PRODUCT IDENTITY FOOTPRINT:
A SET OF TOOLS TO CLARIFY THE FRONT END OF INDUSTRIAL DESIGN PROJECTS IN ORDER TO START AND DEVELOP PRODUCTS THE RIGHT WAY.

Rodriguez Cuevas, JM. RODZ+, Toluca, Mexico, rodzmas@gmail.com

Islas Munoz, JA. University of Cincinnati, Cincinnati, USA, juanantonio.islasmunoz@uc.edu

Abstract

Having observed that many industrial design projects are started with the wrong approach, producing loss of resources, time, and professional relationships, this article presents a set of three tools that enables a clearer view of the Fuzzy Front-end (Vogel, Cagan). The first tool helps to understand the **design order** (Buchanan) of the product to be developed, and to place it in the **utilitarian product universe** (practical and economically biased)**,** the **transitional-wholistic product universe** (practical, economic, and emotionally balanced)**,** or the **emotional product universe** (viscerally and symbolically biased). The second identifies a product's global purpose composed by its **practical, economic, and emotional** purposes, as well as the value factors they include (practical and indicative function, usability, practical or emotional cost-benefit, visceral appeal, and symbolic meaning). The third tool involves the **type of project** to be undertaken (vision, new development, major enhancement, or minor enhancement). Applicable to all disciplines of design, the three tools comprise the **product identity footprint**, which helps inform the selection of appropriate strategies to start a project the right way. It can increase the efficiency of the product development process by providing an agreed view that can be shared with all the development team, from the project sponsor to the engineering, marketing, planning, and creative departments.

Keywords: industrial design methodology, design strategy, project development, design theory, industry

In his book "Making Ideas Happen," Scott Belsky, founder and CEO of Behance mentions that one of the most relevant causes of ideas not seeing the light of day is that the idea itself does not have value until the pertinent actions to make it happen are taken. Thomas Edison mentions that for an idea to succeed, 1% of inspiration and 90% of perspiration are required. Materializing an idea through Belsky's pertinent actions and Edison's 90% or perspiration heavily depend on **organization and structure**. However, according to studies done for Belsky's book, the creative

guild is the most disorganized of all. A survey done through Behance shows that creatives reject structure while claiming that it constrains their creative instinct. Jorge Mauricio Rodriguez Cuevas has also seen a similar pattern through his 18 years of experience in industry and academia in Mexico. He has observed that people aspiring to work in the discipline of industrial design tend to be disorganized and fear processes and constraints, but embrace the self-expression and emotional potential that is closer to art, shown in their impactful renderings, prototypes, and aesthetic interpretation. At the College of Design, Architecture, Art, and Planning, faculty member Juan Antonio Islas Munoz observes similar patterns. Students and professionals who adhere to the artistic and visually impactful side of design usually struggle when facing projects in which this is not a priority, while students who tend to be more functionally-driven suffer in projects that have a stronger emotional bias. One of the most common problems faced by design practitioners is negligence in decision-making of appropriate strategies to identify the type of challenge before a project is started. Important matters such as the selection of the right team to be assembled, and quantification of resources to face the project are not considered. There is the feeling that being creatives, good sketchers, or model-makers, is enough to direct and execute a design project. This is a quotidian reality, sometimes present in minor or major scale, but practically as an unfortunate constant.

Figure 1. Parking pay machines with different levels of structure and complexity.

Beginning a design project the right way is not easy. It is a complex endeavor that has even been called “The Fuzzy Front-end” (Vogel, Cagan). However, this is where structure and organization can help make this complex stage simpler for creatives. According to Norman, complexity can

be made simple, as long as there is a legible structure with patterns that can be understood by the human mind. In turn, simplicity can quickly turn complex if the aforementioned structure does not exist, as can be seen in Figure 1. This document seeks to help clarify the Fuzzy Front-End by proposing a structure to the complexity of this stage.

Like other authors have done for decades, this paper proposes that industrial design is a blend between the disciplines of art and engineering. However, it goes beyond that by emphasizing the varying levels of mixture and nuances possible as products get close to the rational dimension of engineering, or to the emotional dimension of art. Industrial Design products located close to either side require different approaches and resources for project development. This may seem obvious but, as it was specified before, it is not uncommon for industrial design projects to be executed with the same approach, regardless of where they are on the spectrum due to preference for self-expression over constraints and processes.

Designers are not the only protagonists in the complex world of product development, and applying the same approach to develop products in opposite sides of the spectrum is not exclusive to them. In industry, there are other groups such as the sponsor or company that requests the development, marketing teams, as well as engineering and planning ones. Each of them represents a different set of demands, requirements, and wishes, all related with the project's objectives. However and odd-seemingly, even though they are all part of a group that seeks the same result, the understanding of the product to be developed can be different since these demands, requirements, and wishes are related to each group's specific interests and particular contexts, which impacts their approach when developing a product. The following list exemplifies some of the actions or thinking states that are frequent in the teams about how the product should be developed:

1. The personality of the sponsor that commissions the development: this entity tends to have a preconceived notion or desire about what the product to be developed should be, which is not always related to the purpose that the product has to respond to.

2. The personality of the marketing team: this way of thinking can judge product development based on the information that user groups have provided, trends and fashionable style, or in reaction to the competition.

3. The personality of the planning team: planners normally focus on the project being executed according to what was stipulated in terms of time, as well as making sure that the development cost does not surpass what was initially calculated.

4. The personality of the engineering team: it normally seeks the least amount of impact of any kind so the product stays within cost while still functioning properly, and it adjusts to what the planners demand.

5. The personality of the design team: it normally has an idealistic vision that exceeds what the product should be, and despite having objective marketing data (to some extent), always seeks to push other teams to go beyond what is expected. This does not seem like a negative in principle, however, when the design team is young and inexperienced, it

may not execute an objective plan or strategy that aligns to the requirements of the other teams. As it has been explained before, its passion and excitement over creation tend to win over following the constraints of boring but real requirements.

Summarizing, the lack of a correct and well-established judgement by all the team involved in the development of a product, is the main cause of the possible failure in the project's results. This is why it is important to have a set of tools that help clarify the pertinent priorities specific to the project, so that all teams involved have a common understanding and thus become able to work together in a more unified way. The tools presented in this paper are useful for the project leader (designer or otherwise) to create awareness and persuade all teams involved about these pertinent priorities.

