POLITECNICO DI TORINO
Repository ISTITUZIONALE

Assessment tools for disposable and long durability products

Original
Assessment tools for disposable and long durability products / Fiore, E., Barbero, S.. - ELETTRONICO. - Volume 4, Issue 1:(2016), pp. 228-233. (The 4 th International Virtual Conference on Advanced Scientific Results (SCIECONF-2016) Zilina, Slovak Republic 6-10 June, 2016) [10.18638/scieconf.2016.4.1].

Availability:
This version is available at: 11583/2646720 since: 2016-08-30T00:17:50Z

Publisher:
EDIS - Publishing Institution of the University of Zilina

Published
DOI:10.18638/scieconf.2016.4.1

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

23 October 2026

Proceedings in Scientific Conference

The 4th year of International Virtual Conference on Advanced Scientific Results

SCIECONF 2016

6. - 10. June 2016

ScieConf
SCIENTIFIC CONFERENCE

Slovak Republic

Published by: EDIS - Publishing Institution of the University of Zilina
Univerzitna 1
01026 Zilina
Slovak Republic

Editors: Ing. Michal Mokrys; Ing. Stefan Badura, Ph.D.

ISBN: 978-80-554-1234-4

cdISSN: 1339-3561

eISSN: 1339-9071

DOI: 10.18638/scieconf.2016.4.1

Pages: 266

Printed in: 100 copies

Publication year: 2016

- All published papers undergone single blind peer review.
- All published papers are in English language only. Each paper had assigned 2 reviewers and each paper went through two-tier approval process.
- Papers are published as delivered by authors without content modification. All accepted papers have been formally checked by the conference Technical Committee and regularly reviewed in single blind peer reviewing process by the conference Scientific Committee (Reviewers Committee).
- The publication contents are the sole responsibility of the publication author and it does not reflect the Publishing Society, Zilina, Slovakia.

Open Access Online archive is available at: **http://www.scieconf.com/archive**
(proceedings will be available online one month after the publication release).

In case of any questions, notes or complaints, please contact us at: **info(at)scieconf.com**.

Paper Citation Example: In (Eds.) S. Brown, S. Larsen, K. Marrongelle, and M. Oehrtman, Proceedings of The 4th International Virtual Conference on Advanced Scientific Results (SCIECONF-2016), Vol. 4, pg #-#. Zilina, Slovakia.

Warning
Copyright © The authors mentioned in the table of contents, Publishing Society, Zilina, Slovakia, All rights reserved.

Section Chairman Committee

Rafał Parvi

• About:

Rafał PARVI has been a member of the Scientific & Reviewer Committee's for: Science-com conferences (University of Zilina and Publishing Society, Slovakia), ICTIC Conference of Informatics and Management Sciences, Global Virtual Conference, International Virtual Conference on Advanced Scientific Results – SCIECONF, Electronic International Interdisciplinary Conference – EIIC, HASSACC - Virtual Conference Human And Social Sciences at the Common Conference, International Virtual Research Conference In Technical Disciplines RCITD, Virtual International Conference on Advanced Research in Scientific Areas - ARSA, Virtual Multidisciplinary Conference - QUAESTI and a participant at conferences. The author of ca. 100 professional papers.

• Affiliation:

Assistant Professor at School of Banking, Faculty of Economics

• Scientific specialization:

Finance, management of finance, financial analysis, economic analysis, experimental economics, taxes, due diligence, feasibility study, banking

• Country:

Poland

Sandro Serpa

• About:

Sandro Serpa holds a Ph.D. in Education, specialty in Sociology of Education, since July 2013. He is Assistant Professor in the Department of Educational Sciences at the University of the Azores, Portugal.

• Affiliation:

University of the Azores, Department of Educational Sciences

• Scientific specialization:

- Sociology - Education
- Sociology - Organizations
- Educational Administration
- Leadership
- Organizational culture
- Virtual organizations

• Country:

Portugal

Elżbieta Szafranko

• About:

Author of over 50 scientific journal articles, 60 conference papers and 4 conferences papers indexing in Web of Science database, the member of 11 scientific committees of international scientific conferences. Author of several chapters in edited books.

I am especially proud of my works: "Multi-criteria methods in an analysis of variants of a construction project", International Scientific Publication, Materials, Methods & Technologies, Volume 9/2015, p. 155-168, "Evaluation Of Variant Construction Projects Supported By Expert Opinion Systems Based On Multi-Criteria Methods", International Journal of New Technologies in Science and Engineering, Vol. 2, Issue. 5, 2015, p. 39-46, "Applicability of the indicator method to evaluation of road building projects", News in Engineering 1/ 2015 p.1-7.

• Affiliation:

Assistant Professor, University of Warmia and Mazury in Olsztyn; Faculty of Geodesy, Geospatial and Civil Engineering; Institute of Building Engineering, www.uwm.edu.pl

• Scientific specialization:

- Civil engineering – management in investment process
- Civil engineering – economic and planning in construction and civil engineering
- Civil engineering - environmental protection
- Transport – road investment, transportation network
- Transport – environmental protection
- Civil engineering and Transport – planning and multi-criterial analysis

• Country:

Poland

Victorița Trif

• About:

Current position and responsibilities:

- Associate Professor at the Teacher Training Department, University of Bucharest (Romania)

Past Positions:

- Expert at the National Institute of Magistracy, Bucharest, Romania

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

- Expert in assessment for CNCSIS, Romania
- Member of the scientific board for the Romanian Journal ”Education. Today” (”Educația / Azi”), (2008, 2009, 2010)
- Coordinator for Section no.4: Educational Sciences , at the conference PSIWORLD 2012, Bucharest (Romania
- Expert in Educational Sciences for the Mentors Conference, covered by British Council, ASMERO and the University of Bucharest, Romania (2012)
- Reviewer for Hassacc Virtual Conference (www.hassacc.com)

• Affiliation:

University of Bucharest, Department of Sociology

• Scientific specialization:

Education

• Country:

Romania

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

International Scientific Committee and Reviewers Committee

Rana Khudhair Abbas Ahmed
Al-Rafidain University College, Iraq

Bulent Acma
Anadolu University, Turkey

Abd Elmoniem Ahmed Elzain
Kassala University, Sudan

R. S. Ajin
GeoVin Solutions Pvt. Ltd, India

Fisnik Aliaj
University of Prishtina, Kosovo

Mehran Amiri
Payamenoor University, Iran

Karina Cecilia Arredondo Soto
Autonomous University of Baja California, Mexico

Stefan Badura
Publishing Society, Slovakia

Kaptain Kishor Bajpayee
Dr. R.M.L. P.G. COLLEGE, India

Dumitra Baron
"Lucian Blaga" University of Sibiu, Romania

Desidério Batista
University of Algarve, Portugal

Maria del Carmen Bellido Márquez
University of Granada, Spain

Ana-Maria Bercu
UNIVERSITY OF IASI, Romania

Ewa Binkuńska
University of Gdansk, Poland

Haron BOURAS
Mohamed Cherif Messaadia University Souk-Ahras, Algeria

Aliaksei Bykau
Belarus State Economic University, Belarus

António Caleiro
Universidade de Évora, Portugal

Sorin Cananau
University POLITEHNICA of Bucharest, Romania

Adrian Caprita
Banat's University of Agricultural Sciences and Veterinary Medicine, Romania

Rodica Caprita
Banat's University of Agricultural Sciences and Veterinary Medicine, Romania

Luiza Caraivan
"Dimitrie Cantemir" Christian University, Romania

Ubaldo Comite
University "Giustino Fortunato", Italy

Ana Craciunescu
Stefan cel Mare University of Suceava, Romania

Martina Černá
College of Polytechnics Jihlava, Czech Republic

Mircea Laurentiu Dan
University POLITEHNICA Timisoara, Romania

Anna D'Auria
University of Naples Federico II, Italy

Rajesh Raghavbhai Desai
Ambaba Commerce College, India

Krzysztof Drachal
University of Warsaw, Poland

Ara Alexandra da Eira Serra
Polytechnical Institute of Cávado and Ave, Portugal

Peter Ekweozoh
FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY, NIGERIA

Francisco Javier Blanco Encomienda
University of Granada, Spain

Modrea Arina Florenta
UNIVERSITY „PETRU MAIOR'' TIRGU-MURES, ROMANIA

Emanuela Giancola
CIEMAT, Spain

Iwona Gorzeń-Mitka
Czestochowa University of Technology, Poland

Rakesh Gupta
Roorkee Engineering and Management Technology Institute, India

Gina Chianese
Free University of Bolzano, Italy

Dan Chicea
Lucian Blaga University of Sibiu, Romania

Mariana Iancu
BIOTERRA University of Bucharest, Romania

Jonas Jakaitis
Vilnius Gediminas technical university, Lithuania

Rohit Kachhal
Roorkee Engineering & Management Technology Institute Shamli, India

Michail Kalogiannakis
University of Crete, Greece

Kayvan Kaseb, Iran

Morteza Khazaei Pool
Allameh Tabatabaii university, Iran

Marcin Komańda
University of Economics in Katowice, Poland

Maja Kostadinovska
National and University Library "St. Clement of Ohrid", Macedonia

Balázs Kotosz
University of Szeged, Hungary

Binod Kumar
JSPM Jayawant Institute of Computer Applications, India

Igor Kuzmenko
Kyiv polytechnic institute, Ukraine

Jolanta Latosińska
Kielce University of Technology, Poland

Regina Lenart-Gansiniec
Jagiellonian University in Kraków, Poland

Jolanta Maj
Opole University of Technology, Poland

Eliana Mariela Werbin
National University of Cordoba, Argentina

Elisabete Mendes Duarte
Polytechnic Institute of Leiria, Portugal

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

Angelo Robert Nichola (J) Molson
Ministry of Interior Affairs, Greece

Isabel Mª Martín Monzón
Universidad de Sevilla, Spain

Sónia Morgado
Instituto Superior de Ciências Policiais e Segurança Interna, Portugal

Pablo José Moya Fernández
UNIVERSITY OF GRANADA, Spain

Edward Muntean
University of Agricultural Sciences and Veterinary Medicine, Romania

Hesham Noaman Mustafa
King Abdulaziz University, Saudi Arabia

Alireza Salehi Nejad
University of Tehran, Iran

Janusz Nesterak
Cracow University of Economics, Poland

Helena Neves Almeida
University of Coimbra, Portugal

Mahammad A. Nurmammadov
Azerbaijan State Pedagogical University, Azerbaijan Republic

Małgorzata Okręglicka
Czestochowa University of Technology, Poland

Artur Gomes de Oliveira
Sergipe Federal Institute of Education Science and technology, Brazil

Cristina Paraschiv
University of Bucharest, Romania

Rafał Parvi
Opole School of Banking, Poland

João Carlos Pereira Mira Leitão
Instituto Politécnico da Guarda, Portugal

Krzysztof Piasecki
Poznań University of Economics, Poland

Theodoros Pierratos
Laboratory Centre of Natural Sciences (EKFE) of Evosmos, Greece

Danica Pirsl
University of Nis, Serbia

Amir Khazaei Pool
Islamic Azad University, Iran

Reena Rani
ROORKEE ENGINEERING AND MANAGEMENT TECHNOLOGY INSTITUTE SHAMLI, India

Angela Roman
Alexandru Ioan Cuza University of Iasi, Romania

Ioan-Gheorghe Rotaru
'Timotheus' Brethren Theological Institute of Bucharest, Romania

Oana Rusu
Alexandru Ioan Cuza University of Iasi, Romania

Teodor Rusu
University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania

Andrii Ryzhkov
Autonomous University of Nayarit, Mexico

Mohamed Musa Saad Hasb-Elkhalig
Qassim University, Kingdom of Saudi Arabia

Fernando José Sadio Ramos
Polytechnic of Coimbra, Portugal

Arvind Kumar Saraswati
Banarsidas Chandiwala Institute of Hotel Management & Catering Technology, India

