

FUTURE LIVING STUDIO: SOCIO-TECHNICAL EXPERIMENTS IN SUSTAINABLE DESIGN

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ABSTRACT

Local creative community and design engineers are key stakeholders in initiating a local discourse on sustainability that includes considerations of production and consumption issues. The role of designers is increasingly changing to that of a strategic or facilitator role. Aligned with this global development, we developed Future Living Studio (FLS) as a platform for intercultural exchange to influence strategic design input on sustainable design and production issues for Vietnamese companies branded products. FLS is a series of 3-month design collaborations between local and foreign designers developed in Vietnam to promote reciprocal learning on sustainability through a studio approach. Vietnamese designers (during each studio, respectively), external designers, and local companies collaborated, in a learning-by-doing process. The collaborations' design visions and product concepts embody aspects of the learning process.

In this paper, we reflect on the first two editions of FLS, developed through an action research approach. Between the iterations we experimented with the different stakeholders involved and project framing. Training curriculum and developed facilitation tools aimed at improving collaboration processes based on our experience from the first studio. The aim of this study is to investigate how design can support learning processes to improve international design collaborations in Vietnam. We compare evidence for first and second order learning within the two studios with a focus on the Vietnamese designers involved. We found that learning was improved with the second iteration. The results

suggest that designing with first and second-order learning in mind is a promising approach for introducing sustainable design in Vietnam. Focusing on valorizing and representing knowledge of stakeholders involved supports learning and the collaboration processes. A learning approach creates a better foundation to potentially take the next step towards a longer-term transition to sustainability, which relies on local context and knowledge to pursue inclusion into lasting global discourse and processes.

KEYWORDS

Learning, socio-technical experiment, cross-cultural design collaboration, emerging nations, South East Asia, sustainable design in Vietnam, Design for Sustainability (D4S), design capacity building, product innovation, meeting demand in transitioning nations, integrating local sustainability practices in global design trends

1. INTRODUCTION

Design plays a large role in determining the sustainability of products, regarding both production and usage. Design for sustainability (D4S), eco-design, or design for end-of-life, address sustainable production [1,2,3]. Recently, the global discourse on sustainable design has been increasingly targeting user behavior and practices linked to consumption [4,5].

There is an opportunity to introduce sustainable product design and production to Vietnam. Design will play an important role as Vietnam moves from exporting commodities to developing branded

products [6] especially with regards to Vietnam's burgeoning middle and affluent classes, projected to double in size to about 30 million in less than 10 years [7]. Jackson states that reaching these new customers will only be possible with, "a solid understanding of these markets' consumers and how to satisfy them" [7]. This rapidly changing context presents the opportunity to develop sustainable practices from the ground up and to learn from global sustainability best practices developed in the last decades [8].

Throughout this paper we refer to the need to introduce sustainable design because: 1) the concept is new in product design industries and 2) following political-historical periods of industry latency (Vietnam war followed by economic embargo) the country has experienced delayed industrial activities and consumer trends. In making up for lost time, there has been a tendency to emulate unsustainable development patterns exemplified by the Western industrialization model [11]. For example, local handicraft traditions in Vietnam are traditionally sustainable as they are connected to communities and their livelihoods, but input is needed on different parts of the value chain, for example, reduction of fertilizer use, or increasing safety in the workplace.

There is an opportunity to leapfrog unsustainable development patterns exemplified by the Western industrialization model [9,10]. As sustainable design is inexplicably linked with user behavior, important questions must be answered such as: what does sustainability look like, or what does it mean, in the Vietnamese context?

Product design is nascent in Vietnam, though Vietnamese furniture and handicraft sectors are competitive internationally as bulk exporters. Companies recognize that they can no longer compete on price against e.g., China, but they don't yet have the experience to add value to their products through marketing, differentiation, and design [12]. In the local market, companies currently produce copies of Western products demanded by local consumers though these products are ill suited to their needs, e.g. regarding ergonomics [13]. As a discipline, product design is nascent in Vietnam, and designers are not involved yet in strategic design processes. For example, product design education is offered only at 2 institutions in the South of Vietnam [14].

Two main types of international design collaboration address the need to upgrade Vietnam's design

capacity. The most popular approach pairs international design consultants with Vietnamese companies (hereafter, "consultant approach"); the outcome is usually a designed product or marketing plan, that can also lead to longer-term business-oriented partnerships. Companies are acquainted with design and its added value activities via a learning-by-doing process. In these projects, companies do not necessarily know how to replicate the process because this knowledge is not contained "in house" [11]. This approach has been adopted in several projects including the WWF Rattan Project [15], or the Joint Programme on Green Production and Trade to Increase Income and Employment Opportunities for the Rural Poor [12], and by local organizations such as Vietcraft.

A second approach (hereafter "methodology transfer approach") adopted by the Sustainable Product Innovation (SPIN) Project (our project) and others, such as the Centre for the Promotion of Imports from developing countries (CBI), transfers relevant methodologies to local consultants and companies who are mutually interested in the transfer [16]. This approach targets and trains local consultants and key people embedded within relevant organizations and companies to carry out the role of the consultant as filled by the external consultant in the consultant approach.

Following the logic of this methodology transfer approach, we further specify and argue that local designers can be key advocates of sustainability in Vietnam [17,18]. As cultural insiders, they can play a large role in bridging the gap between companies and consumers to address sustainable consumption from the design and production side. This transition requires supporting the designer's strategic involvement in planning, coordinating and monitoring the whole product design process [18].

