

DESIGN INTERNATIONAL SERIES

Direction: Silvia Piardi

Scientific Board:

**Alessandro Biamonti, Ezio Manzini, Carlo Martino,
Francesca Tosi, Mario Piazza, Promil Pande**

Over the last few years the international design research network has become an important reality, which has facilitated the sharing of ideas and opinions, improved understanding of the subject and increased awareness of the potential of design in various socio-geographical contexts.

The current expansion of the educational network allows teachers, students, researchers and professionals to meet, both online and in person.

It would seem therefore that the time is now right to propose a new series of books on design, contributing the construction of the international design community, helping authors bring their work onto the world scene.

The Design International series is thus born as a cultural setting for the sharing of ideas and experiences from the different fields of design, a place in which you can discover the wealth and variety of design research, where different hypotheses and different answers present themselves, in an attempt to draw up a map of Italian design, though in a continuous comparison with the world scene.

Different areas of design will be investigated, such as for example: fashion, interior design, graphic design, communication design, product and industrial design, service and social innovation design, interaction design and emotional design.

Books published in this series are selected by the Scientific Board and submitted to two referees for peer-review.



Il presente volume è pubblicato in open access, ossia il file dell'intero lavoro è liberamente scaricabile dalla piattaforma **FrancoAngeli Open Access** (<http://bit.ly/francoangeli-oa>).

FrancoAngeli Open Access è la piattaforma per pubblicare articoli e monografie, rispettando gli standard etici e qualitativi e la messa a disposizione dei contenuti ad accesso aperto. Oltre a garantire il deposito nei maggiori archivi e repository internazionali OA, la sua integrazione con tutto il ricco catalogo di riviste e collane FrancoAngeli massimizza la visibilità, favorisce facilità di ricerca per l'utente e possibilità di impatto per l'autore.

Per saperne di più:

http://www.francoangeli.it/come_publicare/publicare_19.asp

I lettori che desiderano informarsi sui libri e le riviste da noi pubblicati possono consultare il nostro sito Internet: www.francoangeli.it e iscriversi nella home page al servizio "Informatemi" per ricevere via e-mail le segnalazioni delle novità.

DESIGN RESEARCH IN THE DIGITAL ERA

Opportunities and implications
Notes on Doctoral Research in Design 2020



edited by Lucia Rampino and Ilaria Mariani

D. | . **FRANCOANGELI** OPEN  ACCESS
DESIGN INTERNATIONAL

ISBN: 9788891799913

ISBN e-book Open Access: 9788835100317

Cover by: Ilaria Mariani

Copyright © 2020 by FrancoAngeli s.r.l., Milano, Italy.

This work, and each part thereof, is protected by copyright law and is published in this digital version under the license *Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)*

By downloading this work, the User accepts all the conditions of the license agreement for the work as stated and set out on the website

<https://creativecommons.org/licenses/by-nc-nd/4.0/>

Printed by Logo srl, sede legale: Via Marco Polo 8, 35010 Borgoricco (Pd).

Contents

**Designing in an era of transformation
comes with responsibility**

Lucia Rampino and Ilaria Mariani

pag. 9

Human-centered Design Practice

**Human Resource Design.
Steering human-centred innovation
within private organizations**

Martina Rossi

» 23

**Designing for Ambient UX:
Design Framework for Managing User
Experience within Cyber-Physical Systems**

Milica Pavlovic

» 39

**Design For Intercultural Experience:
A Design Framework within User
Experience Approach**

Shushu He

» 55

Digital Transformation

Creativity 4.0. A method to explore the influences of the digital transition on human creativity within the design process

Carmen Bruno

pag. 75

**Toward a Yacht Design 4.0.
How the new manufacturing models and digital technologies [could] affect yacht design practices**

Arianna Bionda

» 91

**Displaying open cultural collections.
Interface characteristics for effective cultural content aggregators**

Giovanni Profeta

» 107

**From Adriano Olivetti's project:
Eduardo Vittoria. Research, drawing and design. New methods of representation to enhance modern architecture**

Sara Conte

» 125

Ethics and social awareness

**Personal Interaction Design.
Introducing into the Design Process the Discussion on the Consequences of the Use of Personal Information**

Laura Varisco

» 143

**Delaying Obsolescence in Digital Products.
Interdisciplinary Research through
Emotionally Durable Design and Well-Being
in the Z Generation**

Mario de Liguori

pag. 163

Design for Sustainability in Fashion

Trinh Bui and Alba Cappellieri

» 183

Ethics and social awareness

Delaying Obsolescence in Digital Products. Interdisciplinary Research through Emotionally Durable Design and Well-Being in the Z Generation

Mario de Liguori

Department of Design, Politecnico di Milano

Abstract

Does planned obsolescence of products affect people's happiness? Does having a long-term relationship with things improve our wellbeing?

This study positions itself in the Life Cycle Design literature, addressing the human environmental footprint, from the Psychological point of view. Focusing on electronic goods, particularly smartphones, as a case study, it investigates whether longer lasting emotions towards objects, can improve the psychological well-being of people. In doing so, it supports those Circular Economy strategies and Business models, aimed at slowing down the frantic loop of production and consumption of material goods.

This chapter presents the main principles of Emotionally Durable Design theory by relating it to Positive Psychology – a discipline focused on the pursuit of well-being. It seeks to synthesise a broader, empirical study based on a sample of about 1.300 young people, mostly belonging to the Z generation. The chapter briefly shows the original methodology designed for this study, previews the huge amount of data, and provides just the main results – the interpretation of which deserves to be deepened during future years of study.

Introduction

This chapter is an overview of a wider three-year theoretical research program which culminated in an experimental investigation.

