

MILANO | MEXICO CITY | BANGALORE | CAPE TOWN | CURITIBA | BEIJING

3-5 April 2019

DESIGNING SUSTAINABILITY FOR ALL

Edited by Marcelo Ambrosio and Carlo Vezzoli

Proceedings of the

3rd LeNS world distributed conference
VOL. 3

ISBN 978-88-95651-26-2



EDIZIONI
POLI.DESIGN



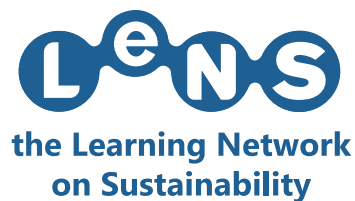
With the support of the
Erasmus+ Programme
of the European Union

Designing sustainability for all

Proceedings of the 3rd LeNS World Distributed Conference,
Milano, Mexico City, Beijing, Bangalore, Curitiba, Cape Town,
3-5 April 2019

Edited by **Marcelo Ambrosio** and **Carlo Vezzoli**

LeNS - the Learning Network on Sustainability - is a project funded by LeNSin Erasmus+ Programme of the European Union



Edited by Marcelo Ambrosio and Carlo Vezzoli

Double-Blind Peer Review.

Scientific Committee:

Carlo Vezzoli, Politecnico di Milano, Italy
Aguinaldo dos Santos, Federal University of Paraná, Brazil
Leonardo Castillo, Universidad Federal de Pernambuco
Claudio Pereira Sampaio, Londrina State University
Ranjani Balasubramanian, Srishti Institute of Art Design and Technology
Ravi Mokashi, Indian Institute of technology Guwahati
Brenda Garcia, Universidad Autonoma Metropolitana, Mexico
Rodrigo Lepez Vela, Universidad de la Valle de México
Ephias Ruhode, Cape Peninsula University of Technology
Elmarie Costandius, Stellenbosch University, South Africa
Xin Liu, Tsinghua University, China
Jun Zhang, Hunan University, China
Fabrizio Ceschin, Brunel University, United Kingdom
Cindy Kohtala, Aalto University, Finland
Jan Carel Diehl, Delft University of Technology, Netherlands

Graphic project by:

Roman Maranov, Politecnico di Milano, Italy
Xinrui Wang, Politecnico di Milano, Italy
Yuting Zhang, Politecnico di Milano, Italy
Giacomo Bevacqua, Politecnico di Milano, Italy



This Work is Licensed under Creative Commons Attribution-NonCommercial-ShareAlike CC BY-NC-SA
For full details on the license, go to: <https://creativecommons.org/licenses/by-nc-sa/4.0/5>

The proceedings are also available at: www.lensconference3.org

Endorsment:



ISBN: 978-88-95651-26-2

Published by © 2019 Edizioni POLI.design
Address: via Durando 38/A – 20158 Milano
Tel. 02-2399.7206 Fax 02-2399.5970
e-mail: segreteria@polidesign.net
website: www.polidesign.net

First Edition

CONTENTS

VOLUME 3 (paper in this volume)

6. DESIGN FOR SUSTAINABLE CULTURAL AND BEHAVIORAL CHANGE

ARTISTIC CRAFTSMANSHIP VS DEGRADATION RISK OF HISTORICAL AREAS Adriano Magliocco, Maria Canepa	639
STRATEGIES FOR ECO-SOCIAL TRANSFORMATION: COMPARING EFFICIENCY, SUFFICIENCY AND CONSISTENCY Andreas Metzner-Szigeth	644
SYNTHESIZING SOLUTIONS: EXPLORING SOCIALIST DESIGN AND ITS MODERN RELEVANCE THROUGH THE MEDIUM OF PLASTICS Aniruddha Gupte	650
MOTHERS FROM INOSEL: AN EXERCISE IN COLLABORATION TOWARDS A MORE SUSTAINABLE SOCIETY Bárbara de Oliveira e Cruz, Rita Maria de Souza Couto, Roberta Portas Gonçalves Rodrigues	655
THE ECOLOGICAL AESTHETIC CONNOTATIONS IN CHINESE TRADITIONAL ENVIRONMENT CONSTRUCTION SKILLS Changliang Tan	661
UPCYCLING IN COMMUNITIES: LOW CARBON DESIGN PROMOTES PUBLIC ENVIRONMENTAL AWARENESS AND OPTIMIZES SOCIAL Qiu Dengke, Peng Jinqi, David Bramston, Qiu Zhiyun, Chen Danrong	667
FASHION DESIGN FOR SUSTAINABILITY: A FRAMEWORK FOR PARTICIPATORY PRACTICE Dilys Williams	672
A DIFFERENT DEFINITION OF GENERATIVE DESIGN Erika Marlene Cortés López	678
SUSTAINABILITY AND DEMOCRACY WIDESPREAD COLLABORATIVE DESIGN INTELLIGENCE Ezio Manzini	682
UTSTAL: HEADING HEARTS AND JOINING COMMUNITIES Fernando Rafael Calzadilla Sánchez, Francisco Emanuel Pérez Mejía	687
SUSTAINABLE DESIGN AND AESTHETICS IN THE SOFT SCIENCE AGE Francesca La Rocca, Chiara Scarpitti	690
THE SOCIAL CONSTRUCTION OF ENVIRONMENTAL CRISIS AND REFLECTIONS ON THE SUSTAINABILITY DEBATE Gabriela Sandoval Andrade	696
DESIGN FOR HUMAN FLOURISHING: PERCEPTUAL MAPPING OF DIFFERENT DESIGN APPROACHES TOWARDS HAPPINESS AND WELL-BEING Guilherme Toledo	700
USING EMOTIONAL DURABILITY FOR SUSTAINABLE PACKAGING DESIGN PRACTICE BASED ON USAGE SCENARIO Jifa Zhang	706

THE VALORIZATION OF INDIGENOUS CULTURE THROUGH UPCYCLING Jordana de Oliveira Bennemann, Eduarda Regina da Veiga, Ana Luisa Boavista Lustosa Cavalcante	711
CLOTHING LANDSCAPES: INTERDISCIPLINARY MAPMAKING METHODS FOR A RELATIONAL UNDERSTANDING OF FASHION BEHAVIOURS AND PLACE Katelyn Toth-Fejel	715
INTEGRATION OF ART OF HOSTING METHODOLOGIES AND PRINCIPLES INTO THE SOCIAL INNOVATION LAB PRACTICE: Lewis Muirhead, Rosamund Mosse	720
DESIGN AS DEMOCRACY: THE DEMOCRATIC POTENTIAL OF DESIGN Luiz Lagares Izidio, Dijon De Moraes	727
REGENERATIVE FOOD SERVING SYSTEM FOR A SUSTAINABLE UNIVERSITY CAMPUS LIFESTYLE: A SOCIAL AND BEHAVIOURAL STUDY Nariman G. Lotfi, Sara Khedre	732
DESIGNING FURNITURE BASED ON STUDENT’S LIFESTYLE AND MERGING WITH A SUSTAINABLE CAMPUS Neha Priolkar, Franklin Kristi	737
PERIOD. A CARD GAME ON SOCIAL TABOOS AROUND MENSTRUATION Devika Saraogi, Gayatri Chudekar, Nikita Pathak, Sreya Majumdar	742
ESTABLISHING A QUANTITATIVE EVALUATION MODEL FOR CULTURE-BASED PRODUCT DESIGN Pan Li, Baosheng Wang	748
SUSTAINING CULTURAL HERITAGE : DERIVING THE CONTEMPORARY FROM THE IDIOM OF TRADITIONAL CRAFTS Puja Anand, Alok Bhasin	753
EMPATHY SQUARE: AN AID FOR SERVICE DESIGN FOR BEHAVIOUR CHANGE TO SUPPORT SUSTAINABILITY Ravi Mahamuni, Anna Meroni, Pramod Khambete, Ravi Mokashi Puneekar	759
ECOMUSEUM AS A DESIGN TOOL FOR SUSTAINABLE SOCIAL INNOVATION Rita de Castro Engler, Gabrielle Lana Linhares	764
MISLEADING IDENTITIES: DO PERCEPTUAL ATTRIBUTES OF MATERIALS DRIVE THE DISPOSAL OF SINGLE-USE PACKAGING IN THE CORRECT WASTE STREAM? Romina Santi, Agnese Piselli, Graziano Elegir, Barbara Del Curto	770
I TAKE CARE OF MY PLACES—PROJECT BY ALESSANDRO MANZONI HIGH SCHOOL, LECCO Rossana Papagni, Anna Niccolai, Eugenia Chiara, Laura Todde	776
THE ESPERANÇA COMMUNITY GARDEN AND THE CHALLENGES OF INTEGRAL SUSTAINABILITY Samantha de Oliveira Nery, Ediméia Maria Ribeiro de Mello, Rosângela Miriam Lemos Oliveira Mendonça	780
SPIRAL DYNAMICS: A VISIONARY SET OF VALUES FOR HUMANITY’S SUSTAINABLE DEVELOPMENT Sergio Dávila Urrutia	785
CRAFT CHANGE: BEHAVIOUR PROGRESSION FRAMEWORK – EVALUATION IN QUASI PARTICIPATORY DESIGN SETTING Shivani Sharma, Ravi Mahamuni, Sylvan Lobo, Bhaskarjyoti Das, Ulemba Hirom, Radhika Verma, Malay Dhamelia	791

