# Visualising Product-Service Systems applied to Distributed Renewable Energy The Energy System Map

Silvia Emili Dr Fabrizio Ceschin Dr David Harrison College of Engineering, Design and Physical Sciences Department of Design





## **PSS applied to DRE**

Complex solutions that require a new design approach and new design tools



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## **Designing PSS applied to DRE**

#### **Innovation Map**

#### Design Framework and Cards





#### Visualisation and communication tools

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## **PSS applied to DRE**

### **The Energy System Map**

A tool to visualise and communicate new sustainable business models

### **The System Map**



A graphic representation of the stakeholders involved in the system and the interactions between them, i.e. the flows of goods, services, information and money.

Highly Customerised Solutions, Solution-oriented design, production and delivery systems (European Research, GROWTH Programme - Jegou et al., 2004)

Stakeholders

Flows / interactions

## **Development of the visualisation system**





ENERGY SYSTEMS					ENERGY-USING PRODUCTS								
	Charging	Isolated	Connected			C\$	Bulbs &	Mobile				Computer &	Cooling/
Mini kit energy system	station	mini grid	mini grid		Lantern	Battery	lights	charger	Kadio	IV	Fan	IT device	device
RENEWABLE EN	ERGY SOU	RCES		_									
	A		<u> </u>										
Biomass Solar	Wind	Hydro	Human	Hybrid									
SERVICES													
T T	T	X		()									
Financing Installation	Training	Maintenance & repair	Product upgrade	End-of-life									
NETWORK OF PROVIDERS													
			42 <u>0</u> 2										
Private Technology manufacture	Local entrepreneur	Community	Cooperative	Non-Govern- mental Org.	Micro Finance Institution	National grid supplier	Public and gov entity						
CUSTOMERS													
22	E Cor		<u> 22</u> 2										
Individual Local household entrepreneur	Productive activity	Public building	Community	Public and gov entity	Mix of customers								
OFFER					PAYMEN	IT CHANN	IELS						
			)				E Se a la l		55			)	
Pay to Pay to lea purchase or rent	Pay per ene consume	rgy Pay per un of satisfaction	it on		Mobile payments	Scratch cards / energy codes	In-kind contribution	Fee collection	Credit payments	Cash payment	Meter reading		

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## **First application**

#### Describing archetypal models of PSS applied to DRE



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Visualising PSS applied to DRE: the Energy System Map

#### ARCHETYPAL MODELS

1- Selling individual energy systems with advice and training services

2- Offering advice and training services for community-owned and -managed isolated mini grids

3- Offering advice and training services for community-owned and -managed connected mini grilds

4 Selling mini kits with additional services

5- Setting individual energy systems with additional services

6- Offering individual energy systems (and energy using praducts) in leasing

7-Renting energy-using products through entrepreneur-owned and managed charging stations

B-Renting energy-using products through entrepreneur- orcommunity-managed charging stations

 Offering access to energy (and energy-using products) on a pay-per-consumption basis through individual energy systems

10- Offering access to energy (and energy-using products) on a pay-per-consumption basis through isolated mini strids

11 - Offering access to energy and energy-using products on a pay-per-unit of satisfaction basis through mini Rits

12- Offering access to energy (and energy-using products) on a pay-per-unit of satisfaction basis through individual energy systems

 Offering access to energy-using products through community- or entrepreneur-managed charging stations on a pay-per-unit of satisfaction basis

14- Offering recharging services through entrepreneur-owned and managed charging stations

15- Offering occess to energy (and energy using products) on a pay-per-unit of satisfaction basis through mini grids

### **First application**

#### Describing archetypal models of PSS applied to DRE



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## **Development of the Energy System Map**





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#### **Rules**





#### Ownership

The ownership of energy system and energy-using products is clearly shown by a colour-block filling of either the provider (violet) or customer (pink) icons. The products involved are presented with the same colour

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#### **Rules**





#### Flows

Each interaction is represented with a characterising flow which define the type of action (e.g. service provided, payment) and indicates who performs it. Flows have numbers to facilitate the reading process

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#### **Rules**





**Offer boundary** 

The main offer is included within the offer boundary, clarifying that secondary stakeholders and interactions may be included or detailed but they can be represented with smaller icons

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### **Testing activities**



### **Testing the clarity and ease of use**



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## **Application 1:**

Visualise and communicate case studies of PSS applied to DRE in a clear and effective way

"the system map gives you a visual picture of how the case study looks like. It gives you an overview of the whole business model"

> "Helped refine and define interrelationships between actors in a simple way"

"I can more clearly understand the important relationship and interrelationships between key stakeholders, products and services, value proposition and the customers"

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## **Applications 2:**

#### Design and detail new concepts of PSS applied to DRE



### **Application 2:**

Design and detail new concepts of PSS applied to DRE

"using the system map you are able to put together concepts or ideas that might be elusive during the brainstorming session"

> "the system map is a great deal on clarification of the concept"

"enables all actors to be given a role with clear relationships"

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#### **Next steps**

- The visualisation system of PSS and DRE models and the Energy System Map will be applied in further testing activities in Nairobi and Gaborone.
- A refined version will be digitally available.