The exploration covers areas which are apparently distant, including environmental sustainability design and research on Psychological well-being, which are then compared.

The research supports the theory of Emotionally Durable Design (Chapman, 2005). It takes as a model a milestone of psychological studies on the “meaning of objects” (Csikszentmihalyi and Halton, 1981), and embraces theories and methods of Positive Psychology (Csikszentmihalyi and Seligman, 2000), and adapts them to their purposes during empirical research. The study supports the reasons for a slower and more balanced idea of development, in harmony with the cycles of nature and humanity, to the benefit of the environment and people. The most important challenge is ensuring that this change of pace considers the legitimate economic interests of producers.

Smartphones as WEEE

The study focuses on WEEE¹, waste electrical and electronic equipment, which by its nature undergoes ever-faster technological obsolescence, using the smartphone, a symbol of our age, as a case study.

The 2002 directive governs the disposal of this type of waste, encouraging the collection and recycling of components. The regulation covers large and small household appliances, from washing machines to toasters and products such as TVs and computers in addition to all those products that use electricity and electronic components. The production, use and disposal of such components have a negative impact on the environment. The new WEEE directive (19/EU of 2012) applies to other types of previously excluded equipment, such as smartphones, which at the time of the first regulation did not exist. Therefore, we need to consider the speed with which the electronics market creates and discontinues new products.

Since 14 August 2018, products that use technologies related to electricity and electronics, including future products, will be subject to the regulation, regardless of their type, but excluding certain categories of professional items used by public utilities.

The WEEE debate concerns more and more not only large household appliances, but also small devices such as smartphones, which by their nature undergo rapid obsolescence more than others. This can be driven by market interests or unstoppable and increasingly pressing technological innovation.

Extending the life cycle of a smartphone, even for a few months, has an enormously positive impact on the environment (Chapman, 2014).

¹ The acronym WEEE stands for Waste Electrical and Electronic Equipment.

In a Skype interview granted to me on 04/04/2019, Prof. J. Chapman² stated:

[...] the aim is not to make products last forever! The aim is to design products that last longer! So, if you have a smartphone that lasts 12 months, then you can find a way to make it last 18 months. That would be a very significant change!

It is estimated that seven billion mobile phones have been sold worldwide in 10 years; in China 95 percent of people own one, in America and Europe the figure is 91 percent (Kantar Worldpanel, 2017; Greenpeace, Jardim, 2017). Not everyone knows the devastating effect of the rapid production and disposal of a smartphone.

A smartphone weighs a few grams, but the extraction of the precious materials it contains requires the excavation of at least 30 kg of rock.

A Remedia study³ conducted in partnership with Politecnico di Milano (Masi, Cristiani, Dotelli, Iannicielli Zubiani, Sciuto, Azzone and Bengo, 2012) found that a single smartphone contains more than 60 valuable raw materials of which many are potentially poisonous.⁴

Multiplying by the seven billion smartphones sold worldwide in the last decade (more than 35 million sold in a year in Italy alone), we understand the extent of this huge source of pollution.

Emotionally Durable Design

In literature, many studies have focused on theories which support product life extension as a strategy for environmental sustainability, based on the product's physical, functional, performance, economic and technological duration (Sanderson and Uzumeri, 1997; Lounis *et al.*, 1998; Rose, 2000; Horie 2004; Sundin and Bras 2005; Rüdener and Gensch, 2005; Lindahl *et al.*, 2006; Cooper 1994-2005; VHK, 2011).

There are fewer and more recent studies which defined the goods' durability by observing the cultural, psychological and semantic aspects that lead

² Formerly professor of design for sustainability at Brighton University (UK), Jonathan Chapman is now full professor in Transition Design at Carnegie Mellon University in Pittsburgh, Pennsylvania (US), where he is Director of Doctoral Studies in the School of Design.

³ Consortium in charge of Italian WEEE disposal.

⁴ On average: nine grams copper, 11 grams iron, 250 mg silver, 24 mg gold, nine mg palladium, a gram of rare earth (Praseodymium, Neodymium, Cerio, Lanthanum, Samarium, Terbium, Dysprosium) and other precious metals such as Cadmium, Cobalt and Ruthenium.

the user to establish a more lasting bond with goods (van Hinte 1997; Kos-tecki 1998; Takada *et al.*, 1999; Lyndhurst, 2011; Gnanapragasam, Cooper, Cole and Oguchi 2017).

Prof. Chapman stands out as an author who, more than others, has put this principle into practice in design literature. He links the importance of products' psychological and emotional durability to the environmental issue, and has devoted much of his studies to defining the Emotionally Durable Design (2005, 2008, 2015) concept.

Landfills are full of physically intact and functional products, especially electronics. Their obsolescence is induced by logics of incremental technological innovation, which do not add substantial value to the user experience, prompting them to replace still efficient products before their time. This replacement is due to a market logic, based on the planned obsolescence business model (London, 1932) – a worn out and uncivilised system which is fatal for humans and the environment. Although this model was legitimately created to remedy the socio-economic damage of the 1929 economic crisis, it cannot and must not represent a dominant economic model today.

According to Chapman's theoretical framework, the product life extension must take into account the design of emotions. Therefore, it is a concept of durability that is independent from the product's physical resistance and function, and therefore its technical or technological capacity to last over time. According to Chapman, product durability must focus more on the emotional point of view, and the degree of long-term user attachment. Chapman summarises this theory into a "Six Point Experiential Framework", subsequently reworked (Haines-Gadd *et al.*, 2018). It originally represented (2005) an attempt to provide an operational tool, which makes the concept of emotional durability applicable through six types of interaction between user and object:

Narrative, Detachment, Surface, Attachment, Fiction, Consciousness.