Dharmendra Kumar Satnami
DR. HARI SINGH GOUR CENTRAL UNIVERSITY SAGAR, INDIA

Sandro Serpa
University of the Azores, Portugal

Sanjay Sharma
Roorkee Engineering & Management Technology Institute, India

Narcisa Schwarz
Western University Vasile Goldis of Arad, Romania

Monika Sipa
Czestochowa University of Technology, Poland

Andrzej Skibiński
Czestochowa University of Technology, Poland

Ana-Alexandra Sorescu
National Institute for Research&Development in Chemistry and Petrochemistry - ICECHIM, Romania

Radu D. Stanciu
University Politehnica of Bucharest, Romania

Renata Stasiak-Betlejewska
Czestochowa University of Technology, Poland

Elena Stavrova Velkova
Union of Scientist, Bulgaria

Elżbieta Szafranko
University of Warmia and Mazury in Olsztyn, Poland

Jacek Szmalec
Maria Curie-Skłodowka University in Lublin, Poland

Giuseppina, Maria, Chiara Talamo
KORE UNIVERSITY, Italy

Cezarina Adina Tofan
Spiru Haret University, Romania

Dominika Topa-Bryniarska
University of Silesia, Poland

Victorița Trif
University of Bucharest, Romania

Violeta Urban
George Bacovia University in Bacau, Romania

Magdalena Valsikova
Slovak University of Agriculture Department of Vegetabe production, Slovakia

Bhavesh Vanpariya
Tolani Institute of Management Studies, India

María J. Vilar
University of Helsinki, Finland

Kamil Żyła
WEiI Politechnika Lubelska, Poland

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

Conference Sponsors and Partners

Publishing Society

Slovak Republic

www.The-Science.com

Science & Technology Park Zilina

Slovak Republic

European Center for Ethnic Studies

University 'Giustino Fortunato'

European Center of New Technologies and Financial Innovations

The School of Banking and Management in Cracow

Lucian Blaga University in Sibiu

BIOTERRA University of Bucharest

University of National and World Economy

Published by

EDIS
Publishing Institution of the University of Zilina

Univerzitna 1
01026 Zilina
Slovak Republic

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

Summary

Dear Reader,

it is our pleasure to introduce you this proceedings. This book contains all accepted papers from conference, which is described below in more details. We hope published papers contribute to the academic society and provide interesting information for researchers world wide.

Conference details:

- Conference full name: **Scientific Conference**
- Conference short name: **SCIECONF**
- Conference edition: **4th**
- Conference dates: **June 6 - 10, 2016**
- Conference web page: **www.scieconf.com**
- Conference online archive: **www.scieconf.com/archive**

Conference paper approval process:

Each registered paper was evaluated in double tier approval process.

1. Scientific Committee evaluation (in average 2 reviews were prepared per paper).
2. Conference Editorial Board.

Only papers recommended by these committees were accepted for online presentation at the conference and for publication in this conference book.

Conference presentation:

All accepted papers were presented at the conference during conference dates. Asynchronous online chat was prepared for each paper, where all conference members could freely discuss the topic. During the conference, the Section Chairmen Committee steered the conference discussion. Short presentation were proposed for effective conference discussion.

Conference post processing:

- Each published paper is available in **CDRom** and **online** proceedings (online archive).
- All papers in online archive are available for downloading for potential readers (**open access policy**).
- For effective linking and citation each paper is provided with **DOI**, we recommend to use DOI for referencing.
- The online archive may be possibly evaluated by several Abstracting and Indexing services in future.

Sincere thanks for:

- **Scientific Committee** and **Section Chairmen Committee** for their volunteer work during reviewing.
- Conference **partners** for promotional work and their contribution.
- **Editorial Board** for enormous workload and patience.

Stefan Badura
Conference Organizing Committee
The-Science.com community
Publishing Society

June, 2016

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

Table of Contents

Psychology

Language and Perception (The species-specificity of auditory cortex in human and animal communication) 14
Alessandra Anastasi

Economics

The Influence of Catastrophic Risks Realization to The Insurance Markets 20
Karina Benetti

ISSUES OF INFORMAL ECONOMY REFORMATION IN ALBANIA 26
AURELA BRAHOLLI

Two auction mechanisms (For the allocation of a bad) 30
Lorenzo Cioni

Competition, Preductivity and Competitiveness (A theoritical review) 35
Gledian Llatja, Theodhor Kuro

Fair value of the banking sector companies quoted on the Warsaw Stock Exchange in Poland within 2006-2016 and their financial analysis 39
Rafał Parvi

Role of milk production in Albania 45

Alerta Shtepani (Basha), Ludjana Vero, Raimonda Ajdini, Arjola Luci, Jerina Vukaj

Business

ITIL Service Strategy processes adoption in chosen SMEs in Poland. 51
Magdalena Ciesielska

Functional drink added with extracts of shell in Granada (Punica granatum) with virucidal Property 56
Francisco J. Güemez Ricalde, Edith Graciela Gonzalez Mondragón, Dew Gabriela Tirado Mendoza

Review of benefit assessment methods in decision making process 60
Inita Henilane

Hedonic price models in the Hospitality Industry: an integrative review 66
Estefanía Hernández-Estárico

Business analisys for Bulgarian Railway Company – what type of new rolling stock to acquire? 70
Dimitar Mihaylov

THE DEVELOPMENT OF THE PROFESSIONAL IDEOLOGY OF ENGINEERS IN THE SOCIETY OF POST SOCIALIST TRANSFORMATION 75
Smiljana Mirkov, Marija Runic Ristic, Igor Ristic

Online Service Quality Measurement Models: A Comparative study 79
Art Shala, Genc Alimehmeti

Environmental and technical determinants of investments in geothermal power plants in Poland and in Germany and their economic consequences 82
Adam Staliński

Accounting and Financing

Potential for residential REITs in the South African REIT market 88
L. Anderson, C. E. Cloete

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

The Corporate Insolvency Proposals in The Czech Republic after The Financial Crisis 98
Karina Benetti

Bulgarian Banking System in Light of the IFRS 9 – Adoption and Impact 101
A. Filipova-Slancheva