Toward this end, the authors (hereafter "we" - a team of design researchers from DUT) set up a series of socio-technical experiments, Future Living Studio (FLS). We developed FLS based on the idea that experimentation can simultaneously build capacity through cross-cultural pollination and trigger learning on many levels about sustainability in the Vietnamese context. The studio (1) engaged Vietnamese designers and companies in a dialogue on sustainable design in their respective countries via a learning by doing process, (2) promoted the adoption of sustainable design and production practices in Vietnam, (3) facilitated especially local

designers to become advocates of sustainable design because they will ultimately be the ones involved in the long term processes, and (4) utilized local and international exchange to permeate and leapfrog local knowledge and hierarchies.

This paper reflects on the process and results of the first two editions of FLS and illustrates how improvements were made to support learning processes. A framework for analyzing learning is developed, via literature on socio-technical experiments, and turned to the studios' process and products. We reflect on how improved project framing, training curriculum, and facilitation aimed at improving collaboration processes influence learning processes in international collaborations.

2. SOCIO-TECHNICAL EXPERIMENTS

2.1. Definition

Socio-technical experiments (also known as transition experiments, bounded socio-technical experiments [19] or societal innovation experiments [20]) are small-scale laboratories that are launched in sheltered but real-life settings [21]. The aim of a socio-technical experiment is to learn about, and explore alternatives to the dominant (unsustainable) socio-technical regime. In other words, these experiments aim to change the socio-technical contexts in which they are launched by catalyzing, exploring, incubating, embedding and ultimately scaling up solutions for sustainability [22-23]. Key elements are a dynamic and iterative approach, a wide and diverse network of stakeholders, a collectively developed long-term vision, a continuous process of learning and evaluation with all participants, and exchange across related experiments [24].

2.2. Example: the Mitka project

An example of a well-known socio-technical experiment is the Mitka program [19, 25, 26]. Mitka aimed to create an innovative electric vehicle and its connected services. As a leapfrog sustainable mobility solution, it tried to influence aspects on product, service, infrastructure, and legislation levels. The project demonstrated key elements of socio-technical experiments. For example, diverse stakeholders in the collaboration were represented such as broad business and research interests; partners included, TNO, Nike, Gazelle, and the TU Delft [25]. In addition to a fruitful learning process

between stakeholders, the complexity of this collaboration raised questions on how to define system boundaries, how to balance short-term and long-term goals [26], and how the design process and designers [25] fit into socio-technical experiments. Unfortunately, Mitka was not successfully brought to market despite a fruitful learning process.

2.3. Learning in socio-technical experiments

Learning is one of the key aims and success factors of socio-technical experiments because learning is the first step to taking action to transform society [23, 27]. In socio-technical experiments, the process of learning is more important than reaching concrete results; an effective learning process can promote the success of innovations into the market or socio-technical context [21, 23, 28, 29]. Two types of learning are described in transition literature, first-order learning (also known as single loop learning, and second-order learning (also known as double loop, higher-level learning, or reflexive learning).

First order learning is linked to "how to" solve problems. The impacts of first-order learning relate mostly to product or product-service levels [30], and can touch diverse domains for example, societal, institutional, technological, socio-cultural, environmental or economic domains [31-33].

Second order learning is linked to questioning, exploring, framing, and reflecting on underlying assumptions around institutions, existing ways of thinking, social values, and behaviors [22,23,33-36]. In this way, second order learning is linked to changes at the socio-technical and societal system levels [30]. Hoogma et al. [23] stress the importance of designing experiments to foster second-order learning. Table 1 synthesizes criteria for first- and second-order learning from the discussion above.

Table 1 Criteria for learning

First order learning

- Do the participants gain new knowledge on how to solve problems?

Second order learning

- Do participants show evidence that their frame of reference has been shifted? Are their underlying assumptions questioned regarding sustainability?

3. PROJECT BACKGROUND

3.1. The Sustainable Product Innovation (SPIN) Project in Vietnam

Future Living Studio is situated within a larger set of socio-technical experiments carried out within the four year, SPIN Project, funded by the EU SWITCH-Asia Program. SPIN was established in 2010-2014 to promote sustainable product innovation in Vietnam, Cambodia and Laos, by disseminating the D4S methodology to regional stakeholders through trainings and demonstration projects [16]. SPIN uses a combination of the two approaches to international collaboration described in section 1.3 to reach its goals. SPIN aims to train 50 local consultants, work with 500 small to medium sized enterprises (SMEs), develop 1,000 new or redesigned products, and disseminate results to the greater network. A collaboration between local and external partners, SPIN partners include a diverse set of stakeholders, including the Vietnam Cleaner Production Center (VNCPC), the Asian Institute of Technology (AIT) in Vietnam, United Nations Environment Programme (UNEP) and Delft University of Technology (DUT), amongst others.

3.2. D4S methodology

D4S methodology is the main technology utilized by the SPIN project. As a general design process, D4S claims to be a promising approach to introduce sustainable design and production thinking in emerging nations [2,3,18]. It espouses a systematic, life-cycle, phase gate, and team-oriented approach to product innovation [37-38]. D4S was developed from Ecodesign and green product design to address the need to reduce the environmental impact of product design [1], D4S now also includes additional social and profit elements. For example, D4S includes an orientation for meeting consumer needs in a more sustainable way. See Crul et al. 2009 for a detailed explanation of the D4S methodology, its curricula and methods [3].