Such a theoretical construct represents not only an academic study subject, but has also been used to draw up the British government waste management policies. It has become the subject of attention and research by important companies in different sectors, such as Puma, Philips, and Sony, just to mention three well-known brand names.

Chapman's thesis on Emotionally Durable Design reinterprets and expands, in an original and unprecedented way, some concepts already expressed by other authors (Papanek, 1992; van Hinte, 1997; Desmet, 2002; van Krieken, Desmet and Mason 2012; Kwan, 2012; Weidman and Dunn, 2016).

The originality of this theoretical construct lies in its ability to relate (fig. 1) design for sustainability, and life cycle design (LCD) to emotional design (Norman, 2003;). The emotional design theme by itself could potential-

ly conflict with the principle of sustainability, stimulating compulsive and insignificant purchases dictated by enthusiasm, due to temporary emotions, exploited by marketing. This happens especially today, where the market of emotions, which are reduced to commodities (Cabanas and Illouz, 2019), exploits the internet immediacy, encouraging “easy” click-enabled purchases (Pani and Biolcati, 2006).

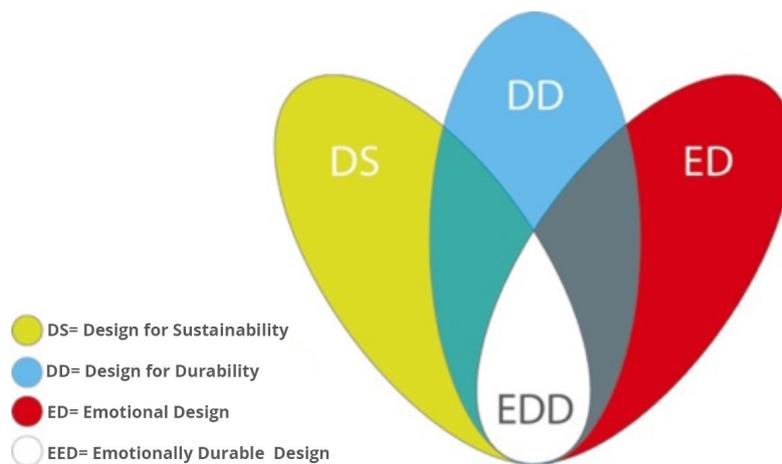


Fig. 1 – Positioning Emotionally Durable Design.

Making Product Durability Economically Desirable

Many companies do not take kindly to the idea of extending products’ useful life, as they fear losing sales volumes. Mistrust and prejudice towards more durable products are also shown by some consumers, which are fearful of forsaking the latest technological product.

The design books contain legendary objects and status symbols that are not always a commercial success. This has reinforced a prejudice among manufacturers, who do not necessarily associate the idea of a durable and well-designed product with one which is economically viable. Several economics studies prove the opposite and investigate the effectiveness, and commercial success, of durable design products. These include “Business Classics” (Sanderson and Uzumeri, 1997) which are aesthetically durable products that are style icons, but last on the market and generate profits for a long time. A typical case in the automotive industry was the Fiat Panda designed by Giugiaro (Marchesi, 2005; Verganti, 2009).

A speed-based production and organisational model is not necessarily a gain for the company. Preferring continuous product replacement, can sometimes prove disastrous, and not only for society or the environment, but manufacturers' economic and financial interests. This phenomenon is well known in economic literature as an "acceleration trap" (Von Braun, 1990) and shows that competition based on a faster time-to-market damages the market itself. Production acceleration leads to a short-term gain, thanks to the sale of more goods, but ends up irremediably weighing on the organisational processes to the point of becoming unmanageable and unprofitable. In the medium-long term it risks direct negative effects on the company's turnover (Bruch and Menges, 2010).

The product life extension attractiveness from the consumer's point of view, and the business potential for manufacturers of durable goods, is supported by research (Eurobarometer, 2014), which shows that 77 percent of European citizens would rather repair their products than buy new ones, if they could choose. Ninety percent of respondents would like stores to put an expiry date on non-food products, such as computers or appliances.

According to the same statistical surveys, young people seem more inclined to use refurbished or second-hand products. Here are some figures: 84 percent of young people between 15 and 24, against 54 percent of adults.

The environmental cost of products with an ever-shorter life cycle is high, for the environment, consumers and companies. Consumers are forced to increasingly replace their devices, at ever higher prices, to meet the producers' interests. Companies are forced by governments to comply with updated environmental standards, which are increasingly stringent and vexatious (Chapman, 2005). These costs end up weighing on the consumer.

Making a circular economy, which is financially sustainable for companies, means activating a systemic design strategy, using complementary design solutions that work together, such as design for long lasting products (or design for durability), disassembling, reparability, upgradability, modularity and so on. These should be combined with legislative incentives, servitisation strategies and business models, capable of transforming profit logic (traditionally based on the sale of products) into the sale and management of new services related to longer-lasting products (which are more repairable, upgradeable and customisable). In this case, product and components' end of life would also follow a more controlled, efficient disposal process, reducing the environmental impact.

The product life extension in a traditional and linear economy based on product sale probably does not work but, used in a service-based system, it can represent a strong strategic and competitive value for companies and also a

new business opportunity. Such a logic, which is based on more durable products and service provision, would give consumers greater savings and choice. It would give them more customisable products, which can provide a more individual, lasting and exclusive emotional user relationship, despite commodification that makes products, especially electronics, identical to each other.

Well-being in Developed Countries

Investigating the effects of product life extension on user well-being was fundamental to understanding what well-being really was in industrially advanced countries, and how to measure it. We could summarise this by saying that happiness, even before material wealth, is 50 percent ascribed to genetic factors and, 50 percent to environmental factors, mostly linked to our behaviour (40 percent) and only a small part (10 percent) to accidental events and factors beyond our control (fig. 2).

