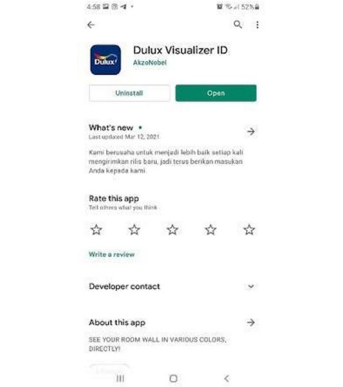Table 2: Application Analysis Data for designing wall colors.

DULUX VISUALIZER	
User Interface (UI)	The UI is visualized attractively. The appearance and product specifications are unclear. The Dulux identity is only displayed
	through the Dulux logo on the top left.
Technology	Real-time interface, AR, connected with online websites

Table 2: Application Analysis Data for designing wall colors (cont.).

UX related advantage	• Users can see the product they want to test with all the features. Users can virtually apply 8 groups of paint colors to the desired wall by simply pointing the iPhone or android camera. • The application has mobile application options for the Android and iOS platforms. • Accuracy up to 98%. • There is a feature to save color ideas and edit them as needed. • The application can be used by a layman, not necessarily by an interior designer or an architect. https://www.dulux.co.id/en/tips-dan-saran-dorasi/duluxvisualizer
UX related disadvantage	• The display is less informative, so that users must try existing features to find what they want. • The uneven light in the area where the color will be simulated greatly affects the simulation results. There is a chance that the paint color may not be applied evenly.

Table 3: Application Analysis Data to bring together architecture, contractors and interior designers with home owners.

HOUZZ	https://www.houzz.com/mobileApps
User Interface (UI)	1. A: The same features are displayed over and over, such as: shop search, professionals, latest photos, and feeds.

User Interface (UI)	2. A-B-C-D-E: Shopping is displayed separately with a trolley icon (cart) in the upper-right corner of the main page. 3. B-C-D-E: There are options for manual typing, filters and categories for topics/ fields/ groups of interest in the search photos, search professional service, shop now, search latest stories/ discussion/ Houzz TV features. 4. F: There is a separate notification feature and message box. 5. G: There is a photo collection feature that can be made thematically as needed. 6. H: There is a feature to find similar photo recommendations (similar ideas) to what the user is looking for and to add a photo description. In each photo there is also a tag on the item that can be clicked on to find out the model/ type and the manufacturer. 7. K: Discussion forums are divided based on topics of interest. They can be used to share projects and discussions, bring together users, suppliers, contractors, and designer consultants. 8. J-L: Stories and TV feature news and updates on the latest trends, styles, and materials, such as blogs and vlogs.
Technology	Augmented Reality and Visual Recognition
UX related advantage	• Bring together architectural, contractors, and interior designers with homeowners. • Combining features of blogs, vlogs, discussion forums, and shopping in one application. • A site that has the most home design images on the internet. • More than 65,000 design professionals from all over the country have uploaded more than 2,189,151 images that make up something like a flip book. 96,312 architects and designers joined this social network. https://www.plimbi.com/article/1 30012/houzz-situs-jejaring- social-mencari-inspiration- • desa?force_desktop=1
UX related disadvantage	• The same features are displayed over and over, such as: search shop, professionals, latest photos, and feeds. • Not yet accessible in Indonesia, limit-ed to certain countries (majority USA).

Table 3: Application Analysis Data to bring together architecture, contractors and interior designers with home owners (cont.).

REDECOR – HOME DÉCOR GAME	
User Interface (UI)	 UI is visualized attractively: appearance, material specifications, and specifications of the design style are designed nicely.
Technology	Real-time interface
UX related advantage	• Users can choose the interior design style they want to try. • Users can choose their own material and color according to the style to be applied. • Users get capital in the form of money to shop for materials. • The application has mobile application options for the Android and iOS platforms. • The application is in the form of a game, so that it is more interesting. • The application can be used by laypersons and designers. • There are challenges.
UX related disadvantage	Users have to pay for materials.

