EMPATHY RESEARCH FRAMEWORK IN DESIGN THINKING PROCESS THROUGH UNDERSTANDING THE SUPRA-FUNCTIONALITY NEEDS FOR HOME SOFA FURNITURE DESIGN IN MALAYSIA

By

MOHAMMADALI HADDADIAN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

January 2023

FRSB 2023 1

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EMPATHY RESEARCH FRAMEWORK IN DESIGN THINKING PROCESS THROUGH UNDERSTANDING THE SUPRA-FUNCTIONALITY NEEDS FOR HOME SOFA FURNITURE DESIGN IN MALAYSIA

By

MOHAMMADALI HADDADIAN

January 2023

Chair : Professor Khairul Aidil Azlin Abd Rahman, PhD
Faculty : Design and Architecture

The global market value of furniture was estimated to be worth 509.8 billion U.S. dollars in 2020 and 127.2 billion U.S. dollars in Home Furniture & Bedding. The Malaysian furniture industry focused on contributing RM19 billion in trades by 2025. Furniture items have come to a level of functional development. In order to attract the attention of the end-user, the designer has to offer added value in the field of pleasure, referred to as 'Supra-Functional needs', defined as attributes that satisfy users beyond their practical and functional needs. Users have long-lasting intimate sensory interactions with their sofa, making it a good case for studying supra-functional needs. The main problems in this respect are a lack of pleasurable home sofa fit the different user's purchasing power and difficulty expressing and understanding supra-functional needs. Therefore, there is a need for an alternative empathy research method for understanding users' supra-functional needs. The general research question is "How can an empathy research method uncover the supra-functional needs of users in a home sofa furniture?" and the main research objective is "to determine the criteria for an alternative empathy research method in the Design Thinking process". This study used mixed methods research, that combined both qualitative and quantitative methods because empathy is the exploration and collection of qualitative data supported and complemented by the quantitative research method. Face-to-face interviews were conducted to collect qualitative data from furniture stakeholders. The coding approach was used to code and analyse the qualitative data by ATLAS.ti software. Descriptive statistics, two-way ANOVA and Spearman correlation in SPSS software were used to analyse the quantitative data collected from home sofa end-users through Google Form Likert- scale questionnaire. Significant findings are: The main visual attributes of a sofa that Malaysian families positively perceive in the order of priority are shape, colour, material and texture. The features of the end-user that are relevant to understanding the end-users supra-functional needs are the user's gender, household income education and race. Sixteen criteria have emerged for the

alternative empathy research method. These criteria are categorised into four main groups: virtual contact with users, using nonverbal techniques, attention to main supra-functional factors in sofa context, and considering market segmentation. Findings show an alternative empathy research method that uses online and visual approaches and considers end-user's preferences and expectations. Furthermore, segments of the sofa market can uncover the end-user supra-functional needs. The researcher suggests that end-user's visual and online data be collected by categorising style and supra-functional ranking tasks. To summarise the research findings, the researcher has created a framework for understanding end-user supra-functional needs in the home sofa in the Malaysian furniture market. The researcher conducted a validation process with furniture designers to ensure that this framework is valid. Overall validation results were based on three main categories, which were application, ease of implementation and benefit. The validation result shows that the framework is applicable with a high mean of benefit. However, it is a medium mean for application and a low mean for ease of implementation.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KERANGKA KERJA PENYELIDIKAN EMPATI DALAM PROSES PEMIKIRAN REKA BENTUK MELALUI MEMAHAMI KEPERLUAN SUPRA-FUNGSI UNTUK REKA BENTUK PERABOT SOFA RUMAH DI MALAYSIA

Oleh

MOHAMMADALI HADDADIAN

Januari 2023

Pengerusi : Professor Khairul Aidil Azlin Abd Rahman, PhD
Fakulti : Rekabentuk dan Senibina

Nilai pasaran global perabot dianggarkan bernilai 509.8 bilion dolar A.S. pada 2020 dan 127.2 bilion dolar A.S. dalam Perabot & Peralatan Tempat Tidur. Industri perabot Malaysia menyasarkan untuk menyumbang RM19 bilion dalam eksport menjelang 2025. Produk perabot telah mencapai tahap kematangan berfungsi. Untuk menarik perhatian pengguna, pereka bentuk mesti memberikan mereka nilai tambah dalam alam keseronokan, dirujuk sebagai 'keperluan Supra-Berfungsi', ditakrifkan sebagai atribut yang memuaskan pengguna melebihi keperluan praktikal dan berfungsi. Pengguna mempunyai interaksi deria yang berpanjangan dan intim dengan sofa rumah, menjadikannya kes yang baik untuk mengkaji keperluan supra-berfungsi. Masalah utama dalam hal ini adalah kekurangan sofa rumah yang sesuai dengan kuasa beli pengguna yang berbeza dan kesukaran menyatakan dan memahami keperluan supra-berfungsi. Oleh itu, terdapat keperluan untuk kaedah penyelidikan empati alternatif untuk memahami keperluan supra-berfungsi pengguna. Soalan kajian umum ialah Bagaimanakah kaedah penyelidikan empati dapat mendedahkan keperluan supra-berfungsi pengguna dalam perabot sofa rumah? Manakala, objektif kajian utama ialah untuk menentukan kriteria bagi kaedah penyelidikan empati alternatif dalam proses pemikiran reka bentuk. Kajian ini menggunakan kaedah penyelidikan campuran, yang menggabungkan kedua-dua kaedah kualitatif dan kuantitatif kerana empati adalah penerokaan dan pengumpulan data kualitatif yang disokong dan dilengkapi dengan kaedah penyelidikan kuantitatif. Temu bual secara bersemuka telah dijalankan untuk mengumpul data kualitatif daripada pihak berkepentingan terhadap perabot. Pendekatan pengekodan digunakan untuk mengekod dan menganalisis data kualitatif oleh perisian ATLAS.ti. Statistik deskriptif, ANOVA dua hala dan korelasi Spearman dalam perisian SPSS digunakan untuk menganalisis data kuantitatif yang dikumpul daripada pengguna sofa rumah melalui borang Google soal selidik berskala Likert. Dapatan penting ialah: Atribut visual utama sofa yang dilihat secara positif oleh keluarga di Malaysia mengikut keutamaan ialah bentuk,

warna, bahan dan tekstur. Ciri-ciri pengguna yang relevan untuk memahami keperluan supra-berfungsi pengguna ialah jantina pengguna, pendapatan isi rumah pendidikan dan bangsa pendidikan dan bangsa. Enam belas kriteria telah muncul untuk kaedah penyelidikan empati alternatif. Kriteria ini dikategorikan kepada empat kumpulan utama: hubungan maya dengan pengguna, menggunakan teknik bukan lisan, perhatian kepada faktor supra-berfungsi utama dalam konteks sofa, dan mempertimbangkan pembahagian pasaran. Penemuan menunjukkan kaedah penyelidikan empati alternatif yang menggunakan pendekatan dalam talian dan visual serta mempertimbangkan pilihan dan jangkaan pengguna. Tambahan pula, segmen pasaran sofa boleh mendedahkan keperluan supra-berfungsi pengguna. Penyelidik mencadangkan agar data visual dan dalam talian pengguna dikumpul dengan mengkategorikan gaya dan tugas kedudukan supra-berfungsi. Untuk meringkaskan dapatan kajian, pengkaji telah menghasilkan rangka kerja untuk memahami keperluan supra-berfungsi pengguna dalam sofa rumah dalam pasaran perabot Malaysia. Pengkaji menjalankan proses pengesahan bersama pereka perabot untuk memastikan rangka kerja ini sah. Keputusan pengesahan keseluruhan adalah berdasarkan tiga kategori utama, iaitu aplikasi, kemudahan pelaksanaan dan faedah. Keputusan pengesahan menunjukkan bahawa rangka kerja itu boleh digunakan dengan min faedah yang tinggi. Walau bagaimanapun, ia adalah min sederhana untuk aplikasi dan min rendah untuk memudahkan pelaksanaan.

ACKNOWLEDGEMENTS

First and foremost, I am incredibly grateful to my supervisor, Prof. Ts. Dr. Khairul Aidil Azlin Abd Rahman, for their invaluable advice, continuous support, and patience during my PhD study. I would also like to thank the supervisor's committee, Ts. Dr. Velu Perumal and Assoc. Prof. Ts. Dr. Sumarni Ismail for their technical support in my study.

I want to thank all the members of the UPM International Student. Their kind help and support have made my study and life in Malaysia a wonderful time. Finally, I would like to express my gratitude to my wife and children. Without their great understanding and encouragement over the past few years, it would be impossible for me to complete my study.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Khairul Aidil Azlin Abd Rahman, PhD
Professor, Ts
Faculty of Design and Architecture
Universiti Putra Malaysia
(Chairman)

Velu a/l Perumal, PhD
Senior Lecturer, Ts
Faculty of Design and Architecture
Universiti Putra Malaysia
(Member)

Sumarni Binti Ismail, PhD
Associate Professor
Faculty of Design and Architecture
Universiti Putra Malaysia
(Member)

_____
ZALILAH MOHD SHARIFF, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 08 June 2023

Declaration by the Graduate Student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
- intellectual property from the thesis and the copyright of the thesis are fully-owned by Universiti Putra Malaysia, as stipulated in the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from the supervisor and the office of the Deputy Vice-Chancellor (Research and innovation) before the thesis is published in any written, printed or electronic form (including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials) as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld in accordance with the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2015-2016) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software

Signature: _____ Date: _____

Name and Matric No.: Mohammadali Haddadia_____

Declaration by Members of the Supervisory Committee

This is to confirm that:

- the research and the writing of this thesis were done under our supervision;
- supervisory responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2015-2016) are adhered to.

Signature:	
Name of Chairman of Supervisory Committee:	Prof. Ts. Dr. Khairul Aidil Azlin Abd Rahman
Signature:	
Name of Member of Supervisory Committee:	Ts. Dr. Velu a/l Perumal
Signature:	
Name of Member of Supervisory Committee:	Assoc. Prof. Dr. Sumarni Binti Ismail

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

S-F	Supra-functionality
DT	Design Thinking
NPD	New Product Development

CHAPTER 1

INTRODUCTION

1.1 Introduction

As market globalization makes industrial production more competitive, design scholars need to propose new tools and methods to guide and facilitate the industrial innovation process. Seizing opportunities, finding new directions for innovation, and implementing the right organisational processes to bring the right products to market at the right time have become necessary milestones for companies that want to control the future (Rouvray et al., 2008).