To back these theses, there are known and accredited psychological studies (Seligman, 2011) which were supported by previous scientific evidence (Iacono and McGue, 2002).

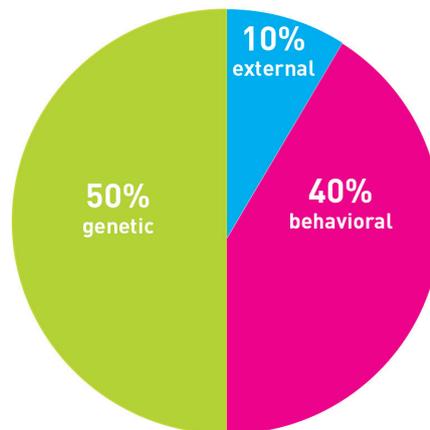


Fig. 2 – Diagram summarising the data cited by M. Seligman (2011), attributable to the same data published by the Minnesota Twin Family Study (2002).

Today, we still insist on measuring countries' well-being based on their degree of technological advancement and their ability to produce and consume, using a one-dimensional development logic – as if industrialisation and technology were a guarantee of happiness and well-being.

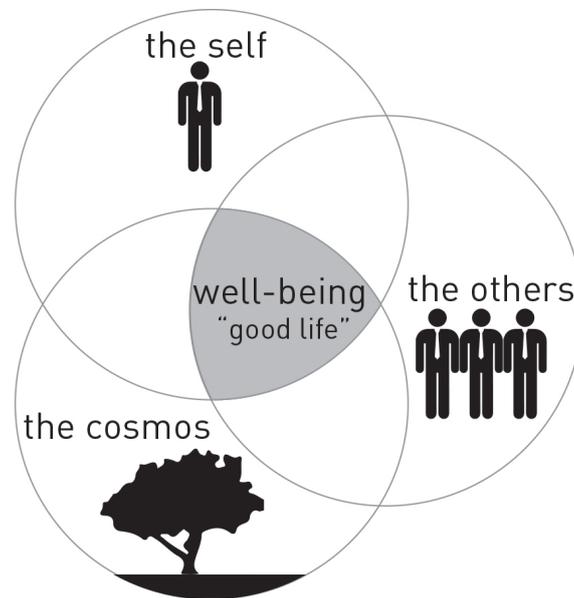


Fig. 3 – Author’s illustration “The good life Beyond the self.”

Although several recent alternative indicators have been suggested⁵ almost 90 years after its introduction, the measurement of the well-being of nations is still sadly done through GDP calculation (Kuznet, 1934). This means we use a quantitative indicator to measure a qualitative aspect such as “well-being.” Well-being is a holistic, polymorphic, systemic and complex entity, just like the environmental sustainability issue. It is due to the interaction of several factors, which are not always material or related to a single reason. Individual well-being cannot practically exist, except in connection to natural and social well-being.

The investigation of many psychological studies, particularly those about how objects and materialism affect our well-being (Csikszentmihalyi and Halton, 1981; Inghilleri, 2003) confirm that the life quality of the individual transcends the self’s egoistic dimension. There can be no self-happiness without a good relationship between the person’s social, environmental and broader cosmic interactions (fig. 3).

The experience economy (Pine and Gilmore, 1999) and Maslow’s hier-

⁵ For example, the OECD Life Index, or BES in Italy by CNEL/ISTAT, ISEW, HDI (Human Development Index) used by the UN, GNH or FIL, HPI and many others. For further information see Rinaldi and Zelli (2014). *Misurare il benessere. La sfida degli indicatori alternativi al PIL*. Roma: Donzelli Ed.

archy of needs (1954), show how much the industrially advanced countries have already met their primary needs. This shifts the search for well-being to a more metaphysical and “superstructural” dimension – the psychological. The search for well-being today works in the sphere of mental needs, linked to a meaningful, cognitive and emotional dimension, rather than a purely material dimension.

Well-being as good relations with others

Well-being is now linked to intangible and behavioural factors and was highlighted in the well-known *Grant Study* (1948-2018), of the Massachusetts General Hospital in Boston, which lasted about 80 years. This study proved that life quality, or well-being, was inextricably linked to interpersonal relationship quality, rather than other material factors. The emotions that come from love and friendship help us live longer, healthier and happier.

According to another study (Sandstrom and Dunn, 2014), this evidence is not only about strong ties with our friends, relatives, parents or partners, but includes “weaker” ties, such as impromptu relationships established with unknown transient people. These behavioural and environmental factors linked to relational life, seem stronger than genetic factors, in influencing the life quality and duration of surveyed subjects.

According to the *Grant Study*, loneliness kills more than alcohol, cigarettes or any other disease.

A mental issue

According to the World Health Organisation (2017), anxiety is the worst disease of our century; 3.6 percent of the world’s population, in the so-called rich countries, suffer from anxiety disorders, and this percentage increases dramatically every year. Depression is expected to be the second biggest cause of disability in 2020.

It has long been known that “[...] the depression rate is related to modernisation [...]” (Nesse and Williams, 1994).

Treatment of psychological well-being is a crucial issue in the so-called “rich” countries. This is economically relevant to State budgets, since 340 million people suffer from depression worldwide and its cost, in Europe, is about 92 billion Euro annually (Epidemiology of Mental Disorders [ES-EMeD], 2004).

Material Well-being and Wealth

Money won't bring you happiness is a cliché which is sometimes mocked in its apparent naivety, but it is now scientifically proven.

The American economist Irving Fisher (1906) already realised that economic well-being depends mainly on the psychological enjoyment of life, and not only on available goods.