4. FUTURE LIVING STUDIO

4.1. General approach

Future Living Studio (FLS) is a design studio concept. FLS recombines aspects of the two approaches to international collaboration. From the

consultant approach, consultants are replaced with a cross-cultural design team to exchange their knowledge and experience through collaboration with companies. The studio positions a cross-cultural (diverse institutional and cultural backgrounds) team of designers to leverage their mixed insider-outsider status, to exempt the teams from the rigid hierarchy structure within the sector, while being able to operate within the local context.

From the methodology transfer approach, we develop a curriculum of sustainable design concepts and methods. The goal is for designers expand their vision around sustainability and gain tools on to address sustainable design issues locally. Designers are introduced to diverse sustainability concepts and frameworks such as sustainable development [39], triple bottom line [40], David Report [41], Holistic Sustainability Assessment [12]. Additionally, “how to” knowledge is introduced to the design team primarily via two “toolboxes,” D4S, and the Delft Design Guide [42] (which were both developed at DUT).

As a series of sub-projects within SPIN, FLS adopts the same goals as SPIN in a new configuration: train local consultants, acquaint companies, develop products, and disseminate knowledge and experience gained to the greater network on sustainable design. The order of priority of these goals in FLS are: 1) fruitful cross-cultural exchange, 2) support Vietnamese designers to become advocates of sustainable design, 3) sensitize companies to the added value activities of sustainable design by developing products together, and 4) disseminate experiences to the greater network through public events such as exhibitions, as well as through website and social media channels (Facebook, Twitter, and Pinterest). The final prototypes, furniture and handicraft products, were exhibited at domestic trade fairs.

The set up of each project involves 3 Vietnamese designers and 3 external designers to form a design team. In the period of 3 months together, on the ground, the design team works with 3 companies to develop a collection of sustainable products for a general market/user. Starting from this general market/user brief, the design team develops specific sub-briefs based on each company’s production and material expertise. The local teams start earlier and ends the project later to help set up and round off the project locally; the first month is dedicated to preparation and training with a follow up month

where the local team follows up with companies. The studios explore solutions for sustainable design in Vietnam through the development of design artifacts in the form of visions, models, designs and prototypes. See **Figure 1** for a summary of the general design process followed by the studios.

To date, two studios have taken place in Ho Chi Minh City (HCMC), Vietnam, in 2011 and 2012, respectively. A third studio was launched in Hanoi, Vietnam (2013). A fourth studio has just completed in Phnom Penh, Cambodia (2013). Though the studios were developed in and for Vietnam, Cambodian stakeholders have adopted the concept in their context. This paper focuses on the first two studios implemented in HCMC.

4.2. FLS redesign

The design of the first studio was developed based on a conceptual framework combining the insights from our exploratory work in SPIN, as trainers in D4S and as consultants for company work (2010-2011), with a *bricolage* of theories from literature including, networked innovation, insider-outsider cross-cultural hybrids, and learning-by-doing [43]. After implementation of the studio concept in FLS 1, our analysis showed us that the low power and representation of the Vietnamese designers within the design team resulted in a weak cultural interface between the team and participating companies that ultimately undermined the process and results of the studio [44].

Using an action research approach, we made changes to the project to include new project framing, training curriculum, and facilitation to strengthen the role of local designers as cultural brokers between all project stakeholders in FLS 2. Figure 1 shows changes made from the first to second studio with differences highlighted in bold. The first author, together with local project managers recruited from the first studio, developed and facilitated these activities. The activities formalized learning and feedback from participating designers and companies in the first studio.

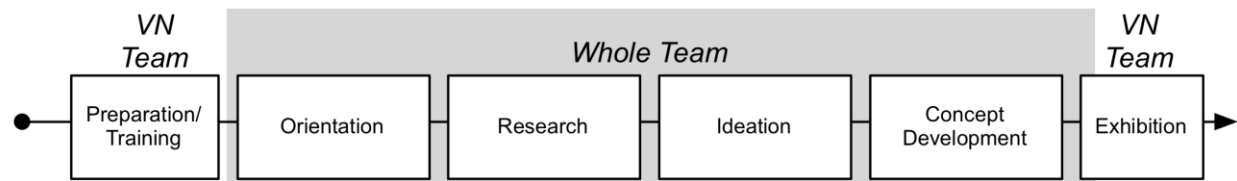
The project framing of the second studio was changed from FLS 1 to FLS 2 to valorize local knowledge. The overarching market/user brief was changed to focus on the domestic market, a new market for all parties involved. This clarification meant that main driver for developing design requirements was based on research with real users, rather than following the aesthetic preference of

individual designers. We also redefined the relationships between different stakeholders in the process; the Vietnamese designers became the main contact persons between companies and the team. The Vietnamese team lead company work, instead of cross-cultural pairs. In the second studio, all communication between company directors and producers were conducted in Vietnamese, including presentations.

In the second studio, local designers were acquainted with different design and sustainability methods from the D4S manual and Delft Design Guide in the preparation/training stage of the project to give them a head start in the project. These methods were applied by the Vietnamese designers in the project context, to practice new methods as well as gather information for the later teamwork. For example, local designers were asked to apply specific methods, such as a SWOT or product portfolio analyses, after visiting participating companies. In this period, the external designers were given the same reading; they were additionally asked to read articles on Vietnam to familiarize them with the culture. All designers were asked to read the project manual we developed after the first studio, containing a set of explicit project norms. In the first studio, designers were just asked to read up on the D4S methodology before starting the project.

In the orientation period, formal and informal team-building activities were developed to build trust and a shared working process between the designers. These activities were a series of workshops developed and led by the research team, including cultural, sustainability, and design sharing activities. For example, in the shared process building workshop, designers found commonalities between their individual design processes to build a shared design process to work from.

