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ARTICLE

Models of furniture design using coconut wood based on local culture for global and domestic markets

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ABSTRACT

This study provides, for creative industries, a convenient overview of a process that is still rarely used. This study aims to provide a model of furniture design and production that can compete with the growth of furniture exports and market demand. Demand is increasing for furniture that is not mass-produced and is based on local culture. The design thinking approach was used to produce this model. This process consists of several steps, such as the study of references, group discussions with expert participants and the exploration and development of design products by students; the products are based on local culture with coconut wood as the main material. This research improves upon previous models. Building a knowledge base in the initial phase was very important and involved the identification and extraction of local resources. This phase needs to be supported by experiential activities of 'digging' to extract design boundaries, along with other activities involving the transformation of ideas into visual schemes as sources of design inspiration. This phase is then followed by interpretation and execution, including feasibility tests of the design product.

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Introduction

Both the Indonesian government and furniture businesses, through the Association of Indonesian Rattan Furniture and Craft, have predicted the development of a new furniture industry that is expected to grow by 4% per year, while furniture exports should grow by an average of 8%–10% per year over the next 5–10 years. This has been discussed in the Achievement Indicators of the Ministry of Industry No. 119/M-IND/PER/10/2009 in the Road Map of the Furniture Industry Cluster. Furniture constitutes a major industry and is divided into two general areas, namely the agribusiness-based industries and the creative-based industries. In terms of creativity, Indonesian furniture offers a major opportunity in the furniture industry because of the nation's social-cultural diversity, which serves as an ongoing source of inspiration in the development of creative industries (Pangestu 2008).

Indonesia is a multi-cultural country with significant influences from Central and East Asia (including Japan) as well as the cultures of former Western colonial powers such as

the Portuguese and Dutch. In response to this diverse mix of cultures, Indonesia's local culture has adapted to different global contexts in different eras, and the nation has also developed its own distinct culture. The local culture that is referred to in this study is the set of local values formed naturally through the efforts of a local community to increase the value of its design and obtain recognition from the global market (Setiawan 2011).

Local culture can be formed as a result of art, tradition, patterns of thought or customary laws. The visual features of local culture may be based on original characteristics, the production of artefacts, the society and its way of life and attributes of the site or landscape of the region of origin (Lin, Tseng, and Lin 2014; Lin 2009; Lin et al. 2007; Moalosi, Popovic, and Hickling-Hudson 2010, 2007; Wang, Hsiao, and Kuo 2011). Lin et al. (2007) and Lin (2009) have made progress in designing modern products on the basis of traditional cross-cultural exchanges. However, some problems have been observed. One problem is that it is still difficult for businesses in the creative industry to duplicate the models and results of research products, particularly those produced through the semiotic approach. Meanwhile, another scientific approach, i.e. Theory of Inventive Problem Solving has emerged; this is a problem-solving method based on logic and data that aim to solve problems quickly and creatively (Liu and Wang 2011). Given these two conditions, it is a challenge for all parties to develop a creative process that is not complicated and could be easily duplicated.

Furthermore, industrial growth and the increase in the quantity of products required to meet rising global market demand have led to an increase in demand for timber. At the same time, forestland and timber plantations have decreased in area. There are several choices of alternative raw materials that offer various advantages and could be used to respond to this phenomenon of decreased timber combined with increased demand. This research focuses on coconut wood as an alternative material for furniture, based on several factors. These factors include the following: (1) the availability of coconut wood is equivalent to 2.5% of the required value of wood as a raw material in the Indonesian forest industries; (2) Indonesia has the largest coconut agricultural land in the world, with a total area of 3.88 million hectares (and this value continues to increase); (3) each piece of coconut wood from the edge of the palm trunk, the inside of the trunk and the base of the stem is technically able to replace conventional wood; (4) the difference in the price of coconut wood board compared to cambium wood can range from 16% to 36%, and thus, coconut wood is advantageous in terms of cost (Suharto and Ambarwati 2009). Coconut wood can also be used as an engineering material, such as in block-board (Mawardi 2013). This complements previous studies, which tested the combination of palm oil with adhesive polystyrene in making particle board. Thus, furniture makers can extract a variety of benefits from coconut wood in terms of technical use.