Another economist (Easterlin, 1974) explained a similar idea when he described the relationship between happiness and wealth as a paradox. An inverted "U" (fig. 4) where wealth – a source of well-being at its first stage, often ends up becoming a source of discomfort when it exceeds a certain limit.

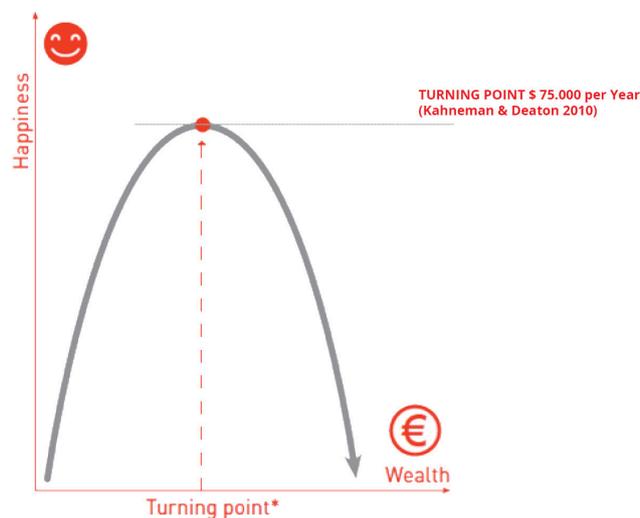


Fig. 4 – Easterlin paradox.

Some scholars (Kahneman and Deaton, 2010) have recently engaged in experimental research to assess the exact economic threshold of this limit. They rate at \$ 75,000 per year of revenue the figure beyond which material wealth would start becoming a threat, and no longer a well-being functional tool.

Even if we do not want to believe such an extreme theory, we must admit that a life built only around material wealth often generates unease and complexity that cannot be reconciled with an idea of complete well-being. Wealth can trigger interpersonal relationships which are not always genuine, and often entails a burden of responsibility and anxiety linked to the management of assets and related interests.

While not harmful in itself, materialism can become destructive based on the mistaken meaning we give it.

This thesis does not demonise, but rather exalts, the materialist value and meaning in our lives, according to a principle of “instrumental materialism” (Csikszentmihalyi and Halton, 1981). A materialism that is functional to well-being, contributing to a use and consumption of goods that are more “meaningful”.

Material objects can be symbols that unite (e.g. religious symbols), or diabolical⁶ tools, that separate people, creating conflicts. Wars over possessions are one example.

Methodology

Fig. 5 shows the research’s extreme thematic synthesis and how it evolved into a more experimental phase in the field.

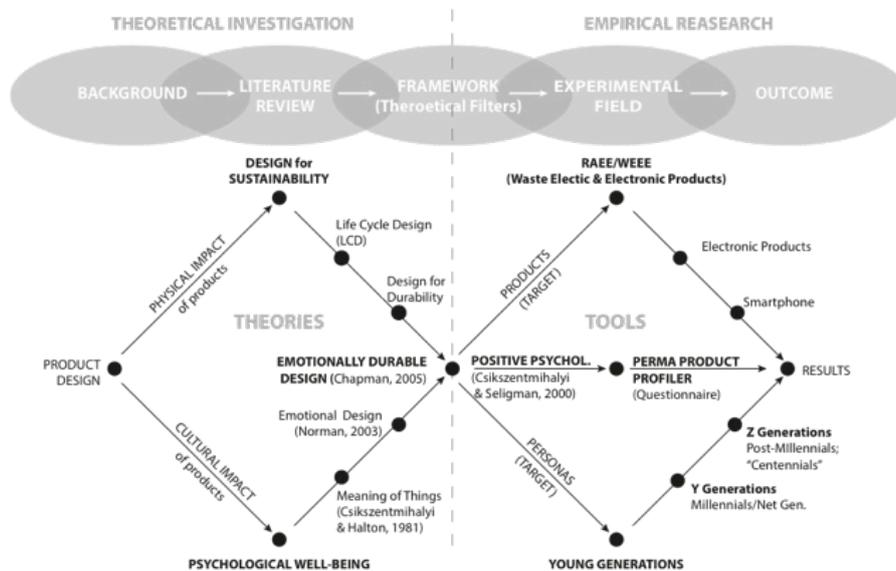


Fig. 5 – Research methodology.

⁶ See the etymology of the Greek words: “Symbolic” from σῦμ- (sym-), “together” plus the verb βάλλω (ballo) “throw”, which means “to unite”, and “diabolic”, διαβάλλω (diaballo) from which the modern term «devil», the one who «divides» par excellence.