Educational sciences

Teaching and Learning English Language with Technology 105
Magbule Mejzini

Promoting Citizenship Education via Lifelong Learning Programs 108
Panagoula PAPADIMITROPOULOU

Development of Pre-primary and Junior School Children's Singing Voice in Musical Education Classes: Examples in Lithuania, Latvia and Taiwan 113
Asta Rauduvaite, Jolanta Lasauskiene, Jolanta Abramauskiene, Jelena Davidova, Ming-Jen Chuang

Sociology

THE ARCHITECTURE OF PARTICIPATION IN TRANSFORMATIVE SOCIAL INTERVENTION PROCESSES 119
Helena Neves Almeida, Pedro Vaz Serra

Informal Education as a Starting Point in Creating an Individual's Social Personality 123
Delia Elena RUSU, Elena Oana MAIDANIUC

Volunteering and social interactions towards self-development 127
Delia Elena RUSU

Other social sciences

Intelligent Optimization for Logistics 131
Gamze Guler, Utku Kose

Improvement of a Child with Down's Syndrome – Case Study. (The Approach of the Occupational and Speech Therapists.) 138
Jacek Szmalec, Ewa Binkuńska

History and Archaeology

Archaeological investigations in Montella: the excavation of the trench Z / 87 142
Assunta Campi

Healing aspects identified by archaeoacoustic techniques in Slovenia 147
Paolo Debertolis, Daniele Gullà

A procedure for identifying cellulose fibers in paper artifacts (Differentiating between flax, hemp and cotton) 156
Maja Kostadinovska, Zorica Jakovleska Spirovska, Travis Taylor

Remote fruition of material and non material goods (ICT for IV century BC necropolis) 163
Adriana Rossi, Emilia Carbone, Fausta Fiorillo

Other humanities

Sustainable Design in Fair Trade Shops (A project to increase the environmental awarness of consumers) 169
Silvia Barbero, Giada Rivella

Europeana and the European digital culture (An excursus on the debate, strategies and recent projects of Europeana portal with a focus on Italy) 176
Mara Giordano

eISSN: 1339-9071, cdISSN: 1339-3561

ISBN: 978-80-554-1234-4

Space and social structure (The spatiality of health facilities in developing countries) 182
Domenico Chizzoniti, Letizia Cattani, Monica Moscatelli, Luca Preis

Chemical sciences

Green synthesis of silver nanoparticles using plant extracts 188
Ana-Alexandra Sorescu, Alexandrina Nuţă, Rodica-Mariana Ion, Şuică-Bunghez Ioana-Raluca

Earth and related Environmental sciences

Comparative assessment on morphological composition of municipal solid waste (Comparison between morphological composition of municipal solid waste generated on the territory of municipalities from South-West and North-East Regions of Bulgaria) 194
Petar Petrov, Elena Georgieva, Stanimira Ivanova, Ekaterina Todorova

Computer architecture

Proposal of Information Communication Technology Architecture for People with Disability 197
Marko Periša, Rosana Elizabeta Sente, Luka Brletić

Intelligent systems

Intelligent Transport Systems in Europe with Reference to Serbia 203
Džemail Zornić, Dragan Radovanović, Denic Nebojsa

Civil engineering

Toward Occupational Safety and Health Management in Afghanistan's Construction Industry 209
Mehran Amiri, Mohammad Elyass Darvish, Mohammad Akbar Sarafrazi, Mohammad Jawad Hashemzadeh

Risk Assessment and Allocation in Conventional Construction Contracts of Afghanistan 214
Mehran Amiri, Mohammad Elyass Darvish, Mohammad Akbar Sarafrazi, Mohammad Jawad Hashemzadeh

The construction sector. Analysis of activity in Spain. 219
Esteban Fraile-Garcia, Javier Ferreiro-Cabello, Eduardo Martinez de Pison Ascacibar, Francisco Javier Marrodan Esparza

Direct electricity production from Avgas UL91 fuel 223
Paweł P. Włodarczyk, Barbara Włodarczyk

Other engineering

Assessment tools for disposable and long durability products 228
Eleonora Fiore, Silvia Barbero

Design for Sustainable Healthcare in a European context (A comparative analysis of Sustainable Healthcare and Design strategies in three European case studies.) 234
Amina Pereno, Paolo Tamborrini

Clinical medicine

The Impact of Psychosocial and Functional status on Quality of Life of Patients with some Skin Disorders 239
Filka Georgieva

Health sciences

Bell's palsy (Physical therapy and surface electromyography biofeedback) 243
Irina Karaganova, Stefka Mindova

Personal healthcare platform for chronic diseases with mobile self-management support 248
A. I. Petrenko, N. V. Roenko

Agriculture, Forestry, and Fisheries

The presence of Phytoseiids in some grape cultivars in Albania 254
Aris Huqi, Aurela Suparaku, Natasha Haka

DIAGNOSIS AND CONTROL OF PLUM POX VIRUS (PPV) ON PLUM AT THE DISTRICT OF TROPOJË, ALBANIA 258
Dhurata Shehu, Harallamb Paçe, Dritan Sadikaj, Ragip Elezaj

Powdery mildew, caused by Podosphaera pannosa, of some Peach and Nectarine varieties in Albania. 261
Hajredin Toca, Thanas Ruci

Other agricultural sciences

Importance and cultivation of spice pepper (Capsicum annum L.var. longum) in Slovakia 264
Marián Rehuš, Magdaléna Valšíková

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

Assessment tools for disposable and long durability products

Eleonora Fiore
Department of Architecture and Design
Politecnico di Torino
Turin, Italy
eleonora.fiore@polito.it

Silvia Barbero
Department of Architecture and Design
Politecnico di Torino
Turin, Italy
silvia.barbero@polito.it