The results of the analysis above describe:

a. An attractive user interface, with clear features, makes it very easy to use the application.

b. If the user is also for a layperson, a game can be added to make the application more interesting.

c. Photo collection feature that can be arranged thematically as needed will enrich the application features.

d. The various specifications on material and design style will enrich the application.

e. Moreover, it will be more appealing if the specifications can be selected in a variety of ways.

f. The application to be created does not require AR because it is not an interior space application.

g. The application to be made will utilize the website and its technology that pays attention to UI/ UX design. UI design prioritizes the implementation of interactive tools, while UX design prioritizes the successful outcome of existing interactions (Roth, 2017)

h. High enough accuracy will increase user confidence in the application. This can be realized through the accuracy of size and color.

i. The application to be created is not to bring together designers and consumers, but to bring together regional and even international designers. Designers can use the fabric assets of East Sumba when they need them as a design element.

2.3 Grid System

The grid system has been implemented for a long time, although it is not always referred to as a grid. The grid uses small measurements but can build larger modules while maintaining consistent spacing. The grid system as we know it today can be adapted for various layout design uses. The grid serves as a behind-the-scenes structure for designers to achieve consistency and balance (Thompson, 2018).

Pages can be divided into vertical and horizontal lines, to create the number of rows and columns of a grid. The number of consistent vertical divisions from left to right and horizontal divisions from top to bottom is called a modular grid. Many designers use this grid system to keep their content well organized (Lupton, 2009).

2.4 Drag-and-Drop

Drag-and-Drop is a type of direct manipulation that is useful for reordering, moving, or resizing objects. To initiate the interaction, users needs an object that can retrieve from a mouse or touch gesture (such as a mouse click or, respectively, a long press). While keeping the object selected by continuous pressure on a mouse button or a finger, user then moves the pointing device to a targeted place. This is called "drag" step. Finally, user deselects the object, for example by letting go of the mouse button. This is the "drop" part. The outcome of all these steps may simply be that the object has been relocated (Laubheimer, 2020).

3 RESULTS AND DISCUSSION

The design of this application is a collaborative project of interior design and informatics engineering. There are several preparations made, which can be explained as follows:

(1) Preparing the assets, such as classifying the Sumba's fabric motifs based on its symmetrical pattern on top, bottom, right, left, and color. There is a total of 20 pieces of fabrics photographed. Their motifs are traced in detail to become assets in the application to be designed.

Figure 1: An example of the original East Sumba cloth cropping.

Figure 2: Examples of artificial East Sumba motif tracing.

(2) Classifying the assets and interior elements from the largest to the smallest size and distinguishing the original East Sumba cloth assets from the artificial ones.

Table 4: Table of asset classification and interior elements.

Category	Item name	Size	Original Sumba Fabric	Artificial
XL	Wall Treatment	2m x 2m 3m x 3m 4m x 4m 5m x 5m	v	v
XL	Floor	according to the size of the room		v
XL	Ceiling	according to the size of the room		v
L	Credenza	1m x 2m 2m x 2m 2m x 3m	v	v
L	Wardrobe	60x100x240 cm 60x150x240 cm 60x200x240 cm	v	v
L	Dining Table	square 2mx1m	v	v
L	Round Dining Table	diameter 2m	v	v
L	Coffee Table	1m x 2m 2m x 2m 2m x 3m	v	v
L	Round Coffee Table		v	v
M	Side Table	50cm x 50 cm	v	v
S	List Plafon			v
S	Lampshade	Diameter: 23 cm Tinggi: 16.5 cm	v	
S	Pillow Case	Panjang: 50 cm Lebar: 50 cm	v	

(3) Designing the program flow - general architecture application

The main feature in this application is designing interior accessories with East Sumba fabrics. The choice of accessory assets is in accordance with Table 4, while the cloth assets of East Sumba use the original images of East Sumba fabrics and the artificial ones.

As shown in Figure 4, this feature starts from selecting the category, then selecting the items that users want to design with East Sumba fabrics. There are several items that come with different sizes that users have to choose first before starting the design process. There are also some items that come with one size only, so that users can immediately start the design process with the fabrics without having to choose the item's size.

The design process itself will take advantage of the application of grid system to the interior accessories. With the help of a grid, designers can easily search for results that match their personal style (Beaird, 2010). The application will provide a visualization of interior accessories with East Sumba fabrics. The grid system can be adjusted flexibly, and it can be a predefined module in the application system. Users can drag-and-drop East Sumba cloth motif to the available interior accessories. Users can easily order patterns on interior accessories with a grid system without distorting the East Sumba cloth motif. The drag-and-drop features help users reorder and move the preferences for East Sumba cloth motif to the interior accessories.