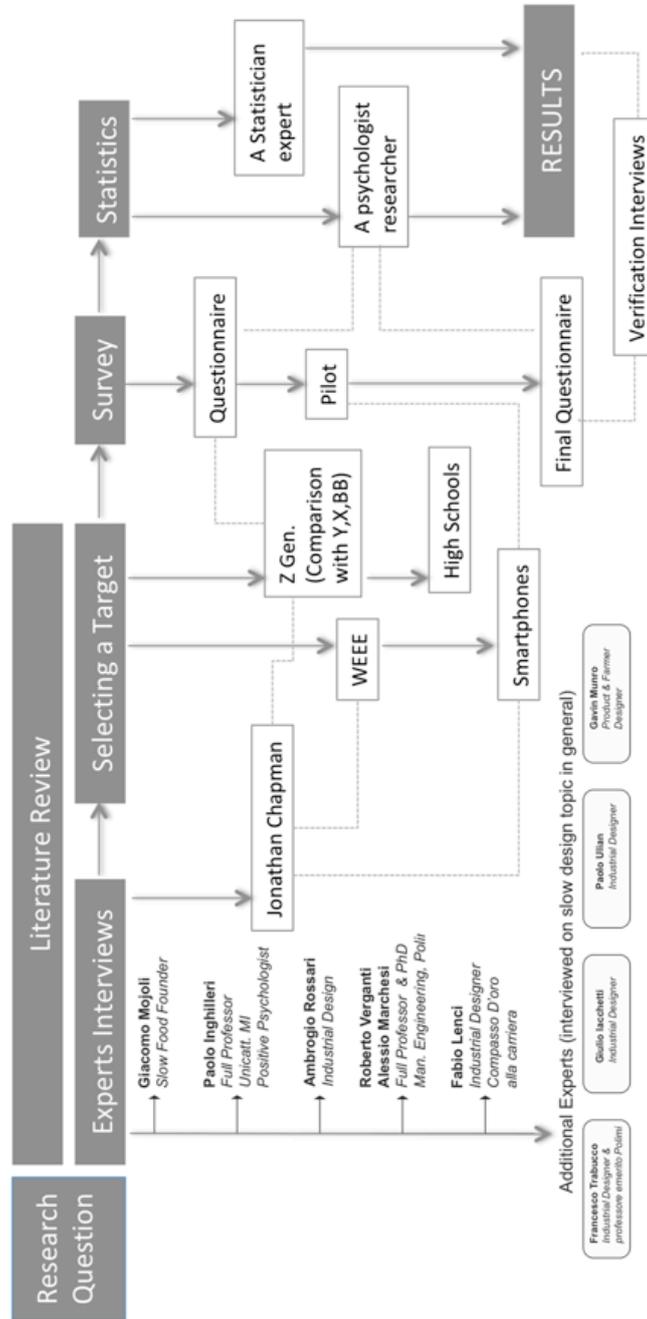


Fig. 6 – The research’s experimental phase and the tools used.

Referring more specifically to the tools, a second diagram (fig. 6) details the research's experimental phase and the tools used. It included expert interviews, which were fundamental to the formulation of the final survey on the enlarged user sample.

After a phase of investigation through pilot tests, empirical research was condensed into a survey of 1338 people, of which 676 were in Lombardy and 662 throughout Italy. Excluding 41 unreliable answers, 1297 subjects were analysed using a statistical method, about 80 percent were school aged, between 14 and 26 years old. The survey's objective was to study the relationship between the duration of the user-object bond, and the well-being that derives from it for the individual. It looked at the connections and the effects that this duration has, or could have, on the user psychology.

After a careful examination of the psychometric scales⁷ historically used by psychology to measure well-being, the research chose the Martin Seligman PERMA model (2011), as an interpretative filter. This was adjusted and interpreted for research purposes, by creating a tool dubbed Perma Product Profiler (PPP), for the measurement of object-induced well-being.

Seligman's PERMA model does not really represent a scale of measurement immediately applicable in field research, but it is a broader theory, developed as part of Positive Psychology, of which Seligman is one of the founders with Mihaly Csikszentmihalyi (2000).

This thesis is added to the work of other authors (Kern, 2014; Butler and Kern, 2016; Kun, Balogh, Krasz, 2017) who used the PERMA model to obtain independent scales of measurement, which are applicable at an experimental level, in a specific context.

PPP provides 30 questions (items) divided into five modules, corresponding to the five variables of Seligman's theoretical construct which include: *Positive Emotion (P)*, *Engagement (E)*, *Relationship (R)*, *Meaning (M)* and *Accomplishment (A)*. For Seligman, these variables constitute the five ingredients of the "good life" (Inghilleri, 2003) and psychological well-being that our society needs. PPP is structured according to the Likert method (1932), subjecting the respondent to six degrees of agreement or disagreement for each item/question.

The survey does not end with PPP, but includes interviews and other questions to collect information about the socio-demographics, family relation-

⁷ We only mention the main ones here: State Trait Anxiety Inventory (Spielberger, Gorsuch and Lushene, 1964) and related distinction between state and trait anxiety (Cattle, 1966); Manifest Anxiety Scale (Taylor, 1953), Hamilton's Rating Scale for Anxiety (HRSA or HAM-A)(1959); Zuckerman's Multiple Affect Adjective Check List (1960); Ryff (Ryff, 1998; Ruini *et al.* 2003) better known as Psychological Well-being Scales (PWS).

ships, the sample's objects of affection, intensity of the bond with the object, its duration, meaning/reason and type of relationship with the smartphone.

The questionnaires were provided using Google Form, and the answers were entered in spreadsheets (Excel).

The amount of data resulting from the approximately 1300 questionnaires was subsequently processed through the main statistical analysis standards and led to mostly unpublished and unexpected results.

Fourteen product categories were identified among the products preferred by the sample. These and the other answers were numerically interpreted to aid calculation. This involved the help of two expert statistics researchers to give the data collected the most reliable interpretation.

Microsoft SPSS version 23 software processed the data. The data analysis was expressed as an average value \pm SEM or as median and interquartile, where necessary.

The relationship and comparison between two data groups were carried out using contingency tables and evaluated using Spearman's non-parametric test. The relationship and comparison between several data groups was then carried out with ANOVA. The correlation between groups of variables was evaluated by calculating Pearson's correlation index.

Where necessary, the questions' predictive value was carried out using Cronbach's Alpha test.

Results and Discussion

This paragraph does not report the full research data. The amount of data collected is so large that it cannot be easily summarised in the space granted by this publication. Many of the results deserve a more in-depth analysis and further interpretation before they are published. We will provide only a summary to give an idea of the nature and potential of the work.

What are the most popular objects for the younger generations?

The smartphone was absolutely the most voted object in the sample, with 499 people out of 1297, but it was young people who voted for it the most. As age increases, the value drops, until it occupies the penultimate place for the Baby Boomers (the oldest group of the interviewed sample).