Abstract—**The current market situation is characterized by planned obsolescence. It warns the need to design in a more efficiently way, by optimizing the recycle and disassembly operations and lowering the impact on the environment of all kind of products, from the easiest to the most complex ones. This paper focuses on short-lived and long durability products by analyzing them respectively according to the methodologies developed by the Observatory of EcoPack (OEP) and the Design by Components (DC) that share the same general framework and scenario. For disposable products, i.e. packaging, the analysis was carried out with a comparative analysis on components and communication, up to the definition of guidelines for a specific productive sector. Regarding the long durability goods, i.e. household appliances, the analysis is done according to the DC, in which the complex products are simplify to a function-essential structure. This is the starting point for a new design of complex goods focused on disassembly and maintenance. These two methodologies are able to provide useful tools for designing and innovating, through a scientific quali-quantitative analysis on products that are currently on the market.**

Keywords- disassembly, maintenance, components, packaging, household appliances, sustainability, ecodesign

I. INTRODUCTION

Product lifespans in industrialized societies have steadily declined over the past decade, leading products to a planned obsolescence, which makes them obsolete or inoperative before the end of usual lifetime. This trend has many negative implications including the increase of waste generation and the uncontrolled exploitation of natural resources. Different products require different hierarchies of their life extension and recycling strategies, based on the product features [1]. This study focuses on packaging and household appliances, which were included into two broader categories called respectively short-lived or disposal products and long durability products. To successfully design products in these two categories two different tools have been developed, by using a common framework with different design outcomes. In both of them there is a part of analysis on existing products [2] but they differ from the tools highlighted in previous studies [3] since they enable the designer to collect a several requirements that can be actively exploited in the design phase. As Lofthouse pointed out [3], designers need guidance, a tool that pulls together relevant ecodesign issues, making the process easier and quicker [4]. These tools help designers to ask the right questions and draw the guidelines they will use to design in an innovative way. Start making questions is a useful way to design, in order to decrease the distances between the designer and the products' users, placing the individual at the center of the design stage [5]. In contrast to other tools and programs, like LiDS wheel [6] and the EcoReDesign programme [7] the two tools presented in this paper give the designer the possibility to decide which aspects and questions consider and which ones are irrelevant to his/her work with the aid of a scientific methodology.

II. SHORT-LIVED OR DISPOSAL PRODUCTS

Among short-lived products, the packaging is the product-waste par excellence because of its extremely short life. At the same time, packaging design is one of the most challenging tasks for a designer, due to the number of variables involved. Packaging is indeed a functional and service element, halfway between an object and communication product. Although it has a very short useful life, it must be reliable and durable to ensure the content protection [8]. The need for eco-design solutions in the packaging field is evidenced by Italian data: in 2013 the production of packaging waste in Italy reached 8.7 million tons, which represents approximately 1/3 of the total volume of municipal solid waste (CONAI, General program of packaging prevention and management 2014).

A. *Methodology*

The Observatory of EcoPack (OEP) [9] was created in 2005 within the Department of Architecture and Design (DAD) and it combines scientific research with academic education, by investigating the environmental requirements of the packaging in the university investigation and in classroom in order to mix theory and practice [10]. The analysis carried out within the OEP leads to design new packaging starting from a market study of a specific productive sector and it includes both local products and foreign goods, mass market and niche products.

This tool includes a set of questions are grouped in 4 categories:

- Functionality
- Environmental sustainability
- Information
- Communication

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

These questions are summarized below. Functionality and environmental sustainability are addressed in Tab. 1; the information in Tab. 2; the communication elements in Tab. 3 and five communication functions [11] have been identified in Tab. 4.

TABLE I. FUNCTIONALITY AND ENVIRONMENTAL SUSTAINABILITY

Functionality	**1. Space optimization**	**2. Protection and preservation of the product**	**3. Practical use of the packaging**
	- *Does the shape make optimal use of the space in the transportation phase?* - *Does the shape make optimal use of the storage on the shelf?*	- *Does the packaging reliably protect and preserve the product in relation to its characteristics and requirements?*	- *How do you evaluate its affordances?* - *How do you evaluate its usability?* - *Is it easy to open, reseal and reuse?*
Environmental Sustainability	**4. Over-pack**	**5. Composition and materials**	**6. Weight and the volume compared to the product**
	- *Is it a primary packaging or it has an over-pack?* - *If there is an over-pack, does it have a practical function, or just an aesthetic or communicative one?* - *Is the packaging considered oversized compared to the content?*	- *What are the materials involved?* - *Are they heterogeneous?* - *Is there a clear indication of how to separate the different materials?* - *Are they easily separable or disposable?* - *What kinds of adhesives are used?*	- *Is the packaging volume proportional to the product one?* - *Is the packaging considered heavy compared to the content?*

TABLE II. INFORMATION

Information	**1. Information-communication ratio**	**2. Marks**
	- *How much surface of the packaging is intended to information?* - *How much surface is intended to communication?* - *How much surface is left free from information and communication (empty space)?*	- *What do the symbols printed on the packaging mean?* - *Are they environmental marks?* - *Are they referred to the producer or the product and its supply chain?* - *Are they referred to the packaging, its disassembly and separation or its disposal?*

TABLE III. COMMUNICATION ELEMENTS

Communication Elements	**1. Colours**	**2. Images**	**3. *Fonts***	**4. *Senses***
	- *What is the colour palette of the packaging?* - *How many colours are used?* - *What are their communicative functions?* - *Are the colours typical of that sector?* - *Is the comprehension favoured by the use of those colours?* - *Is the communication favoured by the use of those colours?*	- *What is the role of the images?* - *Are they in the foreground or in the background?* - *Are they dominant compared to the other communication elements?* - *Do they communicate the scenario that characterised the product?* - *Do they refer to other scenarios?*	- *Which fonts are used?* - *Are they serif, sans serif or script?* - *Is the comprehension favoured by the use of these fonts?* - *Do they properly highlight different information?*	- *Do the materials have a communicative role?* - *Are the sensorial, visual, tactile, auditory perceptions properly exploited? For what purpose?*

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

TABLE IV. COMMUNICATION FUNCTIONS

	1. **Appellative function**	2. **Identification function**	3. ***Evocative function***	4. ***Informative function***	5. **Prescriptive function**
Communication Functions	- *Does the packaging in the store stand out from the shelf? How?* - *Is it able to attract the attention of potential buyers? In which way?* - *Does it facilitate the selection and the purchase?*	- *Is the product immediately recognizable and distinguishable among the others?* - *Is it recognizable even in other sales and consumption contexts?* - *Is it recognizable in the domestic context?*	- *Is the packaging referred to the product's scenario and its origin?* - *Does it communicate the production or consumption contexts?* - *Does it communicate some values?* - *Does it raise awareness towards positive attitudes?*	- *Does the packaging convey content related to the product, the producer or the packaging itself?* - *Is the packaging able to provide clear and adequate information?*	- *Does the product communicate how to use it?* - *Does the pack require additional tools?*

At the end of the cataloguing phase the designers fill two comparative analyses on functional and communicational requirements, which highlight differences and similarities and provide the designer a rich picture of the product sector examined.