FOR AN AESTHETICS FOCUSED ON SUSTAINABILITY: STUDIES FOR THE CONFIGURATION OF ECOLOGICALLY ORIENTED PACKAGING Thamyres Oliveira Clementino, Amilton José Vieira de Arruda, Itamar Ferreira da Silva	796
CRITICAL ZONE: THE EARTH BELOW OUR FEET Vasanthi Mariadass	800
SERIOUS GAME AS A NEW WAY OF HANDICRAFT INHERITANCE—A CASE STUDY ON “HUAYAO CROSS-STITCH MASTER GROWTH RECORD” Xile Wang, Duoduo Zhang, Yuanyuan Yang	807
7. PRODUCT DESIGN FOR SUSTAINABILITY	
PROPOSAL OF RECOMMENDATIONS FOR DESIGN UNDER A SUSTAINABLE APPROACH: LCA CASE. Bonifaz Ramírez Adonis Wenceslao, González Leopoldo Adrián	812
CIRCULAR DESIGN AND HOUSEHOLD MEDICATION: A STUDY ON THE VOLUNTARY DRUG DISPOSAL PROGRAM OF THE CITY OF BETIM MUNICIPALITY Aline Rodrigues Fonseca, Rita de Castro Engler, Armindo de Souza Teodósio, Luiz Fernando de Freitas Júnior, Mariana Costa Laktim, Travis Higgins	817
DESIGN FOR SUSTAINABLE FASHION: A SUSTAINABILITY DESIGN-ORIENTING TOOL FOR FASHION Barbara Azzi, Carlo Vezzoli, Giovanni Maria Conti	823
DESIGN PRACTICE FOR SUSTAINABILITY: DEVELOPMENT OF A LOW-COST ORTHOSIS Caelen Teger, Isabella de Souza Sierra, Dominique Leite Adam, Maria Lúcia Leite Ribeiro Okimoto, José Aguiomar Foggiatto	831
MECHANISM ANALYSIS AND APPLICATION STUDY OF SUSTAINABILITY EVALUATION TOOL FOR FURNITURE E-COMMERCE(ICSFE) Chuyao Zhou, Fang Liu, Suqin Tan, Tianwei Sun, Guixian Li, Shaohua Han*	837
ANUVAD: CREATING SUSTAINABLE SMART TEXTILES THROUGH THE MEDIUM OF TRADITIONAL CRAFTS Chhail Khalsa	843
DESIGN FOR SUSTAINABILITY FRAMEWORK APPLIED TO THE PROBLEM OF GARMENT WASTE: A BRAZILIAN STUDY Cláudio Pereira de Sampaio, Suzana Barreto Martins	848
LIFE CYCLE DESIGN (LCD) GUIDELINES FOR ENVIRONMENTALLY SUSTAINABLE CLOTHING CARE SYSTEMS: AN OPEN AND OPERATIVE TOOL FOR DESIGNERS Carlo Vezzoli, Giovanni Maria Conti	854
THE RESEARCH OF YI ETHNICITY FURNITURE DESIGN BASED ON ARCHITECTURAL SPACE Ding Yang	860
DESIGN FOR SUSTAINABILITY AND ICT: A HOUSEHOLD PROTOTYPE FOR WASTE WATER RECYCLING Fiammetta Costa, Marco Aureggi, Luciana Migliore, Paolo Perego, Margherita Pillan, Carlo Emilio Standoli, Giorgio Vignati	864
OPEN-ENDED DESIGN. LOCAL RE-APPROPRIATIONS THROUGH IMPERFECTION Francesca Ostuzzi, Valentina Rognoli, Francesco Fittipaldi, Patrizia Ranzo, Rosanna Veneziano, Gustavo R. P. Nascimento, Victor J.D. S. Baldan, T. M. Ponciano, Janaina M. H. Costa, Eduvaldo P. Sichert, Javier M. Pablos	868
ANALYSIS OF THE POTENTIAL APPLICATION OF RECYCLED THERMOFIX INDUSTRIAL POLYURETHANE RESIDUE IN SCHOOL DESKS Gustavo Ribeiro Palma Nascimento, Victor José Dos Santos Baldan, Thales Martins Ponciano, Janaina M. H. Costa	

Eduvaldo Paulo Sichieri, Javier Mazariegos Pablos	880
RE-DESIGNING RECOVERED MATERIALS. CASE STUDY: FIBERGLASS IN THE NAUTICAL SECTOR Helga Aversa, Valentina Rognoli, Carla Langella	884
UNFINISHEDISM Huanhuan Peng	890
CRITICAL FUTURES TODAY: BACK-CASTING SPECULATIVE PRODUCT DESIGN TOWARDS LONG-TERM SUSTAINABILITY Jomy Joseph Jomy Joseph, Mariana Costa Laktim, Larissa Duarte Oliveira, Rita de Castro Engler, Aline Fonseca, Camilla Borelli, Julia Baruque-Ramos	899
HOME TEXTILE: AN ANALYSIS OF ENVIRONMENTAL AND ECONOMICAL IMPACTS IN BRAZIL Mariana Costa Laktim, Larissa Duarte Oliveira, Rita de Castro Engler, Aline Fonseca, Camilla Borelli, Julia Baruque-Ramos	905
PRODUCT DESIGN FOR SUSTAINABILITY – GUIDELINES FOR THE LIFE CYCLE DESIGN OF OFFICE FURNITURE Lena Plaschke, Carlo Vezzoli, Francesco Scullica	910
ON THE COLLABORATIVE MODELS FOR DESIGN SCHOOLS ENGAGING IN THE SUSTAINABLE DEVELOPMENT OF TRADITIONAL BAMBOO CRAFTS Li Zhang, Hai Fang	915
EXPERIMENTAL MATERIAL DEVELOPMENT LEADING TO SUSTAINABLE PRODUCT DESIGN Martin Bolton	921
AUTOMATIC COMPOSTER FOR HOME USE Maycon Manoel Sagaz, Paulo Cesar Machado Ferroli	926
SUSTAINABILITY IN THE PRODUCT LIFE CYCLE OF PAPER Qian Yang	932
BIOINSPIRED STRUCTURES IN LIGHTWEIGHT PRODUCT DESIGN WITH ADDITIVE MANUFACTURING Owen Gagnon, Brenton Whanger, Hao Zhang, Ji Xu	936
SMART HOME GRID: TOWARDS INTERCONNECTED AND INTEROPERABLE ELECTRICAL MODEL TO IMPROVE THE USAGE AWARENESS Paolo Perego, Gregorio Stano	941
ZERO WASTE: EXPLORING ALTERNATIVES THROUGH FOLDING Pragya Sharma	946
ENVIRONMENTAL PRODUCT OPTIMISATION: AN INTEGRAL APPROACH Reino Veenstra, Henri C. Moll	953
SUSTAINABLE DESIGN 4.0: METHODS AND TECHNIQUES OF THE CONTEMPORARY DESIGNER IN THE KNOWLEDGE SOCIETY Roberta Angari, Gabriele Pontillo	959
NEM, NEAPOLITAN EVOLUTION MEN’S WEAR: A BIO PROJECT OF MEN’S TAILORING Roberto Liberti	965
NEW SUSTAINABLE COSMETIC PRODUCTS FROM FOOD WASTE: A JOINED-UP APPROACH BETWEEN DESIGN AND FOOD CHEMISTRY Severina Pacifico, Simona Piccolella, Rosanna Veneziano	970

CHILDREN FURNITURE DESIGN FOR SUSTAINABILITY Xiang Wang, Lulu Chai, Ren Fu	975
STUDY ON THE DESIGN OF TENON AND MORTISE JOINTS FOR NEW TYPE SUSTAINABLE EXPRESS PACKAGING BASED ON THE CONCEPT OF INTEGRATED CYCLING Xue-ying Wang, Jiao Yi	981
8. DESIGN FOR SUSTAINABLE TECHNOLOGIES AND RESOURCES	
INTERACTIVE DESIGN STRATEGY FOR SUSTAINABLE BEHAVIOR CHANGE BASED ON OPEN SOURCE HARDWARE Yongshi Liu, Jing Ou, Yunshuang Zheng, Jun Zhang	988
DESIGN-DRIVEN STRATEGY FOR THE SUSTAINABLE TEXTILE HERITAGE COMMUNITY IN CHINA Yuxin Yang, Eleonora Lupo	994
EXPLORING THE DESIGN ETHICS OF THE FUTURE INFORMATION SOCIETY: A BRIEF DESIGN ETHICS STUDY OF “DIDI GLOBAL” AS A SOCIALITY INTERNET PRODUCT Zhilong Luan, Xiaobo Lu	1000
GLEBANITE® FOR MODELS AND MOULDS IN SHIPYARDS APPLICATIONS RATHER RESORTING TO MONOMATERIC SOLUTIONS Andrea Ratti, Mauro Ceconello, Cristian Ferretti, Carlo Proserpio, Giacomo Bonaiti, Enrico Benco	1006
PROJECT REMA: THE REGIONAL ECO-MATERIALS ARCHIVE Y.H. Brian Lee, Ding Benny Leong	1010
MATERIALS CLASSIFICATION IN FURNITURE DESIGN – FOCUS ON SUSTAINABILITY Paulo Cesar Machado Ferroli, Emanuele de Castro Nascimento, Lisiane Ilha Librelotto, Franchesca Medina, Luana Torralles Carbonari	1015
THE SUSTAINABILITY OF BIOMIMETIC SYSTEM DESIGN: FROM ORGANISM TO ECOLOGY Fan Wu, Jun Zhang	1021
SUSTAINABILITY DESIGNED WITH(OUT) PEOPLE? UNDERSTANDING FOR WHAT ENERGY IS (OVER-)USED BY TENANTS IN AN ENERGY EFFICIENT PUBLIC HOUSING IN MILAN Giuseppe Salvia, Federica Rotondo, Eugenio Morello, Andrea Sangalli, Lorenzo Pagliano, Francesco Causone	1027
RESEARCH ON BIOMASS ENERGY UTILIZATION IN RURAL AREAS BASED ON SUSTAINABLE DESIGN CONCEPT Haiwei Yan, Ruolin Gao, Ke Jiang, Yuanbo Sun	1032
LIFE THE TOUGH GET GOING PROJECT: IMPROVING THE EFFICIENCY OF THE PDO CHEESE PRODUCTION CHAINS BY A DEDICATED SOFTWARE Jacopo Famiglietti, Carlo Proserpio, Pieter Ravaglia, Mauro Ceconello	1035
RETHINKING AND RECONSTITUTED MATERIALS FOR A SUSTAINABLE FUTURE — “RECONSTITUTING-PLAN” PROJECT AS AN EXAMPLE Jiajia Song	1040
BAMBOO SUPPLY CHAIN: OPPORTUNITY FOR CIRCULAR AND CREATIVE ECONOMY Lisiane Ilha Librelotto, Franchesca Medina, Paulo Cesar Ferroli, Emanuele de Castro Nascimento, Luana Torralles Carbonari	1046
ALTERNATIVE MATERIALS TO IMPROVE THE ASSEMBLY PROCESS OF FURNITURE FOCUSED ON SUSTAINABILITY DESIGN Paulo Cesar Machado Ferroli, Lisiane Ilha Librelotto, Natália Geraldo	1051

