LEARNING THE UNLEARNED: PRODUCT DESIGN FOR SUSTAINABILITY IN CHINA

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ABSTRACT

The teaching and learning of Design for Sustainability (DfS) is not any easy undertaking within today's well-established discipline of industrial design. As DfS learning emphasises 'unlearning' the product-based approach, it involves the uptake of a set of design skills that, if not contradictory, are entirely novel, such as the co-creation approach, consumption-alleviation thinking and solution-based design, thus posing a challenge for most physically oriented design students. Because of the seemingly alienated nature of DfS, most design schools in China are having difficulty in promoting DfS teaching, or have been forced to put it to one side as a 'decorative' subject within the discipline of industrial design, thus hindering its natural development within design education. In this paper, the authors argue that DfS learning is best begun from the 'unlearned' practices of industrial design, and is best pursued within a local, social setting. Cases supporting this view are also presented to serve as a reference for alternative DfS teaching and learning approaches in and for China.

KEYWORDS

Design Education; Product Design for Sustainability; Industrial Design; Social Design

1. INTRODUCTION

1.1 The Promotion of DfS in China

In response to the recent transitions towards service-based economy and sustainable development, the West saw calls for a systemic change aimed at sustaining economic growth and maintaining people's well-being while reducing the consumption of environmental resources. Such change involves a great emphasis on the teaching, promotion and practice of 'sustainable consumption' as a core strategy to achieve sustainable development in the long run.

At the same time, within the design arena, the idea of **Design for Sustainability** (DfS) – a conception of strategic design that reflects the desire to conceive of 'sustainable solutions' via a product-service system to *satisfy* the needs and quality of life aspirations of people, while minimising the consumption of environmental resources – was then initiated to supplement the prevailing practice of **Design for Environment** (DfE) or eco-design and achieve a swifter transition towards sustainability (**Charter & Tischner, 2001; Leong & Manzini, 2006; Tukker & Tischner, 2006; Vezzoli, 2007**).

In collaboration with Professor Ezio Manzini, Professors Carlo Vezzoli (Politecnico di Milano) and J.H. Zhao (Hunan University), the author has initially promoted the concept of DfS in China between 2000 and 2003 by examining SPSS (the sustainable product-service system) and SpD (system-product design)^[1] in a series of workshops and pilot projects conducted at key design universities in Hong Kong, Beijing, Hunan, Wuxi and Guangzhou. The idea of DfS had eventually arrived in China.

^{1.} SpD (system-product design) is "a design approach and process which aims to identify, design and strategize needed products to be utilized within the Product-Service System (PSS) of a designated Sustainable Solution" (Leong, 2002). A series of workshops were conducted in 2003 in Hong Kong, Guangzhou, Hunan and Wuxi by the principal author and Ms. Elaine Anne, Director of Kaizor Innovation Ltd., to promote the concepts of SpD and DfS in China.

1.2 Confrontation Between the 'Old' and the 'New'

Though DfS was initially welcomed as a novel concept, it failed to become properly established in China in that particular period of time. Because it had been doubtful about the practicality of a solution-based DfS approach for industries in China (Leong, 2008). A review of participant feedback and experience highlights two fundamental reasons for these doubts.

a) Developmental Reality of China – China and the West presented very different conditions and were going through very different stages of economic development in the early 2000s. China's economy was still at an early stage of industrialisation. For instance, manufacturing accounted for 35.3% of Chinese gross domestic product in 2003 (Economy Watch, undated). The whole industrial environment was very much oriented toward production and OEM (original equipment manufacturing), China was still at the developmental phase of a *product-based* economy at that time.

b) The Dilemma of 'Unlearning'- Given this economic reality, the promotion of DfS was not an easy undertaking, as the main emphasis of DfS learning is 'unlearning' the product-based approach. It involves the uptake of a set of design skills that, if not contradictory, reflect an entirely alternative design ethos, thus posing a challenge to most physically oriented design students and conventionally trained teachers. Quite a number of these contradictions could be experienced from the design inception to final phases of a typical industrial design project, as listed in the following table (Table 1):