Many industrial products have reached a level of functional maturity, making it difficult to differentiate themselves from competitors based on functionality alone, especially for products that are not technology-based, like furniture. Innovation based on usability and ergonomics alone has also reached its limits: consumers today take ease of use for granted and are not surprised by easy-to-use products. So, in order to attract the consumer's attention, designers need to offer them added value in terms of pleasure (Jordan, 2000; Olsson et al., 2013), or what Weightman and McDonagh (2017) refer to as 'Supra-Functional needs' (S-F) that are related to the user's positive emotions (McDonagh, 2017).

By having a positive emotional impact on the consumer, pleasant sensory qualities make industrial products consumer friendly and encourage creativity (Ding & Bai, 2019; Norman, 2004). Consideration of human factors in the design process, particularly consumer emotions, is fundamental to generating positive emotions in users. It is well understood in the design community that understanding user's needs is vital to the analysis and design development (Strickfaden & Devlieger, 2011). Therefore, it is crucial to know the user's needs, likes, and dislikes, especially those that positively affect their emotions.

The commercial success of most companies depends on their ability to identify customer needs in order to develop products that meet those needs quickly (T. Ulrich & D. Eppinger, 2016). Design Thinking (DT) is a way to align innovation with customer needs to solve problems in many domains. The design thinking is a user-centred approach that focuses on the user's needs, services, and preferences. Generation in the design thinking worldview only begins when users' hidden wants and needs are explored (Meinel & Leifer, 2012). Hidden needs are usually emotional needs that are difficult to understand and express. Nigel Cross (2011) calls a user's hidden needs "nonverbal thoughts". He believes that nonverbal thinking is intrinsic to design thinking.

Needs are very difficult to identify and meet, and it's difficult to create a worthy product that someone truly loves (Kolko, 2014). User needs can be separated into functional, and supra-functional (emotional) needs, or as Jordan (2000) says, the three types of user needs are functionality, usability, and pleasure (supra-functional). Designers can keep user's needs for functionality and usability at an acceptable level. Users want more than just functionality. They want their dreams, aspirations, values, and generally their emotional models to be reflected in their products (McDonagh, 2017; Weightman & McDonagh, 2004). It is now not enough for a product to operate correctly, be efficient and usable, or be aesthetically pleasing; but it must also evoke positive emotional responses (P. M. A. Desmet, 2002; Yoon et al., 2020). Designers should focus on refining their ability to understand and extract the emotions and feelings of end-users (Dandavate et al., 1996; Heylighen & Dong, 2019).

The most popular approach in the design thinking process to understand and gain insights into user's needs is empathy (Brown, 2009a; Brown & Katz, 2011). Designers must focus on empathy for the people they are designing for in order to achieve the desired outcome in the design thinking process. Empathy is essential to developing meaningful products (Kolko, 2014) for the reason that empathic understanding can fill the gap between the designer and the emotional desires of the end-user (McDonagh, 2015; Meinel & Leifer, 2012).

Empathy is considered key to understanding user's experiences and emotional models. Indeed, empathy in design is strengthened when designers focus on individual experiences and private situations rather than practical purposes (Heylighen & Dong, 2019; Kouprie et al., 2009; Takahashi et al., 2018; Wright & McCarthy, 2008). Several empathy methods can be used to uncover the needs of the user in order to achieve maximum empathy. These techniques mainly focus on user needs in terms of functionality and usability. Using an alternative empathy technique that focuses on extracting the user's emotionality needs (in this case, needs beyond functionality which calls supra-functionality), designers can achieve more genuine empathy and subsequently design more enjoyable and better products.

Furthermore, the sustainable design agenda can be addressed by considering the supra-functional needs of the user. The sustainable design agenda is not achieved through legislation but a series of individual customer decisions. These decisions will be based on positive choices of products that are perceived to be better. Better products (with better functional and supra-functional aspects) are a better fit for the user and make customers buy fewer products or keep their existing products longer (Weightman & McDonagh, 2004; Woodcock & Mcdonagh, 2018).

Supra-functionality can play an essential role in the purchase decision, especially when the price and quality of the alternatives are almost the same. This situation is common when buying home furniture. The market for home

furniture is competitive, with small and large manufacturers differing in form, price, quality, and ease of use.

Home sofa furniture as a non-mundane product has reached maturity in functionality and usability, making it difficult to distinguish a home sofa from its competitors based on these two types of needs. Furniture designers should look for a method to identify the third level of user needs related to pleasure (Jordan, 2000; Olsson et al., 2013). Our world is fast-paced, and designers need to know the end-users with a quick and accurate method, especially in markets like furniture. Designers can predict their customers' buying decisions by knowing their needs that relate to pleasure.

1.2 Malaysian furniture industry

Malaysia is rich in natural resources. The luxuriant rainforest provides a great variety of woods for furniture manufacture. The entire trade esteem for Malaysian wood items and furniture in 2018 stood at RM22.3 billion, contributing 1.6% to the country's gross domestic product and 2.2% to total exports. The accessibility of raw materials, combined with progressed techniques and lower labour/production costs, clearly gives Malaysia an advantage in wood furniture production, which meets worldwide quality measures and requirements (Why Visit? : Malaysian International Furniture Fair, 2021).

Malaysian Furniture Industry is among the best 10 furniture exporters universally; Malaysia exports almost 80% of its production. With key markets within the Australia, United States and Japan, Malaysia features a strong position within the worldwide furniture industry. Furniture producers stay strong, as indeed inside the pandemic year 2020, Malaysia has overseen the export of RM10.63 billion worth of furniture (Shahril, 2022).

Under the National Timber Industry Approach, the furniture industry is focused on contributing RM19 billion in trades by 2025. Despite the country facing the COVID-19 pandemic and frequent economic downturns, the furniture industry is still backed by solid worldwide request. Over the last few years, growth has shifted from the fabrication of general products to its design, which was essential to propel Malaysia on the international stage. Popular with average to upper-class foreign buyers, foreign buyers look to Malaysia for manufacturers who can meet their high production demand (Malaysian Furniture Industry :: Malaysian International Furniture Fair, 2021).

1.3 Home sofa

Living-room and dining-room furniture has the highest growth among other furniture kinds in the Malaysian furniture industry (Furniture - Malaysia | Statista Market Forecast, 2022), and the sofa is ordinary furniture in this category. A sofa, also called a couch, futon, chesterfield, or settee may be a piece of furniture with seating for two or three individuals within the frame of a seat with arms that are somewhat or completely upholstered, regularly with springs and custom-made cushions. Sofas are usually found in the living room, family room, study or lounge in homes. Now and then they can be found in non-residential spaces, such as hotels, halls of commercial spaces, waiting rooms and bars. Sofas in non-residential spaces are not an issue for this research.

The most common types of sofas are the two- or three-seaters, designed to seat two or three people and have two or more seat cushions. Other variations include the divan, the fainting sofa (with no back or partial back), and the canapé (a decorative three-seater). To save space, some sofas in sofa beds, daybeds or futons also serve as beds.

A sofa comprises the frame, the padding and the cover. The frame is made of wood but can also be made of metal, plastic, or covered boards. Sofa padding comprises foam, feathers, down, fabric, or combination. The sofa covers are ordinarily made of delicate leather, corduroy or material texture. The sofa as a group product (not a personal product) and not as a gender-specific product was examined in this study. A common type of sofa in the Malaysian furniture market, namely a one-piece three-seater sofa that is partially or fully upholstered, was selected as the case study.

A home sofa is not a technology-based product, and most furniture factories and even woodworking shops can produce this product in almost the same way and with the same technology and even in the same form and at the same price. For this reason, there is tight competition in this industry. What differentiates a piece of furniture from others and convinces users to buy it is the look and the enjoyment factor that meets the needs of the end-users.

This study addresses that home furniture case products are individual items that deal with practical issues and are related to customer feelings (Al-Azzam, A. F. M., & Fattah, 2014). Sofas, as a typical home furnishing good, have proven to be helpful furniture because people have a more prolonged and more intimate sensory interaction with this product (Rouvray et al., 2008). This furniture is an essential everyday product for many people nowadays. It means that people are likely to have a range of opinions and preferences regarding their sofa. In this study, the aim is to understand the real needs of the end-users in terms of their feelings and thoughts related to supra-functional needs for home sofa furniture to provide maximum enjoyment of the furniture.

In short, furniture exports show that the furniture industry has developed positively and contributes to Malaysia's economy by providing high-quality products at reasonable prices (Osman & Rahman, 2019). In absolute terms, price and quality are important factors when buying a sofa. However, since price and quality are almost the same among the user's alternatives when buying a sofa, users need to be convinced to choose the desired furniture alternative. This goal can be achieved by focusing on user's needs beyond functionality and ease of use. Therefore, user behaviour and habits are essential for furniture designers when buying a new sofa.

Figure 1.1: A two seat sofa in the Malaysian semi-detached house
(Source: Author, 2020)

1.4 Design Thinking

Design thinking is documented as an exciting approach to tackling problems in a variety of disciplines, and it is acknowledged that the design thinking can provide the best potential answer (Brown,2009a). What actually happens in design thinking is 'intuition' (Cross, 2011). The basis of design thinking lies at the intersection of technical feasibility, economic viability, and desirability to the user. The trade-off between what people need and technical feasibility and economic viability is significant to the design thinking (Brown & Katz, 2011). However, human desirability is the foremost basic portion of this process (Brown, 2009b) which can provide significant value for innovation and management (Hassi & Laakso, 2011). Desirability is one of the most important lenses through which designers must search for a solution in the design thinking (Schweitzer, 2016b).

Design thinking is a way of aligning innovation with customers to create new market opportunities and, ultimately, competitive advantage (Schweitzer, 2016c). That is what sofa furniture needs to survive in today's competitive marketplace.

The design thinking as a collaborative and participatory process to address the problems has five phases: Empathising, Defining, Ideating, Prototyping, and Testing (Figure 1.2) (*Interaction Design Foundation | What Is Design Thinking?*, 2019). The empathy or discovery stage is approximately learning more about the users, particularly their hidden and latent needs, and empathising with them (needs that can be very strong, even if the individuals are most likely incapable of expressing them) (Follow & Brown, 2017).

Design thinking is both a mind-set and a process, and both aspects are fundamental. Design thinking shapes and forms the various practices used to solve complex problems as a process. The different phases of a typical design thinking process include deep empathy with the end-users, reframing the problem domain, ideation, prototyping, and testing. As a mind-set, design thinking refers to the underlying values and beliefs that can become ingrained in an organisation's culture over time (Schweitzer, 2016c). There are several methods to gain empathy in design thinking as a process.