Meanwhile, potential markets, both domestically and globally, are also changing: tendencies that were once supply-driven have now become more consumer-oriented or demand-driven. These consumer-oriented industries have triggered the need to create a system that is not based on mass production, making possible a variety of options and highlighting the emotional content and appeal of product designs (Pangestu 2008). In the modern era, it has become realistic to demand such that cultural factors significantly influence the marketing of a product in both the domestic and global markets (Supriyono 2012). New conditions began to form in the 'local-global' era, in which global situations

influence a local culture and then that local culture adapts itself to the global situation to survive and meet the needs or demands of global society (Chaubet 2013). Bali is a typical example of such a situation, where the local culture (dance) was renewed by mass tourism in the late 1970s.

Given the growth of furniture exports, as well as market demands that have been mostly moving towards non-mass produced products designed with emotional and local wisdom, designing using the approach of local culture, including the use of local materials such as coconut wood to replace typical wood, is both a great advantage and a necessity in the modern furniture industry. The lack of in-depth research on this topic, which is necessary to provide clear steps by which creative industries can produce furniture through a creative process, has driven the need for a system that can be easily duplicated and followed. Thus, when producing a new model of design and production and going beyond the in-depth studies of various models that have already been developed, there is also a need to explore the development of products based on local culture, with coconut wood as the main material.

Method

This research is aimed at building a model for the design and production of furniture that uses coconut wood as its main material and is based on local culture. This model uses the design thinking approach, which consists of the following stages: inspiration, interpretation, generating ideas, experiments and evolution (IDEO 2012). Participants included experts from various fields as well as third-year bachelor of design programme students. A total of nine expert participants led the exploration process through focus group discussions; they interpreted the results and built the final model collaboratively. They included product designers, architects, environmental planners, managers, project officers and observers of history and culture.

Qualifying student participants were those who have completed the furniture design studio from levels one to three in the Interior Design Bachelor Program of Petra Christian University, Surabaya. They were guided throughout the design and production process, starting from the formulation of the problems, to programming to establish solutions, to schematic design, to design development and finally to design production, followed by a joint exhibition held to obtain feedback. These activities formed a long process that took four months to complete, from mid-February to June 2015.

Literature reviews were required in the initial assessment and interpretation stages to help build the model (or the visual framework) to support the exploration process undertaken by the participants. The literature reviews involved 13 different literature sources that are directly related to the research topic and were presented by 10 researchers.

The end result of this method of design thinking is the final model of furniture design development, in which coconut wood is the main material and designs are based on local culture. The result is a process of iteration and collaboration involving various models produced by the participants, as well as a literature review from the stage of generating ideas, to performing experiments, to evolution. The relationship between the stages of research activities of the subjects as data resources can be seen in [Table 1](#).

Table 1. Stages and activities of research methods.

Stages	Data resources		
	Expert participants	Third-year students	Literature review
Inspiration	Nine experts explore problems and inspiration through focus group discussions	Six student participants explore issues based on research topics	Researchers conduct in-depth study of over 13 scientific articles
Interpretation	The experts conduct the process of categorisation, naming themes (coding) and identifying linkages between themes	The participants are students performing programming or design analysis	Researchers conduct the process of categorisation, naming themes (coding) and identifying linkages between themes
Generating ideas	Experts develop a framework of visual thinking/new concepts	The student participants propose the concept and schematic design of events	Researchers develop a visual frame of thinking/new concepts on the basis of a literature review
Experiment	Experts conduct comparative tests between the models offered and the model based on the literature reviews	The participants are students entering the production phase and test phase	–
Evolution	Experts further evaluate the product, explore the results of the third-year students and compare them with the previous model of the test results	The participants are students entering the stage of presentation and assessment of the product evaluation by experts	–

Results

The track records of the student participants who had completed the exploration process were categorised according to their scheme or theme code. The themes are the sources of local culture that inspired the students in the programming, design and implementation of their work. All of these categories were then compared with a benchmark constructed from the literature review. The furniture designed by the student participants using coconut wood as main material is displayed in [Figure 1](#) and the benchmark formulated is shown in [Table 2](#).

Based on the table above, it is clear that there were gaps or problems that were not addressed in detail even through the literature studies conducted. The first is the attempt to determine global trends based on the market conditions of the intended target. The second is how to explore local factors more intensively, which could be done through direct experience, such as by dissecting the characteristics of the local material and studying the limitations of production. The challenge of understanding the global environment has been mentioned by Lin (2007, 2009), but the specifics of how to construct a strategy for a global target specific to the market have not been discussed in detail. Thus, the student participants performed what is called a global–local strategy (Chaubet 2013). The next gap, understanding the context of local inspiration, is also a very different idea from that of Wang, Hsiao, and Kuo (2011), who explored localism by creating images rather than dissecting it in depth, as done in this study.