Phases of project	DfS learning	Industrial design learning	
Research	People-centred (real-life context)	User-centred (i-methodology ^[2] based)	
Analysis	Socio-culturally driven	Economics-driven	
Ideation	Co-creative (participatory)	Expert mindset	
Design approach	Strategic: service-based	Operative: product-based	
Idea development	Integrated, system thinking	Linear, process thinking	
Design formation	Physical consumption alleviation	Materials production reinforcement	
Outputs	Dematerialised solution Physical product		

Table 1. Comparison of modes of thinking in DfS-driven project and industrial design-driven project

Because of the seemingly alien nature of DfS practice outlined above, most leading design schools in China had difficulty aligning DfS teaching with the existing design curriculum, or were inclined to put it to one side as a 'decorative' pedagogic component of the mainstream syllabus within the industrial design discipline. As a result, DfS teaching did not draw sufficient attention among students and senior managers of design schools in China, and its promotion within the design education arena tailed off between 2004 and 2007.

1.3 The Return of DfS in China

Ironically, soon after moving into the 'bottleneck' its *production-led* economy has created – the appreciation of Chinese yuan (up 21% from 2003 to 2008) (**Forex Finance People, 2010**); the widening social disparity (e.g. income of the richest 10% is 65 times that of the poorest 10% (**'Diagnosing China'', 2010**)) and the rapidly deteriorating environment ^[3] – China has to move up the value chain of its industrial economy whilst considering how to address its environmental and social problems through alternative developmental strategy. In its 11th and 12th five-year plans, the two most recently announced, the Chinese central government has demonstrated its determination to seek major socioeconomic transitions to support China's future development, including turning export-oriented industries into *domestically-focused* ones, replacing a high-carbon economy with a *low-carbon* alternative, and switching from nationally focused development towards *people-centered enrichment* (**CPEIN, 2010**).

^{2. &#}x27;I-methodology' is a primitive user-based design methodology under which designers design with themselves or their friends in mind (*Lindsay*, 2003).

^{3.} Today, over 40% of surface water and 90% of water in aquifers in China is unusable; about 40% of its land is affected by soil erosion. Acid rain affects one-third of its agricultural land, and the country's agricultural output is falling. (*Economy & Lieberthal, 2007*). Socially, the number of environmental proceedings increased 87% from 2008 to 2009. Environmental issues have become the ninth largest cause of social unrest in China (*Yang, 2010*).

In this particular context of sustainable transition, the strategic solution-based concept of DfS has seen something of a revival in China, and has once again been placed under the 'spotlight' of design, and of design education in particular. Two specific networks related to DfS were established in China in around 2009. One is the LeNs (the Learning Network on Sustainability); the other is DESIS-China (Design for Social Innovation and Sustainability Network of China).

2. THE MYTH OF T-SHAPED DESIGN TRAINING

2.1 The Rise of 'Design Thinking'

In the industrial design discipline, in response to rapidly shrinking business in the United States at the beginning of the 2000s (**McGetrick**, **2006**, **March**), the design industry leader IDEO took the lead in advertising the *strategic* and *design thinking* skills of designers by publishing books and articles (an initiative led in particular by David Kelly and Tim Brown, the founder and CEO of the company).

For instance, Brown stated that business strategy in large companies "often gets mired in abstraction" (**Brown, 2005:2**), while design and design thinking are inherently part of a prototyping process that ideally meets the needs of visualisation and communication of strategy for business innovation. In another article entitled "Design Thinking" published in the world-renowned business journal, the Harvard Business Review (HBR), Brown (**2008**) further promoted design thinking and stated that:

"...as economies in the developed world shift from industrial manufacturing to knowledge work and service delivery, innovation's terrain is expanding. Its objectives are no longer just physical products; they are new sorts of processes, services,....ways of communicating and collaborating – exactly the kinds of human-centered activities in which **design thinking** can make a decisive difference." (para. 4: 86)

In other words, the strategic value of innovative design thinking has also been proclaimed.