B. Results

This process leads to a quali-quantitative data collection, the definition of criteria on which to focus on in the design stage and the definition of the guidelines. In particular, this is the starting point for the packaging design aimed at environmental compatibility.

In this paper a packaging case study is provided to understand the implementation of the methodology explained. The case study was taken from regional funded project, EN.FA.SI. [12] developed by the design research group of Politecnico di Torino, which aims to improve the sustainable production of Cuneo Bean from farm to table. Among other results, the project led to the introduction of two types of dried beans characterized by low cooking times: precooked bean without preserving liquid and bean flakes. The role of packaging design in this project was fundamental, as it was the first means of communication and dissemination of the whole project. The methodology applied to it leads to the definition of some guidelines and the final packaging (Fig. 1) takes into account the long shelf life of these products, which need to maintain the integrity of them for about two years. A vacuum packed solution was chosen to optimize the space during the transport and storage and to protect the product that easily crumbles. The material is a polymeric heat welding laminated, which is justified by the long shelf life of the product and can be disposed of in the plastic collection. The communication is conveyed through a folded poster-label, which is joined to the packaging with glue dots. These adhesives can be easily removed, making the two parts completely separable. Waste separation is clarified on the label, as well as the message and the values of the project.

Figure 1. EN.FA.SI. PACKAGING

The interaction between functionality, environmental sustainability and communication ensures that designers identify the important issues to address in design stage, find cases studies to understand how other designers or companies addressed these needs, and then return to the project with specific product-focused information [3]. Thereby, it is possible to teach the value of objects over time, as opposed to the disposable concept, that characterized for a long time our consumption and behavioural habits [13].

III. LONG DURABILITY PRODUCTS

Household appliances are commonly regarded as mature products, whose basic technology and layout has not changed over the decades. For this reason their design will require to reach an intimate knowledge of how the product and its parts wear and tear, and of how to decide which parts should last, and which should be replaced [14]. Moreover, it is important to understand why and how people accept and accommodate ever-shorter product lifespans (the period from product acquisition to discarding of the product by the final owner). If on the one hand products with high use energy compared to embedded energy should be replaced frequently [15] [16] to

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

improve their energy efficiency, the appliances should allow upgradability and the replacement of some components, as a kind of refurbishment. Understanding how to optimize product lifespan from a sustainability perspective without compromising the product's economic viability is a challenging objective that every designer should perform and product life extension requires high level of design research. In the past decades a number of methods and tools were developed to assist design for remanufacturing, design for recycling, and design for end-of-life [17]. It may be worthwhile to consider developing tools on a very practical level, driving the designer through the process that he should be followed to approach the problem and then to design. As evidence of this, developments in legislation and regulation such as revisions of the Waste Electrical and Electronic Equipment (WEEE) and EcoDesign directives in the EU and the Electronic Product Environmental Assessment Tool (EPEAT) in the USA stressed the importance of design for end-of-life, product longevity and life cycle extension.

A. *Methodology*

The Design by Components (DC) is defined as "the design of all elements whose components are interrelated with each other and that make up the object system [18]". This approach means planning by following a few basic guidelines, such as:

- The disassembly of the parties;
- The design for equal lifetimes of the components or partial replacement in time of some of them;
- Simplification.

Designing by components means, then, designing objects made up of multiple parts to enable the technological upgrading of them, achieving uniform obsolescence of parts, avoiding aesthetic and not-functional outer casing and the developing customized products, which satisfy specific needs. Complex products should be investigated at the current state and then reduced into function-essential structures based on the tasks they must perform. The reduction of the number of parts and, therefore, the number of components, is advantageous in terms of recycling (larger pieces are more easily selected and, consequently, more easily reusable), of assembly and disassembly (by reducing the number of parts in order to make these operations convenient and easy to perform) and in terms of quality (it is proved that the quality decreases when the number of components increases) [18]. The possibility of making focused maintenance interventions or replacing the product for parts, helps to reduce the volume of waste for disposal and encourages their recycle [19]. Teaching designers about disassembly works best when designer can actually dissemble the products, in order to fully understand them. Starting from this analysis, it is defined the difficulty of disassembly of the individual components, the tools necessary to disassemble, types of joints, welds, the accessibility and the possibility of maintaining it (Fig. 2).

Subsequently components are analysed and they are grouped into functional groups (in this example they are: structure, interface, cooking group, gas pipeline and gas control, carter) with a specification of the role of the components, dimensions, weight and materials, technical characteristics (e.g. for engines). This provides a reliable overview on how products work and their usability. As in the previous case the analysis is conducted through questions used to encourage designers to think more holistically (Tab. 5).

This method provides the starting point for designing complex goods focused on disassembly, maintenance and, in general, with a lower environmental impact. It takes into account many variables, including the disassembly, maintenance, reduce, reuse and upgradeability phases. Finding best practice case studies may be useful to understand how other designers or companies addressed specific needs and eventually how environmental impacts can be minimized. The designer should be able to understand, through the analysis on case studies, how these products work, focusing on some aspects such as functions performed, innovative aspects and problems, resource use and consumption generated, in order to draw specific guidelines. Possibilities for refurbishing and upgrading, replacing of parts of the product will extend product useful life and, at the same time, help to decrease the volume of waste in landfills and to facilitate recycling. Thus, it is needed the identification of new projects that will lead to revision of the machining cycles, the simplification of the maintenance phase, and then to a rethinking of the processes of assembly and disassembly.