The spectrum of industrial design product universes proposed in this document is composed by three categories: the **Utilitarian Universe** (practical and economically biased products) the **Transitional-Wholistic Universe** (practical, economically, and emotionally balanced products)**,** and the **Emotional Universe** (visceral and symbolic biased products). Its correct and deep understanding and the priorities related to them, in addition to the **type of project** that is being developed, and the **design order** (Buchanan) involved, are proposed to be used as a set of tools to create a **Product Identity Footprint.** Its objective is to clarify the front end of projects, and help product development teams and leaders understand which approach within the spectrum of rationality or emotionality, is appropriate to take before the execution of a design project.

Theoretical foundation

Industrial design as a spectrum between engineering and art

The classification proposed in this document considers different universes of industrial design products, as they are set in the scale that transitions from Engineering to Art. In order to understand these universes, it is important to review the fundamental differences between the products of both worlds.

Engineering products.

The main purpose of engineering is to materialize human ideas in the field of the practical and the operational. Exact disciplines and specific processes are applied to bring engineering products to life with the highest level of effectiveness possible, which means achieving the desired result (efficacy), with the least amount of resources possible (efficiency). Engineering products are rational and concrete.

Figure 2. Examples of engineering products.

Art objects:

Differently, art's sole reason of existence is to express the emotions of the artist and/or to provoke them in the audience. Art products are capricious and abstract. Their purpose is to try and satisfy the senses or give a non-logical answer to the great need of humans to express our nature, condition, insecurity, or security. Art products do not need to be tied to a practical purpose, solve a problem, or have a utility to exist. They are not necessarily brought to life with efficiency, but with whatever means are necessary to make them exist.

Figure 3. Examples of art products.

Industrial Design products are a mixture of the hard disciplines from engineering, and the expression and human perception disciplines from art. They can be both rational and concrete, capricious and abstract, or a mixture of both. Industrial Design represents an appropriate, strategic, and precise balance (or imbalance) between both worlds, with no identifiable border of when one starts and the other ends, but with a progressive variation of the logical, objective, and rational to the emotional, subjective, and irrational.

The purpose of products

In Aristotle's rhetoric, the discourse is the means in which an orator tries to transmit a message, which should be understood in the best way possible by the listener. In order to achieve this, Aristotle divides the discourse into three main dimensions. The first one is called *logos,* which is of a rational order and has to do with the objective definition of the message: its practical purpose. The second and third dimensions of the discourse are of an emotional nature. The second dimension is called the *ethos*, which is related to the attitude, conduct, and character in which the orator emits the message, which in turns aims to create an emotional sense of certainty and credibility in the listener. The third dimension is called *pathos,* which has a symbolic nature by generating an emotional impact in the listener, this time by connecting with other experiences or feelings. Summarizing, the *logos* of a discourse is its practical purpose, the *ethos* is the emotional sense of the orator's credibility, and the *pathos* is the listener's emotional identification with what is being said, and how it is being said. Products are analogous to Aristotle's ideas in the way that they also have a **practical purpose**, which is related to the effectiveness of their function, as well as an **emotional purpose**, which aims to produce a

response in the user related to the *pathos*, which is backed up by the product's or brand's *ethos*. In addition, products also have an **economic purpose** which can have two foci. The first one is to get the best **practical cost-benefit** by seeking to materialize the product in the most efficient way, with the least amount of resources in their operation, fabrication, maintenance, etc. The second one is to get the best **emotional-cost benefit** by seeking to maximize the impact of the product by means of visceral appeal and symbolic meaning.

Like a speech, before beginning a project to develop an industrial design product, it is important to identify what needs to be achieved. This depends on where the product is located in the spectrum from engineering to art. Engineering products prioritize the practical and economic purposes, less relevant for art products, which prioritize the emotional purpose. For industrial design, all three purposes coexist in a **global purpose**, which changes by the way the practical, economic, and emotional purposes are balanced depending on their location in the spectrum. The practical and economic purpose outweigh the emotional purpose if the industrial design product is closer to engineering than art, and vice versa. Figure 4 shows how the balance shifts as products transition from one side of the spectrum to the other.

Figure 4. In the spectrum of engineering to art, the global purpose of products is balanced differently.

A series of **value factors** can be used as arguments to help pertinently prioritize the importance of each of the three purposes when developing an industrial design product. Their importance and relevance in the conversation varies depending on where they can be placed in the spectrum from engineering to art. The value factors can be observed in Table 1.

Rational value factors	**Practical purpose**	**Practical Function:** considers the correct operation of the product, its utility, durability and endurance, etc. It is object-centric. **| Indicative function** (or marking functions, Burdek)**:** considers the portion of aesthetics that communicates how the product is assembled or operated. It is user-centric. **| Usability:** it is related to the indicative function, and considers the reduction of cognitive lag related to the learning curve for operation, and/or allows for a the better utilization of the product. It is also user-centric.
	Economic purpose	**Practical cost-benefit:** considers manufacturing cost and its implications in terms of final price, quality, etc. It is also related to making the product perform and operate.
Emotional value factors		**Emotional cost-benefit:** considers the resources used to obtain the maximum effect possible in their audience.
	Emotional purpose	**Visceral appeal** (Norman)**:** considers the desired initial reaction of the person that comes in contact with the product. **| Symbolic meaning:** considers the reflective relationship (Norman) between an object and the person's values and background.

Figure 5. Rational and emotional value factors as related to the product purposes

If the product is closer to the rational side of the spectrum, it can be argued that the focus on the practical purpose's value factors (practical function, indicative function, and usability) should be stronger than the emotional one (visceral appeal and symbolic meaning), and that a practical-cost benefit should be the focus on the economic purpose rather than an emotional-cost benefit.

The three universes of industrial design products

The understanding of the different weighting of a product's purposes and their value factors

makes it possible to identify three main categories: the **Utilitarian Product Universe,** the **Transitional-Wholistic Product Universe,** and the **Emotional Product Universe.** It is important to mention that there is no border in-between these categories but rather a progressive transformation from one to the other.

Figure 6. Examples of products in the Utilitarian Product Universe (practical and economically biased)

The Utilitarian Product Universe exists next to the engineering side of the spectrum. The goal of the products in this universe is to provide a service in the best way and at the lowest cost possible, which means that their practical and economic (with a practical cost-benefit focus) purposes are a priority. In this universe of products, aesthetic considerations are not necessarily non-existent, but any application depends on enhancing performance or indicating the function and correct use of the product rather than to produce emotion. Usability can be a priority since it increases productivity. Utilitarian products are more object-centric than user-centric the closer they are to the engineering side of the spectrum. A person that pretends to purchase a product in the Utilitarian Universe considers the following decision-making factors: first, the product should operate correctly and be capable of solving the problem or need with the highest productivity possible; second, the product should have a fair price in relation to quality, warranty, productivity, part availability, maintenance cost, post-sale service, etc.