2.2 'T' Design Thinkers

While affirming the strategic value of *design thinking*, Brown also advocated the recruitment and promotion of '*T*'-shaped people (or '*design thinkers*') to enable innovation for business. In his view, so-called T-shaped people are people who " *have a principal skill that describes the vertical leg of the T*—they're mechanical engineers or industrial designers. But they are so empathetic that they can branch out into other skills, such as anthropology, and do them as well." (**Brown, 2005:3**)

In reality, Brown was not the only design leader to advocate the importance of the 'horizontal' (design thinking) skills of *T*-shaped designers within and without the design realm. Quite a number of leading design institutes, such as the Institute of Design, IIT and the d.school of Stanford in the United States, have long been pursuing the value of design thinking training, which emphasises capabilities from a macro (or big-picture/strategic) perspective, system thinking, integrative knowledge (knowledge of related disciplines such as business, social sciences and marketing), process innovation and co-creation facilitation. These design schools contended that design thinking methods can be applied to many real world problems such as service design, system design, organisational design, business innovation, and even social design.

2.3 The Risks of Blurring the 'Old' Discipline for Dfs

2.3.1 A Rush towards 'T'-Shaped Design Training

Returning to China, since the two core developmental concerns of (i) turning 'made in China' into 'created in China'; and (ii) balancing 'environment' and 'development' became key parts of the national agenda in 2000, industrial design education in China has been aimed at achieving massive and lofty goals. With over 14,000 students now enrolled annually (from the few hundred enrolled in the mid-1990s), there has been an

increasing shift from the *vocational* towards *T-shaped* strategic, innovative training. Some of these trials involving remodeling the industrial design profession in design education could not simply be judged as either *right* or *wrong*, especially within a short timeframe. However, multiple perspectives should be contemplated in making similar attempts, particularly in the context of teaching and learning DfS in China today.

First, from an *economic perspective*, no matter how much we (as designers or design educators) would like to have the label 'the world's factory' removed from China, we have to accept that China's economy is still heavily reliant on manufacturing (manufacturing accounted for 48.9% of Chinese GDP in 2009, while it accounted for only 20% and 25% in the United States and the UK, respectively) (**Liu**, 2010). Moreover, even if the Chinese economy evolves in a more sustainable manner with a smaller volume of domestic trade, physical production and consumption will still be required. This is not to mention the necessary 'transition phase' (from 'industrial' to 'service' economy) as China moves towards a sustainable economy.

Second, from the *pedagogic perspective*, as design educators, one advantage we have over our apprentices is that of early exposure to new design ideas, such as the concept of *design thinking* from the developed West, through attending conferences and/or visiting leading institutes abroad. In addition, having learned essential design skills at an early stage of our professional life, we have taken basic skills for granted. It is always tempting for design educators to plan the *'most advanced'* curriculum and introduce the *'latest'* design theories to our students, foregoing the standards set for, or even the nature of, the programme ^[4] we are teaching. Of course, *T-shaped design* is one such *'hot'* subject which many design educators are very willing to promote in China these days. However, might we forget whether students are supposed to be taught or told to be a T-shaped designer, regardless of whether they are prepared or interested? Furthermore, are the extended horizontal design competencies promoted by the T-shaped approach really preferable? Moreover, are they appropriate for China?

Third, from the *disciplinary perspective*, there are notable ongoing queries about the overemphasis on the magic of 'design thinking' from both within and without the design arena. For example, at a DMI conference held in London in July 2010, Geoff Mulgan (a former director of the Young Foundation), the world's leading expert in social innovation, explained how designers 'entered' the social entrepreneur space but failed because of their '*naivete*', lacking domain knowledge (i.e. designers are normally quite unaware of the background of their new domain, often coming up with failed ideas tried decades ago) (as cited by McCullagh, 2010). Therefore, they are unable to effect change.