During the project, process mechanisms were developed for the second studio to monitor and troubleshoot the project via scheduled team feedback sessions and presentations with companies. Here, the design process was held accountable by an iteratively developed shared vision. The design teams met directly with company representatives at least once in each design phase to get feedback on, and adjust emerging design deliverables. In addition, the focus on the domestic market required a strong emphasis on user research throughout the design process. A probing and learning approach was taken during the design process [45-46]; alpha prototypes were tested



FLS 1 - Eco-tourism "Inspired by Vietnam"

DESIGN TEAM	- Read D4S manual (all)	- Project brief - Sustainability Workshop	- Eco-Tourism (brief) - Company - Material - Market	- Sketching - Sketch models - Proposed concepts	- Model making - Products organized based on eco-hotel spaces - Prototype 1	- Local and remote followup
COMPANY	- <i>cross cultural pairs lead company work</i>	- Company visits - Company brief	- Presentation of results and feedback gathering	- Presentation of results and feedback	- Presentation of results and feedback - Prototyping	- Final Prototype
CLIENT	- <i>VN expat & VN tourism market focus</i>	- Client brief	- Site visit to Phu Quoc Island	- Presentation of results and feedback	- Presentation of results and feedback	
NETWORK	- <i>expose sustainable design activities in studio</i>		- Public review	- Public review	- Public review	- Lifestyle Fair (2012)

FLS 2 - Exploring Waste Streams & Young Vietnamese Families

DESIGN TEAM	- Read D4S manual & project manual (all) - Preparation (all) - 2 week training on design and sustainability tools (VN)	- Project brief - Sustainability Workshop - Explicit sustainability vision - Team building - Shared process building	- Local waste streams (brief) - Company - Explicit design directions - Teamwork feedback	- Sketching - Sketch models - Proposed concepts - Teamwork feedback	- Model making - Explicit company vision + concept directions - Teamwork feedback	- Local and remote followup
COMPANY	- <i>Vietnamese designers lead company work</i> - Company visits - Company brief	- Company visits - Company brief	- Presentation of results and feedback gathering	- Presentation of results and feedback	- Presentation of results and feedback - Prototype 1	- Final prototype
USERS/MARKET	- <i>domestic market focus</i>	- User/market brief - Market and user research mock-up	- Market research - User research (survey & home visits)		- User testing	- VIFA Home Fair (2012)
NETWORK	- <i>expose local sustainable design capital</i>	- Friday Open Tea (FOT)	- FOT (weekly)	- FOT (weekly)	- FOT (weekly)	- VIFA Home Fair (2012)

Figure 1 General process of FLS studios with a summary of changes from FLS 1 to 2 in bold

with users of the customer segment to understand emerging design requirements as well as to sensitize them to sustainable products. In comparison, the first studio followed a more emergent process that was checked by the research team.

In the course of each studio, there were points of interface with the greater project network. The first studio used a public review/open studio format to periodically share the results of the ongoing collaboration with companies and the greater public. In the second studio, we separated sharing studio results from network building activities. We developed Friday Open Tea (FOT), a platform that

focused on exposing existing sustainable capital in the local community. Each week we invited three designers, educators or sustainability experts to share their experiences with the greater public. Themes of FOT included: community building, bio-materials, eco-fashion, art in Vietnam, etc. Each week, new audience members or their network were recruited as future speakers.

4.3. Participants FLS 1 and 2

Local designers were recruited for their knowledge, attitude, and experience regarding sustainable design in Vietnam. All of the designers were interested in

getting more input on sustainable design methods, experience working with companies, and experience collaborating with external designers. Three out of the six designers had been trained in the D4S methodology in SPIN; despite their participation, they still reported that they did not know how to apply what they had learned in the training to their work.

The two studios represented a mix of senior and junior designers, with experience working in diverse fields. The overall experience level in the second studio was higher, with two senior level designers. All designers were educated at the same university, though one designer from FLS 1 had been educated, as an architect. One designer from each studio also had relevant experience working as in house designers within furniture and handicraft companies. Table 2 gives a summary of the profile of local designers recruited for FLS 1 and two.

Table 2 Profile of local designers

Local designers recruited for FLS 1:

- Education: graduates of HCMC University of Architecture: 2 in product design, 1 in architecture. 2 trained in SPIN training.
- Experience: 2 recent graduates in product design, with less than 1 year of professional experience, and 1 senior architect with more than 15+ years of professional experience.
- Industries: 1 freelance designer in publishing, 1 in-house furniture designer, 1 architect with own studio.
- Cross-cultural work experience: all had worked under foreign management or cross-cultural teams.

Local designers recruited for FLS 2:

- Education: all graduates of HCMC University of Architecture in product design. 1 trained in a SPIN training.
- Experience: 1 recent graduate and 2 senior designers with more than 7+ years experience.
- Industries: 1 freelance product designer, 1 in-house furniture/handicraft designer, 1 freelance designer in graphic design and advertising, with in-house experience in advertising.
- Cross-cultural work experience: the 2 senior designers had experience working with foreign buyers and clients.

The external designers represented diverse cultural and institutional design backgrounds (Table 3). They

were recruited based on their knowledge, attitude, and experience working or living in cross-cultural contexts and on sustainable design. Reasons they wanted to join the project: they wanted to experience a new culture, work directly with producers, and get new inspiration. Diversity in cultural, educational, and experience background was improved from the first to the second studios.