Figure 5. Examples of products in the Transitional-wholistic Product Universe

The **Transitional-wholistic Universe** (Figure 5) encompasses the products that are in the middle of the transition between engineering and art. In this case, the practical, economic (both types of cost-benefit), and emotional purposes have an equal weight distribution and reach a true balance. Usability becomes more important as well and products become more user-centric. Transitional-wholistic products are designed to be sold globally and are intended to be used by culturally diverse people, with different physical constitutions, languages, lifestyles, etc. Due to their complexity, they are developed by big corporations with the appropriate infrastructure, economic resources, and specialized, multidisciplinary staff. Products within this universe present a more sophisticated appearance and nuanced function than the ones in the Utilitarian Product Universe. In the Transitional-wholistic Product Universe, form is derived from function, as much as function is derived from form. Since all value factors have the same weight, the persuasion tools for purchasing these kind of products becomes more complex. Generally speaking, a person that is looking to purchase a product in this universe wants it to work as intended, be affordable, be visually appealing, and resonate with their personal emotions at the same time. This may produce an indecision conflict in the buyer, who will have to decide if to buy the most effective, the most affordable, or the most emotionally appealing product.

Figure 6. Examples of products in the Emotional Product Universe

Lastly, the **Emotional Product Universe** (Figure 6), is represented by those products in which the emotional purpose is the most important, and thus the economic purpose has an emotional cost-benefit focus. Generally, consumers of these type of products are persuaded by the style, brand, and lifestyle they inspire. They are aspirational products whose only purchase justification is tied to an emotional thinking structure. In this universe, the practical and economic purpose values are not relevant, and are overcome by the product's visceral and symbolic appeal. A buyer of these products would base their purchase decision in phrases such as: "This is beautiful, I need to have it!" "People will know how smart I am if I buy this," "Not everyone can have one of these," "I don't know if I will use this, but it would look great in my living room," etc.

Figure 7 shows the three universes going from the rational dimension of the engineering discipline to the emotional dimension of art in the X axis. At the bottom of the graph, the way the practical, economic (with both foci), and emotional purpose are balanced differently as products are located in different parts of the spectrum. Utilitarian products are more rational and concrete, and the emotional products are on the abstract and emotional side. In the Y axis, the curve and faces displayed represent the size of the market, and the expression of the faces moves from indifference to emotion as the spectrum advances. Transitional-wholistic products are

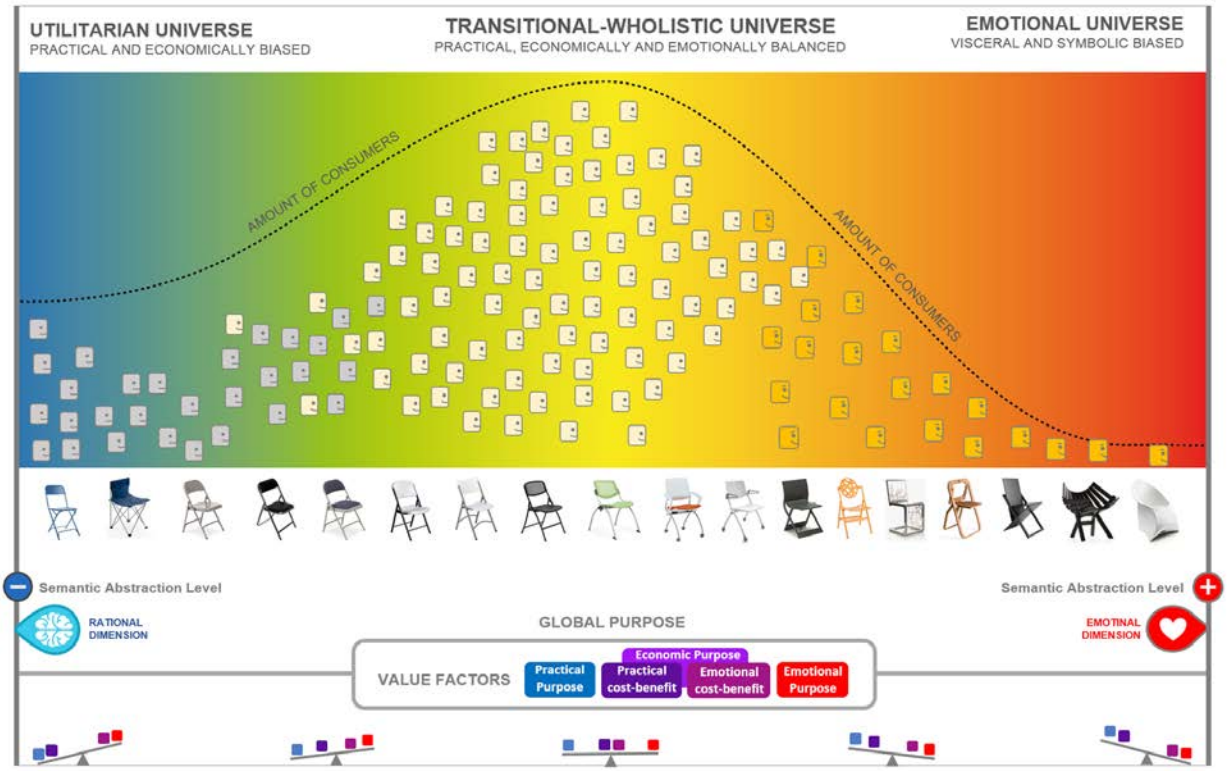


Figure 7. Industrial Design Product Universe infographic

produced for large global markets and are frequently manufactured by the millions, and thus have a larger consumer base. Utilitarian products, frequently tied to agriculture, transformation, manufacturing of goods, and purely functional objects, tend to have a smaller market share, but they can still be considered as large productions. Emotional products on the other hand are not tied to big sales, and thus have smaller markets, sometimes producing only hundreds, dozens, or even unique pieces.