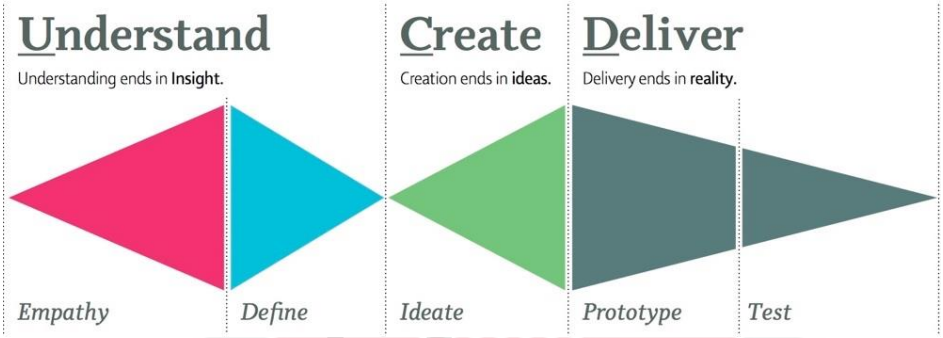

Figure 1.2: Design Thinking as an User Centred process
(Source: UCD process, n.d.)

Traditional methods such as reports from marketers and retailers are not conducive to building empathy and cannot help designers achieve deep empathy. These methods will never lead to breaking standards, developing distractions, and changing games (Brown, 2009b). They cannot help a designer develop deep empathy, and they are insufficient as tools for building empathy (Bastiaansen et al., 2019; Crossley, 2003). Market researchers focus on emotional needs, but especially on emotions around the purchase of things (Dandavate et al., 1996) not the emotions connected with use and desirability. On the other hand, it is essential to know the feelings and behaviour of users because immaterial things may be worth more than material things (Brown & Katz, 2011); in contrast, market research pays more attention to material things. Therefore, designers should use other empathy research methods in the design thinking process to better understand the needs of end-users, especially their emotional and latent needs. As Brown (2009) mentioned, designers can only fully understand and design desirable products and services if they have a

thorough understanding of people's needs, desires, preferences and experiences. Design thinking strives for a deep understanding and insight of users.

1.5 Empathy Approach

A successful design program has three mutually reinforcing elements: insight, observation, and empathy (Brown, 2009a). Observation is one of the strategies of sympathy, whereas insight is the result of empathy. In design, insight could be a challenging statement of reality around a person's behaviour (Kolko, 2014).

The best-known way to deal with insight is empathy. The first step of the design thinking process is empathy. Both design philosophers and design experts define empathy as a major influencing factor in the design thinking (Meinel & Leifer, 2012). Empathy is found in several disciplines that have diverse definitions, but the discipline that is most familiar with its design is psychology (Dandavate et al., 1996; Heylighen & Dong, 2019). In psychology, empathy is considered as understanding and comprehending the perspective (experiences, thoughts and feelings) of others (Devecchi & Guerrini, 2017).

Empathy in design usually implies a good creative understanding of users' needs and experiences for new product development (NPD) (Kouprie et al., 2009; McDonagh & Thomas, 2010a; Postma et al., 2012). Empathy is created when designers begin to consider more user-friendly styles when developing products (Devecchi & Guerrini, 2017) and empathy can act as a connection between people and needs (Meinel & Leifer, 2012). McDonagh (2006) defines the empathy as "the intuitive ability to identify other people's thoughts and feelings – their motivations, emotional and mental models, values, priorities, preferences, and inner conflicts" (Kouprie et al., 2009; Woodcock, Mcdonagh, et al., 2018).

Empathy plays a central role in the beginning step of the design thinking process when the product has to be perceived, and the product concepts have to be developed (Postma et al., 2012; Takahashi et al., 2018) because designers know that design is about the user experience, not the final product (McDonagh & Thomas, 2010a). Experiential design is a design that focuses on comprehensive understanding of users and their experiences (Crossley, 2003; Postma et al., 2012). These experiences must be perceived, documented, and interpreted in order to obtain some forms of tacit knowledge from user experiences (Meinel & Leifer, 2012).

In the empathy approach, the user is measured as a partner. This respect takes place in the first step of the design thinking process (McDonagh & Thomas, 2010a). In empathic design plan, users are recognised as an essential foundation for insight and innovation (Woodcock & Mcdonagh, 2018).

In summary, the empathy approach can help the designer identify the user's needs (which they may not be aware of) by gaining insight into their lives and experiences to increase the likelihood that the product will meet the user's needs (Kouprie et al., 2009; Meinel & Leifer, 2012). As McDonagh (2004) mentioned, empathy is an intuitive ability to understand a user's thoughts and feelings related to supra-functional needs.

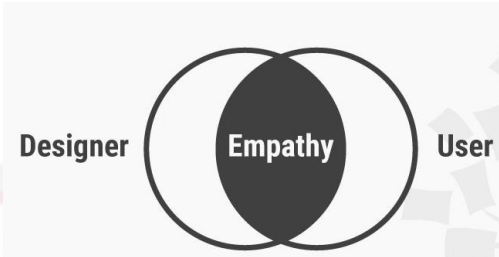

Figure 1.3: Empathy is finding user's needs and insights by designers
(Source: How to Develop an Empathic Approach in Design Thinking, 2020)

1.6 Supra-Functionality needs

Designers need to know about user's supra-functional needs to create a lovely product. Based on a hierarchy of industrial product needs (Jordan, 2000; Olsson et al., 2013), there are three different levels of needs: Level 1: Functionality, Level 2: Usability, and Level 3: Pleasure (Jordan distinguishes between four types of pleasure factors: socio-pleasure, psycho-pleasure; ideo-pleasure; physio-pleasure). Nowadays, most products have come to a level of functionality and usability, and users pursue more than just functional needs (Mcdonagh & Weightman, 2015). Users seek the product that satisfies their need for pleasure, especially when functionality and ease of use can be reconciled in one product. There is no apparent difference between the product alternatives. In some cases, the need for pleasure becomes the most desired need, like a luxury. Supra-functional needs refer to the user's pleasure needs and are purely emotional that products can arouse. There is no doubt that products can bring joy and stimulate emotions (Naeini et al., 2015; Porter et al., 2003).

To be successful in the marketplace, product manufacturers must consider user needs beyond functionality. While good functionality and ease of use remain paramount, companies are looking for other means to gain a complete edge in the marketplace as stakeholders now shift their product-related decisions to other, highly selective criteria. These criteria are referred to as supra-functional, meaning that they go beyond the functional and are often linked to the cultural, social, emotional, inspirational and tribal needs of stakeholders, with the emotional domain proving to be one of the most important (Olivier C Fenech & Borg, 2007). Designing for product- emotion is a relatively new area of product

design, but its potential in new product development and marketing has been recognized (Olivier C Fenech & Borg, 2007; McDonagh, 2017).

Users want more than functionality. Users have compound supra-functional needs such as emotions, feelings, dreams, and aspirations (McDonagh & Thomas, 2010a). Expressing and understanding thoughts is tough, particularly emotional needs, because feelings/emotions are private and complex (Kolko, 2014), and they cannot be perceived directly; they must be inferred by paying thorough attention to various clues (Meinel & Leifer, 2012).

The goal of supra-functional needs is to create a positive emotional impact on the consumer. Supra-functional can be defined as follows: Attributes that satisfy the user beyond utilitarian functional needs (McDonagh & Thomas, 2010a), building a positive emotional relationship between user and product (McDonagh, 2017; Weightman & McDonagh, 2004) supra-functional refers to the more ephemeral needs of the user (Silva, 2010).

Supra-functional specifications can be summarized as follows: A) It is the final deciding factor, when functional needs and pricing points are similar, and there are no clear contrasts between the two products. B) It is a completely psychological and intangible need. C) It often has elements that are difficult to grasp. D) It is vibrant and change frequently (Silva, 2010). E) Tools for integrating supra-functionality are very different in content for each product (McDonagh, 2017). F) Supra-functional factors co-operate with the functional aspects (Mcdonagh & Weightman, 2015).

Supra-functionality has many consequences that affect product design including (Weightman & McDonagh, 2004): people's attachment to the product, pride of ownership, respect for function, enjoyment of performance, emotional attachment to the product, pleasurable experience, loyalty, and attachment to a product. All of these are results of the perception of pleasant emotions (Chowdhury et al., 2015; O C Fenech & Borg, 2006).

Supra-functionality has a significant impact on purchase decisions, user-product loyalty and brand loyalty (Silva, 2010). Functionality and ease of use are no longer the decisive attributes in purchasing decisions when customers choose to buy, own or use a product (O C Fenech & Borg, 2006).

The behaviour and habits of users when choosing a new sofa are essential in the purchase decision. Furniture is a type of product that consumers choose wisely and spend much time on before finally deciding to buy it (Oblak et al., 2017). Supra-functionality is the deciding factor when quality, price and other functional needs are similar among the selected furniture alternatives. Furniture

designers should know the supra-functional needs of end-users to predict their purchase decision behaviour and deliver fine furniture.

Note that the researcher has chosen to use the word *need* to label any attribute of a home sofa desired by the end-user and does not distinguish here between a want and a need. Also, memo that the researcher used the term "end-user" to refer to a person who uses a sofa versus the term "user" or "customer", who is the person performing the purchasing. The word "customer" means the "end user" in the questionnaire forms. The researcher has not used the end user in the questionnaire forms because the word customer is more understandable for the interviewees.

Figure 1.4: Furniture stores in Viva mall, Kuala Lumpur, Malaysia
(Source: Author, 2020)

1.7 Research Motivation

The motivation for this research is to investigate and understand the needs of end-users to improve furniture designers' ability to predict user behaviour when making purchasing decisions and subsequently provide more lovely and enjoyable furniture for the family living room. There are many similar pieces of furniture in furniture stores, online sales websites and even furniture shows. The function, quality and price of these furniture items are almost equal and finding a different and beautiful piece of furniture is usually tricky for families.

Furniture in sales centres seems to have different shapes, colours and textures, but when a family wants to choose a piece of furniture such as a sofa, they find that there is a minimal choice to choose the one that suits them and meets their needs. The furniture is eventually chosen and purchased, but that does not mean the family is delighted with their purchase. In practice, it is not easy to find a fine piece of furniture that meets the user's needs (not just the functional and user-friendly ones).