The final result of this application is in the form of a 2D display, with focus is to apply the Sumba cloth motif that has been cropped correctly so that the motif will not be cut off, especially for assets that use the original East Sumba cloth in real terms can indeed be made by the weavers. This application can also be used as a simulated design with East Suma cloth motifs with other interior texture elements such as wood and colour motifs. In this application, the fabric assets of East Sumba will be able to add a variety of motifs.
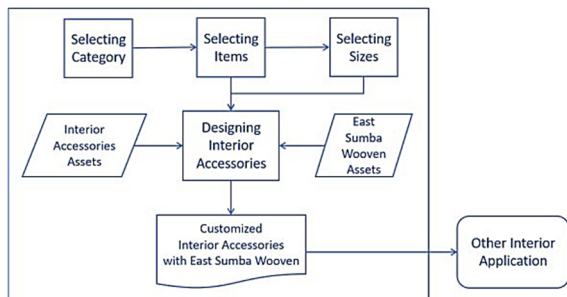

Figure 3: General architecture of the system.

After completing the design process, the results can be used as assets for other interior applications. However, because the visuals are 2D, they need to be combined with other interior design software.

Figure 4 depicts one of the step from the system. Users can select items and sizes before applying the East Sumba fabric assets. Figure5, Figure 6 and Figure 7 shows an example of applying the grid to interior accessories. The existing East Sumba fabric assets, both original and artificial fabric images, can be dragged and dropped on the available grid. Later, it will produce pictures of furniture that have been combined with the fabrics.
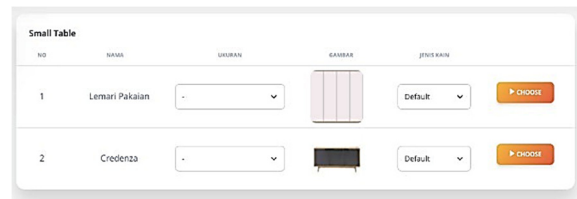

Figure 4: An example process of selecting items and sizes.

Figure 5: An example of applying the grid system to interior accessories using original fabric images.
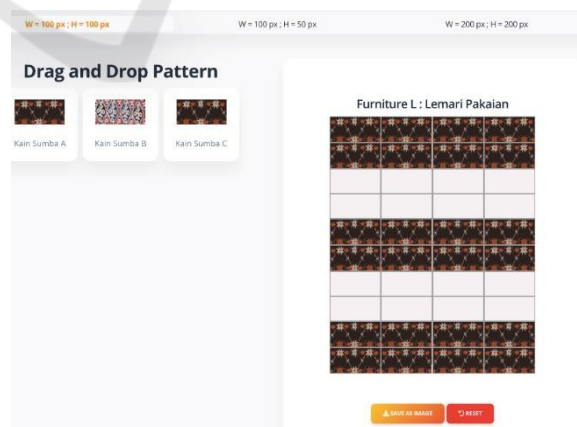

Figure 6: An example of applying the grid system to interior accessories using artificial fabric images or original fabric images.
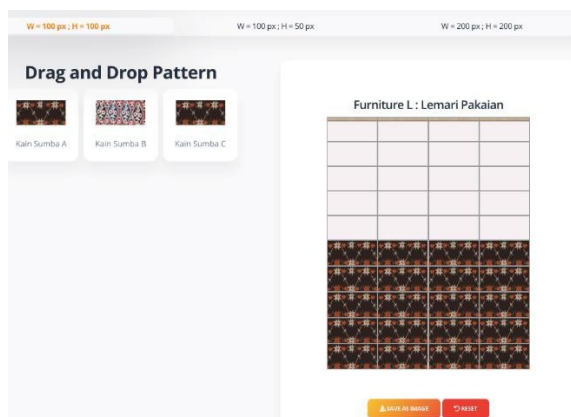
293

Figure 7: An example of applying the grid system to interior accessories using artificial fabric images or original fabric images with different module.

4 CONCLUSION

The sustainability of a local culture can be supported by the help of technology. The interior design application created has the novelty of incorporating the unique East Sumba fabric motifs combined with various forms and additional materials into interior design elements. This kind of application has not existed yet. Being created with web technology and the application of a user-friendly grid system, the final result of this application is an asset that can be used in designing a harmonious interior space with good interior design principles. In addition, the resulting assets can be used in other existing design applications.

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