SUSTAINABLE DESIGN PRINCIPLES FOR USING BAMBOO STEMS Ping Wu, Tao Huang	1056
SUSTAINABLE MATERIALS AND PROCESSES DESIGN: THE CASE STUDY OF POLY-PAPER Romina Santi, Silvia Farè, Barbara Del Curto, Alberto Cigada	1061
ENABLING USER KNOWLEDGE TO SUPPORT THE DECISION-MAKING PROCESS IN ENERGY RETROFITTING OF PUBLIC HOUSING: A CASE STUDY IN MILAN Giuseppe Salvia, Federica Rotondo, Eugenio Morello	1067
EFFECTS OF COLOURED AMBIENT LIGHT ON PERCEIVED TEMPERATURE FOR ENERGY EFFICIENCY: A PRELIMINARY STUDY IN VIRTUAL REALITY Siyuan Huang, Giulia W. Scurati, Roberta Etzi, Francesco Ferrise, Serena Graziosi, Lavinia C. Tagliabue, Alberto Gallace, Monica Bordegoni	1073
BUILDING INTEGRATED PHOTOVOLTAICS (BIPV): SYSTEM APPLICATION GUIDELINES AND ALBEDO ASPECTS Sofia Hinckel Dias, Flávia Silveira, Aloísio Schmid	1079

VOLUME 1

FOREWORD	I
LENSIN PROJECT	II
THE LENS CONFERENCE	III
LENS MANIFESTO	IV
1.KEY NOTE PAPERS	
TOWARDS SUSTAINABLE DESIGN VALUES: EVOLUTIONARY CONCEPTS AND PRACTICES Xiaobo Lu	001
CIRCULAR ECONOMY, SYSTEMIC DESIGN AND SOCIAL DEVELOPMENT GUIDELINES FOR EMERGING ECONOMIES Leonardo Castillo	005
DESIGNING TO CREATE A SHARED UNDERSTANDING OF OUR COLLECTIVE CONCERNS Poonam Bir Kasturi	012
DESIGNERS FACING GLOBAL CHALLENGES Julio Frías Peña	015
SOUTH AFRICAN KEYNOTE SPEECH FOR LENS WORLD DISTRIBUTED CONFERENCE DESIGNING SUSTAINABILITY FOR ALL Angus Donald Campbell	019
THE CIRCULAR INDUSTRIAL ECONOMY IN A NUTSHELL Walter R. Stahel	024

2. PRODUCT-SERVICE SYSTEM DESIGN FOR SUSTAINABILITY

SUSTAINABLE PRODUCT-SERVICE SYSTEM REQUIREMENTS IN FASHION RETAIL Alana Emily Dorigon, Maria Auxiliadora Cannarozzo Tinoco, Jonatas Ost Scherer, Arthur Marcon	1
1TRASTOCAR. INTERACTIVE ART-DESIGN TO MAKE VISIBLE ENVIRONMENTAL IMPACT Ana Carolina Robles Salvador, Rodrigo Rosales González	6
PRODUCT-SERVICE SYSTEMS DEVELOPMENT PROCESS: SYSTEMATIC LITERATURE REVIEW Barbara Tokarz, Bruno Tokarz, Délcio Pereira, Alexandre Borges Fagundes, Fernanda Hãnsch Beuren	12
INTRODUCING SYSTEMIC SOLUTIONS FOR SUSTAINABILITY AT THE DESIGN COURSES IN UAM CUAJIMALPA. STUDY CASE: BOOK CLUB IN MEXICO CITY Leonel Sagahon, Brenda García	16
IMPLEMENTATION OF THE LENS PROJECT AT THE UNIVERSIDADE DO ESTADO DO PARÁ (UEPA) Camilla Dandara Pereira Leite, Alayna de Cássia Moreira Navegantes, Antonio Erlindo Braga Jr	20
INITIAL PROPOSALS FOR THE IMPLEMENTATION OF THE PRODUCT-SERVICE SYSTEM AT THE UNIVERSIDADE DO ESTADO DO PARÁ (UEPA) Camilla Dandara Pereira Leite, Jamille Santos dos Santos, Alayna de Cássia Moreira Navegantes, Vinícius Lopes Braga, Agatha Cristina Nogueira de Oliveira da Silva, Antonio Erlindo Braga Jr.	24
ASPECTS OF THE PRODUCT-SERVICE SYSTEM IN BRAZILIAN LITERATURE Camilla Dandara Pereira Leite, Antonio Erlindo Braga Jr.	27
“LIBRARY OF STUFF”: A CASE OF PRODUCT SHARING SYSTEM PRACTICE IN TURKEY Can Uckan Yuksel, Cigdem Kaya Pazarbas	31
RESEARCH ON SERVICE SYSTEM DESIGN BASED ON VISUALIZATION OF SUSTAINABLE PRODUCT CARBON FOOTPRINT Chenyang Sun, Jun Zhang	37
INNOVATIVE SCHEME RESEARCH OF SHIMEN CITRUS’ LIFE CYCLE BASED ON PRODUCT-SERVICE DESIGN THINKING Chuyao Zhou, Jixing Shi, Jeff Lai, Amber Tan, Yuan Luo, Yongshi Liu, Shaohua Han	42
PRODUCT-SERVICE SYSTEMS (PSS): THE USE OF PRINCIPLES IN THE CREATIVE PROCESS OF PSS Emanuela Lima Silveira, Aguinaldo dos Santos	47
STUDY ON THE SERVICE DESIGN OF URBAN YOUNG DRIFTERS COMMUNITY Fei Hu, Yimeng Jin , Xing Xu	53
URBAN AGRICULTURE STARTUP CASE STUDY FOR SERVICE DESIGN IN BRAZIL Gabriela Garcez Duarte, Elenice Lopes, Lucas Lobato da Costa, Mariana Schmitz Gonçalves, Aguinaldo dos Santos	59
DEVELOPMENT MECHANISM ON CHINA’S INDUSTRIAL DESIGN PARKS THEMED DESIGN ENTREPRENEURSHIP Hongbin Jiang, Qiao Zhang	65
RESEARCH OF SUSTAINABLE PRODUCT SERVICE SYSTEMS ON CHINESE MINORITY BRAND CONTEXT Hong Hu, Feiran Bai, Daitao Hao, Jie Zhou	69
CHILDREN’S TOY SHARING SYSTEM FROM THE PERSPECTIVE OF SUSTAINABLE COMMUNITY CONCEPT Zhong Huixian, He Yi, Chen Chaojie	75

PRODUCT SERVICE SYSTEM APPLIED TO AIR-ENERGY PRODUCT BUSINESS MODEL INNOVATION Jiahuan Qiu, Jun Zhang	81
DESIGN AND RESEARCH OF RESOURCE RECYCLING SERVICE SYSTEM IN TOURIST ATTRACTIONS: TAKING INTERNATIONAL CRUISES AS AN EXAMPLE Jingrui Shen, Jun Zhang	85
RESEARCH AND PRACTICE ON INTELLIGENT AGRICULTURAL MACHINERY PRODUCTS AND SUSTAINABLE BUSINESS MODEL DESIGN Jun Zhang, Caizhi Zhou	90
THE CORPORATE SOCIAL RESPONSIBILITY (CSR) AND STRATEGIC MANAGEMENT FOR THE MEXICAN SPECIALIZED PUBLISHING SMES Lupita Guillén Mandujano, Bertha Palomino Villavicencio, Gerardo Francisco Kloss Fernández del Castillo	96
SLOC MODEL BASED SERVICE DESIGN STRATEGIES AND PRACTICE ON ECOLOGICAL AGRICULTURE Lyu Ji, Miaosen Gong	101
APPLICATION OF THE CARD SORTING TECHNIQUE ASSOCIATED WITH THE STORYTELLING APPROACH IN A PSS FOR SUSTAINABILITY Manuela Gortz, Alison Alfred Klein, Evelyne Pretti Rodrigues, Félix Vieira Varejão Neto, Henrique Kozłowski Buzatto, Aginaldo dos Santos	106
EMOTIONAL DESIGN IN FUNCTIONAL ECONOMY AND PSS TOWARDS BEHAVIOR CHANGE Manuela Gortz, Décio Estevão do Nascimento	111
SOUTH-TO-SOUTH SOLUTIONS: AN EXCHANGE OF AUSTRALIAN AND LATIN AMERICAN DESIGN APPROACHES TO THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS Mariano Ramirez	117
DESIGN AND SUSTAINABILITY: SYSTEMATIC REVIEW OF LITERATURE IN BRAZILIAN PHD THESES Marina Arakaki, Conrado Renan da Silva, Tomas Queiroz Ferreira Barata, Olímpio José Pinheiro, Mariano Lopes de Andrade Neto	123
COMPARATIVE STUDY OF PRODUCT SERVICE SYSTEM BASED ON LIFE CYCLE ANALYSIS— INNOVATIVE LUNCH TAKEAWAY SERVICE SYSTEM DESIGN Nan Xia	129
SERVICE DESIGN FOR INNOVATION: THE STRATEGIC ROLE OF SERVICE DESIGN IN INNOVATION FOR MANUFACTURING COMPANIES Naotake Fukushima, Aginaldo dos Santos	135
WICKED PROBLEMS AND DESIGN IN EMERGING ECONOMIES: REFLECTIONS ABOUT THE DESIGN OF SYSTEMIC APPROACHES FOCUSED ON FOOD AND TERRITORY Priscilla R. Lepre, Leonardo Castillo, Lia Krucken	141
HORTALIÇÁRIO: GARDEN FOR ANY SPACE Rita de Castro Engler, Thalita Vanessa Barbalho, Letícia Hilário Guimarães, Ana Carolina Lacerda	147
EMOTIONAL DESIGN IN FUNCTIONAL ECONOMY AND PSS TOWARDS BEHAVIOR CHANGE Manuela Gortz, Décio Estevão do Nascimento	154
DESIGN FOR SUSTAINABILITY APPLIED TO WORKSPACES Susana Soto Bustamante, Elena Elgani, Francesco Scullica, Ricardo Marques Sastre, Marcia Elisa Echeveste, Maria Auxiliadora Cannarozzo Tinoco, Fabiane Tubino Garcia, Arthur Marcon	160