Furniture is not a common product for families. People spend a lot of money and time (after the house and the car) to buy an appropriate piece of furniture for their home. The average price of a sofa in 2019 in the Malaysian market is around RM5000, and the average lifespan of a sofa is around five years. Users usually search the internet, furniture stores, and furniture exhibitions and ask friends to find a suitable piece of furniture. Some critical factors influence the family's buying decision, such as the price, quality, ease of use, and match with the home decor. However, when they want to choose among the available options, none of them is entirely satisfactory. There is something lost in these furniture designs that has nothing to do with their function or usability. Users can easily relate emotionally to the furniture because it is valuable and not an everyday product. Knowing these emotional needs is vital for furniture designers to design satisfying furniture.

Based on interviews conducted by the researcher with some Malaysian furniture designers, their primary methods of identifying user needs are limited to short interviews and observations at furniture exhibitions and rely on the findings of market researchers. These methods are insufficient and not reliable enough to identify the complex needs of users. Therefore, most of the designed furniture does not meet the supra-functional needs of the users and results in dissatisfied and unpleasant furniture.

As a product designer, the researcher has experience asking users their opinions about a product. In most cases, they cannot express their feelings or point out a problem or issue related to the current or desired furniture. Usually, people use common words like "This sofa is not comfortable" or "I do not like the colour or texture". These phrases cannot help designers understand user's actual and hidden needs. Designers need a way and a method to identify user's needs, especially those that go beyond functional needs, the so-called supra-functional needs.

The idea of conducting this research came after the researcher conducted an initial interview with some furniture designers and gathered his personal experience in product design. The researcher believes that products should be functional, fun and enjoyable. Jordan (2000) considered that usable products are not necessarily enjoyable products and that usability and aesthetics should be considered in the design of enjoyable products that will affect future purchasing decisions (Lee & Koubek, 2010). Designing a preferred product is a vital matter for better information services and product sales (Borsci et al., 2016; Lee & Koubek, 2010). These issues prompted the researcher to conduct a study to explore the empathy approach in the design thinking process to understand the latent needs of users, which are primarily supra-functional needs.

1.8 Issues

The researcher's issues are summarized below:

Finding a suitable and pleasant piece of furniture (sofa as a case study) is usually tricky for end-users in the furniture market, especially for users with low purchasing power. On the other hand, it is difficult for furniture designers to identify the user's needs (the hidden and emotional) beyond usability and functional needs.

Usually, users do not know their needs, especially their hidden and emotional needs, and even if users know their needs, they cannot express them correctly and verbally. Usually, as research participants, users do not like to share their feelings or thoughts or even cannot express them efficiently.

There is no reliable method in the empathy approach of design thinking to understand the feelings and thoughts of end-users. Feelings and thoughts are difficult to capture and understand using current empathy methods such as observation and interviews because thoughts and feelings cannot be seen directly or expressed easily. So, the central theme of this study is to propose an alternative empathy research method to know the user's needs beyond functionality and usability, which is called supra-functionality needs. These kinds of needs are full of feelings and emotions.

1.9 Problem Statement

The main problem is current empathy methods have less focus on extracting user's supra-functional needs. Users are looking for more than functionality; adequate functionality is now expected (McDonagh & Thomas, 2010b), especially in the competitive furniture market. When functional needs and cost points are similar, and there are no apparent differences between furniture, supra-functional needs can be the final deciding element.

Based on the hierarchy of needs for an industrial product (Jordan, 2000), there are three different levels of needs for a product: A) functionality, B) usability and C) pleasure (Jordan distinguishes four types of pleasure factors: psycho-pleasure; socio-pleasure; physio-pleasure; ideo-pleasure). This third level of user needs refers to the user's emotions and pleasures, which go beyond functionality and usability needs and are referred to as supra-functional needs by MacDonah (2004). This high level of user needs becomes essential when the other two needs are met. Responding to user needs for functionality and usability is common and does not surprise users. Therefore, designers and stakeholders need to formulate, understand, and meet user's needs for pleasure. According to the main problem statement, there are two sub-problems explained as follows.

a. Lack of pleasurable home sofa fit to different user's purchasing power:

furniture is generally produced and sold in three distinct classes, the cheap or economy class, the middle class, and the expensive or luxury class. The furniture in the sales centres seems to have different shapes, colours and textures, but when a family wants to choose a piece of furniture like a home sofa, they find very few alternatives to choose the one that suits them and meets their needs. Since furniture is a valuable product, the furniture is eventually chosen and purchased. In practice, it is not easy to find a piece of furniture that meets the needs of the user (not only functional and usability needs), especially in the economy class and middle class.

Furniture is not a mundane product for most families. People spend a lot of money and time buying suitable furniture for their homes. Users can quickly establish an emotional relationship with furniture because it is a valuable and not an everyday product, and they want to enjoy having, seeing and using their furniture. This need for pleasure is less dominant in today's furniture industry, at least with the low purchasing power of users.

b. Difficulty in expressing and understanding Supra-Functionality needs:

understanding supra-functional needs is difficult for designers. Assessing user satisfaction and emotions can be complex or highly subjective (Cardoso & Clarkson, 2012). Supra-functional needs are complex and vibrant and change frequently (McDonagh & Thomas, 2010). These user needs cannot be directly observed, and the feelings are personal and complicated (Kolko, 2014). Different people have a personal relationship with different products depending on the features of the product and their own (Weightman & McDonagh, 2004). With current methods, it is challenging for designers to understand the supra-functional needs of users.

Expressing supra-functional needs is usually a difficult thing for users. The main problem with expressing needs is that users adapt so quickly to uncomfortable situations that they are often unaware of their needs (Brown & Katz, 2011). Users cannot or tend to express their needs adequately, especially their emotional needs. Supra-functional needs are latent needs (needs that may be very strong even though the individual is unlikely to be able to express them) (Brown, 2009a). As a result, designers need a methodology to help end-users articulate their supra-functional needs adequately.

Empathy in design thinking usually means a brilliant and creative understanding of user's needs and experiences when developing new products (Postma et al., 2012). However, current empathy methods focus less on extracting user's supra-functional needs (McDonagh, 2015). Supra-functional needs are related to user's feelings and thoughts and have a crucial influence on user's purchase decisions. Current empathy methods focus on knowing and understanding user's needs in

terms of functionality and usability. These methods are based on observation and conversation, while supra-functional needs are not visible and difficult to express in a conversation. Therefore, there is a need for an alternative empathy research method for understanding user's supra-functional needs.

Based on the interviews conducted by the researcher with some Malaysian furniture designers, their primary methods of identifying user needs are limited to short interviews and observations at furniture exhibitions and rely on the findings of market researchers. These methods are not reliable when it comes to determining the complex needs of users. Therefore, most designed furniture misses the users' actual needs and results in dissatisfaction and unpleasant furniture. Our world is fast-paced, and designers need to know the end-users through a quick and accurate method, especially in markets like furniture.

1.10 Research Questions

For this study, there are three main research questions:

Research Question1: What is the role of supra-functionality in empathise stage of the design thinking process?

Research Question 2: Why are some supra-functionality factors more important in furniture products?

Research Question 3: How can an empathy research method uncover the supra-functional needs of users in a home sofa furniture?

1.11 Research Objectives

This study has four objectives:

a) To identify the supra-functional factors in the empathise stage of the design thinking process

b) To analyse the most important supra-functional factors in home sofa furniture

c) To determine the criteria for an alternative empathy research method in the design thinking process

d) To validate the proposed alternative empathy research method in the design thinking process.

1.12 Scope of the Study

This research intends to construct an alternative empathy research method in the design thinking process by understanding users' supra-functional needs for home sofa design. There are three scopes highlighted: empathise stage in the design thinking process, supra-functional needs and factors related to the home sofa, and predicting user purchase decision by furniture designer through an alternative empathy research method.

The design thinking process is a human-centred approach to creatively solving a problem for the first scope. Since this research aims to know and understand the needs of the users, design thinking is the best approach to address this research problem. The design thinking process starts with empathy or understanding people as users. Empathy is a common approach to understanding a user's context and needs. Therefore, this research aims to identify the empathy stage in the design thinking process and the empathy research methods to find the gap in understanding user's supra-functional needs.

The second scope relates to the needs and factors of supra-functionality in sofa furniture. The tricky and crucial skill of designers is understanding user's needs beyond functionality and usability. Emotional needs play an essential role in product design, and supra-functional needs are purely emotional. In the competitive market of furniture, the role of supra-functionality in a user's purchase decision cannot be overlooked. Therefore, this study aims to identify the needs and factors of supra-functionality related to furniture and to find the most crucial factor of supra-functionality related to sofa design. Constructing a method to identify user's needs in terms of supra-functionality is facilitated by identifying the most important supra-functional factors.

The third scope of this research is to find an alternative method to identify the critical supra-functional needs of home sofa users that influence their purchasing decisions. This alternative method can complement the current empathy methods and fill the gap. This method must be suitable for sofa furniture (sofas as everyday furniture in today's lifestyle and as a case study). There are many furniture alternatives and options for users when purchasing sofa furniture. Many of the alternatives are in the same price and quality category. Supra-functionality can play a crucial role in the purchase decision in this situation. This study aims to predict user's purchase decisions and to understand their needs in terms of supra-functionality.

1.13 Significant of the research

This study's generalisation would significantly contribute to the vast knowledge in the empathise stage of the design thinking process. Furthermore, the results of this investigation could be highly significant and beneficial for the following:

Designers:

Understanding Supra-functional aspects in the design thinking process: The study's results will help designers, especially furniture designers, to recognise more about the Supra-functional features of the product. Designers' tricky and crucial skill is understanding user's needs beyond functionality and usability.

Identification of the most important and most effective Supra-functional factors for home sofa furniture: This study will provide information regarding the most critical Supra-functional factors in the home sofa context. Designers can gain empathy faster and easier by knowing key Supra-functional factors in a related context.

Understanding user Supra-functionality needs to reach deep empathy and user pleasure: Furniture designers can identify user's needs to gain insights and achieve more genuine empathy, encounter minor user misunderstandings, and subsequently design more lovely furniture using the proposed alternative empathy research method.

Proposing an alternative empathy research method with focus on Supra-functionality in the design thinking: This study provided an alternative method of empathy research that focuses on uncovering and understanding the end-user's supra-functionality needs. Current empathy methods focus on knowing and understanding user's needs regarding functionality and usability.

Predicting end-user's purchase decision-making: Furniture designers can improve their ability to predict user's purchase decision-making behaviour by using the proposed alternative empathy research method. One of the most critical factors in the purchase decision is end-user enjoyment, directly related to user supra-functionality needs.