2.3.2 Queries over Being a Design 'Generalist'

The idea of extending the *horizontal* capabilities of design or promoting *design thinking* as a new design skill has also recently been queried by the renowned design scholar Don Norman and the design practitioner Kevin McCullagh. Norman (2010) simply disagreed with the claim of either the uniqueness of *design thinking* or the designer's right to hold a monopoly on creativity. He argued that:

"...what is being labeled as "design thinking" is what creative people in all disciplines have always done." (para. 3)

"design thinking is a public relations term for good, old-fashioned creative thinking." (para. 5)

Meanwhile, McCullagh (2010) observed that:

"...without a strong vertical stack of capabilities that are relevant to their chosen problem domain, designers stop being designers - and join the legions of free-floating generalists." (para. 8)

Given that the whole notion of T-shaped people originated from management consultants before it was popularised by IDEO in the noughties, there are reasons to be cautious about its recent popularity in the design field. In fact, not long after Brown's "Design Thinking" article appeared in the HBR, another article entitled "The Innovator's DNA" was published. It reported the results of studies undertaken by a group of business management professors about enhancing *creativity* through the so-called 'five discovery skills' of *associating, questioning, observation, experimenting and networking* (Dyer, Gregersen & Christensen,

^{4.} Industrial design programmes in China are traditionally developed from arts and engineering disciplines. 'Design' is still a very new discipline in terms of its development in China. The notional graduate or undergraduate awards of BA, BEng, BSc, Mdes, MFA, MA, MEng, MSc or Mphil can still be confusing for inexperienced educators or newly established design institutions in China today.

2009). Their proposed approach resembles much of the *design thinker's profile* Brown (**2008**) and others have recently been promoting. Therefore, instead of trying to expand *horizontal* skills to reach new or higher ground for design, we should seriously re-examine the risk of overstretching horizontal capabilities whilst diminishing our *vertical* stack of expertise.

2.4 Belief of Learning the Unlearned

2.4.1 Revisiting Design Basics

In view of the rapid transitions towards service economy and sustainable development at the turn of the last century, industrial design has seemingly became an *odd* and *embarrassing* discipline, or an approach that is better '*unlearned*' in favour of promotion of the immaterial practice of DfS. However, we consider that the discipline of industrial design should be *revisited* and its potential for green applications *explored*.

In terms of DfS learning within industrial design, the basic values of the discipline and the set of physical skills it requires should be *revised* from the tradition of design learning and treated as new '*essentials*' (focusing on green, batch, quality and customised production/consumption) for the promotion of DfS in China. Our argument is based on the *reality* and *vision* described as follows:

(1) **Reality**— To transform the 'world's factory' into a sustainable economy, a transitional period is required. During this period, creative sustainable products are essential to enable a smoother transition from today's economy to a better and more preferable one;

(2) *Vision*— The sustainable society we envision will rely on a large variety of customised services supported by specially designed products (mostly systemised for sharing) to serve people's daily needs. These products may no longer be mass-produced. Basic knowledge and skills such as form semantics, prototyping skills, and know how on modern ergonomic, materials and fabrication techniques of industrial design are likely to be *revised* to give them new value and significance.

2.4.2 'V' shape instead of 'T'

With this *vision* and *reality* in mind, we advocate the training of 'V'-shaped designers rather than the T-shaped thinkers currently being promoted. For a V-shaped designer, the required design training starts from (and is very much founded on) the inverted apex of deep 'V' expertise. The acquisition of relevant *skills*, *knowledge* and *methods*, along with accumulated capabilities from *specific* and *generic* (across design disciplines) to *extended* levels, would be sharpened through years of training and practice (see Table 2).