Table 3 Profile of external designers

External designers recruited for FLS 1:

- Countries represented: 2 Dutch, 1 Chinese-American
- Education: all product design graduates representing alumni from 2 Dutch universities.
- Experience: 2 recent graduates in product design, 1 junior designer with less than 5 years of experience.
- Industries: 1 freelance product designer, 1 freelance product and graphic designer, 1 freelance strategic designer

External designers recruited for FLS 2:

- Countries represented: 1 Italian, 1 Vietnamese-American, 1 German
- Education: 1 interaction design graduate, 2 product design graduates from different universities.
- Experience: 1 recent graduate, 1 junior designer, and one senior designer with 7+ years of experience.
- Industries: 1 interaction designer, 1 fabricator, 1 product designer both in-house and free-lance.

Each studio worked with 3-5, furniture or handicraft, companies specialized in a particular material such as bamboo (2 companies), hardwood (1), terra cotta (1) or water hyacinth (1), and we also partnered with one company to investigate how to turn their hardboard production waste into products.

In the first studio we recruited companies from the SPIN network that were mainly exporters, but had an interest in developing their domestic market share (no experience in this market). Two companies from FLS 1 had partnered with SPIN before, and the directors had participated in TOT trainings.

In the second studio, we recruited companies with the requirement that they already had a share of the domestic market (usually Vietnamese upper class or expatriates), but were looking to reach new local customers. For the companies involved in the second studio, this was their first collaboration with SPIN.

All of the companies we recruited were aware of sustainability as a concept. Companies were selected based on the enthusiasm of the director toward the project, the production proximity to HCMC, diversity in material inputs (i.e. no companies with the same base material), and in-house production capacity. Reasons companies cited for joining the project: receiving input or exposure on local market/emerging consumer groups, design and/or sustainability issues as well as curiosity/interest in collaborating with external designers.

5. METHOD

Vietnamese designers were the main target group for learning out of all the stakeholders: participating external designers, participating companies, and the emergent network around the studio. We focused on the learning process and results related directly to the Vietnamese designers, reflect briefly on learning by the other stakeholders, and evaluate learning in some of the designs developed.

We use diary entries from the design team as the primary source for indication that learning was achieved. Diary data was supplemented by project documentation generated by the research team: field notes, semi-structured interviews, process photographs, and project documentation generated by the design team: blog posts, design process artifacts, emails, reports and presentations.

Designers were asked to reflect on their daily activities for 10-15 minutes per day. The entries were e-mailed to a blog. The criteria for learning (Table 1) were compared against the quotes from diary entries. Learning was considered verified if three or more quotes from the diaries were found to corroborate criteria for learning. Building on the analytic framework developed in Table 1, we further delineate three main learning domains for first-order learning based on the project goals: production/material context (based on the company context), market/user context (based on the market/user brief), and sustainable design in general.

For other stakeholders involved, we evaluate learning based on the content of activities that would have facilitated learning on different domains, with some quotes. A “yes” is given if three or more activities carried out in the project would have acquainted stakeholder groups to learning, a “weak” is given if less than three activities would have exposed stakeholders to concepts in a certain domain. Comparing learning from one studio to the next, a

“+” is given if the content of activities carried out by the management team or design teams would suggest that learning was improved on a specific domain.

Three external reviewers (see Acknowledgements) with experience in sustainable design and the context of Vietnam were asked to review this paper to provide intersubjective agreement on the preliminary results described in this paper. The quotes presented below are anonymized for each studio.

6. RESULTS

6.1. First-order learning

An analysis of first-order learning by stakeholders across the three domains shows that learning was generally improved from the first to second studios (see Table 4). The exception is that the designers learned more about the production and material context in the first studio; the lack of market/user emphasis meant that the designers could spend more time experimenting directly with materials.

Table 4 First-order learning by stakeholders

Stakeholders	Sustainability (FLS 1/FLS 2)		
	Production /material context	Market /user context	General sustainable design
VN designers	Yes+/Yes	Weak/Yes	Yes/Yes+
External designers	Yes+/Yes	Weak/Yes	Weak/Yes
Companies	Yes/Yes	Weak/Yes	Yes/Yes+
+ improved			

Learning by working in real production contexts shed light on the challenges and opportunities for implementing sustainable design in Vietnam. The designers were exposed to companies with various production capacities, material expertise, best and worst practices, and company executives with varying attitudes towards design and sustainability. One designer wrote that, “we lacked knowledge of how sustainable something was.” It was unclear how some of the materials were sourced, how sustainable different finishes were, or how to monitor the sustainability of products if they were taken to market; much was based on the word of the companies. Another local designer commented that, “[company] is totally greener...their techniques are based a lot on the essence of bamboo...that’s why it’s harder to get out of the traditional form.” The designer recognized that the company’s production strength was a weakness from a market point of view, because Vietnamese consumers consider traditional bamboo products cheap.

From a collaboration point of view, designers realized that company directors were key gatekeepers to getting prototypes made; she wrote, “[the production staff’s] enthusiasm comes from the decision of the director...Normally, it is very difficult to have a chance to work with technicians to follow up on designs.” Through the collaboration, company directors gained more understanding of the added value of sustainable design. Feedback from companies suggested that companies got some practical input from the collaboration. A company director stated that, “from working with FLS, I understand...how to select material to make a sustainable product... I could learn how to design new products....”

Exchange on the market/user level was minimal in the first studio, and limited to feedback from the final exhibition. Feedback collected at the exhibitions helped improve the designs and estimate potential market response. Additionally, interest from potential customers validated the designs to some extent.