Delivering more sustainable furniture: The design of successful sustainable furniture can be achieved by creating positive and pleasurable emotions between the end-user and product, which are called end-users supra-functionality needs. In other words, the sustainable design agenda can be addressed by addressing the user's needs beyond functionality.

Clarifying the product development process: Identifying customer needs is a vital stage in the product development process. As the main result of this study, the proposed empathy research method can help designers identify user supra-functionality needs. Supra-functionality needs are latent and emotional. Emotional needs are not visible and are difficult to express verbally. The proposed alternative empathy research method helps designers and other stakeholders gather user's raw data, which are easy to interpret for the product development team.

End-users:

Expressing Supra-Functionality needs will be more straightforward: The proposed alternative empathy research method can be conducted in a fun and exciting form to encourage end-users to participate in the research and disclose their needs. The proposed empathy research uses nonverbal techniques and virtual contacts.

Increasing the likelihood of delivering a delightful, pleasant and enjoyable product: One of the most critical factors in the purchase decision is end-user enjoyment, which is directly related to the user's supra-functionality needs. The proposed alternative empathy research method helps designers extract user's supra-functionality needs and design products to meet these needs.

The pleasurable home sofa fits different user's purchasing power: Furniture is not a mundane product for most families. Users can quickly establish an emotional relationship with furniture because it is a valuable but not an everyday product, and they want to enjoy having, seeing and using their furniture. This need for pleasure is less dominant in today's furniture industry, at least with the low purchasing power of users. Users with different purchasing power can enjoy pleasurable furniture when designers know their supra-functionality needs.

1.14 Thesis structure

The thesis consists of six chapters:

Chapter One (Introduction) introduces the subject matter and studied problems and indicates its importance and validity. It sets out the research objectives to be attained.

Chapter Two (Literary review) contains a critical and comprehensive literature study on the topic of the dissertation. Three primary research constructs, namely the empathy research method in the design thinking process, supra-functionality factors for sofa furniture and furniture purchase decision making, are examined

in the available documents. Design Thinking, empathy approach, supra-functionality and purchase decision making are the keywords of this study.

Chapter three (Methodology) covers a description and justification of the theoretical approaches, materials, experimental designs and methods used to attain the expressed objectives of the study undertaken. This chapter addresses the methodology based on each research objective, research approach, research design, Instruments, data collection, data analysis, and summary.

Chapter four (Results) presents a total account of the results gotten within the study in the form of figures, text or tables so that the critical data is highlighted. The result section was highlighted in qualitative and quantitative data. The findings addressed the supra-functionality factors in home sofas, home sofa purchasing decisions, and the criteria of an alternative empathy research method for empathy in the context of home sofas.

Chapter five (Discussion) contains the interpretations of the results obtained and the conclusions drawn. The researcher discusses the results of the qualitative and quantitative analysis and how the analysis relates to the research objectives, which are "main supra-functionality factors in home sofa furniture" and "the criteria of an alternative empathy research method in the design thinking process".

Chapter Six (Summary, Conclusion and Recommendations for Future Studies) outlines the importance of the study and stresses the findings upon which conclusions are drawn in line with the objectives set, acknowledges the limitations and suggests further investigation.

1.15 Summary

In summary, current empathy methods focus less on extracting user's supra-functional needs. Current empathy methods mainly focus on knowing and understanding the functionality and usability needs. These methods are based on observation and conversation, while the supra-functional needs are not visible and problematic to be expressed verbally.

This study aims to develop an alternative empathy research method in the design thinking process by understanding the end-user's supra-functionality factors for home sofa design. This study uses literature review, the KJ method and brainstorming to identify the supra-functionality factors in emphasise stage of the design thinking process. Then, surveys and interviews are conducted to analyse the main supra-functionality factors for sofa furniture. Then, the qualitative and quantitative data from the survey and interview are analysed to determine the

criteria of an alternative empathy research method in the design thinking process. Finally, the proposed alternative empathy research method in the design thinking process is validated through expert interviews.

The study outcomes include knowing the elements of supra-functionality factors, reaching the conceptual framework, finding research gaps, and identifying the most essential and effective supra-functionality factor in home sofa furniture. Also, constructing an alternative empathy research method in the design thinking focuses on the supra-functional needs. It is expected that the results will lead to the understanding of supra-functionality aspects in the design thinking process, the identification of the most essential and effective supra-functionality factor for home sofa furniture, and the understanding of user's supra-functional needs. Knowing a user's supra-functional needs can lead to deep empathy and user pleasure and predict user purchase decision behaviour.

After introducing the background problem, this study will introduce the literature on supra-functionality in the design thinking process, supra-functionality factors for sofa furniture, empathy research method, and describe the research methodology before presenting the expected results.

This study contributes to the understanding that supra-functional needs to reach accurate and deep empathy with end-users to predict users' purchase decision behaviour. It needs to construct an alternative empathy research method in the design thinking process by understanding the supra-functional needs for home sofa furniture design to achieve deep empathy with end-users and user pleasure in the furniture design industry.

REFERENCES

Abdi, H., & Williams, L. J. (2010). Tukey's honestly significant difference (HSD) test. *Encyclopedia of Research Design*, *3*(1), 1–5.

Al-Azzam, A. F. M., & Fattah, M. (2014). Evaluating Effect of Social Factors Affecting. Consumer Behavior in Purchasing Home Furnishing Products in Jordan. *British Journal of Marketing Studies*, *2*(7), 80–94.

Alif Fianto, A. Y., Hadiwidjojo, D., Aisjah, S., & Solimun, S. (2014). The Influence of Brand Image on Purchase Behaviour Through Brand Trust. *Business Management and Strategy*, *5*(2), 58. https://doi.org/10.5296/bms.v5i2.6003

Allwood, A. (2019). *Customer Empathy: A radical intervention in customer experience management and design* (First edit). All Work Together Pty Ltd.

Arrasvuori, J., Korhonen, H., & Väänänen-Vainio-Mattila, K. (2010). Exploring playfulness in user experience of personal mobile products. *ACM International Conference Proceeding Series*, 88–95. https://doi.org/10.1145/1952222.1952241

B.-N.Sanders, E. (2002). *From user-centered to participatory design approaches*. 1–8. https://doi.org/10.1201/9780203301302.ch1

Bastiaansen, M., Lub, X. D., Mitas, O., Jung, T. H., Ascenção, M. P., Han, D. I., Moilanen, T., Smit, B., & Strijbosch, W. (2019). Emotions as core building blocks of an experience. *International Journal of Contemporary Hospitality Management*, *31*(2), 651–668. https://doi.org/10.1108/IJCHM-11-2017-0761

Batson, C. D., Eklund, J. H., Chermok, V. L., Hoyt, J. L., & Ortiz, B. G. (2007). An additional antecedent of empathic concern: valuing the welfare of the person in need. *Journal of Personality and Social Psychology*, *93*(1), 65.

Belman, J., & Flanagan, M. (2010). Designing games to foster empathy. *International Journal of Cognitive Technology*, *15*(1), 11.

Bennett, C. L., & Rosner, D. K. (2019). The promise of empathy: Design, disability, and knowing the "other." *Conference on Human Factors in Computing Systems - Proceedings*, 1–13. https://doi.org/10.1145/3290605.3300528

Berg, B. L., Lune, H., & Lune, H. (2012). *Qualitative research methods for the social sciences*.

Bernabei, R., Freeman, K., & Power, J. (2011). The Value of Storytelling in Product Design. In *Handbook of Research on Trends in Product Design and Development: Technological and Organizational Perspectives* (pp. 447–460). IGI Global.

Bohorquez, F. A. T. (2017). *Empathy Expression and Development in the Context of Industrial Design Education*. North Carolina State University.

Bootcamp Bootleg. (2011).

Borsci, S., Kuljis, J., Barnett, J., & Pecchia, L. (2016). Beyond the User Preferences: Aligning the Prototype Design to the Users' Expectations. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *26*(1), 16–39. https://doi.org/https://doi.org/10.1002/hfm.20611

Brown, T. (2009a). *Change by design: How design thinking creates new alternatives for business and society*. Collins Business.

Brown, T. (2009b). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (1th ed.). HarperCollins. https://doi.org/10.1017/CBO9781107415324.004

Brown, T., & Katz, B. (2011). Change by design. *Journal of Product Innovation Management*, *28*(3), 381–383. http://web.a.ebscohost.com.ezplib.ukm.my/ehost/pdfviewer/pdfviewer?sid=fa898831-e921-4923-8efb-12026686af28%40sessionmgr4005&vid=13&hid=4106

Brown, T., & Wyatt, J. (2010). Design Thinking for Social Innovation. *Stanford Social Innovation Review*. https://doi.org/10.1108/10878571011042050

Bryman, A. (2011). Research methods in the study of leadership. *The SAGE Handbook of Leadership*, 15–28.

Cardoso, C., & Clarkson, P. J. (2012). Simulation in user-centred design: helping designers to empathise with atypical users. *Journal of Engineering Design*, *23*(1), 1–22.

Chang, H., Chou, Y. C. J., Bang, D., Ming, L., & Hsieh, H. (2018). User-centered empathy design : a prototype of school-age children learning aids system. *Journal of Ambient Intelligence and Humanized Computing*, *0*(0), 0. https://doi.org/10.1007/s12652-018-1047-1

Chapman, J. (2015). *Emotionally Durable Design: Objects, Experiences and Empathy* (2nd Editio). Routledge.

Choi, Y. M. (2018). *Challenges to Teaching Empathy in Design*. 3–12. https://doi.org/10.1007/978-3-319-60597-5

Chowdhury, A., Reddy, S. M., Chakrabarti, D., & Karmakar, S. (2015). Cognitive theories of product emotion and their applications in emotional product design. *Smart Innovation, Systems and Technologies*, *34*, 329–340. https://doi.org/10.1007/978-81-322-2232-3_29

Coleman, J. S. (1994). Social capital, human capital, and investment in youth.

Youth Unemployment and Society, *34*.

Coleman, R., ClaRkSON, J., & Cassim, J. (2016). *Design for inclusivity: A practical guide to accessible, innovative and user-centred design*. CRC Press.

Costa, P. M., Galvão, T., e Cunha, J. F., & Pitt, J. (2015). How to support the design and development of interactive pervasive environments. *2015 8th International Conference on Human System Interaction (HSI)*, 278–284.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Cross, N. (2008). From a Design Science to a Design Discipline: Understanding Designerly Ways of Knowing and Thinking. In *Design Research Now*. https://doi.org/10.1007/978-3-7643-8472-2_3

Cross, N. (2011). *Design thinking: Understanding how designers think and work*. Berg.