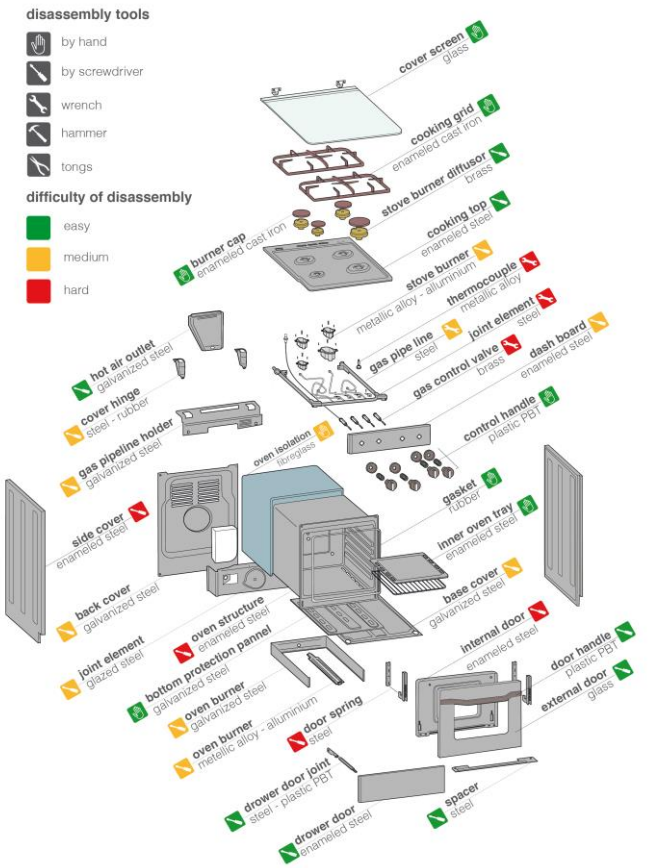

Figure 2. COOKER AND OVEN DISASSEMBLY

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

TABLE V. FUNCIONALITY

	1. Disassembling	2. Components	3. Maintenance and accessibility	4. Ergonomics and sense perception
Functionality	- *How do you evaluate the disassembly phase? Is it easy?* - *Who is going to disassemble it?* - *Is it possible to disassemble the component without breaking the object?* - *Which tools are needed to disassemble it?* - *Can the disassembly rely on specialist or common tools?* - *What type of joints, welds are there?* - *Are they reversible?*	- *Which function does this component perform?* - *Is it an electrical component?* - *What are its weight and dimensions? Does it quickly wear out?* - *Is it interchangeable or can be replaced?* - *Is it dominant compared to the other parts?* - *Which material is used for every component? Is it mono-material?* - *If there is more than one material, how are these materials held together?*	- *Is there the possibility of maintaining the product?* - *Does it require assistance to replace its parts?* - *Is it accessible in every part?* - *Is the accessibility guaranteed for each part?* - *Is it characterized by planned obsolescence?* - *What is its expected useful life?*	- *Is it usable by all types of users? What about children, disabled people?* - *Are there parts too high or too low to be reached?* - *Are the parts all visible?* - *Is it easy to understand how they work?* - *Are the interfaces clear?* - *Does the product produce unpleasant odours or noises? Always or sometimes?*

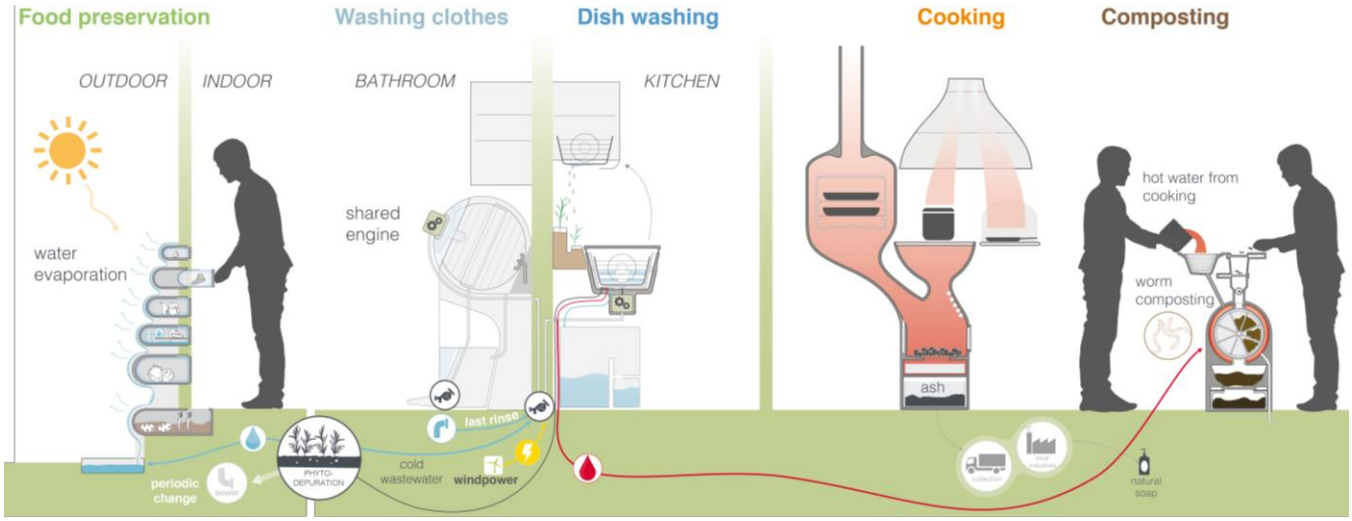

Figure 3. NEW HOUSEHOLD APPLIANCES' SYSTEM

B. Results

DC application lead to a material efficiency, a longer product life, the reparability, refurbishment, remanufacture and recycling of the products because products will be completely disassembled and implementable. This is the starting point to design product which are detached from actual ones and which should be focused on environmental sustainability. In this paper an example is provided to understand the implementation of the DC methodology (Fig. 3). The project "Ecodomestic Appliances" is the redesign of household system [19] with a strong territorial connotation. It follows a new interpretation of the functioning of the product, in which the components do not carry as much a single function, but rather cooperate together to accomplish main actions (washing, cooking, conserving and disposing).