MECHANISM ANALYSIS AND APPLICATION STUDY OF SUSTAINABILITY EVALUATION TOOL FOR FURNITURE E-COMMERCE(ICSFE) Chuyao Zhou, Fang Liu, Suqin Tan, Tianwei Sun, Guixian Li, Shaohua Han	174
SUSTAINABLE PRODUCT SERVICE SYSTEMS: A NEW APPROACH TO SUSTAINABLE FASHION Yaone Rapitsenyane, Sophia Njeru, Richie Moalosi	180
PRODUCT-SERVICE SYSTEM DESIGN OF HOUSEHOLD MEDICAL WASTE MANAGEMENT FOR DIABETICS Yiting Zhang, Miaosen Gong, Dongjuan Xiao, Yuan Hu	185
BUSINESS MODEL DESIGN BASED ON THE CONCEPT OF SUSTAINABLE DEVELOPMENT—A SERVICE DESIGN OF THE PHYSICAL IDLE MALL AS AN EXAMPLE Luo Yuqing	190
3. DISTRIBUTED ECONOMIES DESIGN FOR SUSTAINABILITY	
DISTRIBUTED MANUFACTURING APPLIED TO PRODUCT-SERVICE SYSTEMS: A SET OF NEAR-FUTURE SCENARIOS Aine Petruleityte, Fabrizio Ceschin, Eujin Pei, David Harrison	196
METHODS AND TOOLS FOR COMMUNITY BASED RESEARCH PROJECTS: DISTRIBUTED DESIGN AND DISTRIBUTED INFORMATION FOR VOLUNTEER ORGANISATIONS IN SOUTH AFRICA Arnaud Nzawou, Ephias Ruhode	202
RECOVERY AND RECYCLING OF A BIOPOLYMER AS AN ALTERNATIVE OF SUSTAINABILITY FOR 3D PRINTING Camilla Dandara Pereira Leite, Leticia Faria Teixeira, Lauro Arthur Farias Paiva Cohen, Nubia Suely Silva Santos	207
EPLORING SCENARIOS TO FACILITATE THE ACCESS TO 3D PRINTING TECHNOLOGY IN EGYPT THROUGH SUSTAINABLE PSS APPLIED TO DISTRIBUTED MANUFACTURING Doaa Mohamed	211
INVESTIGATION OF THE IMPACT OF SUSTAINABILITY ON 3D PRINTING TECHNOLOGIES Emilio Rossi, Massimo Di Nicolantonio, Paola Barcarolo, Jessica Lagatta, Alessio D’Onofrio Design of abandoned vegetable and fruit transportation system based on sustainable distributed economy Haiwei Yan, Ruolin Gao, Yuanbo Sun, Ke Jiang	218
DESIGN OF ABANDONED VEGETABLE AND FRUIT TRANSPORTATION SYSTEM BASED ON SUSTAINABLE DISTRIBUTED ECONOMY Haiwei Yan	224
DISTRIBUTED PRODUCTION AND SUSTAINABILITY STRATEGIES FOR FASHION Alba Cappellieri, Livia Tenuta, Susanna Testa,	228
SUSTAINABLE PRODUCT SERVICE SYSTEMS: CASES FROM OCEANIA Mariano Ramirez	233
VISUALISING STAKEHOLDER CONFIGURATIONS IN DESIGNING SUSTAINABLE PRODUCT-SERVICE SYSTEMS APPLIED TO DISTRIBUTED ECONOMIES Meng Gao, Carlo Vezzoli	239
LAMPS - ‘DESIGNERLY WAYS’ FOR SUSTAINABLE DISTRIBUTED ECONOMY Prarthana Majumdar, Sharmistha Banerjee, Jan-Carel Diehl, J.M.L.van Engelen	245

THE THIRD SECTOR AS A VECTOR TO FOSTER DISTRIBUTED DESIGN AND DISTRIBUTED ECONOMY INITIATIVES: A CASE STUDY Priscilla Ramalho Lepre, Leonardo Castillo	251
‘SHKEN’ NATURALLY YOURS – SOCIAL DIMENSIONS OF SUSTAINING RURAL DISTRIBUTED BAMBOO CRAFT ENTERPRISES OF NORTH EAST INDIA Punekar Ravi Mokashi, Avinash Shende, Mandar Rane	257
DISTRIBUTED SUSTAINABLE MARKET DESIGN BASED ON COMMUNITY Ruolin Gao, Haiwei Yan, Ke Jiang, Yuanbo Sun	261
PURA FRAMEWORK - A MODEL FOR DISTRIBUTED ECONOMY FOR INDIA Sharmistha Banerjee	265
CONTEXTUALIZING SUSTAINABLE PRODUCT-SERVICE SYSTEM DESIGN METHODS FOR DISTRIBUTED ECONOMIES OF INDIA Sharmistha Banerjee, Pankaj Upadhyay, Ravi Mokashi Punekar	270
DISTRIBUTED ELECTRIC VEHICLE CHARGING SERVICE SYSTEM DESIGN BASED ON BLOCKCHAIN TECHNOLOGY Wandong Cheng, Jun Zhang	276
MODEL FOR THE DEVELOPMENT OF OPEN SOURCE PRODUCTS MOD+RE+CO+DE Willmar Ricardo Rugeles Joya, Sandra Gomez Puertas, Nataly Guataquira Sarmiento	280
RESEARCH AND TEACHING PRACTICE OF PRODUCT SERVICE SYSTEM APPLIED TO DISTRIBUTED ECONOMY Yao Wang, Jun Zhang	285

VOLUME 2

4. SYSTEM AND CIRCULAR DESIGN FOR SUSTAINABILITY

SYSTEM DESIGN FOR TERRITORIAL CYCLE TOURISM Alessio D’Onofrio	291
DESIGN TOOLKIT FOR SUSTAINABLE IDEATION Ameya Dabholkar, Shivangi Pande, Puneet Tandon	296
THE SUSTAINABILITY OF PACKAGING FOR E-COMMERCE: FROM SYSTEM TO PRODUCT. Amina Pereno, Silvia Barbero	301
SUSTAINABLE INTERACTION FOR MOBILITY SYSTEM Andrea Arcoraci	308
DESIGN AND AGRIFOOD FOR NEW SUSTAINABLE LOCAL DEVELOPMENT C. Anna Catania , Aurora Modica	313
ZERO KILOMETRE PLANTS PRODUCTION. AN INTEGRATED DESIGN APPLICATION Attilio Nebuloni, Giorgio Buratti, Matteo Meraviglia	319

DESIGN FOR CIRCULAR ECONOMY - A RE-THINKING PROGRESS IN THE WAY WE MAKE, BUY AND USE THINGS Barbara Wong	325
DESIGNING SUSTAINABLE AND HEALTHY FOOD SYSTEMS THROUGH CATERING: THE ROLE OF DESIGNERS Berill Takacs	333
SYSTEMIC DESIGN DELIVERING POLICY FOR FLOURISHING CIRCULAR REGIONS Carolina Giraldo Nohra	339
SUSTAINABLE CYCLE DESIGN AND EXPLORATION BASED ON TRADITIONAL GARBAGE COLLECTION MODEL Cheng Lin He	345
WHAT REALLY MATTERS? SYSTEMIC DESIGN, MOTIVATIONS AND VALUES OF THE CIRCULAR ECONOMY COMPANIES IN ITALY Chiara Battistoni, Silvia Barbero	351
IS DESIGN PLAYING A ROLE IN THE REALISATION OF CIRCULAR ECONOMY PROJECTS IN EUROPE? A CASE STUDY ANALYSIS.	356
“THE SEVEN TREES SIGNIFICANCE”. THE BENEDICTINE MONKS’ AGROSILVOPASTORAL PRODUCTIVE SYSTEM Prof. arch. Claudio Gambardella, Dott. Raoul Romano	362
ECOLOGICAL DESIGN THINKING FOR THE 21 ST CENTURY David Sánchez Ruano, PhD	366
DESIGN FOR SUSTAINABILITY TRANSITIONS AND SUFFICIENT CONSUMPTION SCENARIOS:A SYSTEMATIC REVIEW Iana Uliana Perez, Mônica Moura, Suzana Barreto Martins, Jacob Mathew, Faiqa Halim	371
DESIGN FOR A SUSTAINABLE INNOVATION OF THE ITALIAN COMPANIES: THE ECODESIGNLAB EXPERIENCE Jacopo Mascitti, Daniele Galloppo	384
DESIGN AND TRANSITION MANAGEMENT: VALUE OF SYNERGY FOR SUSTAINABILITY Jotte de Koning	390
DESIGN AND NATURE: NEW WAYS OF KNOWING FOR SUSTAINABILITY Kate Fletcher, Louise St Pierre, Mathilda Tham	396
CO-DESIGNING A COMMUNITY CENTRE IN USING MULTI-MODAL INTERVENTIONS Kim Berman (Visual Art), Boitumelo Kembo-Tolo (Multi-Media)	401
CRAFTING SUSTAINABILITY THROUGH SMALL, LOCAL, OPEN AND CONNECTED ENTERPRISES ON THE CANADIAN PRAIRIES: THE CASE OF MANITOBAN CRAFT BREWERIES Iain Davidson-Hunt, Kurtis Ulrich, Hannah Muhajarine	406
CASULO VERDE PROJECT: A SYSTEMIC APPROACH TO DESIGN MANAGEMENT. Larissa Fontoura Berlato, Isabel Cristina Moreira Victoria, Luiz Fernando Gonçalves de Figueiredo,	412
MAPPING & CLASSIFYING BUSINESS MODELS TO REPLACE SINGLE-USE PACKAGING IN THE FOOD & BEVERAGE INDUSTRY: A STRATEGIC DESIGN TOOL Noha Mansour, Fabrizio Ceschin, David Harrison, Yuan Long	418
CLIMATE SWITCH: DESIGN LED SYSTEM RESPONSE TO CLIMATE CHANGE INDUCED BY CONSUMPTION Palash Ghawde, Bindiya Mutum, Praveen Nahar	424