Product Design training ← ←		$\rightarrow \rightarrow Extended Design$ training		
	SPECIFIC	GENERIC	EXTENDED	
SKILLS (tacit-based know how)	 handling of surface geometry 3D visualisation/drawing empathy model making etc. 	- creativity - visual sophistication - problem framing - communication skills - etc.	- leadership - opportunity framing - analytical thinking - collaboration, etc. (+ extended domain skills)	
KNOWLEDGE (codified know how)	 form aesthetics & semantics 3D principles & related color theory material (eco-material) properties basic mechanics fabrication processes (mass/ rapid) drafting ergonomic/human factor Eco-design (DfE), 4DfD, etc. etc. 	 critical, creative thinking representational drawings visual literacy computer literacy user research &UCD design theory & methodology art/cultural appreciation design history DfS 	 design management project planning system/strategic thinking PS/process innovation cross-silo facilitation, etc. (+ extended domain knowledge) 	
METHODS (tool-based know how)	 scale, proportion & orientation color wheel I-methodology CAD/CAID Task analysis LCA, MET, strategic wheel, etc. etc. 	 brainstorming, mind mapping, etc. figure, objective, perspective drwgs. 2D, 3D, 4D software observation, contextual inquiry, etc. story boarding, maps/matrices etc. 	 - 5Cs analysis - strategic mapping/frameworks - NPD, PCP, PIP, etc. - PS development strategy - creative workshops, etc. - scenarios, SOD, PSS, etc. (+ extended domain methods) 	

Table 2. Examples of capabilities required for 'V'-shaped product-based design training

The idea of such 'V'-shaped product design training is to focus closely on core expertise, yet provide a perceivable framework of learning within the bounds of designated *tacit* (artistic), *codified* (literacy) and *tooled* (technical) know how ^[5]. This would avoid the probable T-shaped design training drawbacks of overstretching horizontal capabilities (without knowing the specific scope of learning) while weakening vertical expertise and producing free-floating generalists.

2.4.3 Product Design for Sustainability?

To support the promotion of 'V'-shaped design training to enhance DfS learning, we focus on 'product'-led DfS (also referred to as *Product Design for Sustainability* -- PDfS) in this paper. Unlike the 'system'-based DfS (alternatively called *System Design for Sustainability* -- SDfS), PDfS focuses on *product-based* solutions and relies more on operative core (the inverted apex of the 'V' shape) design training competencies.

In sum, notional PDfS embraces the following basic beliefs, purposes and potential applications:

(1) Beliefs and Purposes

[a] Subjectively based (or 'i-methodology') user-centered design ideology as a starting point for design. Emphasis on the ethics of designing things for others as for oneself;

[b] Individuals are vital in enabling collective change towards sustainability. Every seemingly tiny contribution made by an individual counts, and could stimulate or influence many others;

[c] Product as a key to drive (both behavioural and mental) changes in individuals. Enables people to act and take responsibility for their daily creation and or consumption;

[d] Product as a vehicle to alter social perceptions and enable sustainable forms and/or practices of lifestyle.

(2) Potential applications

[a] To promote a sustainable lifestyle or way of living via creative product solutions;

[b] To design and strategise product(s) to be utilised within the product-service system (PSS) of a designated *sustainable solution (please refer to footnote 1)*; or

[c] To revitalise indigenous crafts and skills or small-scale fabrication to facilitate knowledge and capital exchange among marginalised and affluent social groups (*please refer to the two specific cases presented below*). (Leong, 2002, 2009; Siu, Pan & Lee, 2009).

3. SAMPLE CASES OF PDFS PRACTICE

Based on the beliefs and purposes described above, we briefly present two sample cases of product design for sustainability (PDfS) training and practice at the School of Design, Hong Kong Polytechnic University (SD, HK PolyU) in China.

3.1 PDfS Training Case

The first case concerns the teaching and learning of PDfS. Final-year students of industrial and product design at SD, HK PolyU take a subject called *Sustainable Product Design-SPD*. This subject is aimed at reinforcing the design skills, knowledge and methods students have learned while introducing them to the ideas of design for the environment (DfE) and system design thinking, and most importantly, teaching them how to develop products from a broader social and ecological context based on notional DfS..