IV. CONCLUSIONS

These two methodologies should provide a useful tool for design and innovate, through a careful quali-quantitative analysis on products that are currently on the market. They break away from a consolidated traditional product re-design by offering a change of mentality in the design of objects, totally detached from their commonly known shapes. The new forms thus arise directly from the functions to be performed and the needs underpinning by users, not from styling purposes.

These two methodologies (OEP and DC) follow the same general approach:

- Disassemble the existing products;
- Understand the critical aspects;

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

- Define some new guidelines to design innovative products.

Even if the two tools differ for specific questions and project outcomes, the general approach is comparable and it identifies a new framework for developing short-lived products and long durability goods.

The two tools developed in this paper provide content, which are closely related to design issues, according to culture of Industrial Design and take into account that a designer should have his/her own way of carrying out projects. Indeed the designer should be able to quickly assess the usefulness of the different pieces of information in relation to his/her current project, to draw his/her conclusions and convert them into design concepts. Regardless of the type of product (complex or simple, durable or perishable) the designer should use a scientific method that allows him/her to design in an innovative way. OEP and DC methodologies should inspire the designer, boost his/her confidence and support the concept development. These methodologies are continually updated as part of the on-going research carried out at Politecnico di Torino (Italy).

ACKNOWLEDGMENT

The research leading to these results was supervised by prof. Paolo Tamborrini and Silvia Barbero, with the collaboration of Amina Pereno, from Politecnico di Torino, Department of Architecture and Design. We thank the Systemic Design research group for the collaboration to these projects, especially to the coordinator prof. Luigi Bistagnino.

REFERENCES

[1] Wanga, F., Huismana, J., den Hollandera, M. (2014) Products that go round: exploring product life extension through design. Journal of Cleaner Production, 69 (2014) 10e16.

[2] Walker S. (1998) Experiments in sustainable product design. The Journal of Sustainable Product Design 1998;7:41e50.

[3] Lofthouse, V. (2006). Ecodesign tools for designers: defining the requirements. Journal of Cleaner Production, 14 (2006) 1386e1395.

[4] Sherwin C. (2000) Innovative Ecodesign e An Exploratory and Descriptive Study of Industrial Design Practice. Doctoral Thesis, Cranfield University.

[5] Germak, C. (2009). Man at the Centre of the Project. Design for a New Humanism. Allemenadi, Torino.

[6] Brezet, H., van Hemel C. (1997) Ecodesign: A promising approach to sustainable production and consumption. Paris: Rathenau Institute, TU Delft & UNEP .

[7] RMIT (1997) Introduction to EcoReDesign e improving the environmental performance of manufactured products. Royal Melbourne Institute of Tech.

[8] Bozzola M. Conscious design and packaging. Sustainability with paper and cartboard. In: Bozzola, M. (Ed.) (2011) easyEATING: Sustainable Paper Packaging for traditional products Per Produce. Dativo, Milan, pp. 14-19.

[9] Barbero, S., Tamborrini (2012) P. Observatory of Eco-Pack: Research and Teaching Exchange field. In: E.M. Formia (ed.) Innovation in design education. Theory, research and processes to and from a Latin perspective. Allemandi, Torino.

[10] Barbero, S., Pereno, A., & Tamborrini, P. (2011). Qualitative/quantitative cross analysis to design eco- pack. International Symposium on Sustainable Design - ANAIS, Editora Universitaria UFPE (BRA), International Symposium on Sustainable Design (ISSD) (pp. 105- 115), Federal University of Pernambuco, Recife, Brazil. 29-30 September 2011.

[11] Brunazzi, G., Parisi, S., Pereno, A. (2014). The Importance of Packaging Design for the Chemistry of Food Products. New York: Springer, pp. 92-105.

[12] Barbero, S., Tamborrini, P. (2012) Systemic Design in agroFood Sector: EN.FA.SI project. International Conference on Designing Food and Designing For Food, Metropolitan University, London, UK. 28-29.

[13] Tamborrini, P. (2009). Sustainable design – objects, systems and behaviour. Electa, Milano.

[14] Murakami, S., Oguchi, M., Tasaki, T., Daigo, I., Hashimoto, S., (2010). Lifespan of commodities, part 1. The creation of a database and its review. Journal of Industrial Ecology 14 (4), 598e612.

[15] Allwood, Julian M., Ashby, Michael F., Gutowski, Timothy G., Worrell, E., (2011). Material efficiency: a white paper. Resour. Conserv. Recycl. 55, 362e381.

[16] Van Nes, N., Cramer, J. (2006) Product lifetime optimization: a challenging strategy towards more sustainable consumption patterns. Journal of Cleaner Production,14, 1307e1318.

[17] Rose, C. M., (2000). Design for Environment: A Method for Formulating Product End-of-life Strategies (Dissertation). Stanford University, Department of Mechanical Engineering.

[18] Bistagnino L., (2008). The outside shell seen from the inside. CEA, Milano.

[19] Fiore, E., Tamborrini, P. (2014) Territorial tool for designers and professionals. 5th International Forum of Design as a Process, Advanced Design Cultures, Monterrey, Guadalajara, Mexico, 18-20 September, 2014.

eISSN: 1339-9071, cdISSN: 1339-3561
ISBN: 978-80-554-1234-4

ScieConf
SCIENTIFIC CONFERENCE

PARTNERS

Publishing Society
Slovak Republic

VTP Žilina

Science & Technology Park Zilina
Slovak Republic

the-science.com

www.The-Science.com

PUBLISHER

EDIS
Publishing Institution of the University of Zilina
Univerzitná 1
01026 Žilina
Slovak Republic

EDITORS

Ing. Michal Mokryš
Ing. Štefan Badura, Ph.D.

ISBN 978-80-554-1234-4
cdISSN 1339-3561
eISSN 1339-9071

© Publishing Society, Univerzitná 8498/25, 010 08 Žilina, Slovakia. All rights reserved