Meanwhile, in the model produced by expert participants in the focus group discussions (FGD), new proposals were introduced to set limits or boundaries on the initial design. It is displayed in [Figure 2](#). Coconut wood is different in nature from cambium wood, so typical carvings, such as those in Java that generally serve as local Indonesian identifiers, would be difficult to produce on coconut wood. Thus, it is necessary to design in a more geometric nature, in consideration of the finished product, while adding



Figure 1. Products of third-year students (with consent for publication).

features that support function, ergonomics and use of accurate techniques. Based on the experiences of the expert participants, geometric shapes that form the basis of elaborate Indonesian ornamentation could be mediated with the conceptual use of colours, or the use of silhouettes of intricate ornamentation.

Interactive technology issues should be considered in the context of the global market. Furniture today must consider the interaction between the product and the user. Global issues can be targeted for global product markets. An issue of primary importance today is sustainability; thus, this issue can be raised in the context of persistent local issues, including traditions and other related artefacts.

Discussion

In previous studies, the phase that precedes the design of a product based on local culture was principally used to build basic knowledge and understanding of the culture of a region or locality, which could then serve as inspiration for product development (Lin, Tseng, and Lin 2014; Lin 2009; Lin et al. 2007; Liu and Wang 2011; Moalosi, Popovic, and Hickling-Hudson 2010, 2007; Setiawan 2011; Wang, Hsiao, and Kuo 2011). Wang, Hsiao, and Kuo (2011) defined at least five sources of local culture: natural, human, production, cultural and landscape. The model of the design of modern products based on local culture is ultimately divided into three phases: building the knowledge base, translation and



Table 2. Results of the exploration process by student participants.

Categories			
Products	Local resources	Programming	Design and implementation
Participant 1	(1) The story of Indonesia as the second largest fish producer in the world. (2) Artefacts: 'jala' as fishing gear.	(1) Exploration of literature, field and experience regarding the use of local materials from coconut wood and rattan. (2) Formulate and define the problem.	(1) Determination of design concepts. (2) Sketching. (3) Development of ergonomics. (4) Selection of design and making of production drawings. (5) The production process is monitored until finished.
Participant 2	(1) Formation of Chinese cultural character as a target market. (2) Insertion of batik arched on 'kawung' motif (local culture) into a three-dimensional form of table legs.	(1) Exploration of the literature on global home furniture trends, target typology of global Asian and Chinese market trends, ergonomics and field studies about production. (2) Formulate and define the problem.	(1) The design concept. (2) Sketching. (3) Selection of design and making of production drawings. (4) Production process.
Participant 3	(1) Local material properties of coconut wood and rattan. (2) Characteristic forms of Japanese culture as a target market.	(1) Global home furniture trend study from literature; targets typology of global market trends of Asia, Japan; field trip to study human skill in production. (2) Formulate and define the problem.	(1) Determination of products and limits ergonomics. (2) The design concept. (3) Sketching. (4) Selection of design and making of production drawings. (5) Production process.
Participant 4	(1) Characteristic forms of Japanese culture as a target market. (2) Introduction to advantages and limitations of production. (3) Reinforcement materials as local value.	(1) Study from literature studies; targeting typology of global market trends of Asia, Japan; field trips to study human skill in production. (2) In-depth exploration of materials: coconut wood and rattan. (3) Formulate and define the problem.	(1) Determination of design concepts. (2) Inclusion limits ergonomics. (3) Sketching and multi view. (4) Selection of design and making of production drawings. (5) The production process is monitored until completion.
Participant 5	(1) Characteristic forms of Japanese culture as a target market. (2) Introduction to advantages and limitations of production. (3) Blending local regional characteristics: 'Mimangkabau' and the samurai of Japan.	(1) Global home furniture trend study from literature studies; targeting typology of global market trends of Asia, Japan; field trips to study human skill in production. (2) Formulate and define the problem.	(1) Determination of design concepts. (2) Inclusion of limits in ergonomics. (3) Sketching. (4) Selection of design and making of production drawings. (5) The production process is monitored until completion.
Participant 6	(1) Characteristic forms of colonial culture as a target market. (2) The production of local materials. (3) Looking for patterns of synergy between the local and the global, natural colour and upholstery.	(1) Exploration of the literature on global home furniture trends, ergonomics and field studies about the advantages and disadvantages of production. (2) Formulate and define the problem.	(1) The use of elements of local artefacts (Hsiao et al. 2011). Strong semiotic approach (Lin 2007, 2009; Hsiao et al. 2011). Gap: experience of the use of local materials. (2) The use of elements of local artefacts (Hsiao et al. 2011). Strong semiotic approach (Lin 2007, 2009; Hsiao et al. 2011). Gap: targets typology of global market trends; field studies about production. (3) The use of local materials as inspiration (Hsiao et al. 2011). Design activities as interaction between designers, users, culture and technology (Lin 2007, 2009; Moalosi, Popovic, and Hickling-Hudson 2007, 2010). Gap: targets typology of global market trends. The use of local materials as inspiration (Hsiao et al. 2011). Design activities as interaction among designers, users, culture and technology (Lin 2007, 2009; Moalosi, Popovic, and Hickling-Hudson 2007, 2010). Gap: targeting typology of global market trends; field studies about production. (4) The use of elements of local artefacts (Hsiao et al. 2011). Strong semiotic approach (Lin 2007, 2009; Hsiao et al. 2011). Gap: targeting typology of global market trends; field studies about production. (5) The use of elements of local artefacts (Hsiao et al. 2011). Strong semiotic approach (Lin 2007, 2009; Hsiao et al. 2011). Gap: targets typology of global market trends; field studies about production.