FARM ONTOLOGY: A SYSTEM THINKING APPROACH FOR PLANNING AND MONITORING FARM ACTIVITIES Pasqualina Sacco, Raimondo Gallo, Fabrizio Mazzetto	429
INCLUSIVE CIRCULAR ECONOMY: AN APPROACH FOR EMERGING ECONOMIES Priscilla R. Lepre, Leonardo Castillo	435
PARTICIPATORY AND SUSTAINABLE STRATEGY-MAKING FOR COMMUNITY RENEWAL: THE CASE OF IAO HON IN MACAO Yan Xiaoyi, Zhou Long, Guoqiang Shen	441
5. DESIGN FOR SOCIAL EQUITY, INCLUSION AND COHESION	
TRANSDISCIPLINARY AND INTERCULTURAL FIELD STUDY AS A NEW APPROACH TO ADDRESS CLIMATE CHANGE DESIGNERLY Yue Zou, Zhiyuan Ou,	448
CERNE PROJECT AND REMEXE COLLECTION: ACTIONS IN SOCIAL DESIGN IN SEARCH OF SOCIAL INNOVATIONS OF SYSTEMIC CHARACTER Juliana Pontes Ribeiro, Adriana Tonani Mazzeiro, Gabriel Julian Wendling	454
TOWARDS INCLUSIVITY: EXPLORING THE IMPLICATIONS OF MULTI-SENSORY AND PARTICIPATORY DESIGN APPROACHES IN A SOUTH AFRICAN CONTEXT Alexis Wellman, Karolien Perold-Bull,	459
THE OPPORTUNITIES OF SUSTAINABLE HOUSING TO PROMOTE GENDER EQUALITY Anahí Ramírez Ortíz	467
DESIGN FOR ALL TO SUSTAINABILITY FOR ALL SOCIETY Antonio Marano, Giuseppe Di Bucchianico	473
INTILANGA: THE HUMAN-CENTRED DESIGN OF AN OFF-GRID FOOD PROCESSING SYSTEM FOR MICRO-ENTERPRISES WITHIN JOHANNESBURG Antonio Marin, Martin Bolton	478
SOCIAL SUSTAINABILITY AND VIRTUAL REALITY HEAD-MOUNTED DISPLAYS: A REVIEW OF THE USE OF IMMERSIVE SYSTEMS IN THE AID OF WELL-BEING Antônio Roberto Miranda de Oliveira, Amilton José Vieira de Arruda	484
RESEARCH ON DESIGN EMPOWERMENT OPPORTUNITIES FOR THE ELDERLY IN COMMUNITY Binbin Zheng, Miaosen Gong, Zi Yang	490
FRAMEWORK OF ANALYTICAL DIMENSIONS AND DESIGN APPROACHES FOR SOCIAL INNOVATION Camila Ferrari Krassuski, Liliane Iten Chaves	496
COLLECTIVIZATION OF DESIGN AND DIGITAL MANUFACTURING: SOCIAL LABORATORIES Daniel Llermaly Larraín	502
FOSTERING SOCIAL INNOVATION THROUGH SOCIAL INCUBATORS AND CORPORATE SOCIAL INCUBATORS: EVIDENCE FROM ITALY Davide Vigliani, Paolo Landoni	507
UN-NUANCES OF CO-DESIGNING AND CO-CREATING: A DESIGN THINKING APPROACH WITHIN A 'ZONGO' COMMUNITY IN GHANA Patrick Gyamfi, Edward Appiah, Ralitsa Debrah	513

THE DESIGN OF BANYANKOLE TRADITIONAL HOUSE: POWER DIMENSIONS, HOSPITALITY AND BEDROOM DYNAMICS Emmanuel Mutungi	518
CHALLENGE BASED INNOVATION FOR HUMANITARIAN PURPOSES:DESIGNING A WEB-APP TO FIGHT OBESITY. RESULTS OF THEPORT_2018 PIER 32 Eveline Wandl-Vogt, Amelie Dorn, Enric Senabre Hidalgo, James Jennings,eGiuseppe Reale,	
KAROLOS POTAMIANOS	524
USER EXPERIENCE IN DESIGN TARGETING POVERTY ALLEVIATION: A CASE STUDY OF “SHANJU RENOVATION” ACTIVITY IN MAGANG VILLAGE	
FEI HU, JIXING SHI,	529
DESIGNING SUSTAINABLE MOBILITY FOR PEOPLE AT RISK OF SOCIAL ISOLATION – TWO CULTURAL PERSPECTIVES FROM SINGAPORE AND FRANCE Henriette Cornet, Penny Kong, Flore Vallet, Anna Lane, Yin Leng Theng	535
RESEARCH ON THE DESIGN OF SUSTAINABLE BATH EQUIPMENT IN POOR RURAL AREAS OF HEBEI HuHong, Li Heng	541
MAKING A COMIC ABOUT WESTBURY’S ANTI-APARTHEID ACTIVIST, FLORRIE DANIELS Florrie Daniels, Jean Bollweg	546
FROM ROBOTS TO HUMANS: PROSTHETICS FOR ALL Maria Rosanna Fossati, Manuel Giuseppe Catalano, Giorgio Grioli, Antonio Bicchi	552
DESIGNING SUSTAINABILITY FOR ALL OR CO-DESIGNING SUSTAINABILITY WITH ALL? Marie Davidová	558
DESIGN FOR SOCIAL INNOVATION WITHIN A VULNERABLE GROUP. LESSONS LEARNT FROM THE EXPERIMENTATION VIVICALUSCA IN ITALY Daniela Selloni, Martina Rossi	564
SUSTAINABLE DESIGN IDEA FOR ALL PEOPLE Dong Meihui	570
THE FUTURE IS FRUGAL Naga Nandini Dasgupta, Sudipto Dasgupta	574
#ECOTERACY, DESIGNING AN INFO INCLUSIVE AND UNIVERSAL LANGUAGE OF SUSTAINABILITY Nina Costa, Alexandra Duborjal Cabral, Cristóvão Gonçalves, Andreia Duborjal Cabral, Isabel Vasconcelos, Dânia Ascensão, Adriana Duarte	580
CULTURAL AND NATURAL HERITAGE FOR ALL: SUSTAINABLE FRUITION OF SITES BEYOND PHYSICAL ACCESSIBILITY Paola Barcarolo, Emilio Rossi	585
ADOPTION OF BIO-BASED ECONOMIES IN RURAL KENYA FOR IMPROVED LIVELIHOODS Pauline N. Mutura, WairimuMaina, Peter Kamau	591
DESIGN DISCRIMINATION–REFLECTION FOR CRITICAL THINKING Ravi Mani	597

ORGANIC FARMING AS A LIVELIHOOD OPPORTUNITY AND WELL BEING FOR SUNDARBAN FARMERS Sanjukta Ghosh	602
ERSILIALAB IN MILAN. A PARTICIPATORY EXPERIENCE TO DESIGN NEW WAYS FOR ROMA'S SOCIAL INCLUSION Silvia Nessi, Beatrice Galimberti	608
REVITALIZING MARGINALIZED COMMUNITIES FOR SUSTAINABLE DEVELOPMENT BY DESIGN Tao Huang, Eric Anderson	614
THE CONTRIBUTION OF COMMUNICATION DESIGN TO ENCOURAGE GENDER EQUALITY Valeria Bucchetti, Francesca Casnati	619
APPLYING HUMAN-CENTERED TECHNOLOGICAL APPROACH FOR SUSTAINABLE BUSINESSES IN INDIAN INFORMAL ECONOMIES Vivek Chondagar	624
STUDY ON SUSTAINABILITY OF WATER MANAGEMENT SYSTEM IN TRADITIONAL VILLAGES IN WESTERN ZHEJIANG PROVINCE - TAKING SHEN'AO VILLAGE IN ZHEJIANG PROVINCE AS AN EXAMPLE Zhang Yao, Zhou Haoming	629
SUSTAINABLE RURAL TOURISM SERVICE SYSTEM DESIGN THAT BALANCES LOCAL REVITALIZATION AND EXTERNAL INVOLVEMENT—TAKING THE AKEKE AS AN EXAMPLE Yiting Zhao, Jun Zhang	634

VOLUME 4

9. ARCHITECTURAL AND INTERIOR DESIGN FOR SUSTAINABILITY

SUSTAINABLE-ORIENTED CHANGE MANAGEMENT FOR ALL BUILDING DESIGN PRACTICE Anna Dalla Valle, Monica Lavagna, Andrea Campioli,	1083
RELIGIOUS BUILDINGS AND SUSTAINABLE BEHAVIOUR: UNDERSTANDING IMPACT OF DESIGN ELEMENTS ON HUMAN BEHAVIOUR Ashish Saxena	1088
RESTRICTING FACTORS IN THE SELECTION AND SPECIFICATION OF SUSTAINABLE MATERIALS: AN INTERIOR DESIGN PERSPECTIVE. Emmerencia Petronella Marisca Deminey, Amanda Breytenbach	1094
OPTIMIZATION AND LCSA-BASED DESIGN METHOD FOR ENERGY RETROFITTING OF EXISTING BUILDINGS Hashem Amini Toosi, Monica Lavagna	1101
INDOOR ENVIRONMENTAL QUALITY DESIGN OF HOTELS IN THE UNITED STATES AND EUROPE Ivan Alvarez Leon, Elena Elgani, Francesco Scullica	1106
SUSTAINABLE TECHNIQUES TO IMPROVE THE INDOOR AIR QUALITY (IAQ) AND THERMAL COMFORT IN HOT AND ARID CLIMATE. Laura Dominici, Sanam Ilkhanlar, Sara Etminan, Elena Comino	1112
DEVELOPMENT AND PROPOSITION OF A TOOL TO EVALUATE THE ECOLOGICAL IDENTITY OF PRODUCTS: FURNITURE CASE Onur Y. Demiröz, Meltem Özkaraman Sen	1117