^{5.} Tacit design know how comes from the combination of artistic skills and knowledge that could only be learned by doing and experiencing. Codified design know how is consolidated from the fusion of literate knowledge and methods that can be encoded in various symbolic forms such as the textual, audio and visual, and can be acquired by anyone who understands the code (e.g. visual and form language). Tooled design know how is accumulated from technical skills and methods acquired through years of training and practice. It can be embodied into the form of physical artefacts (hard-tooled) and programmes, standard processes or methods (soft-tooled).

3.1.1 From 'Specific' Skills to 'Extended' Learning

The first challenge was to complete a 'mini project' designed as a warm-up exercise at the beginning of the course. Students were required to make use of used PET (polyethylene terephthalate) bottles and come up with a useful design. Their designs should make best use of the material and form characteristics of the PET bottles, and should be capable of being reproduced with simple hand tools at home. In addition to attending course lectures, students were asked to conduct desk research to locate places where discarded PET bottles could be collected (locally in Hong Kong) and to undertake tests to examine the physical and structural properties and possibilities of the PET bottles they collected. Their understanding of materials and hands-on design skills – the inverted apex of the 'V' shape – was again reinforced by this mini project .

The second short design undertaking – phase I of a two-stage project named *PDfS*– is aimed at introducing students to the basic concepts and tools of system design, particularly those relating to sustainability (also related to the *generic* level of 'V'-shaped design training), and is intended to prepare them for phase II of the project. During this first phase, students were asked to work in groups while performing various required tasks, such as *field research*, case *visualisation*, *analysis* and finally *redesign* of the case.

Throughout this design undertaking, tutorials, reference seminars, and samples of tools (such as *mental models, system maps* and *storyboarding*) were provided. The below is a selected design outcome of this exercise (the "Sustaining a green organic farm" (Fig. 1)), which demonstrated that students gained an initial comprehension of basic system thinking and design skills and learned how to manage them.



Figure 1. The design outcomes of the project 'Sustaining a green organic farm'

The final challenge of the course was phase II of the PDfS project (which also represented the core of the whole subject). At this specific stage, students were expected to design a new product in conjunction with a group of women sewing workers from an NGO called the *Hong Kong Women Workers Association* (HKWWA)^[6]. Students were asked to make use of discarded banner materials and marketing advice provided by ECOLS (a company that trades recycled furniture and products made out of used materials).

In addition to being backed by the expertise of ECOLS, HKWWA and the subject tutors, the students were expected to make use of the knowledge, skills and tools (for example, *mental map, system maps*, etc. see **Fig. 3**) **that** they had acquired in both the 'mini' project and the first phase of the PDfS project. This phase of the project enabled them to practice and receive training on the *extended* level of their 'V'-shaped knowledge and skills.

3.1.2 Design Realisation as 'Extended' Learning

At the end of the course, two projects were selected for further development. One of these projects was recently further developed and commercialised by SDWorks (a unique platform established within the School of Design to encourage entrepreneurship by commercialising items designed by talented students). This project was named '*Living pixels*'. 'Living pixels' is a series of colourful lights that are mainly made out of used discarded lamp stands and used banner materials (as light diffusers). Its originality came from the translucence of the banner material, which is usually printed with solvent ink on one side and left blank on the other. The students discovered this property after conducting several rounds of material tests and structural experiments, and following a thorough process of prototyping and discussions with the skillful sewing masters from the HKWWA (**Fig. 2**). This wonderful series of creative lights can be designed and made in a flexible and unique manner every time, as they are mostly made from many standard pieces of square-formatted banner 'pixels'.

^{6.} The HKWWA is an NGO established in 1989 to assist low-income marginalized women workers in Hong Kong, such as sewing workers who became unemployed after garment factories moved to mainland China around the 1980s.



Figure 2. The process of testing materials and realising the final collection of 'Living pixels'

The 'Living pixels' design series has revived the forgotten sewing skills of the women workers (and their professional pride). With the 'Living pixels' collection now being sold online by SDWorks (http://sdworks.sd.polyu.edu.hk/living-pixels/), we have witnessed an alternative small-scale production format and consumption practice spawned locally in Hong Kong.

3.2 Reviving Indigenous Craftsmanship via Product Design

The second case is an actual, yet experimental, project in which product design skills were employed for social innovation and sustainability in Hong Kong. This project, '*Transforming the wooden cart*', was one of the undertakings within a larger design research initiative that started in mid-2007 by SD, PolyU. This project was about reviving traditional *wooden cart*-making skills (a declining craft) to create new designs and an alternative form of production and consumption practice.

3.2.1 Background of Project

The '*Transforming the wooden cart*' project is led and coordinated by Mr. Brian Lee, the second author of this paper and an experienced furniture and product designer. The project focuses on Yau Kee, a trolley shop that is located in Sham Shui Po, one of the poorest districts of Hong Kong, and is owned by Mr. and Mrs. Li, an old couple who have specialised in producing wooden trolleys (**Fig. 3**) for over 50 years. The wooden cart fabrication practices adopted by Yau Kee have been socially viable and environmentally sound throughout this period. For instance, the construction materials employed are discarded bed planks and used tires, while the finished products are mainly made for and sold to construction workers and street cleaners living within the same district as handy collection tools (**CMP, 2007**).

The Yau Kee trolley shop is a typical handicraft workshop that operates on a unique, small and local scale and is closely connected with local business partners and clients within this urban district. It is also a craftbased business that carries the DNA of the local culture and conserves the indigenous values of the Sham Shui Po community. However, as mass-produced metal carts have become more popular, Yau Kee's craftbased business model and skills might soon become redundant as a result of keen competition.

3.2.2 Transformation of Declining Handicraft

From the perspective of the second author of this paper, Mr. Brian Lee, urban handicraft industries in old communities are full of vitality and social relevance. This model of handicrafts and fabrication could be learned, revived or even replicated in similar social contexts in Hong Kong. Lee also believes that as a physical discipline, product design could be employed to help regenerate traditional designs while preserving the essential techniques, processes and values of fading crafts such as *wooden cart making* in Hong Kong.

To attain this objective, Lee planned three concurrent product co-design processes to transform wooden cart-making skills into a new design and product solution: (*[i] the craftsman-driven process; [ii] the designer plus craftsman process; and [iii] the designer-driven process* (Siu, Pan & Lee, 2009). It was also backed by an operating model of design for social concern that outlines the relationships between activities involving the exchange of materials and human resources and partnership methods proposed by Siu and Lee (2009).

The process of applying the co-design process outlined above resulted in a simple yet innovative table design (with some simple adjustments and the reuse of materials and skills, the old wooden cart has been

transformed into an entirely different design) (**Fig. 3**). Later in the same year, Lee worked together with Yau Kee to further develop the wooden cart furniture series by adding a stool and a rack.



Figure 3. Mr. and Mrs. Li have helped to transform the old wooden cart into a new transportable table.

4. CONCLUSION

While most design professionals consider that *product design* might become outmoded and irrelevant due to the rapid transition towards a sustainable service-based economy, both the '*Transforming the wooden cart*' and '*Living pixels*' projects presented above demonstrate precisely the opposite — solid product design skills and competencies are invaluable (the very emphasis of 'V'-shaped design thinking). Not only could DfS learning and training begin with the skills of *design making* (in contrast to the prevailing preference for strategic *design thinking*), *product structuring* (instead of the immaterial *solution devising*), and *emotional empathising* (rather than mere systemic *rational analysis*), but these cases also help to underline the potential of product design skills in preserving indigenous crafts and material cultures, while addressing social issues and promoting newer sustainable business practices within our society and communities.

Therefore, before we blindly mimic the 'high-flying' *design thinking* training approach adopted in the West, and accept that the *T-shaped* mindset will help transform design from the world of *form* and *style* to that of *system* and *strategy* in our own emerging context, we need to reconsider this conception. After all, "*strategy without form is an empty container these days*" (Klinker, 2008:30). Furthermore, we consider that now is the time to relearn how to '*unlearn*' design competencies to better promote DfS in and for China and provide a much more sustainable future for us all.

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