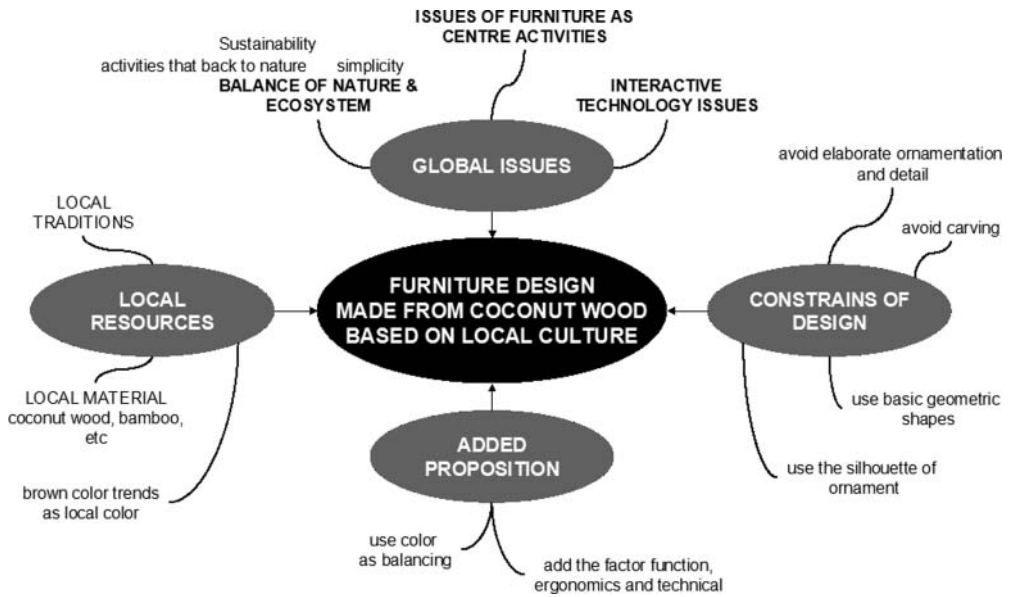


Figure 2. Model of coconut wood furniture design based on FGD.

finally implementation. An inspection process was conducted to test the extent to which the resulting product corresponds to the building of the knowledge base. This model can be seen in Figure 3.