What is the duration of this bond?

The bond with the smartphone is the most frequently stated but also the least lasting. The sample possessed it for less time and didn't plan to keep it as long as other objects. The preservation over time of objects increased with age and women bonded to their objects longer than men.

What is the meaning of this bond?

It is interesting to note that the function that makes the smartphone the object preferred by the sample, changed profoundly based on age. The reason, and the meaning, for using a smartphone was almost the opposite between young people and adults. Young people said they used it mostly for games and social media, while adults for information, study, work and knowledge.

Ratio between product durability and well-being: the longer you keep your objects, the more well-being you get

The sample was asked, without explaining the reasons, how long they owned their favourite object, and for how long they were planning to keep it, if they could choose. The aim was then to relate the duration to the well-being induced by the product. The answers confirmed the initial assumption that there was a strong correlation between well-being and duration of the emotional relationship with the object.

This correlation, in the statistical analysis, was measured by the Pearson coefficient (R), and proved to be significant and causal. The longer the user-object relationship lasted, the more well-being it created and vice versa. The well-being score (measured using PPP) was significantly higher in durable objects. This is true for the possession duration (R=0.07; P=0.009) as well as for the estimated duration (R=0.32; P=0.0001).

Of the 14 object categories, those which induced the most well-being on average percentage value are objects related to sport, play and leisure. Video-photo cameras were in second place and then other objects related to memory – which confirms the importance of objects as a memory tool. The products that induce less well-being (lower PPP) are smartphones, followed by consoles and video games.

Conclusions

The research results confirmed that a link established by users with digital technology products was weak and had little meaning. Despite the smartphone being the Z generation's preferred object in the survey, its emotional aspect is minimal. The link with this type of object seems to be motivated by temporary and functional factors, to the detriment of other emotional reasons. The technological-digital product does not seem to generate user-affection nor acquire meanings that are comparable in duration, intensity and meaning to those embodied by other “analogical” objects identified by the survey. The link with the physical, material, and aesthetic dimension of the electronic product seems to disappear and was confined to the initial phases, i.e. the product purchase and first use.

If these results may appear obvious, the blind test data shows that the link is not only temporary but brings the lowest user well-being and psychological satisfaction. Strong signs are evident from the research. One of these is the identification of mobile phone covers (fig. 7) as an important emotional compensation tool for young people. This is a sort of remedy that compensates for the emotional shortcomings of cold digital technology and humanises it. It gives the phone more meaning and new missing psychological functions that allow a more emotionally meaningful and individualised relationship with the object.

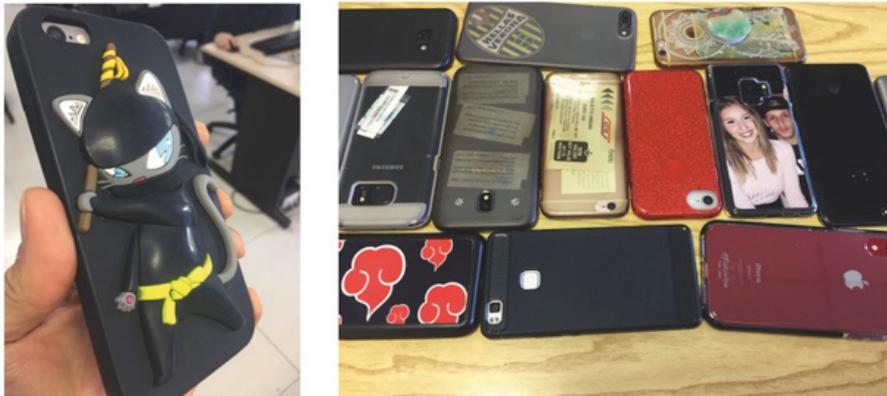


Fig. 7 – Mobile phone covers: an important emotional compensation tool for young people.

Research Contribution

This research is a contribution to the studies on the meaning of objects, using unpublished results on the relationship between young people and material objects. Using experimental data, a strong correlation between the bond duration with objects and the user's psychological well-being was demonstrated. The study confirmed the centrality of product durability among the new circular economy's strategies. In demonstrating the positive effects of long lasting products on the user experience, it makes them more attractive for consumers and also for companies oriented towards customer satisfaction.

The thesis provided a methodological contribution by suggesting and testing a new psychometric scale (PPP), which was specifically designed to measure the relationship between product durability and well-being.

Generally, and despite its technical limitations, the thesis has the value of having experimented with a multidisciplinary approach which answered the research question and generated unexpected data and information worthy of further study, even in areas other than design.

References

- Arguin, C. (2009). *Emotional durability is the new sustainability. Why are objects cherished even after their functionality's been surpassed*. Northumbria University, Newcastle, UK.
- Baldé, C. P., Forti, V., Gray, V., Kuehr, R., and Stegmann, P. (2017). *The Global E-waste Monitor 2017. Quantities, Flows, and Resources*. Bonn/Geneva/Vienna: United Nations University (UNU).
- Butler, J., and Kern, M. L. (2016). The PERMA-profiler: A brief multidimensional measure of flourishing. *International Journal of Wellbeing*, 6(3), 1–48.
- Cabanas, E. and Illouz, E. (2019). *Happycracy. come la scienza della felicità controlla le nostre vite*. Milano, Italy: Codice Edizioni.
- Chapman, J. (2005). *Emotionally Durable Design. Objects, experiences & Empathy*. New York, NY: Routledge.
- Chapman, J. (2008). *Emotionally Durable Design. Sustaining Relationships Between people and things*. Cambridge, MA: Scholars Publishing.
- Chapman, J. (2009). Design for (emotional) durability. *Design Issues*, 25(4), 29–35. <https://doi.org/10.1162/desi.2009.25.4.29>
- Chapman, J. (2014). *Meaningful stuff: Design, ecology and the human condition*. London, UK: Taylor & Francis Ltd/Routledge, 1st ed.
- Chapman, J. (2015). *Emotionally durable design. Objects, experiences & Empathy*. London, UK: Taylor & Francis Ltd/Routledge, 2nd ed.

- Chapman, J. (2017). *Routledge handbook of sustainable product design*. London, UK: Routledge.
- Cooper, T. (1994). *Beyond recycling, the longer life option*. London, UK: The New Economics Foundation
- Cooper, T. (2005). Slower consumption reflections on product life spans and the “Throwaway society”. *Journal of Industrial Ecology*, 9(1-2), 51–67.
- Csikszentmihalyi, M., and Rochberg-Halton, E. (1981). *The meaning of things* (Repr. ed.). Cambridge, MA: Cambridge University Press.
- Csikszentmihalyi, M. and Seligman, M.E.P. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5–14.
- Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. *Nations and households in economic growth: Essays in honor of Moses Abramovitz* (pp. 89-125). Cambridge, MA: Academic Press.
- ESEMeD/MHEDEA 2000 Investigators, Alonso, J., Angermeyer, M. C., Bernert, S., Bruffaerts, R., Brugha, T. S., ... & Gasquet, I. (2004). Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta Psychiatrica Scandinavica*, 109 (s420), 21–27.
- European Commission, Directorate-General for the Environment. (2014). *Eurobarometer: attitudes of Europeans towards waste management and resource efficiency*.
- European Parliament, Public Opinion Monitoring Unit, and Nancy, J. (2017). *Two years until the 2019 European elections. Special eurobarometer of the European parliament*. EU Parliamentary Research Service.
- Gnanapragasam, A., Cooper, T., Cole, C., and Oguchi, M. (2017). *Consumer Perspectives on Product Lifetimes: a National Study of Lifetime Satisfaction and Purchasing Factors*. Amsterdam, The Netherlands: IOS Press.
- Haines-Gadd, M., Chapman, J., Lloyd, P., Mason, J., & Aliakseyeu, D. (2018). Emotional Durability Design Nine—A Tool for Product Longevity. *Sustainability*, 10(6), 1948.
- Hinte, E. v. (1997). *Eternally yours*. Rotterdam, The Netherlands: 010 Publishers.
- Iacono, W. G., and McGue, M. (2002). Minnesota twin family study. *Twin Research and Human Genetics*, 5(5), 482-487.
- Inghilleri, P. (2003). *La «buona vita». Per l'uso creativo degli oggetti nella società dell'abbondanza*. Milano, Italy: Guerini e Associati.
- Jardim, E. (2017). *From Smart to Senseless: The Global Impact of 10 Years of Smartphones*. Washington, WA: Greenpeace.
- Kahneman, D., and Deaton, A. (2010). *High income improves evaluation of life but not emotional well-being*. Washington, WA: National Academy of Sciences.
- Kantar Worldpanel (2017). Report: *An Incredible Decade for the Smartphone: What's next? The Future of Mobile is in Combining Devices, Content, and Services*. London: Kantar ed.
- Kostecki, M. M. (1998). *The durable use of consumer products*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

- Kuznets, S. S. (1946). *National income*. New York, NY: Nat. bureau of economic research.
- London, B. (1932). *Ending the Depression through Planned Obsolescence*. Retrieved from <https://catalog.hathitrust.org/Record/006829435>. Last accessed on October 2, 2019.
- Marchesi, A. (2005). PhD Thesis. *Business classics. managing innovation through product longevity*
- Masi, M., Cristiani, C., Dotelli, G., Iannicielli Zubiani, E., Sciuto, D., Azzone, G., and Bengo, I. (2019). *E-waste lab. Report Finale*. Milano: Remedia/Politecnico di Milano. Retrieved from www.consorzioremedia.it/media/1102/e-waste-lab-report-finale.pdf. Last accessed on October 2, 2019.
- Nesse, R. M., and Williams, G. (1994). *Why we get sick*. New York, NY: Times Books.
- Norman, D. A. (2003). *Emotional design. Why We Love (or hate) Everyday Things* (trad. it: *Emotional design. Perché amiamo [o odiamo] gli oggetti della vita quotidiana*. Milano, Italy: Apogeo, 2013).
- Núria Cases i Sampere, (2015). *Making More Durable and Repairable Products building. A Rating System to Inform Consumers and Trigger Business Innovation*. Brussels, Belgium: European Environmental Bureau.
- Pine, B. J., and Gilmore, J. H. (1999). *The experience economy*. Boston, MA: Harvard Business Review Press.
- Ricardo Aea (2015). *The Durability of Products. Final Report*. Luxembourg: Publications Office of the European Union.
- Sanderson, S. W., and Uzumeri, M. (1997). *Managing Product Families*. Chicago, IL: Irwin.
- Sandstrom, G. M., and Dunn, E. W. (2014). Social interactions and well-being. *Personality and Social Psychology Bulletin*, 40(7), 910–922.
- Seligman, M. E. P. (2011). *Flourish: A new understanding of happiness and well-being and how to achieve them*. London, UK: N. Brealey Publ.
- Van Krieken, B., Desmet, P. M. A., Aliakseyeu, D., and Mason, J. (Sep 11, 2012). A sneaky kettle: Emotionally durable design explored in practice. Paper presented at the *8th International Conference on Design and Emotion*.
- Weidman, A. C., and Dunn, E. W. (2017, Jul 4,). Making consumer products more durable and easier to repair. *Targeted News Service*.