Cross, N. (2021). *Engineering design methods: strategies for product design*. John Wiley & Sons.

Crossley, L. (2003). Building Emotions in Design. *The Design Journal*, *6*(3), 35–45. https://doi.org/10.2752/146069203789355264

Dalsgaard, P. (2014). Pragmatism and Design Thinking. *International Journal of Design*, *8*(1).

Dam, R. F., & Teo, Y. S. (2018). What is Design Thinking and Why Is It So Popular? *Interaction Design Foundation*, 1–6. https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular

Dam, R., & Siang, T. (2018). *Design Thinking: Getting Started with Empathy | Interaction Design Foundation*. https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy

Dandavate, U., Sanders, E. B.-N., & Stuart, S. (1996). Emotions Matter: User Empathy in the Product Development Process. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *40*(7), 415–418. https://doi.org/10.1177/1078390311434260

Dandavate, U., Sanders, E. B.-N., & Stuart, S. (2012). Emotions Matter: User Empathy in the Product Development Process. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *40*(7), 415–418. https://doi.org/10.1177/154193129604000709

Desmet, P. M. A. (2002). Designing emotions (Doctoral dissertation). *Technical University of Delft, Industrial Design Engineering, Delft*.

Desmet, P., Overbeeke, K., & Tax, S. (2001). Designing products with added emotional value: Development and appllcation of an approach for research through design. *The Design Journal*, *4*(1), 32–47.

Devecchi, A., & Guerrini, L. (2017). Empathy and Design. A new perspective. *The Design Journal*, *20*(sup1), S4357–S4364. https://doi.org/10.1080/14606925.2017.1352932

Dilnot, C. (2018). Thinking design: A personal perspective on the development of the Design Research Society. *Design Studies*, *54*, 142–145. https://doi.org/10.1016/j.destud.2017.11.002

Ding, M., & Bai, Z. (2019). Product color emotional design adaptive to product shape feature variation. *Color Research and Application*, *44*(5), 811–823. https://doi.org/10.1002/col.22402

Dorst, K. (2011). The core of "design thinking" and its application. *Design Studies*, *32*(6), 521–532. https://doi.org/10.1016/j.destud.2011.07.006

Fenech, O C, & Borg, J. C. (2006). A model of human sensations as a basis for 'design for product-emotion'support. *DS 36: Proceedings DESIGN 2006, the 9th International Design Conference, Dubrovnik, Croatia*, 705–712.

Fenech, Oliver C, & Borg, J. C. (2006). *Towards A Sensory Approach for Designing Pleasurable User-Product Experiences*. 223–233.

Fenech, Oliver C, & Borg, J. C. (2007). *EXPLOITING EMOTIONS FOR SUCCESSFUL PRODUCT DESIGN*. *AUGUST*, 1–12.

Fenech, Olivier C, & Borg, J. C. (2007). Exploiting emotions for successful product design. *DS 42: Proceedings of ICED 2007, the 16th International Conference on Engineering Design, Paris, France, 28.-31.07. 2007*, 825–826.

Ferreira, B., Conte, T., & Barbosa, S. D. J. (2015). Eliciting Requirements Using Personas and Empathy Map to Enhance the User Experience. *Proceedings - 29th Brazilian Symposium on Software Engineering, SBES 2015*, 80–89. https://doi.org/10.1109/SBES.2015.14

Ferreira, B., Silva, W., Oliveira, E., & Conte, T. (2015). Designing personas with empathy map. *Proceedings of the International Conference on Software Engineering and Knowledge Engineering, SEKE*, *2015-Janua*(May), 501–505. https://doi.org/10.18293/SEKE2015-152

Flyvbjerg, B. (2012). Making social science matter. *Social Science and Policy Challenges: Democracy, Values, and Capacities, Paris: UNESCO Publishing*, 25–56.

Follow, Q. P., & Brown, T. (2017). *Your Empathy Toolbox : Ensuring you design a product your users will need experience , design is a pointless task ."*.

Fox, M. (2019). *Design Thinking Principles Mo's pro's guide to getting more out of classic Design Thinking tools - YouTube*. https://www.youtube.com/watch?v=NAnbSzPGbeU&feature=youtu.be

Frankenberger, E., Badke-Schaub, P., & Birkhofer, H. (2012). *Designers: the key to successful product development*. Springer Science & Business Media.

Frascara, J., Meurer, B., van Toorn, J., & Winkler, D. (1997). *User-centred graphic design: Mass communication and social change*. CRC Press.

Fuller, R. C., & Kruchten, P. (2021). Blurring boundaries: Toward the collective empathic understanding of product requirements. *Information and Software Technology*, *140*, 106670.

Gasparini, A. (2015). Perspective and use of empathy in design thinking. *ACHI, The Eight International Conference on Advances in Computer-Human Interactions*, 49–54.

Gheerawo, R., Bichard, J., Gaggero, C., & Muhammad, Y. (2010). *Digital Barriers: Making Technology Work for People*.

Gibbons, S. (2019). *Design Thinking 101 - YouTube*. https://www.youtube.com/watch?v=6lmvCqvmjfE&feature=youtu.be

Gieser, T. (2008). Embodiment, emotion and empathy: A phenomenological approach to apprenticeship learning. *Anthropological Theory*, *8*(3), 299–318.

Gould, R. K., Bratt, C., & Mesquita, P. L. (2019). Integrating Sustainable Development and Design-Thinking-Based Product Design. *Technologies and Eco-Innovation towards Sustainability I*, 245–259. https://doi.org/10.1007/978-981-13-1181-9_19

Gray, C. M., Yilmaz, S., Daly, S. R., Seifert, C. M., & Gonzalez, R. (2015). Idea generation through empathy: Reimagining the "cognitive walkthrough." *ASEE Annual Conference and Exposition, Conference Proceedings*, *122nd ASEE*(122nd ASEE Annual Conference and Exposition: Making Value for Society). https://doi.org/10.18260/p.24208

Gray, D. (2010). Empathy map. *Osterwalder, A. and Pigneur, Y., Business Model Generation: A Handbook for Visionaries, Game Changers and Challengers. Hoboken, NJ: John Wiley*.

Guo, F., Ding, Y., Wang, T., Liu, W., & Jin, H. (2016). Applying event related potentials to evaluate user preferences toward smartphone form design. *International Journal of Industrial Ergonomics*, *54*, 57–64. https://doi.org/10.1016/j.ergon.2016.04.006

Hassi, L., & Laakso, M. (2011). Design Thinking in the Management Discourse: Defining the Elements of the Concept. *18th IPDM Conference*, 1–14.

Hastings, P. B. (2018). *Design Thinking: Empathize - YouTube*. https://www.youtube.com/watch?v=q654-kmF3Pc

Hauke, J., & Kossowski, T. (2011). Comparison of values of pearson's and spearman's correlation coefficients on the same sets of data. *Quaestiones Geographicae*, *30*(2), 87–93. https://doi.org/10.2478/v10117-011-0021-1

Henriksen, D., Richardson, C., & Mehta, R. (2017). Design thinking: A creative approach to educational problems of practice. *Thinking Skills and Creativity*, *26*(March), 140–153. https://doi.org/10.1016/j.tsc.2017.10.001

Hess, J. L., & Fila, N. D. (2016). The manifestation of empathy within design: findings from a service-learning course. *CoDesign*, *12*(1–2), 93–111.

Heylighen, A., & Dong, A. (2019). To empathise or not to empathise? Empathy and its limits in design. *Design Studies*, *65*(xxxx), 107–124. https://doi.org/10.1016/j.destud.2019.10.007

Hoffman, M. L. (2001). *Empathy and moral development: Implications for caring and justice*. Cambridge University Press.

Interaction Design Foundation | What is Design Thinking? (2019). https://www.interaction-design.org/literature/topics/design-thinking?page=3

Intille, S., Kukla, C., & Ma, X. (2002). *Eliciting User Preferences Using Image-Based Experience Sampling and Reflection Stephen*. 738–739.

Ji, Y. G. (2018). Advances in Affective and Pleasurable Design. *Advances in Affective and Pleasurable Design*, 196–204. https://doi.org/10.1201/b12525

Jiancaro, T. (2018). Empathy-Based Design Approaches. *New Directions in Third Wave Human-Computer Interaction*, *2*, 43–60. https://doi.org/10.1007/978-3-319-73374-6

Johnson, D. G., Genco, N., Saunders, M. N., Williams, P., Seepersad, C. C., & Hölttä-Otto, K. (2014). An experimental investigation of the effectiveness of empathic experience design for innovative concept generation. *Journal of Mechanical Design*, *136*(5), 51009.

Jordan, P. W. (2000). *Designing pleasurable products: An introduction to the new human factors*. CRC press.

Jošt, M., Kaputa, V., Nosáľová, M., Barčić, A. P., Perić, I., & Oblak, L. (2020). Changes in customer preferences for furniture in Slovenia. *Drvna Industrija*, *71*(2), 149–156. https://doi.org/10.5552/drvind.2020.1967

Kahneman, D., & Deaton, A. (2010). High income improves evaluation of life but not emotional well-being. *Proceedings of the National Academy of*

Sciences, *107*(38), 16489–16493.

Kang, H. J., Shin, J. hye, & Ponto, K. (2020). How 3D Virtual Reality Stores Can Shape Consumer Purchase Decisions: The Roles of Informativeness and Playfulness. *Journal of Interactive Marketing*, *49*, 70–85. https://doi.org/10.1016/j.intmar.2019.07.002

Kelley, T. O. M. A. (2001). *The art of innovation: Lessons in creativity from IDEO, America's leading design firm* (Vol. 10). Broadway Business.

Kimbell, L. (2009). Design practices in design thinking. *European Academy of Management*, 1–24.

Kimbell, L. (2011). Rethinking Design Thinking: Part I. *Design and Culture*, *3*(3), 285–306. https://doi.org/10.2752/175470811x13071166525216

Kimbell, L. (2012). Rethinking design thinking: Part II. *Design and Culture*, *4*(2), 129–148. https://doi.org/10.2752/175470812X13281948975413

Kolko, J. (2014). Well-designed : how to use empathy to create products people love. In *Well Designed*. Harvard Business Review press.

Köppen, E., & Meinel, C. (2015). Empathy via design thinking: creation of sense and knowledge. In *Design thinking research* (pp. 15–28). Springer.

Kouprie, M., & Visser, F. S. (2009). A framework for empathy in design: stepping into and out of the user's life. *Journal of Engineering Design*, *20*(5), 437–448.