The domestic market focus in the second studio improved learning and exchange on the market/user level during the whole project. The user research results revealed in depth demands from potential customers. User testing prototypes in progress with potential customers revealed emerging design requirements. User insights gathered during the product development process formed the most convincing evidence for both designers and companies for design improvement. For example, a company refused to make changes to an alpha prototype unless the user testing demonstrated that the changes were necessary. After the user-testing phase proved that changes were necessary, the company updated the prototype. The new focus on the upcoming domestic, middle-class, versus export market was a new knowledge domain for companies who had been producing mostly for export markets or limited consumer niches such as expatriates or elite classes.

Learning on sustainability in general was improved in the design team and company level from the first to the second studio. Both local and external designers from the second studio cited that learning about, and using design methods was useful for their work after the studio. Companies were exposed to regular and consistent updates on the evolving design briefs of designers that linked back to the team’s sustainability design vision.

6.2. Second-order learning

Second order learning was demonstrated designers in both studios, where learning was improved in the second studio. Participating companies demonstrated limited second order learning in the first studio, but in the second studio, the potential for second order learning was improved. On a network level, the broadened scope of dissemination activities engaged a more diverse discussion on sustainability and drew a bigger audience. Finally, we found that the physical prototypes stimulated discussion around sustainable design at the local trade fairs.

In both studios, we found evidence that second-order learning occurred within the design team. In the second studio, many reflective quotes were found directly following the sustainability training and formal feedback sessions. For example, following the sustainable vision workshop, all designers wrote that their conception of sustainability had been broadened beyond just an environmental perspective. A designer wrote, “I recognized [that] sustainability...is also a connection of social relatives, services, or keeping culture.” The training caused another designer to reflect on how to grapple the behemoth of sustainable design; she wrote, “I wonder if we [can] consider “sustainability” as a product so that we also have an orientation for it...we can analyze it in a company, Vietnam.” After the training, designers continued to write and reflect on sustainability issues. For example, one designer reflected, “regionalism is sustainable too, and these companies need consultant about their weakness: organization, building corporate identity and strongly needs new designs for [the] domestic market.”

In the first project, two companies dropped out, while the remaining three companies stated that they stayed in the project to “help young designers”, or to take part in the trade fair. Preliminary feedback from company directors from FLS 2 indicates that the project had shifted some of the directors’ frames of reference regarding sustainable design. One company director from FLS 2 reported that his attitude toward sustainability had changed through working in the project: “as a manufacturer, [we] specialize in producing high quality products at low cost and do not care much about sustainability in products...While working with FLS, I understand how important it is to have sustainable products.” In general, the feedback from the companies was much more positive in the second studio.

The potential for second order learning with the greater community was improved through the setup of the Friday Open Tea platform. The review sessions of the first studio, engaged the larger network mainly on the social and environmental aspects limited to the studio's design process. In the second studio, sourcing content from the community enabled informal exchange many perspectives touching topics of sustainability, development, and design in Vietnam. 12 editions drew audiences of 40+ participants per week.

At the fairs, the physical prototypes were a starting point for further discussion on sustainable design in Vietnam. Many customers were initially intrigued by the novelty, design aspects of the products then drawn into a larger conversation where the sustainability vision inspiring the designs was explained.

6.3. Learning embodied in visions and designs

Analysis of the design visions showed that first order learning on sustainability is embodied in the visions of both studios. While **Figure 2** is an *ad hoc* list of sustainability attributes, the vision in **Figure 3** reframes standard sustainability approaches within the user and company context demonstrating second order learning. The designs developed by both studios demonstrate first order learning on sustainable design. But, the products from the second studio also embody second order learning following the difference in design visions between the two studios. This difference is not obvious on a visual level, but comes out in the product story.

Figure 4 shows a few of the designs developed with representative companies of each studio. The products shown, from the first studio, were based on a brief to promote and update the aesthetic of bamboo in Vietnam in addition to developing sustainable design solutions (Figure 4a-d). The coffee table designed by a Vietnamese designer is demonstrates the following sustainability criteria through structural innovation in joining bamboo elements: flat pack to reduce shipping costs (the legs can be disassembled and stacked), and less material use compared to traditional bamboo products, (Figure 4a). For the producer, these products provided new design and market input and some new techniques for joining bamboo. On a market/user level, feedback from the final exhibition showed that visitors were enthusiastic about the modern design

and the combination of a traditional material with a new one: bamboo and glass.

The example products from the second studio (Figure 4e-g) all share the same sustainable product innovation concept demonstrating second order learning in addition to first order learning. All three designs integrate the company's existing refurbishing and take-back service with the introduction of waste material as a sustainable, and value adding material. For example, the woven elements are not as durable as the wooden frame, but can be replaceable over time. These design considerations increase the sustainability of the product through its durability and customizability.