The phase of building the knowledge base is the process of identifying local resources that are then extracted in both the denotative and connotative contexts. Previous

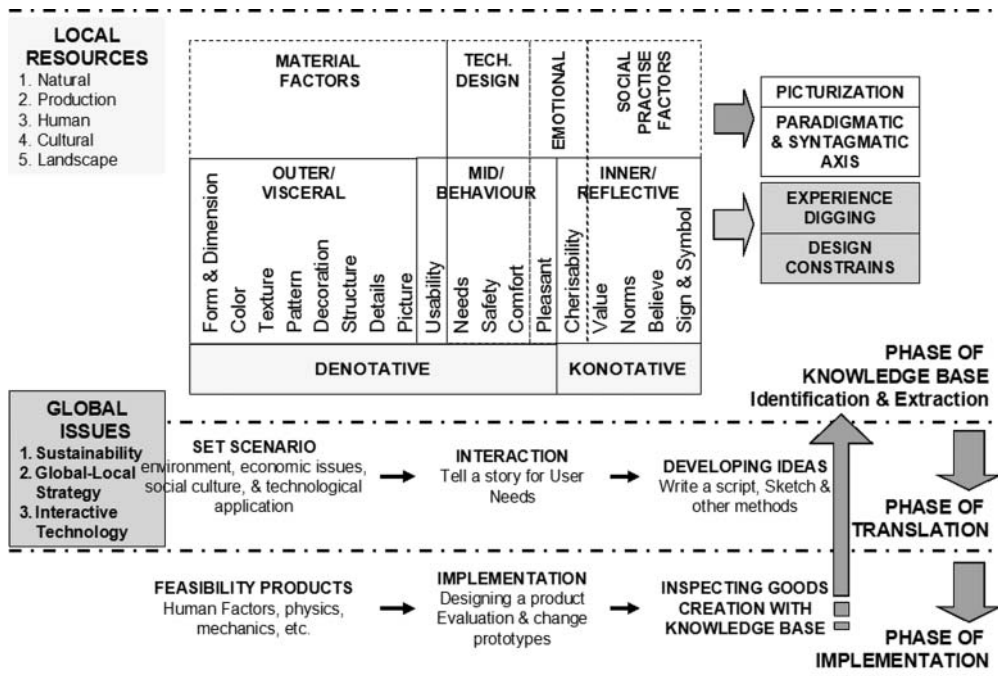


Figure 3. Final model of furniture design based on local culture.

researchers have laid the foundations of this knowledge as part of the identification process. Whatever the format of the local resources, they were extracted to be described as real (tangible) entities, according to their shapes, dimensions, colours or functions, as material factors (Moalosi, Popovic, and Hickling-Hudson 2010, 2007) or visceral factors (Lin et al. 2007, 2009; Norman 2004). Meanwhile, other parts of the sector's behaviour (Lin et al. 2007, 2009; Norman 2004) will be part of the visceral and material factors, as in Wang, Hsiao, and Kuo's (2011) version of the denotative context. Social practices, narrative traditions, norms, community values and symbols are part of the connotative context. Both of these contexts are extracted into visual concepts. The extraction results are translated into a visual matrix that is ready to be used as a source of inspiration for the designers. In this study, additional proposals were submitted to fill the gap in this research. One proposal was to add excavation or 'digging' experiences to construct the boundaries or limits of design. This activity allows many direct experiences, such as direct hand-to-hand experiences with the local cultural sources and materials. Based on these direct experiences of the student participants, the designers and stakeholders involved in the design process could recommend the limits or boundaries of design as part of the knowledge base. Thus, the design boundaries were established in the initial stage of pre-design to minimise the general trial and error patterns that would be a waste of time, effort and money. All these activities can be shown for example in Figure 4.

During the translation phase, the designer develops a scenario based on his experience interacting with environmental factors, issues of economic, social and cultural development, technology applications and users. Another proposal is thus added to fill the gap in this phase. The proposal is to add a global issue to the scenario. Global issues worthy of consideration are sustainability, global-local strategy (Chaubet 2013) and interactive technologies. The formulation of problem solving and concepts of design development are determined by the designer in this phase. According to the explorations conducted by the student participants, the cultural approach to the target of the global market has been the focus of strategy. Five out of six participants used this strategy despite the differences in their global market targets. Figure 5 is a sample concept from participant no. 5 addressing how to translate the knowledge base to promote acceptance by the target market of Japan.



Figure 4. The experience of 'digging' in local resources to produce a knowledge base of local culture for design inspiration.