INTERVENING ON ‘BUILDING AS A PRODUCT’ AND ‘HABITATION AS A SERVICE’ IN CONTEMPORARY URBAN SETTINGS FOR ADAPTIVE MICRO HABITATION DESIGN Shiva Ji, Ravi Mokashi Punekar	1123
RESEARCH ON THE SUSTAINABLE DESIGN OF TRADITIONAL ARCHITECTURAL NARRATIVE CULTURE OF BEIJING HUTONG BLOCKS: A CASE STUDY OF NANLUOGUXIANG STREET Xin Wen, Fan Zhang	1129
SUSTAINABILITY INVOLVES EMOTION: AN INTERPRETATION ON THE EMOTIONAL CHARACTERISTICS OF SUSTAINABLE ARCHITECTURE Yun-Ting Gao	1134
10. LANDSCAPE AND URBAN DESIGN FOR SUSTAINABILITY	
TOWARD SUSTAINABLE CITIES THROUGH FUTURISTIC DESIGN MODEL: A CONSUMERISTIC SOCIETY PERSPECTIVE Azadeh Razzagh Shoar, Hassan Sadeghi Naeini	1141
STUDY ON SUSTAINABLE DESIGN OF RAINWATER LANDSCAPE IN EXISTING URBAN RESIDENTIAL COMMUNITY Di Gao, Xuerong Teng	1145
DESIGN FOR PUBLIC TOILETS: CHALLENGES AND CONTRIBUTION TO THE REESTABLISHMENT OF PUBLIC VALUE Fang Zhong, Xin Liu, Nan Xia	1151
DESIGNING COMMUNITY THROUGH URBAN GARDENING Gloria Elena Matiella Castro,	1157
EXPLORING FOG HARVESTING IN EUROPE: CHARACTERISTICS AND GUIDELINES FOR A SUSTAINABLE CITY MODEL Gloria Morichi, Dr. Gabriela Fernandez, Lucas B. Calixto	1161
CHARACTERIZATION OF TWO URBAN FARMS IN THE CUAUHEMOC BOROUGH OF MEXICO CITY Iskar Jasmani Waluyo Moreno	1166
THE CHALLENGES OF USING PUBLIC LAND SUSTAINABLY IN MEXICO FOR OUTDOORS RECREATION: CAN SERVICE DESIGN HELP BRIDGE THE GAP? Ivan Osorio Avila	1171
INTERCITY RELATIONSHIPS WITHIN URBAN AGGLOMERATION AND THEIR IMPACTS ON URBAN ECONOMIC DEVELOPMENT Jianhua Zhang	1177
URBAN-RURAL NETWORK TOOL FOR DESIGNING SYSTEMS THAT SUCCESSFULLY INTEGRATE COMPANIES AND COMMUNITIES TOWARDS SUSTAINABILITY AND RESILIENCE Juan Montalván, Akie Manrique, Santiago Velasquez, Lucia Rivera, Helen Jara, Luis Quispe	1183
SOCIAL INEQUITY IN PUBLIC TRANSPORT INFRASTRUCTURE & ITS IMPACT ON A CITY’S SUSTAINABILITY Lakshmi Srinivasan	1188
A TOOLKIT: FOSTERING A PARTICIPATORY STUDY OF SUSTAINABLE PAVEMENT DEVELOPMENT Lulu Yin, Eujin Pei	1194
THE LOGIC OF PLACE-MAKING TOWARDS SUSTAINABLE NEW URBAN AREAS IN HANOI: FROM ZERO TO HERO? Minh Tung Tran, Ngoc Huyen Chu, Pham Thuy Linh	1200
MATI- FINDING SELF AND COMMUNITY THROUGH LAND RECLAMATION Srishti Srivastava, Shivangi Pant, Sahil Raina	1206

THE PATTERN AND METHODS CONCERNING THE MICRO-RENEWAL OF THE URBAN ENVIRONMENT Tingting Liu	1211
RITICAL ZONE: THE EARTH BELOW OUR FEET Vasanthi Mariadass	1216
STUDY ON THE LANDSCAPE POLICY AND USAGE SITUATION : A CASE OF XIADU PARK IN YANQING COUNTY, BEIJING Yuanyuan Zhang	1223
AN ANALYSIS AND APPLICATION OF AFFORDANCE THEORY IN DESIGN OF URBAN RAIL TRANSIT Yu-Feng Zhang	1228
DISCUSSION ON THE SUSTAINABLE MODE OF NEW RURAL CONSTRUCTION IN CHINA FROM THE PERSPECTIVE OF ENVIRONMENTAL CONSTRUCTION Zhong Zhen	1234
11. EDUCATION AND DIFFUSION OF DESIGN FOR SUSTAINABILITY	
DSXC: TOOLKIT TO SUPPORT DESIGN EDUCATION PROCESSES FOR SUSTAINABILITY Adolfo Vargas Espitia, Álvarez Quintero, Willmar Ricardo Rugeles Joya	1239
UPSCALING LOCAL AND NATIONAL EXPERIENCES ON EDUCATION FOR SOCIAL DESIGN AND SUSTAINABILITY FOR ALL TO A WIDER INTERNATIONAL ARENA: CONSIDERATIONS AND CHALLENGES Ana Margarida Ferreira, Nicos Souleles, Stefania Savva	1244
INTERDISCIPLINARY HIGH EDUCATION IN PLACE BASED SOCIAL-TECH: THE EXPERIENCE OF THE TAMBALI FII PROJECT IN DAKAR Andrea Ratti, Francesco Gerli, Arianna Bionda, Irene Bengo	1248
EDUCATION STRATEGIES AND BEHAVIORAL ACTIONS TO MITIGATE ENERGY POVERTY Anna Realini, Simone Maggiore, Marina Varvesi, Valentina Castello, Corrado Milito	1254
DESIGNING FOR CLIMATE CHANGE FOR ALL—A MEDIA AND COMMUNICATION DESIGN COURSE TO INCREASE PUBLIC AWARENESS Bo Gao, Glenda Drew, Jesse Drew,	1260
DESIGN PEDAGOGY FOR SUSTAINABILITY: DEVELOPING QUALITIES OF TRANSFORMATIVE AGENTIVE LEARNING. Bruce Snaddon, Andrea Grant Broom	1265
ENVIRONMENTAL ASPECTS IN THE UEL DESIGN COURSE: LEGAL CONCEPTIONS AND REALITY Camila Santos Doubek Lopes, Gabriela Namie Komatsu Yoshida	1270
EDUCATION FOR SUSTAINABLE DEVELOPMENT. CASE OF AN INDUSTRIAL ENGINEERING PROGRAM IN COLOMBIA. Carolina Montoya-Rodríguez	1275
USING DESIGN THINKING AND FACEBOOK TO HELP MOROCCAN WOMEN ADAPT TO CLIMATE CHANGE IMPACTS Diane Pruneau, Abdellatif Khattabi, Boutaina El Jai, Maroua Mahjoub	1281
DESIGN FOR SOCIAL SUSTAINABILITY: DECOLONISING DESIGN EDUCATION Elmarie Costandius, Neeske Alexander	1286
A SUSTAINABLE DESIGN-ORIENTED PROCESS FOR CONVERTING AND SHARING KNOW-HOW Emilio Rossi	1292
FASHION DESIGN EDUCATION AND SUSTAINABILITY. A CHALLENGE ACCEPTED. Erminia D'Itria	1297
TRANSITION DESIGN – PRESENTATION AND EDUCATIONAL APPROACH Erwan Geffroy, Manuel Irlés, Xavier Moulin	1303

SOCIAL INNOVATION THROUGH DESIGN IN THE TRAINING OF YOUNG APPRENTICES: EXPERIENCING SOCIO-EDUCATIONAL PROJECTS Karina Pereira Weber, Isabel Cristina Moreira Victoria, Marco Antonio Weiss, Luiz Fernando Gonçalves De Figueiredo	1309
INSPIRING STUDENTS TO BE AGENTS OF CHANGE: A SOUTH AFRICAN PERSPECTIVE Laskarina Yiannakaris	1314
THE TECHNOLOGICAL MEDIATION OF SUSTAINABILITY: DESIGN AS A MODE OF INQUIRY Lisa Thomas, Stuart Walker, Lynne Blair	1320
DESIGN FOR SUSTAINABILITY. STATE OF THE ART IN BRAZILIAN UNDERGRADUATE COURSES Marcelo Ambrósio, Maria Cecília Loschiavo dos Santos	1326
SUSTAINABLE DESIGN TRENDS WITHIN CREATIVE LEARNING ENVIRONMENTS Mireille Anja Oberholster, Francesco Scullica	1331
MODEL-MAKING COURSES AND APPROACHES IN TERMS OF SUSTAINABILITY: EXAMINATION OF INDUSTRIAL DESIGN SCHOOLS IN TURKEY Necla Ilknur Sevinc Gokmen	1336
SUSTAINABILITY IN UNDERGRADUATE ARCHITECTURAL EDUCATION: A CASE STUDY FROM KAZGASA, KAZAKHSTAN Nurgul Nsanbayeva	1342
ENCOURAGING DFE IN DESIGN EDUCATION TO PROMOTE SUSTAINABLE MEDICAL PRODUCT DESIGN Pranay Arun Kumar, Stephen Jia Wang	1348
INCORPORATING SUSTAINABILITY INTO RESEARCH PROJECTS Rosana Aparecida Vasques, Maria Cecília Loschiavo dos Santos	1354
TEACHING DESIGN FOR SUSTAINABILITY BEYOND THE ENVIRONMENTAL DIMENSION: A TOOLKIT AND TEACHING STRATEGIES Rosana Aparecida Vasques	1359
ROLE OF DESIGN EDUCATION IN IMPARTING VALUES OF SUSTAINABILITY AS SOCIAL RESPONSIBILITY OF DESIGNERS Sanjeev Bothra	1365
SPREADING GOOD SUSTAINABILITY PRACTICES THROUGH TEMPORARY RETAIL SHOPS Silvia Piardi	1370
FASHION DESIGN-RELATED DOCTORAL STUDIES IN SELECTED KENYAN UNIVERSITIES: ADVANCING APPLIED RESEARCH IN SUSTAINABILITY Sophia N. Njeru. Mugendi K. M'riithaa	1375
TRANSDISCIPLINARY FUTURES: WHERE DO EMBODIMENT, ETHICS AND EDUCATION MEET FOR SUSTAINABILITY LEADERSHIP? Srisrividhiya Kalyanasundaram, Sandhiya Kalyanasundaram,	1382
DESIGN: A REFLEXIVE, REFLECTIVE AND PEDAGOGICAL INQUIRY INTO SUSTAINABILITY Sudebi Thakurata	1388
URBAN MINE REDESIGN COURSE: RESEARCH AND TEACHING PRACTICE Xin Liu, Fang Zhong	1394

TRANSFORMING FOOD SYSTEMS IN CHINA: THE ROLES OF FOOD LITERACY EDUCATION IN ALTERNATIVE FOOD MOVEMENTS

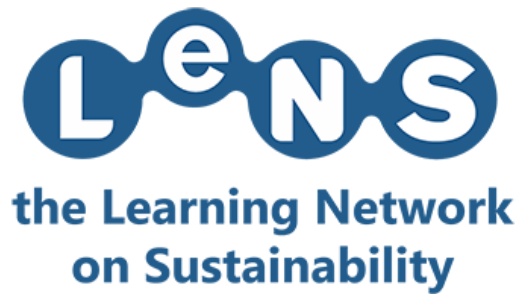
Yanxia Li, Hongyi Tao

1400

SUSTAINABILITY AND CREATIVE EDUCATION: DEVELOPING A SUSTAINABILITY CULTURE OF HIGHER EDUCATION IN CHINA

Dr Yan Yan Lam, Sheng Feng Duan,

1406



This work is licensed under
a Creative Commons Attribution-Non Commercial-
ShareAlike 4.0 International License.