The TV table, by one local designer takes into account the spatial needs of the domestic market

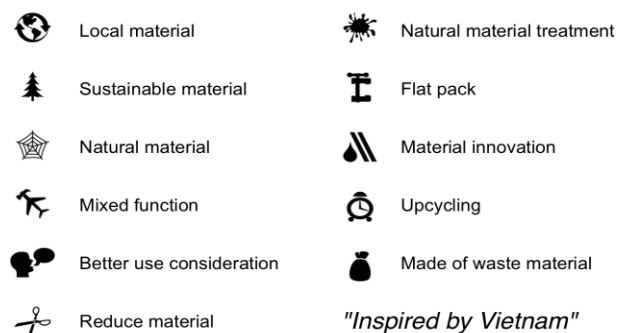


Figure 2 Sustainability elements considered in FLS 1; products for eco-tourism "inspired by Vietnam"

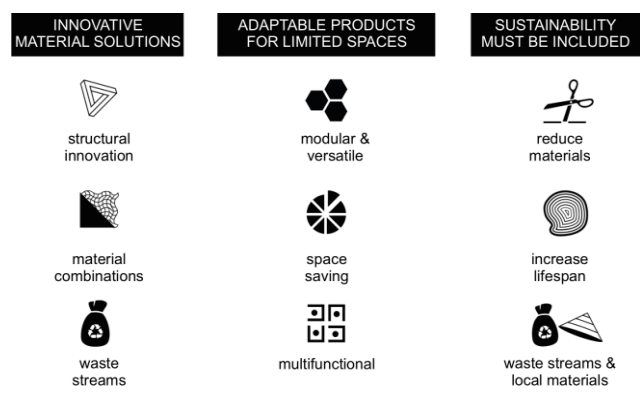


Figure 3 Sustainability themes and elements considered in FLS 2 collection; products developed for young Vietnamese families

defined in the user research (Figure 4f). In addition to the overarching product innovation concept, the design is versatile and multifunctional and reflects elements highlighted in the team design vision: innovative material solutions, adaptability for limited spaces, and sustainability considerations (Figure 3).



Figure 4 FLS 1 products for a bamboo company: a. coffee table (VN), b. salon table (NL), c. open wardrobe (US), and d. desk lamp (NL); FLS 2 products for a water hyacinth company: e. stool (VN), f. TV table (VN), and g. lounge chair with side table (GR)

This kind of thinking was new for the company, and feedback from the exhibition showed that potential customers appreciated the product for its simplicity, compactness, and novel look.

7. DISCUSSION

We found that designing mechanisms such as training and facilitation to improve the position of Vietnamese designers, as well as rethinking the framing of the socio-technical experiment improved learning processes across stakeholder groups from FLS 1 to FLS 2. Though the redesign was aimed at strengthening the Vietnamese designers as the cultural interfaces between local and international stakeholders, we found that learning was a necessary side effect to improved collaboration. In the following, we'll discuss some of our main findings and recommendations.

Framing the project to valorize local knowledge and experience improved learning by stakeholders. Redefining the brief to focus on the domestic market meant that user research was the driver of design requirements, not the aesthetic preferences of individual designers. Findings from user research and user testing represented concrete evidence to justify design decisions amongst collaborators. Assigning local designers to be leaders of company work improved the relationship between the team and the companies. For example, no companies dropped out in the second studio, while 2 out of 5 companies dropped out in the first edition.

To stimulate first and second-order learning we found that it was important to connect theoretical

aspects (methods and concepts) of the training curriculum to the practical aspects of the project. On the “how to” level, new methods could be used in the project work to demonstrate how to apply the methods and as direct input for the project's process. For example, one designer recalled the morphological chart method from the training, and asked for help to apply it later. She used this method to explain several design variations of a concept in a presentation to companies. Regarding second-order learning, we found that the training, together with facilitated workshops, helped jumpstart the reflection process.

Facilitated workshops were important tools for stimulating and checking the collective visioning processes, and stimulating individual and group reflection. Paired with the training curriculum, e.g. the sustainability workshop helped share individual sustainability perspectives to create a shared team vision on sustainability. This finding is supported by the notion that designers' new role involve facilitation and “inventing a shared language for problem solving” [47], and the importance of skilled design facilitation to bring better engagement and knowledge exchange to participatory processes [48].

Facilitated feedback sessions were important points of recognizing good work and troubleshooting problems. A designer from the first studio wrote, “Comments about my strengths surprised me. I didn't know I have these good points...I always know what I'm not good at...it leads me to the feeling of inferiority.” This feedback mechanism was found to be critical, because the cross-cultural team members were learning step-by-step how to work together. It

was a chance to reinforce the project goals, values, and norms of inclusivity, respect, and mutual learning. It contributed to strengthening the Vietnamese designers' equity within the studio in the short-term, and it is hoped to increase self-confidence in the long run.

Reflection about the context of sustainable design in Vietnam was stimulated and shaped by diverse interactions with different stakeholders. For example, working in the team caused a designer to gain more confidence in her ideas. She wrote, "methodologies and group work helped me realize that no idea is stupid." Negotiating the design process with real companies helped the designers to re-evaluate their own expectations of the designer's role. A designer wrote, "the consistency requirement...that the Western designers asked companies. They demanded evidence for everything...normally, Vietnamese is quite complacent...considers the relationship...local designers was to give up more easily on dealing with the companies." In another example, a designer questions the target customer definition with respect to the company's profile; she wrote, "I should talk about my opinion about the home visit...the company, they may also see that our target customer's income is unreasonable for their product..." These findings are supported by sociotechnical literature that learning is supported by contact with diverse stakeholders [24].

One promising result is the large community we built around FOT. This finding partly addresses Manzini's [49] question, what is the role a designer in "designing communities?" We built a community around the studio's activities that exposed social capital in the local community and started diverse dialogues on sustainability with the greater community.

The context specificity of addressing sustainable design in Vietnam, confirms the idea that sustainability must be seen as a moving target [50], based on the local context. This notion is demonstrated by the following quote: "Designers can learn a lot from reality then narrow down and support the companies to develop positive aspects and reduce negative sides at which they are the expert...step by step support to each other...each partner builds up a ladder...higher and higher." This finding is corroborates the potential for learning-by-doing experimentation to incrementally redefine the problems and solution spaces to build up knowledge to effect intended strategic change [22, 51-53].