Kouprie, M., Visser, F. S., & Sleeswijk Visser, F. (2009). A framework for empathy in design: Stepping into and out of the user's life. *Journal of Engineering Design*, *20*(5), 437–448. https://doi.org/10.1080/09544820902875033

Kumar, V. (2012). *101 Design Methods: A Structured Approach for Driving Innovation in Your Organization* (1st editio). John Wiley & Sons.

Lanzoni, S. (2018). *Empathy: A History*. Yale University Press.

Lee, S., & Koubek, R. J. (2010). Understanding user preferences based on usability and aesthetics before and after actual use. *Interacting with Computers*, *22*(6), 530–543.

Leonard, D., & Rayport, J. F. (1997). Spark innovation through empathic design. *Harvard Business Review*, *75*, 102–115.

Li, Y., Zhang, Z., & Zhao, Y. (2016). Analysis on influencing factors of consumers' purchasing behavior online for furniture: A case study on furniture malls and business centers in Harbin. *ACM International Conference Proceeding Series*, *17-19-Augu*(26).

https://doi.org/10.1145/2971603.2971606

Liedtka, J. (2005). *The essential guide to design thinking*. University of Virginia, Darden School of Business. https://darden.virginia.edu/executive-education

Liedtka, J. (2013). *Solving Problems with Design Thinking: Ten Stories of What Works*. Columbia Business School Publishing.

Liedtka, J. (2017). *Design Thinking for the Greater Good: Innovation in the Social Sector*. Columbia Business School Publishing.

Liedtka, J., & Ogilvie, T. (2011). *Designing for Growth: A Design Thinking Tool Kit for Managers*. Columbia Business School Publishing.

Lokman, A. M., Kadir, S. A., Noordin, F., & Shariff, S. H. (2018). Modeling factors and importance of happiness using KJ method. *Advances in Intelligent Systems and Computing*, *739*, 870–877. https://doi.org/10.1007/978-981-10-8612-0_91

Malge, A. M. (2017). Designer's Cognitive Empathy and Emotional Empathy Measurement, a Need for Comprehensive Understanding of User. *2017 International Conference on Transforming Engineering Education (ICTEE)*, 1–4.

Mattelmäki, T. (2005). Applying probes–from inspirational notes to collaborative insights. *CoDesign*, *1*(2), 83–102.

Mccartan, S., McDonagh, D., & Moody, L. (2011). Luxification and Design-Driven Innovation in Superyacht Design. *The Royal Institution of Naval Architects*, 125–133.

McDonagh-Philp, D., & Lebbon, C. (2000). The Emotional Domain in Product Design. *The Design Journal*, *3*(1), 31–43. https://doi.org/10.2752/146069200789393562

McDonagh, D. (2015). Design students foreseeing the unforeseeable: Practicebased empathic research methods. *International Journal of Education Through Art*, *11*(3), 421–431. https://doi.org/10.1386/eta.11.3.421_1

McDonagh, D. (2017). Emotional sustainability. In *Routledge Handbook of Sustainable Product Design* (pp. 271–281). Routledge.

McDonagh, D., & Thomas, J. (2010a). Disability + relevant design: Empathic design strategies supporting more effective new product design outcomes. *Design Journal*, *13*(2), 180–196. https://doi.org/10.2752/175470710X12735884220899

McDonagh, D., & Thomas, J. (2010b). Rethinking design thinking: Empathy

supporting innovation. *Australasian Medical Journal*, *3*(8), 458–464. https://doi.org/10.4066/AMJ.2010.391

McDonagh, D., & Thomas, J. (2011). Design + Empathy = Intuitive Design Outcomes. *The Design Journal*, *14*(2), 147–150. https://doi.org/10.2752/175630611X12984592779881

Mcdonagh, D., & Weightman, D. (2015). *If kettles are from Venus and televisions are from Mars , where are cars from ? Deana McDonagh and David Weightman*. *January 2003*.

McGinley, C., & Dong, H. (2011). Designing with information and empathy: Delivering human information to designers. *Design Journal*, *14*(2), 187–206. https://doi.org/10.2752/175630611X12984592780005

Medeiros, A. C., Crilly, N., & Clarkson, P. J. (2011). The influence of ageing on user experience. *Handbook of Research on Trends in Product Design and Development: Technological and Organizational Perspectives*, 348–364.

Meinel, C., & Leifer, L. (2012). Empathy via Design Thinking: Creation of Sense and Knowledge. In *Design Thinking Research* (pp. 1–11). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-21643-5_1

Merten, J. (2005). Culture, gender and the recognition of the basic emotions. *Psychologia*, *48*(4), 306–316.

Mertens, D. M., & Hesse-Biber, S. (2012). *Triangulation and mixed methods research: Provocative positions*. SAGE Publications Sage CA: Los Angeles, CA.

Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of Cardiac Anaesthesia*, *22*(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18

Mohamed, S., & Yi, T. P. (2008). Wooden furniture purchase attributes: A Malaysian consumers' perspective. *Pertanika Journal of Tropical Agricultural Science*, *31*(2), 197–203.

Mollerup, P., Owen, C., & Cross, N. (2007). Design Thinking: Notes on its nature and use. *Design Research Quarterly*, *2*(1), 1–33. http://www.drsq.org/issues/drq2-1.pdf

Mortensen, D. (2019). *Stage 1 in the Design Thinking Process: Empathise with Your Users | Interaction Design Foundation*. https://www.interaction-design.org/literature/article/stage-1-in-the-design-thinking-process-empathise-with-your-users

Mosely, G., Wright, N., & Wrigley, C. (2018). Facilitating design thinking: A comparison of design expertise. *Thinking Skills and Creativity*,

27(February), 177–189. https://doi.org/10.1016/j.tsc.2018.02.004

Munemori, J., & Nagasawa, Y. (1991). Distributed and Cooperative KJ Method Support System. *Proc. of the 6th International Joint Workshop on Computer Communications*, 55–60.

Naeini, H., Education, S. M.-S. and, & 2015, undefined. (2015). The Role of Pleasure Criteria in Product Design: An Integrated Approach in Ergonomics and Hedonomics (A. *Researchgate.Net*, *3*(3), 39–50. https://doi.org/10.12691/rpbs-3-3-1

Nagamachi, M. (2002). Kansei Engineering as a Powerful Consumer-Oriented Technology for Product Development. *Applied Ergonomics*, *33*, 289.

Neuman, W. L. (2006). Qualitative and quantitative research designs. *Social Research Methods: Qualitative and Quantitative Approaches*, *6*, 149–178.

Ni, C., Wang, I., & Lo, H. (2018). *Applying Storyboards to Fashion Design for Empathy* (Vol. 2). Springer International Publishing. https://doi.org/10.1007/978-3-319-92141-9

Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things*. Basic Civitas Books.

O'Kane, A. A., Rogers, Y., & Blandford, A. (2014). Gaining empathy for non-routine mobile device use hrough autoethnography. *Conference on Human Factors in Computing Systems - Proceedings*, 987–990. https://doi.org/10.1145/2556288.2557179

Oblak, L., Glavonjić, B., Barčić, A. P., Govedič, T. B., & Grošelj, P. (2020). Preferences of different target groups of consumers in case of furniture purchase. *Drvna Industrija*, *71*(1), 79–87. https://doi.org/10.5552/drvind.2020.1932

Oblak, L., Pirc Barčić, A., Klarić, K., Kitek Kuzman, M., & Grošelj, P. (2017). Evaluation of Factors in Buying Decision Process of Furniture Consumers by Applying AHP Method. *Drvna Industrija*, *68*(1), 37–43. https://doi.org/10.5552/drind.2017.1625

Ohly, S., Plückthun, L., & Kissel, D. (2017). Developing students' creative self-efficacy based on design-thinking: Evaluation of an elective university course. *Psychology Learning and Teaching*, *16*(1), 125–132. https://doi.org/10.1177/1475725716681714

Olsson, T., Väänänen-Vainio-Mattila, K., Saari, T., Lucero, A., & Arrasvuori, J. (2013). Reflections on experience-driven design: A case study on designing for playful experiences. *Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces, DPPI 2013*, 165–174. https://doi.org/10.1145/2513506.2513524

Osman, N. S., & Rahman, K. A. A. A. (2019). Strategic Design Management Capability Framework for Bumiputera SME Furniture Manufacturer. *International Journal of Advanced Science and Technology*, *28*(8s), 653–660.

Owen, C. (2007). Design thinking: Notes on its nature and use. *Design Research Quarterly*, *2*(1), 16–27.

Oxley, J. C. (2011). The moral dimensions of empathy: Limits and applications in ethical theory and practice. In *The Moral Dimensions of Empathy: Limits and Applications in Ethical Theory and Practice*. https://doi.org/10.1057/9780230347809

Oxman, R. (2017). Thinking difference: Theories and models of parametric design thinking. *Design Studies*, *52*, 4–39. https://doi.org/10.1016/j.destud.2017.06.001

Parmana, P., Fahmi, I., & Nurrohmat, D. R. (2019). The Influence of Marketing Mix Factors in Purchasing Decision for Wooden Furniture Case of Furnimart Bogor. *Indonesian Journal of Business and Entrepreneurship*, *5*(1), 54–64. https://doi.org/10.17358/ijbe.5.1.54

Pecchia, C., Trincardi, M., & Di Bello, P. (2016). Expressing, managing, and validating user stories: Experiences from the market. *Communications in Computer and Information Science*, *422*, 103–111. https://doi.org/10.1007/978-3-319-27896-4_9

Pedgley, O. (2009). Influence of stakeholders on industrial design materials and manufacturing selection. *International Journal of Design*, *3*(1).

Plattner, H. (2011). *Design Thinking*. 1525–1535. https://doi.org/10.1007/978-3-642-13757-0

Porter, S., Chhibber, S., & Porter, J. M. (2003). Towards an understanding of pleasure in product design. *Design and Emotion*, 13–17.

Postma, C. E., Zwartkruis-Pelgrim, E., Daemen, E., & Du, J. (2012). Challenges of doing empathic design: Experiences from industry. *International Journal of Design*, *6*(1).

Razzouk, R., & Shute, V. (2012). What Is Design Thinking and Why Is It Important? *Review of Educational Research*, *82*(3), 330–348. https://doi.org/10.3102/0034654312457429

Rebelo, F., Noriega, P., Duarte, E., & Soares, M. (2012). Using virtual reality to assess user experience. *Human Factors*, *54*(6), 964–982. https://doi.org/10.1177/0018720812465006

Richards, L., & Morse, J. M. (2012). *Readme first for a user's guide to qualitative methods*. Sage.