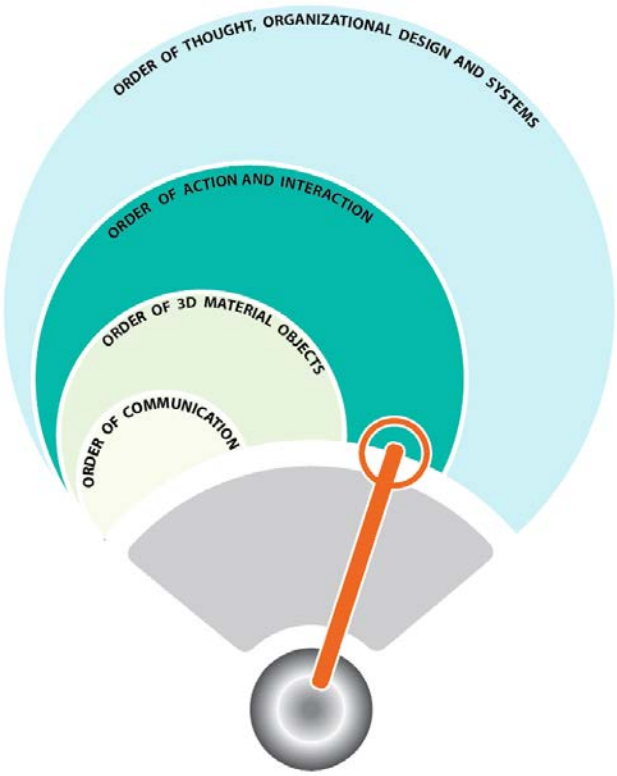


Figure 8. Buchanan's 4 design orders interpreted as an automotive gage.

The 4 Design orders

Another way to understand the complexity of a project is to identify the **design order** that the product to be developed will belong to. Dr. Richard Buchanan presents 4 orders related to the complexity of design: communication, construction, interaction, and systems (Figure 8). The first one encompasses the generation of solutions through bi-dimensional communication, the second one through the construction of tridimensional material objects, the third one through interactivity with physical objects with interfaces, and the fourth one through complex systems. As the design order increases in complexity, each order is inclusive of the next one (figure8): the design of tridimensional material objects includes communication, interaction includes 3D objects and communication, while systems include all three. Understanding the design order of

the product to be developed helps identify what kind of expertise is necessary to take on the project before its execution.

The different types of industrial design projects

In addition, industrial design projects have different levels of complexities. The difference has to do with their objective and scope in relation to the project's global purpose. The different project types are:

- **Vision projects:** their primary goals are to make its output influence the direction a company could take in future long-term projects, or to communicate the company's intentions to their audience if the direction has already been selected. The point is to generate a conversation within and without the company either to convince high executives on what the company could be pursuing, or to inform them by gaging the reaction of the market to this new idea. Examples of these projects are concept cars presented at auto shows.
- **New developments:** they begin from the ground up, with nothing or little being pre-established. Their objective is to break paradigms and have the highest opportunity for innovation, and thus, to be revolutionary in the marketplace. In this case, the research phase is the longest and most thorough. Its development requires the most resources in terms of time and money, since more needs to be created from scratch, and more human expertise is needed. Thus, the cost and duration of a project of this nature is higher.
- **Major enhancement projects:** they have the objective of increasing the life of a product that is already in the market but has begun to lose sales, without the high investment

needed for a new development. Under this evolutionary scenario, projects start from well-established foundations, previous work, existing assets and parts, etc. The project cost and duration is much lower than the previous category, involving the use of a great percentage of existing components from previous versions of the product. The enhancements done to the product are focused in performance and/or usability, cost reduction, and stylistic refresh.

- **Minor enhancement projects:** their impact usually lies in aesthetic and other minor updates, leaving the original product architecture, functional components, and manufacturing processes practically untouched. A project of this nature is useful to further increase the life of a product that has already been under major enhancement. This type of project requires the least amount of resources and duration.

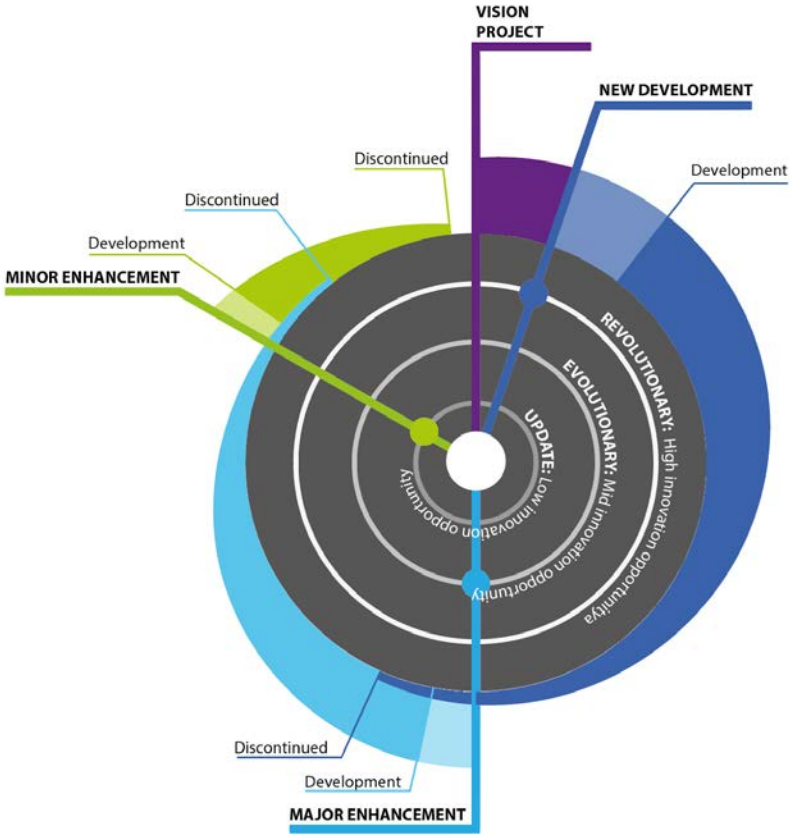


Figure 9, Types of industrial design projects.

Figure 9 shows the life cycle of a product that begins with a short vision project, which leads to a long innovation one. The decreasing area going into the diameter of the largest circle depicts the product's fall of sales as time passes. The product could be discontinued or receive a major or minor enhancement to extend its life. As the new product loses sales again, it could receive a minor enhancement yet again.

Understanding the type of project to be developed before starting is crucial, since the most appropriate one can be selected in relation to the times and resources of the company has. It helps make the decision to avoid jumping into a project that will require a significantly higher investment than originally envisioned, or to take actions to find the right partnerships and secure the level of investment necessary before beginning.