We recommend that the design of future training curricula connect strongly back to the project work. Also, training and facilitation can be designed to positively reinforce each other. In the future, it could be interesting to develop new mechanisms from the perspective of other stakeholders such as companies, i.e. train the companies and other stakeholders beforehand.

Curricula design should take care to introduce different and contrasting conceptual frameworks, and to encourage critical reflection and personal development around learning concepts. Contrasting with other methodology transfer approaches, we recommend that "how to" knowledge is taught, as if they tools in in a toolbox, rather than as linear methodologies. A toolbox approach emphasizes the plurality and inclusivity of approaches needed to address sustainability.

Supported by our previous findings, it is clear that facilitation cannot come from the team itself and must come from the outside; otherwise collaboration within the team would be unequal [44]. Both training and facilitation processes in this project were initiated from the project research team (outsiders), taking feedback from local parties into the redesign. Ideally, the design or redesign of such experiments should engage locals in the collaborative design.

A limitation of the socio-technical approach, demonstrated by the Mitka case, is the lack of market implementation. Similarly, none of the products developed in this project have been successfully taken to market. We noted that though the process was the focus, it was important to have physical products. Designers, companies, network, and potential customers needed real artifacts as a rallying point and tangible starting point for discussing sustainable design. A future avenue of exploration is to look at how to connect such projects to the market. This will likely involve the need to bring in even more stakeholders with different backgrounds.

Ehrenfeld [41] warns against trying to directly replicate systems developed in specific cultures in new cultural settings because they run the risk of ignoring the complexity of socio-technical systems, and the importance of bringing local knowledge from the ground up. Our answer is to emphasize flexibility and inclusivity for input. A third (2013) studio in Northern Vietnam, and fourth (2013) studio in Cambodia, replicating and adapting the process for have just completed. The fact that these projects are, for the first time, largely funded (Vietnam), initiated,

or run (Cambodia) by local partners, is a small measure of success. Follow up studies are needed to investigate how changing the business and country contexts of these projects influence collaboration and learning processes.

So far, the project has also resulted in some longer-term partnerships with local associations, businesses, and partners, demonstrating some longer-term capacity building. Several of the FLS designers have found jobs within the greater SPIN project, with companies and partners within the network. This demonstrates the value of learning and network building. The project has also attracted more experienced local designers, and companies have directly contacted the project with interest to join. We have presented indicative results for further testing. Formal follow-up studies are planned in the next year to follow up with the participating designers, companies, and the network from all the studios. This will give greater insight into the perspective longer-term impact, the perspective of participating companies, and the replicability of the project.

8. CONCLUSIONS

Vietnamese designers are key stakeholders in starting the dialogue on sustainable design in Vietnam. Designers are a promising group because they can be cultural brokers between companies and local consumers as Vietnam moves from producing commodity export products to domestic branded products. We developed a series of temporary design studios to support their transition to this new, strategic role. In these studios, local designers supplement their knowledge by working collaboratively with companies and foreign designers to develop collections of products that demonstrate what environmental, societal, and economic aspects of sustainability look like in Vietnam.

We, the authors, redesigned the FLS studio concept in two editions to valorize Vietnamese designers as the cultural brokers between all project stakeholder; in the redesign, we introduced new project framing, training curriculum, and facilitation aimed at improving collaboration. We analyzed the process and products of these studios using a learning lens developed from the literature on socio-technical experiments, and found that learning can be improved by design.

A new focus on the domestic market showed that connecting to potential users throughout the whole

design process yielded tangible requirements, provided design validation, and simultaneously educated future users.

Both first and second-order learning were improved from the first to the second studio. Improving the interface between stakeholders was critical for fostering learning and exchange. This interface can be supported through project setup and design but is part of a larger learning process of negotiating diverse stakeholder interests. This was especially strong when linked to the local context. A quote from a local designer summarizes this point succinctly; "I found that "learning-by-doing" is the best way for designers and producers to approach sustainable product innovation. In addition, trying to put everyone on board is very important to get the best outcome when we work in an international design team with different cultures, different working styles as well as different background knowledge." High potential areas for future work are to improve socio-technical experiment design by focusing on aspects of collaboration, equity, and making learning and collaboration goals explicit between stakeholders. This can be done via facilitation, expectation sharing and setting, and feedback.

The physical designs embodied learning and also played another important role: they served as incentive for companies to join the project, and as tangible objects around which to start a conversation on sustainable design in Vietnam. Just as the physical products started a dialogue, one important perspective to add is that these projects have the potential to engage the larger community. The success of Friday Open, used design activities within the studio as a starting point for exposing other sustainability capital in the local network.

Sustainability activism should be guided by "strategic intent" developed collaboratively and inclusively from the bottom-up. For cross-cultural collaboration outside intervention must be focused on supporting local actors to take over the transition process in the long term. This requires a shift in role for the cross-cultural collaborator from consultant to facilitator, and a shift in content and process from knowledge transfer to mutual learning. If local and global knowledge can be combined effectively, there is a chance to leapfrog current thinking toward true sustainability.

ACKNOWLEDGMENTS

This research was made possible by the EU SWITCH-Asia, Sustainable Product Innovation (SPIN) Project. The authors would like to thank participating designers and companies of FLS. Special thanks to Satish Beella, Jotte de Koning, and Thi Bay Miradoli for their help reading and editing various drafts of this article.

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