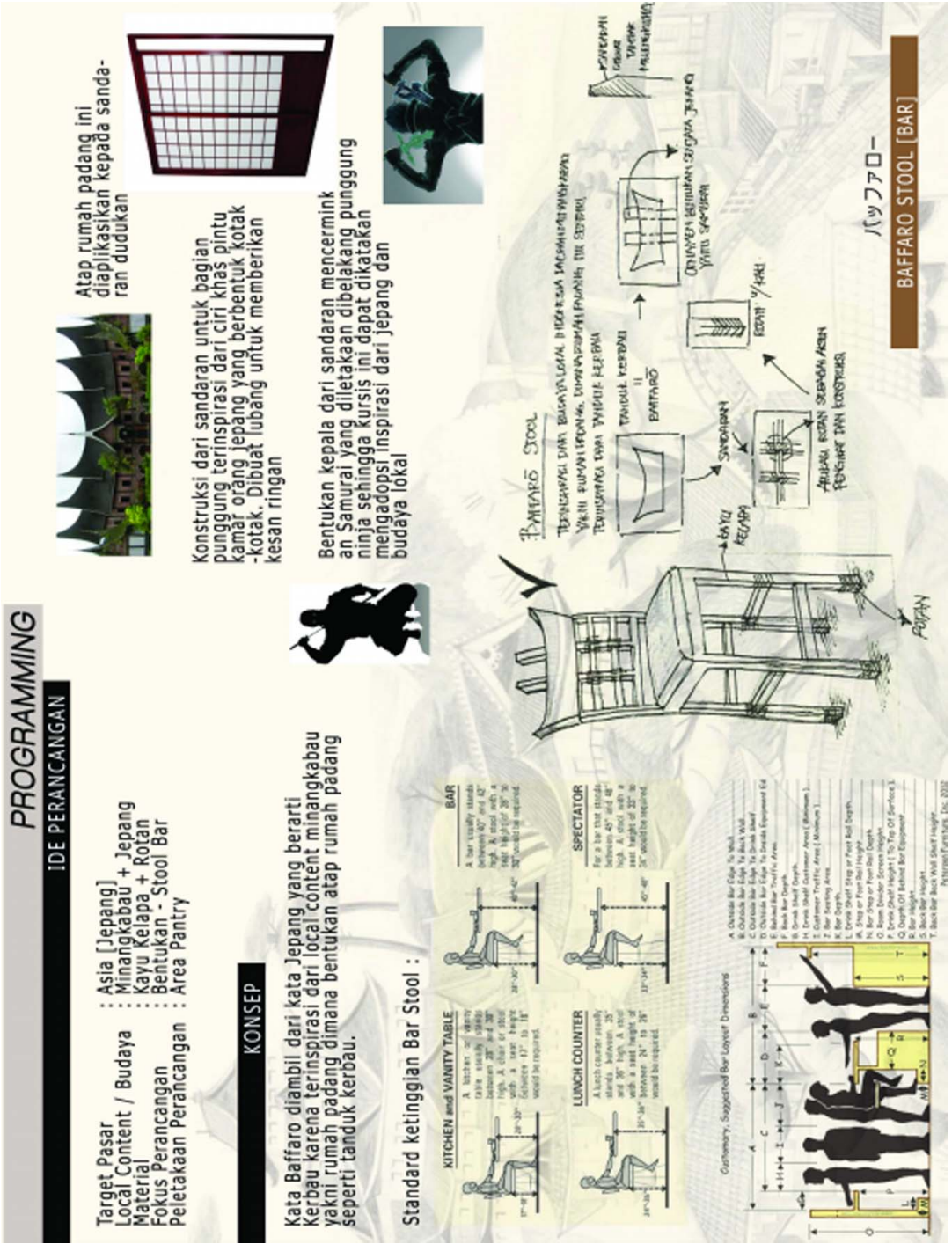


Figure 5. The global-local strategy for a set of scenarios for the global market.

Finally, the implementation phase involves further activities after the development of the design; it also involves a feasibility study. The feasibility study of the product should consider human factors, such as usability, ergonomics, safety, comfort; it should also consider the technical aspects as well as mechanical and production feasibility. After it is successfully manufactured, the product still has to go through the process of inspection as part of an evaluation to ensure that it meets the basic standards of the knowledge base constructed.

Conclusion

The model of local culture-based furniture design, in principle, is to include local resources and aspects of global issues in a system that consists of basic knowledge, translation and implementation. Coconut wood is sourced locally and becomes the key to the knowledge base in its role as a substitute for conventional wood.

This model is the result of research that aims to build a knowledge base that is grounded in the local culture. It aims to establish a set of scenarios for the development of furniture products suitable for the current global environment. It is to be noted that this model is still in its formative stage and must be further assessed before it is completed. The next step in this research would be to make this model suitable for implementation and documentation, thus producing a system that can be easily duplicated and followed by creative industries.

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Disclosure statement

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