Product Identity Footprint

The theoretical foundation explained earlier was used as a base to create a set of tools formed by three main components: the **Design Order and Product Universe Coordinate Chart,** the identification of the **Type of Industrial Design Project**, and the **Value Factor Prioritization Tool**. The addition of these components helps understand the magnitude of the endeavor, and allows for its execution to begin in an appropriate way and down the right path.

Design order and product universe coordinate chart

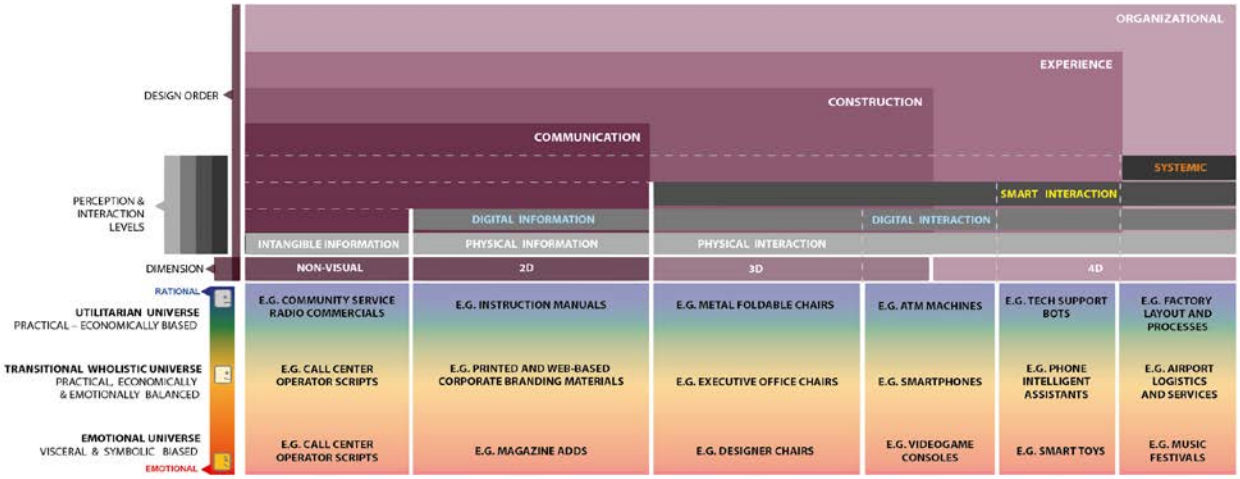


Figure 10. Design order and product universe coordinate chart

In order to obtain a deeper understanding about the subject matter of this document, we have built upon Buchanan's design orders. Within the communication order, a section for the design of intangible assets (e.g. audio) has been added. With this, the delivery of design solutions can be in the dimension of the non-visual, 2D, 3D, and 4D (3D plus interaction). We have also correlated the design orders with levels of information perception and interaction, starting with information (intangible, physical, and digital), and interaction (physical, digital, and smart), ending with systemic, which can include some or all of the aforementioned. This can be correlated with the product universe classification. Athough this paper concerns itself mainly with industrial design products, the model can be extrapolated to all four orders of design, as seen in Figure 10, which shows examples of different design solutions pertaining to each order and universe. This chart can serve as a coordinate system to identify which is the complexity of the product to be developed by placing it in its corresponding order of design and universe. By showing the dimension of the delivery of design solutions, and the perception and interaction

level that it will require, the chart can offer insight on the project needs in terms of the involved disciplines and the human resource expertise required. This in turn allows for a better understanding of the project scope, the development of a product development strategy for the execution of the project, as well as a more accurate economic panorama of what will be necessary to materialize it.

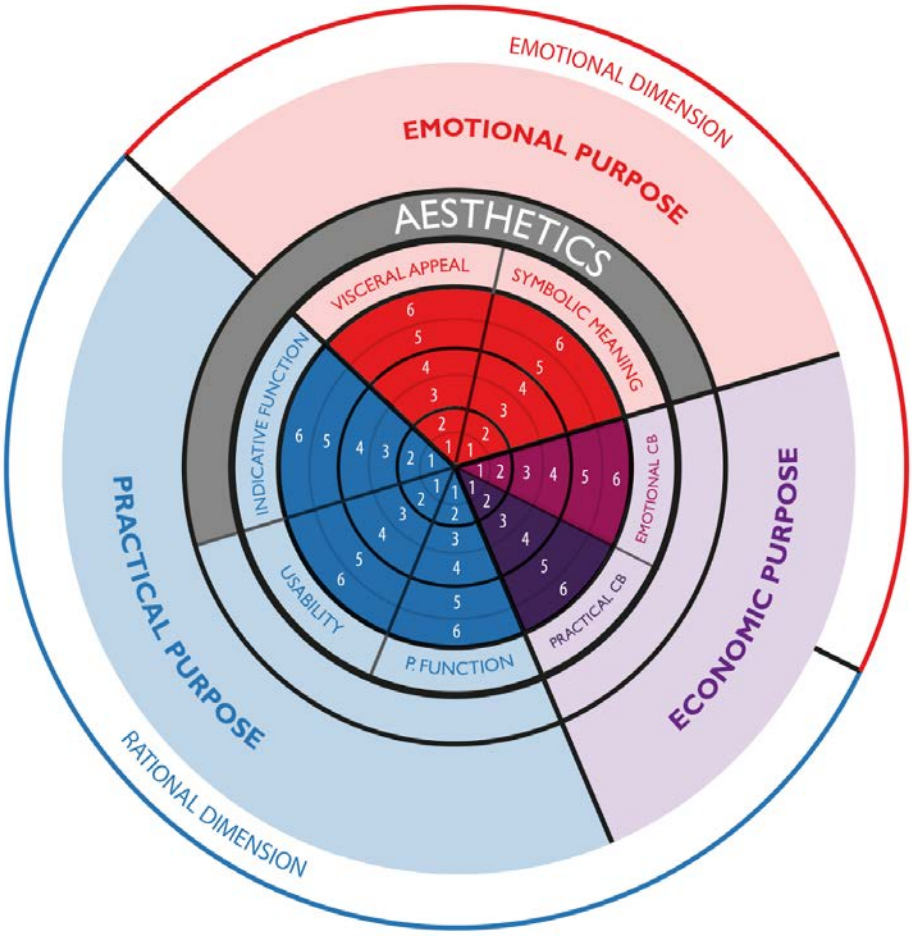


Figure 11. Value Factor Prioritization tool

Value factors prioritization tool

The tool displayed in Figure 11, is formed by concentric circles divided radially. The blue area houses the practical purpose, the purple area the economic purpose, and the red one the emotional purpose. Inside each type of purpose, the value factors are indicated. The shade of

purple used in the economic purpose varies to be closer to blue for the practical cost-benefit, and closer to red for the emotional cost-benefit. When ranking, levels 1-2 indicate low or no priority, 2-3 mid-priority, and 5-6 high priority. It is important to note that aesthetics involve both the practical and emotional purposes.