EMPATHY SQUARE: AN AID FOR SERVICE DESIGN FOR BEHAVIOUR CHANGE TO SUPPORT SUSTAINABILITY

Ravi Mahamuni

Tata Consultancy Services, Tata Research Development and Design Centre, Pune, India. ravi.mahamuni@tcs.com

Anna Meroni

Politecnico di Milano, Via Durando 38/a, Milano, Italy. anna.meroni@polimi.it

Pramod Khambete

Tata Consultancy Services, Tata Research Development and Design Centre, Pune, India. pramod@pramodkhambete.com

Ravi Mokashi Punekar

Indian Institute of Technology Guwahati, India. mokashi@iitg.ac.in

ABSTRACT

Service Design for sustainability requires an integrative intertwined approach for interventions addressing economic, environmental, and social concerns. These design interventions are socio-technical in nature where human beings play a crucial role. To contribute to the larger cause of sustainability, people may have to change their behaviour according to a complex pattern: behaving in a desirable manner once, for a short duration and eventually sustaining the behaviour for a long time. Inducing behaviour change in people often poses an ethical dilemma. Assuming that services trigger new behaviours, designers need to achieve a delicate balance between the concerns of the service-user, human-touchpoints (service staff), service organization and the society or environment as a whole in order to foster more sustainable habits. When designers attempt to address the concerns of all these four stakeholders represented as the Empathy Square, it enables them to facilitate a balanced and ethically appropriate service design solution.

Key Words: Sustainability, Service Design, Behaviour change, Empathy Square

1. INTRODUCTION

Service Design for sustainability requires a human-centric, holistic and integrative approach that balances the individual's perspective and the larger economic, environmental, and social concerns. The design interventions are socio-technical in nature in which human beings play a crucial role. To contribute to the cause of sustainability, people often need to change and align their behaviours to sustainability goals. They may have to adopt a new behaviour, increase desirable behaviour, decrease and eventually cease current undesirable behaviour, or sometimes balance between the two equally desirable behaviours. These behaviour changes would typically progress as one time, initial behaviour change, a continuation of the changed behaviour for a short duration of time and eventually sustaining the behaviour for a long period of time (Fogg, 2009). Considering the noble cause of sustainability, people would progress from being unaware of the needs and suitable behaviours to become the advocates of the intended, desirable behaviour change.

Induced behavioural change often poses an ethical dilemma for designers because there is no universal truth about what is ethical and what is not. Instead, an ethical approach is considered as the act of making conscious and deliberate decisions addressing concerns of all stakeholders in a particular context (Acaroglu, 2019). It becomes challenging for service designers to select the consequential ethics approach i.e. maximise the best outcome for the most people or deontological ethics approach i.e. do the right thing using whatever is current 'rightness' (Acaroglu, 2019). Considering the subjectivity associated with the ethical dimensions of human behaviour, it becomes challenging for service designers to coincide both ethical approaches to initiate and facilitate design interventions. This paper explains how to navigate through this ethical dilemma by balancing the concerns of multiple major stakeholders while designing services for sustainability.

1.1. Sustainability from a social, economic and environmental perspective

Several researchers define sustainability as an interconnection between three pillars – environmental sustainability, economic sustainability and social sustainability (Elkington, 1997). Environmental sustainability is the process of maintaining a balanced environment by considering factors like conservation of natural resources and environmental protection among others on a long-term basis. Social sustainability aims at creating healthy and liveable communities both for current and future generations. Economic sustainability aims at having long lasting and fair activities. Overall, sustainability is a broad area of research aiming at design, development, and use of resources in the environment to ensure a balance between meeting the current and futures needs, while achieving social justice. Achieving sustainability requires intricate attention and conscious efforts towards the design and development of products and services. It involves a holistic approach considering technologies, change in human behaviour, man-made architectures, consumption of natural resources, and so on.

Environmental and social sustainability related problems are rooted in human behaviour. For example, the way we consume natural resources might lead to scarcity of that resource in future or the way we use products (e.g. vehicles) for our convenience might lead to unsafe (polluted) environments for our future generations. To achieve and to maintain environmental and social sustainability, individuals can contribute significantly by promoting sustained behaviour that can contribute to a greater cause (Abusafieh & Razem, 2017). Therefore, there is a need to examine the role of human behaviour while designing sustainability-driven solutions. It is well established that design interventions influence user behaviour and hence, designers have the potential to consciously design products, services, and systems with an intent to change people's behaviour. While cultivating human values and socially desirable behaviours, designers need to understand the human-environment dynamics in promoting pro-environmental behaviour for users.

1.2. Holistic and Integrative Service Design

Designing services that evolve over time through a sequence of events, is a user-centric activity of orchestrating people, infrastructure and communication as an integrative socio-technical system (Bitner, Ostrom, & Morgan, 2008) (Fensel, Facca, Simperl, & Toma, 2011). Service Design provides a holistic approach while solving problems, by leveraging trans-disciplinary collaborations. It encompasses the design of all human-human and human-machine interactions involved in the service. It also focuses on the service environment and the service experiences, by dealing with the emotions and values of humans along with the functionality of the service in a given context. Design in general and Service Design in particular can definitely shape user's behaviour and facilitate to maintain it for a long period. When a service user is using the service for a certain duration, the behaviour of an individual or within a group is influenced by the designed product-service systems. Changing or shaping an individual's behaviour, eventually after a certain time, is a starting point towards the change at a wider level e.g. societal level.

Users of today have an abundance of choices of products and services. Service providers find challenges in being a differentiator in the market and sustaining their users. Value creation through impactful service experiences is the locus of service-providing organizations today. Traditionally, it was a common assumption that organizations can solely design, develop, and sell products and services with little or no interference from their users. This assumption is slowly fading away and the need for value co-creation is becoming more prominent, wherein the users are actively engaged, rather than merely being passive recipients of the service. (Prahalad & Ramaswamy, 2004) (Prahalad & Ramaswamy, 2004). Value co-creation can be defined as a 'benefit

realized from the integration of resources through activities and interactions with collaborators in the customer's service network." (McColl-Kennedy, Vargo, Dagger, Sweeney, & Kasteren, 2012). Co-creation of value is heavily based on the interactions between the user and the provider, of which the basic components have been identified as dialog, access, transparency, relationship, and some others. (Prahalad & Ramaswamy, 2004) (Hansemark & Albinsson, 2004), Along with the service users, human touchpoints i.e. service staff involved in service, play a crucial role in enabling the value co-creation for a user.

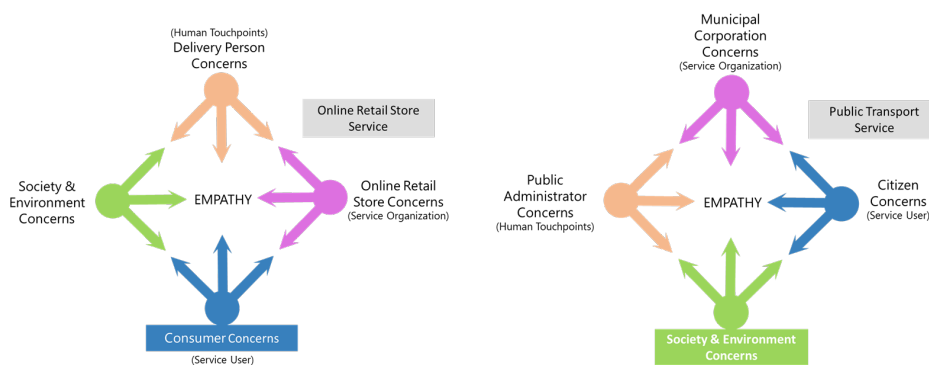
2. ROLE OF BUSINESSES AND CORPORATIONS IN SUSTAINABILITY

Every human being is responsible for shaping a sustainable ecosystem. Individuals, group of individuals, businesses, and government organizations share an active responsibility in crafting and enabling activities that create a symbiotic and sustainable tomorrow. With the increasing rate of climate change affecting the global landscape, it's imperative to include sustainable design as an integral part of business models and state policies. The transformational era of higher automation and interconnectedness in industries compel the later to initiate sustainable design not as a separate corporate social responsibility but as a core to every industrial activity by leveraging on smart solutions that facilitates long term relationship rather than one term consumerism. The movement towards being empathetic towards society and environment as part of the business planning and not as a separate corporate social responsibility i.e. CSR initiative is now evident in organizational practices. It is a right time to adopt social and environmental responsibility through each and every corporate action.

3. EMPATHY SQUARE

Design for sustainability is not just a human-centered design approach but an ecosystem-based holistic design attitude which enables rich symbiosis between the stakeholders constituting the ecosystem. The stakeholders can be majorly categorized as users, design enablers such as industry, service providers, business organizations, society, and environment (includes various flora and fauna). It is imperative that an integrative design approach for sustainability will include the perspectives, concerns, desires, and mutual-benefit of all the stakeholders. Let us take an example; Electric cars are positioned as an eco-friendly vehicle because they run on battery-stored electricity producing no poisonous smoke, minimizing air pollution for a safer environment. However, if one observes with a holistic lens, one can evidently see the amount of pollution that emerges during the manufacturing process of electric batteries that are used in the Tesla cars. Furthermore, it's worth wondering about the lifecycle of all the other materials that are used in the Tesla cars, and their possible impact on the holistic sustainability of our living ecosystem. (Tesla's Electric Cars Aren't as Green as You Might Think, 2016)

The design philosophy of Design for Circular Economy (Ellen MacArthur Foundation, 2015) enables designers to look at the complete lifecycle of products and materials and directs the design ideation from building 'consumership' of products towards 'usership' of the same. Circular Economy enables this paradigm shift in design ideation towards Design for Sustainability by engaging into six principles (Macarthur, 2006) namely: designing out waste, building resilience in diversity, thinking in cascades, thinking in systems, shifting to renewables, and by focusing on restoration and regeneration. There are similar examples, which emphasises on the role of service design for solving sustainability problems by unlocking value for each stakeholder in a value chain. Among the various stakeholders, service staff i.e. human touchpoints are generally getting less or no attention, which may be detrimental for sustainability. On one side, service staff plays a key role in helping service users to encourage, engage, perform and maintain the behaviours towards sustainability. On the other side, it needs are very often neglected, as the staff was not part of a wellbeing equation that is not only crucial for social sustainability, but for the overall quality of the service too (Meroni & Sangiorgi, 2011). It's the prima facie responsibility of the service organizations to take care of the social and financial wellbeing of its service staff.