Roberts, J. P., Fisher, T. R., Trowbridge, M. J., & Bent, C. (2016). A design thinking framework for healthcare management and innovation. *Healthcare*, *4*(1), 11–14. https://doi.org/10.1016/j.hjdsi.2015.12.002

Rotondo, A. (2010). Empathy & enjoyment in computer-mediated design work. *Proceedings of the 16th ACM International Conference on Supporting Group Work, GROUP'10*, 313–314. https://doi.org/10.1145/1880071.1880126

Rouvray, A. De, Bassereau, J., & Duchamp, R. (2008). *Perception and Deception : How Quantity and Quality of Sensory Information Affect Users ' Perception of Office Chairs Perception and Deception : How Quantity and Quality of Sensory Information Affect Users ' Perception of Office Chairs*. *6925*(April 2016). https://doi.org/10.2752/175630608X317896

Scheer, A., Noweski, C., & Meinel, C. (2012). Transforming constructivist learning into action: Design thinking in education. *Design and Technology Education*, *17*, 8–19. http://search.ebscohost.com.ezproxy.liv.ac.uk/login.aspx?direct=true&db=eric&AN=EJ996067&site=eds-live&scope=site

Scholten, H., & Granic, I. (2019). Use of the principles of design thinking to address limitations of digital mental health interventions for youth. *Journal of Medical Internet Research*, *21*(1), e11528.

Schweitzer, J. (2016a). *Design Thinking as a Process - YouTube*. https://www.youtube.com/watch?v=z5PvB_7K3Co&feature=youtu.be

Schweitzer, J. (2016b). *Design Thinking Discovery and Empathy - YouTube*. https://www.youtube.com/watch?v=-sR888VZCk8&feature=youtu.be

Schweitzer, J. (2016c). *What is Design Thinking? - YouTube*. https://www.youtube.com/watch?v=ECSS64UP_74&feature=youtu.be

Scupin, R. (1997). The KJ method: A technique for analyzing data derived from Japanese ethnology. *Human Organization*, *56*(2), 233–237.

Shigemoto, Y. (2021). Beyond IDEO's Design Thinking: Combining KJ Method and Kansei Engineering for the Creation of Creativity. *International Conference on Applied Human Factors and Ergonomics*, 16–23.

Shigemoto, Y. (2019). Designing emotional product design: when design management combines engineering and marketing. *International Conference on Applied Human Factors and Ergonomics*, 28–39.

Shin, D. (2018). Empathy and embodied experience in virtual environment: To what extent can virtual reality stimulate empathy and embodied experience? *Computers in Human Behavior*, *78*, 64–73. https://doi.org/10.1016/j.chb.2017.09.012

Silva, A. (2010). *Handbook of Research on Trends in Product Design and Development: Technological and Organizational Perspectives: Technological and Organizational Perspectives*. IGI Global.

Silva, A., & Simões, R. (2010). Handbook of research on trends in product design and development: Technological and organizational perspectives. In *Handbook of Research on Trends in Product Design and Development: Technological and Organizational Perspectives*. https://doi.org/10.4018/978-1-61520-617-9

Smith, A. (2006). Cognitive empathy and emotional empathy in human behavior and evolution. *The Psychological Record*, *56*(1), 3–21.

Strickfaden, M., & Devlieger, P. (2011). Empathy through accumulating techné: Designing an accessible metro. *The Design Journal*, *14*(2), 207–229.

T. Ulrich, K., & D. Eppinger, S. (2016). Product Design and Development. In *McGraw-Hill Education*. McGraw-Hill Education. https://doi.org/10.4337/9781784718152.00017

Takahashi, I., Oki, M., Bourreau, B., Kitahara, I., & Suzuki, K. (2018). *An Empathic Design Approach to an Augmented Gymnasium in a Special Needs School Setting*. *12*(3), 111–125.

TEDGlobal. (2009). *Tim Brown: Designers - think big! | TED Talk*. https://www.ted.com/talks/tim_brown_urges_designers_to_think_big

Tschimmel, K. (2012). Design Thinking as an effective Toolkit for Innovation. *… of the XXIII ISPIM Conference: Action for Innovation: …*, *June*, 1–20. https://doi.org/10.13140/2.1.2570.3361

Van der Heijden, H., Verhagen, T., & Creemers, M. (2003). Understanding online purchase intentions: contributions from technology and trust perspectives. *European Journal of Information Systems*, *12*(1), 41–48.

van Rijn, H., Visser, F. S., Stappers, P. J., & Özakar, A. D. (2011). Achieving empathy with users: The effects of different sources of information. *CoDesign*, *7*(2), 65–77. https://doi.org/10.1080/15710882.2011.609889

Ventura, M. (2019). *Applied Empathy: The New Language of Leadership*. Atria Books.

Vink, J., & Oertzen, A.-S. (2018). Integrating empathy and lived experience through co-creation in service design. *ServDes2018 - Service Design Proof of Concept*, *June*, 471–483. http://www.servdes.org/wp/wp-content/uploads/2018/07/37.pdf

Visser, F. S., & Kouprie, M. (2008). Stimulating empathy in ideation workshops. *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008*, 174–177. http://dl.acm.org/citation.cfm?id=1795265

Watanabe, C., Naveed, K., Tou, Y., & Neittaanmäki, P. (2018). Measuring GDP in the digital economy: Increasing dependence on uncaptured GDP. *Technological Forecasting and Social Change*, *137*, 226–240.

Watson, B., & McDonagh, D. (2004). Design and emotion. *Engineering Designer*, *30*(5), 8–11.

Weber, M., & Geerts, S. A. M. (2011). Customer involved open innovation: innovation of new products with end users and customers. In *Handbook of research on trends in product design and development: Technological and organizational perspectives* (pp. 259–288). IGI Global.

Wee, C. S., Ariff, M. S. B. M., Zakuan, N., Tajudin, M. N. M., Ismail, K., & Ishak, N. (2014). Consumers perception, purchase intention and actual purchase behavior of organic food products. *Review of Integrative Business and Economics Research*, *3*(2), 378.

Weightman, D., & McDonagh, D. (2004). Supra-functional factors in sustainable products. *Design and Manufacture for Sustainable Development*, 91–101.

Wilcox, R. R. (2022). Two-way ANOVA: Inferences about interactions based on robust measures of effect size. *British Journal of Mathematical and Statistical Psychology*, *75*(1), 46–58. https://doi.org/10.1111/bmsp.12244

Wilkinson, C. R., & De Angeli, A. (2014). Applying user centred and participatory design approaches to commercial product development. *Design Studies*, *35*(6), 614–631. https://doi.org/10.1016/j.destud.2014.06.001

Wincup, E. (2017). *Criminological research: Understanding qualitative methods*. Sage.

Woodcock, A., & Mcdonagh, D. (2018). Developing Empathy for Older Users in Undergraduate Design Students. *Design and Technology Education, 23(2), N2. Chicago*, *McDonagh 2017*, 1–16.

Woodcock, A., McDonagh, D., & Osmond, J. (2018). Developing Empathy for Older Users in Undergraduate Design Students. *Design and Technology Education*, *23*(2), n2.

Woodcock, A., Mcdonagh, D., Osmond, J., & Scott, W. (2018). *Empathy, Design and Human Factors*. *607*. https://doi.org/10.1007/978-3-319-60492-3

Wright, P., & McCarthy, J. (2008). Empathy and experience in HCI. *Proceeding of the Twenty-Sixth Annual CHI Conference on Human Factors in Computing Systems - CHI '08*, 637. https://doi.org/10.1145/1357054.1357156

Xue, L., & Yen, C. C. (2007). *Towards Female Preferences in Design – A Pilot Study*. *1*(3), 11–27.

Yates, L. (2004). *What does good education research look like?: Situating a field and its practices*. McGraw-Hill Education (UK).

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). sage.

Yoon, J. K., Pohlmeyer, A. E., Desmet, P. M. A., & Kim, C. (2020). Designing for Positive Emotions: Issues and Emerging Research Directions. *Design Journal*, *24*(2), 167–187. https://doi.org/10.1080/14606925.2020.1845434

Yuan, S., & Dong, H. (2014). *Empathy Building through Co-design*. 85–91.

Zach, L. (2006). Using a multiple-case studies design to investigate the information-seeking behavior of arts administrators. *Library Trends*, *55*(1), 4–21.

Zingoni, M. (2019). Beyond Aesthetics, Empathy First. *The Design Journal*, *22*(3), 1–20. https://doi.org/10.1080/14606925.2019.1592808

Websites

Furniture - Malaysia | Statista Market Forecast. (2022). Statista; www.statista.com. Retrieved June 26, 2022, from https://www.statista.com/outlook/dmo/ecommerce/furniture/malaysia

Gray, D. (2009). Empathy Map - Gamestorming. Gamestorming; www.gamestorming.com. Retrieved April 10, 2019, from www.gamestorming.com/empathy-map

How to Develop an Empathic Approach in Design Thinking | Interaction Design Foundation (IxDF). (2020, August 3). The Interaction Design Foundation; www.interaction-design.org. Retrieved October 22, 2020, from https://www.interaction-design.org/literature/article/how-to-develop-an-empathic-approach-in-design-thinking

Malaysian Furniture Industry :: Malaysian International Furniture Fair. (2021). Malaysian Furniture Industry :: Malaysian International Furniture Fair; 2022.miff.com.my. Retrieved June 26, 2022, from https://2022.miff.com.my/about-miff/malaysian-furniture-industry/

Shahril, M. (2022). Securing the Future of Malaysia's Furniture Industry - MIDA | Malaysian Investment Development Authority. MIDA | Malaysian Investment Development Authority; www.mida.gov.my. Retrieved June 21, 2022, from https://www.mida.gov.my/securing-the-future-of-malaysias-furniture-industry/

Speedminer - Namespace. (n.d.). Speedminer - Namespace; mytis.mtib.gov.my. Retrieved June 20, 2022, from https://mytis.mtib.gov.my/csp/sys/bi/%25cspapp.bi.index.cls?scnH=921&scnW=1904

UCD Process — Calliope Works. (n.d.). Calliope Works; calliope.works. Retrieved March 20, 2019, from https://calliope.works/ucd-process

Why Visit? :: Malaysian International Furniture Fair. (2021). Why Visit? :: Malaysian International Furniture Fair; 2022.miff.com.my. Retrieved June 24, 2022, from https://2022.miff.com.my/visitors/why-visit/