The following pages show how to fill the tool using three chairs as an example: a utilitarian, a transitional-holistic, and an emotional one. The value system in (Figure 12) is proposed. Figures 13, 14, and 15 show a set of auxiliary charts to be used to analyze every product prior to filling the circular tool. They are meant to rationally describe the product´s purposes, as well as the value factors involved in each. Filling these tables with input from all the development team is crucial for the understanding of what should be prioritized during the project.

	Practical purpose			**Economic purpose**		**Emotional purpose**	
LEVELS	**Practical function**	**Usability**	**Indicative function**	**Practical cost-benefit**	**Emotional cost-benefit**	**Visceral appeal**	**Symbolic meaning**
5-6 HIGH PRIORITY	The product's practical performance needs to be **superior** in relation to others in its category.			The resources invested in the product's development must ensure its **superiority in the practical purpose.**	The resources invested in the product's development must ensure its **superiority in the emotional purpose.**	The product's emotional performance needs to be **superior** to others in its category.	
3-4 MID-PRIORITY	The product's practical performance needs to be **sufficient** in relation to others in its category.			The resources invested in the product's development must ensure the product's **sufficiency in the practical purpose.**	The resources invested in the product's development must ensure the product's **sufficiency in the emotional purpose.**	The product's emotional performance needs to be **sufficient** in relation to others in its category.	
1-2 LOW TO NO PRIORITY	The product should perform practically to some extent, but it is acceptable if this is **not a focus** as it is supervened by the emotional purpose.			**It is acceptable if resources are sacrificed** to ensure the product's success in the emotional purpose.	**It is acceptable if resources are sacrificed** to ensure the product's success in the practical purpose.	The product should perform emotionally to some extent, but it is acceptable if this is of **not a focus** as it is supervened by the practical purpose.	

Figure 12. Rating system for the value factors prioritization tool

PRODUCT Generic metal folding chair							
GLOBAL PURPOSE	ARGUMENT	Low to no priority		Mid-priority		High priority	
PRACTICAL PURPOSE To provide short-term seating in restaurants, cafes, or events while being easy to store and transport.	**Usability** It is aimed at short seating time periods and thus comfort is less important than transportability and					5	
	Indicative function While nothing is indicated through visual or other cues, the product is very simple to understand.					5	
	Practical function It is highly important to provide short term seating and storage.					5	
ECONOMIC PURPOSE The minimum amount of manufacturing processes (just sheet metal cutting, tube bending, spot welding, and painting) shows this product is intended to be made as cheaply as possible.	**Practical cost-benefit** All resources should be allocated to comply with it at the lowest cost possible.						6
	Emotional cost-benefit Not important at all.	1					
EMOTIONAL PURPOSE There is no aim to produce any response from the user. Only color could be used.	**Visceral appeal** Not important at all beyond the color of the paint, which is circumstantial since its mainly to protect the metal of the chair.	1					
	Symbolic meaning There is no intention to create a symbolic meaning. It may have one if seen in a "vintage" shop, but that is circumstantial.	1					

Figure 13. Auxiliary chart evaluating the generic metallic foldable chair

In the case of the utilitarian chair (Figure 13), the practical purpose is more important and thus it is clear that allocating time and resources to improve the visceral and symbolic meaning is not an appropriate strategy. The transitional-wholistic one (Figure 14) is more balanced, making this a more complex project since it needs to fulfill both practical and emotional purposes. Lastly, in the emotional chair (Figure 15), the designer can have free rein to explore the product's visceral and symbolic appeal, as fulfilling the emotional purpose is key.

PRODUCT Simple OEM Middle East Green Fabric Folding Staff Office Chair / Wholesale Conference Meeting Chairs							
GLOBAL PURPOSE	ARGUMENT	Low to no priority		Mid-priority		High priority	
PRACTICAL PURPOSE Provide seating sessions for seminars in executive settings. The product needs to fold to be stored in rooms that have transformable settings.	**Usability** Comfort and ergonomics are indispensable for mid-term seating sessions.					5	
	Indicative function Touch points for operation are indicated with colors and material changes.					5	
	Practical function The product needs to fulfill the practical purpose flawlessly and reliably every time.						6
ECONOMIC PURPOSE The product should look up to the executive room standards, work flawlessly every time, and be competitive in terms of market price.	**Practical cost-benefit** Important. Resources should be allocated to provide a comfortable chair for its intented use span, make it foldable and be able to roll.					5	
	Emotional cost-benefit Important. Resources should be allocated to provide quality materials and manufacturing processes (plastic injection in several molds, upholstery, tube bending,					5	
EMOTIONAL PURPOSE The chair should look professional and refined while blending into its environment.	**Visceral appeal** Important, while the chair does not seek to stand out, it is pleasing to the eye and its use of color is calculated and executed intentionally.					5	
	Symbolic meaning It only needs to looke like it 'belongs' in an executive professional environment, but does not need to create more intense emotions. It shows the company is wealthy.					5	

Figure 14. Auxiliary chart evaluating an office chair

The data from these table is used to fill the Value Factor Prioritization tool which can be used to better visually display the reasoning behind the arguments to lead the product development. Figures 16 shows the comparison of the value factors of the three chairs. It can be used to generate the project strategy and be brought up by any product development team member whenever the project starts going astray from the appropriate and agreed path.

PRODUCT Flux chair				
GLOBAL PURPOSE	ARGUMENT	Low to no priority	Mid-priority	High priority
PRACTICAL PURPOSE Provide seating in the home environment and fold flat for storage.	**Usability** Comfort and human factors are not a priority. The chair forces the user to sit In a specific way without posture	1		
	Indicative function It is also very difficult to assemble, requiring video tutorials online.	1		
	Practical function Not very important, the product is more a piece of decoration than an actual piece of furniture so it only needs to comply with its function for short periods of time with little frequency. The chair has good reviews on wear but they also mention it has disassembled while in use.	2		
ECONOMIC PURPOSE While the chair is made with simple manufacturing processes and materials, the bulk of the price comes from its "high design."	**Practical cost-benefit** Not very important as it is more a piece of decoration than a high-use product.	2		
	Emotional cost-benefit Very important, all the resources are put into the materiality and looks rather than function and use.			6
EMOTIONAL PURPOSE This chair is also a piece of decoration. It should produce joy when seeing it. It is a talking point in the home.	**Visceral appeal** Highly important. It should stand out in the home environment.			6
	Symbolic meaning It seeks to be unique and thus make the user feel unique in turn.			6

Figure 15. Auxiliary chart evaluating the Flux chair

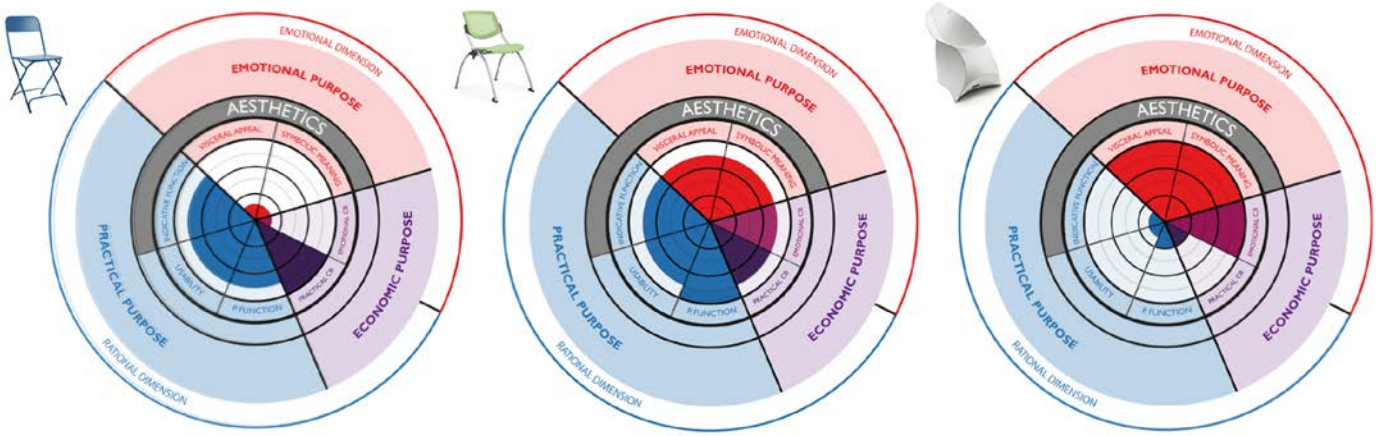


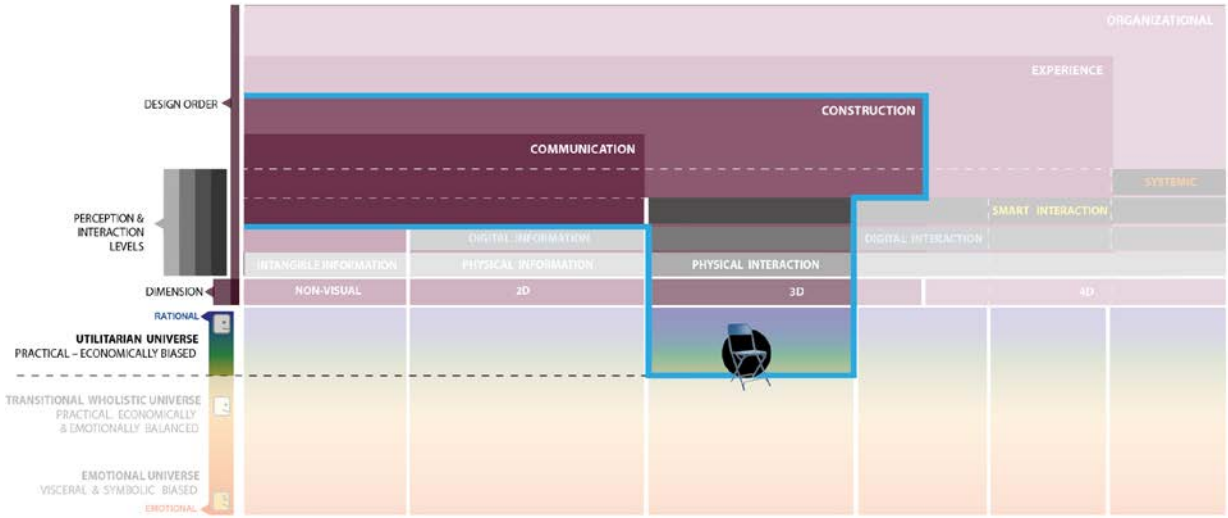
Figure 16. Comparison of the value factor prioritization tools with chairs in different product universe

Putting it all together

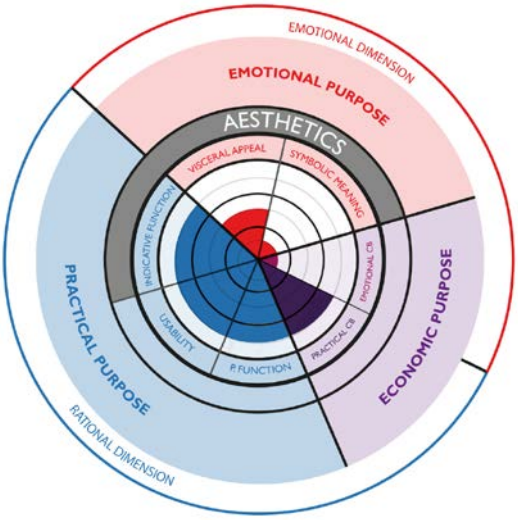
Figure 17 shows the product identity footprint of what could be a project to develop based on the generic metallic folding chair featured in the examples of previous sections. In this theoretical exercise, a company wants to develop the next generation of this chair. Their marketing team has

Product to be developed: metallic folding chair

Design order and product universe coordinate chart



Value factor prioritization tool



Type of project

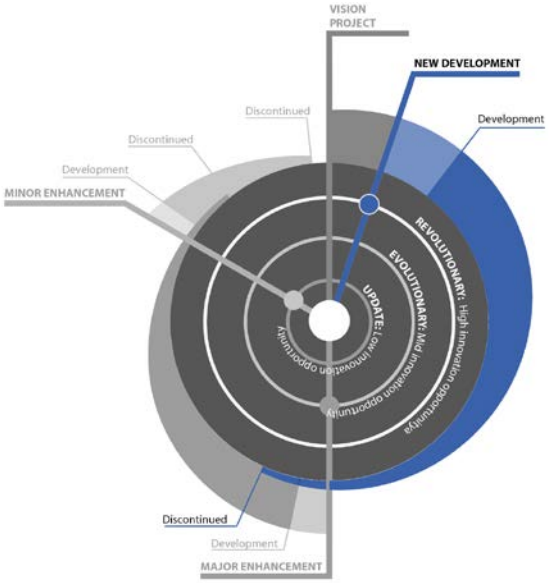


Figure 17. Auxiliary chart evaluating the Flux chair

defined that the product needs a full renovation rather than only enhancement, and that the visceral appeal of the product needs to be improved from its previous iteration.

The **Design Order and Product Universe Coordinate chart** shows that the chair belongs to the utilitarian universe of products. It indicates that it will be part of the construction order of design and thus a 3D material object that people will need to physically interact with, and that it should communicate its use as well. The **Value Factor Prioritization tool** shows that the practical purpose is the priority and thus its practical function, indicative function, and usability are of high priority for development. The emotional purpose is less important but the visceral appeal has to be sufficient. It also shows that the economic purpose is focused on a practical cost-benefit and that this is its highest priority. Since the emotional purpose is of the lowest priority, it is then clear that all resources and efforts from the development team will be focused on the practical purpose. The **Type of Project** is a new development in the example, which means that there is a high opportunity for innovation, and that the project will be require more time and financial resources for its development.

All of this understanding can help define:

- **The disciplines involved:** industrial design and product engineering.
- **Human resource expertise:** mechanical engineers specialized in metal-mechanic processes, and an industrial designer focused in specialized furniture.
- **Design and manufacturing strategy:** it is necessary to start by defining the functional architecture of the product, which should provide a satisfactory user-chair interaction. Part and component optimization, as well as minimizing the amount of manufacturing processes and materials is crucial. The strategy should consider the existing

manufacturing capabilities of the project sponsor or the acquisition of the needed machinery or outsourcing of the process. The same is to be said about the resources of the project sponsor. If not sufficient, a different strategy needs to be selected or partnerships generated. Any applications related to the emotional purpose need to adjust to the practical purpose and the company's manufacturing capabilities.

- **A real economic and time panorama for the project:** with this information it is possible for the company to establish a more accurate amount of money and timeframe for the project development.

Conclusion

The **Product Identity Footprint** provides a wealth of information prior to starting a project that clarifies the fuzzy front-end of product development. It achieves this by providing understanding of the **design order** and the **product universe** it belongs to in the spectrum from the rationality of engineering to the emotion of art, specifying if it is a utilitarian product (practical and economically biased), a transitional-wholistic product (practical, economic, and emotionally balanced), or an emotional product (viscerally and symbolically biased). It helps identify the global purpose of the product to be developed and its practical, economic, and emotional components, as well as the value factors involved in each one. This knowledge is used to identify and understand to the **type of project** to be undertaken (vision project, new development, major or minor enhancement). The addition of all this helps generate an appropriate strategy to begin an industrial design project in the right way. It is also applicable to other design disciplines. The product identity footprint should help make projects more efficient, avoiding misunderstanding and focusing all the development team’s efforts towards a common goal. This is particularly

useful for designers and other creatives, since we are not used to structure and frequently rely too much in our artistic intuition.

The work presented in this document is just part of a bigger model that is currently in development. Because of this, the proposed tools solve only part of the fuzzy-front end. It is still necessary to develop a market analysis tool to validate that the product identity footprint generated by creatives and their development teams will lead to a blue ocean or market gap, rather than a red one with a saturated market (Kim, W. C., & Mauborgne, R.). Another tool that would be a useful addition should delve deeper on identifying the desired attributes of the development team beyond the required disciplines.

A limitation of the set of tools presented in this document, is that a significantly experienced creative leader is more likely to understand all the concepts presented in the document, while most of the problems described are caused by inexperienced creatives. However, it can still help them make a faster and less painful transition to being in control of their projects, allowing them to become instrumental to their success, and thus cultivate productive and long-lasting professional relationships.

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Authors biographies

Jorge Mauricio Rodriguez Cuevas

Jorge Rodríguez graduated with honors from the Center for Industrial Design Research, from the National Autonomous University of Mexico. During his college years, he developed transportation projects that promoted the use of solar and electric energy sources, competing in the Sunrace'95, US, and the "World Solar Challenge'97" in Australia. Between 1997 and 2005, he worked at the General Motors Advanced Design Center in Toluca, Mexico; GM Technical Development Center in Detroit, Michigan and GM Sao Paulo Brazil, developing projects for Chevrolet, Cadillac, Saturn, Pontiac, and Buick. In 2004, he obtained the "Chairman's Honors Award" for his work. Between 2001 and 2003 he studied Automotive Design and Visual Communication at the College of Creative Studies in Detroit, and Digital Modeling at the University of Purdue, Indiana. Between 2005 and 2010 he co-partnered Hunpel, a product, and mobility consultancy, where he worked as Research and Development Director. He currently works under his own brand RODZ+ offering consulting services in several areas as advanced industrial design, innovation, and UX-UI, mainly for companies like Ford Motor Company, AUDI, Chrysler and Mazda among the most important. Also, he worked as a professor in several important universities in Mexico, as well as the University of Cincinnati.

Juan Antonio Islas Munoz

Juan Antonio Islas Munoz is a Master of Design graduate from the University of Cincinnati and has an industrial design degree from Universidad Autonoma de San Luis Potosi, Mexico. From 2007-2011, he worked at Rigoletti Casa de Diseno as an instructor and designer in Mexico City. During this time, he worked managing projects and designing toys for Lactius de Mexico, Octopus Brands, and Conectado Design Studio. In 2011 he obtained a Fulbright scholarship for his graduate studies, in which he researched automotive design aesthetic perception and digital sculpting software for the same discipline. He is currently an Assistant Professor of industrial design at the College of Design, Architecture, Art, and Planning of the University of Cincinnati, where he has focused in visualization for industrial design, multidisciplinary collaborative projects and currently leads the transportation design program. In his current position, has executed design projects for Autodesk, Crown Lift Trucks, General Motors, Fiat Chrysler Automobiles, Boeing, P&G, Pfizer, and Cincinnati Children's Hospital.