[Figure 1] CraftChange – Empathy Square (Mahamuni, Khambete, & Mokashi-Punekar, 2019)

Through multiple service design for sustainability projects (Prendeville & Bocken, 2017) (Matthing, 2017) it is evident that the service design solution needs to be empathetic to the concerns of a service user, service organization, human touch points and most importantly society and environment. To achieve this and arrive at a balanced

and ethically appropriate service design solution for any kind of problems, Empathy square (Mahamuni, Khambete, & Mokashi-Punekar, 2019) as shown in figure 1 seems useful. It can enable designers, all along the design process, to focus on the ecosystemic approach, so to maintain the delicate balance between the concerns of the service-user, human-touchpoints (service staff), service organization and the society or environment. During 1970s Victor Papanek, first asserted that “*Design, if it is to be ecologically responsible and socially responsive, must be revolutionary and radical*” (Papanek, 1970).

The Empathy Square requires the design team to explicitly articulate and match, not only the concerns of the service provider and service user, but also those of the human touchpoints (the staff) and of the society and environments, as entities that have the rights to be “served” and fulfilled in order to achieve sustainability.

In case of online retail shops, to address the concerns of the service user i.e. purchasing required goods effortlessly, anywhere at an affordable cost, service organizations are providing access to the various required goods at affordable rates through their websites and mobile apps to the service users leading to the increase in gross revenue. To make it affordable, the service organizations need to address the concerns of the human touchpoints that is in this case, a delivery person from a social and economic wellbeing perspective. While making it affordable to the service users, organizations should not give inadequate wages to the delivery person leading to negligence towards their social and economic wellbeing. The environmental concerns need to be taken care of, by reducing plastic usage as part of packaging and use of non-polluting vehicles to deliver the goods. For example, the iPhone ships with a biodegradable potato-starch-based shipping material rather than plastics (Sheesley, 2008). Thus addressing the concerns of all the four major stakeholders, the overall solution can be sustainable.

There is no sequence to start from a specific node of empathy square. Designers may start with a node that requires immediate attention and can act as an anchor for other three nodes as shown in figure 1. If it's a sustainability initiative, then designers may start from society and environment node and sequentially move to the other nodes. For an employee wellbeing initiative, designer can start with human touchpoint node and then balance the concerns within other nodes. It's important to be empathetic to the concerns of all four nodes while designing the services to sustain it for a longer period of time. We have used Empathy Square in multiple projects in social and business sector; and found it to be promising. It gets operationalized by addressing the concerns with an anchor node and then taking care of concerns of the other three nodes. It is a part of the larger CraftChange framework (Mahamuni, Khambete, & Mokashi-Punekar, 2019) which is achieved through multiple canvases and design enabler cards. CraftChange is Design for Behaviour change framework which has other elements such as add-on process, Current Intervention Cards for user research phase, Ignite Cards for ideation phase, Challenge Cards for validating and prioritizing ideas and Enrichment Cards for checking completeness of ideas. All these elements, along with multiple canvases, have undergone initial testing and seems promising. The work is in progress and would be reported shortly.

4. CONCLUSION

Service design, due to its holistic and long temporal nature, is a desired approach where sustainability concerns are to be addressed in a sustainable manner. It is evident that people's sustained behaviour plays a crucial role in sustainability endeavours. If service design takes care of sustainability concerns by designing for sustained behaviour change, it will contribute to a long lasting impact. Thus, business organizations can change the focus from CSR initiatives to make sustainable service design as a part of their core business strategy. Empathy Square enables the service designers to balance the concerns of multiple major stakeholders, interlinking service design, sustainability and sustained behaviour change.

With a drastic increase in awareness about sustainable actions among people, society and organizations, it is inevitable to address the concerns of all the four stakeholders consistently through actions, as part of their business. This shift from sustainability as CSR activity to becoming a crucial element of core business strategy has started, and this congruence can expedite the process. We believe that this knowledge will be helpful while designing impactful design interventions, addressing sustainability concerns.

BIBLIOGRAPHY

1. Abusafieh, S., & Razem, M. (2017). *Human Behavior and Environmental Sustainability: promoting a pro-environmental behavior by harnessing the social, psychological and physical influences of the built environment*. 23, p. 2003. EDP Sciences.
2. Acaroglu, L. (2019, Jan 25). *How Design Designs Us - The Ethics of Design*. Retrieved from Disruptive Design: <https://medium.com/disruptive-design/how-design-designs-us-part-3-the-ethics-of-design-ca40e33f5842>
- Bitner, M. J., Ostrom, A. L., & Morgan, F. N. (2008). *Service blueprinting: a practical technique for service innovation*. *California management review*, 50, 66-94.
3. Elkington, J. (1997). *Cannibals with forks: the triple bottom line of twenty-first century business*. Capstone. Oxford.
4. Ellen MacArthur Foundation. (2015). *Towards a Circular Economy: Business rationale for an accelerated transition*. Ellen MacArthur Foundation.
5. Fensel, D., Facca, F. M., Simperl, E., & Toma, I. (2011). *Semantic web services*. Springer Science & Business Media.
6. Fogg, B. J. (2009). *A behavior model for persuasive design*. Proceedings of the 4th international Conference on Persuasive Technology (p. 40). ACM.

7. Hansemark, O. C., & Albinsson, M. (2004). *Customer satisfaction and retention: the experiences of individual employees*. *Managing Service Quality: An International Journal*, 40-57.
8. Macarthur, E. (2006). *Towards the Circular Economy*. *Journal of Industrial Ecology*, 4-8.
9. Mahamuni, R., Khambete, P., & Mokashi-Punekar, R. (2019). Behaviour Progression Framework for Designing Sustained Behaviour Change. In *Research into Design for a Connected World* (pp. 39-50). Springer.
10. Matthing, J. (2017). *Connected heating cabinets provide an overview of food transport*. Retrieved 02 01, 2019, from RISE: <https://www.ri.se/en/our-stories/connected-heating-cabinets-provide-overview-food-transport>
11. McColl-Kennedy, J. R., Vargo, S. L., Dagger, T. S., Sweeney, J. C., & Kasteren, Y. K. (2012). *Health care customer value cocreation practice styles*. *Journal of Service Research*, 370-389.
12. Meroni, A., & Sangiorgi, D. (2011). *Design for services*. Gower Publishing, Ltd.
13. Papanek, V. (1970). *Design for the Real World: Human Ecology and Social Change*. Academy Chicago Publishers.
14. Prahalad, C., & Ramaswamy, V. (2004). *The future of competition: Co-creating unique value with customers*. Harvard Business Press.
15. Prahalad, C. K., & Ramaswamy, V. (2004). *Co-creation experiences: The next practice in value creation*. *Journal of interactive marketing*, 18(3), 5-14.
16. Prendeville, S., & Bocken, N. (2017). *Sustainable business models through service design*. *Procedia Manufacturing*, 292-299.
17. Raar, J. (2002). *Environmental initiatives: towards triple-bottom line reporting*. *Corporate Communications: An International Journal*, 169-183.
18. Sheesley, J. (2008, 07 23). *Destroying the planet one iPhone at a time*. Retrieved from TechRepublic: <https://www.techrepublic.com/blog/decision-central/destroying-the-planet-one-iphone-at-a-time/>
19. Tesla's Electric Cars Aren't as Green as You Might Think. (2016, 03 31). Retrieved 02.10.2019, from Wired: <https://www.wired.com/2016/03/teslas-electric-cars-might-not-green-think/>.



**the Learning Network
on Sustainability**

The proceedings are also available at www.lensconference3.org

This work is Licensed under Creative Common Attribution-NonCommercial-ShareAlike CC BY-NC-SA

The conference was organized by:

Politecnico di Milano
Aalto University
Brunel University London
Cape Peninsula University of Technology
Hunan University
Indian Institute of Technology Guwahati
Srishti Institute of Art, Design and Technology

Technische Universiteit Delft
Tsinghua University
Universidad Autónoma Metropolitana
Universidad del Valle de México
Universidade Federal de Pernambuco
Universidade Federal do Paraná
Universiteit Stellenbosch

Other LeNSin associate partners cooperating with the organization are

- Londrina State University, Fluminense Federal University, Federal University of Alagoas, Federal University of Uberlândia, Federal University of Santa Catarina (**Brasil**)
- C.A.R.E. School of Architecture, Pandit Dwarka Prasad Mishra Indian Institute of Information Technology, Indian Institute Of Technology Gandhinagar, Goa College of Architecture, Hunnarshala Foundation for Building Technology & Innovations, Vastu Shilpa Foundation (**India**)
- Wuhan University of Technology, Jiangnan University, The University of Science and Technology Beijing, Beijing Information Science and Technology University, The Hong Kong Polytechnic University, Guangzhou academy of fine arts, Tongji University (**China**)
- Farm and Garden National Trust, Cape Craft and Design Institute NPC (**South Africa**)
- Univesidad Nacional Autónoma Metropolitana, Instituto Tecnológico de Monterrey Campus Ciudad de México (**Mexico**)

Scientific Commetee:

Carlo Vezzoli
Aguinaldo dos Santos
Leonardo Castillo
Claudio Pereira Sampaio

Ranjani Balasubramanian
Ravi Mokashi
Brenda Garcia
Rodrigo Lepez Vela
Ephias Ruhode
Elmarie Costandius

Xin Liu
Jun Zhang
Fabrizio Ceschin
Cindy Kohtala,
Jan Carel Diehl

LeNSin main partners:

