Part I

Design Thinking Tools

Chapter 2
Inspirational Design Briefing

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Introduction

A *design brief* is a short document, usually 2 to 20 pages in length, that relays issues of "who, what, when, how, and why" to the design team (Petersen & Phillips, 2011). As a written explanation of the aims and objectives of a project, the design brief represents the desired outcome by relaying requests from management to design teams. A well-written design brief enables designers to understand their clients and to communicate with other designers in a team fluently, eventually helping them to develop concepts. As concept development reflects only 5 percent of development costs, yet influences 70 percent of the final product's cost (Andreasen & Hein, 2000), using a design brief to translate management criteria into measurable and actionable design concepts is critical.

Although the design brief plays an important role in concept development, there are few resources about how to write one. In general, the design brief is viewed as a competitive advantage and traditionally is guarded as a business secret. Research on writing a design brief is scant, and prescriptions for how to organize documents are heavily based on individual consultants' experiences. As such, most design briefs are the writer's interpretation of a request for proposals (RFP) or merely a reformulation of an existing business plan (Petersen, 2011).

Design Brief and Wikipedia

When asked to write a design brief, designers often consult Wikipedia. Wikipedia illustrates six elements of design briefs: company history, company profile, problem statement, goals, solution analysis, and synopsis. Unfortunately, these basic elements provided no insight into how to write a high-quality design brief.

The responsibility for writing a design brief is usually relegated to one department, and there is little or no cross-departmental collaboration. At the Industrial Design Society of America event in 2012, for example, design students and professional designers alike voiced their concerns about the design briefs they had seen. The design briefs written by engineering departments contained too much information and were overly restrictive, whereas the design briefs written by marketing

departments contained too little information and did not inspire designers. Therefore, many designers read a design brief when a project is started and rarely revisit it afterward.

2.1 Nine Criteria of an Inspirational Design Brief

To begin, we consider how industrial designers work. Designers are inspired by a wide variety of sources, including nature, fashion, movies, automobiles, aviation, weapons, architecture, and cutting-edge technology. Although some sources may not apply to a specific project, they may help designers formulate a new concept at a later point. Along these lines, we define an inspirational design brief as not only a guide to follow but also a mind-set to help designers leverage constraints in ideation. More specifically, we examined a wide variety of applications submitted to worldwide design awards and identified nine common criteria. We categorized them into three groups—strategy, context, and performance—and introduced them as nine design quality criteria (DQC).

A. Strategy

1. *Philosophy*: History, values, belief, vision, mission, and strategy of a company
2. *Structure*: Domain, business model, and competitive advantage of a company
3. *Innovation*: Area and type of innovation of a company

B. Context

4. *Social/human*: Needs and activities about individual and/or group of consumers
5. *Environment*: Requirements of and expectations for environmental concerns
6. *Viability*: Expectations about economic performance

C. Performance

7. *Process*: Budget and schedule of a project
8. *Function*: Nature of deliverables including unique selling point
9. *Expression*: Sensory styling and aesthetics of products

More detailed explanations, questions to answers, and the conventional metrics of each criterion are provided in Figure 2.1 and Table 2.1.

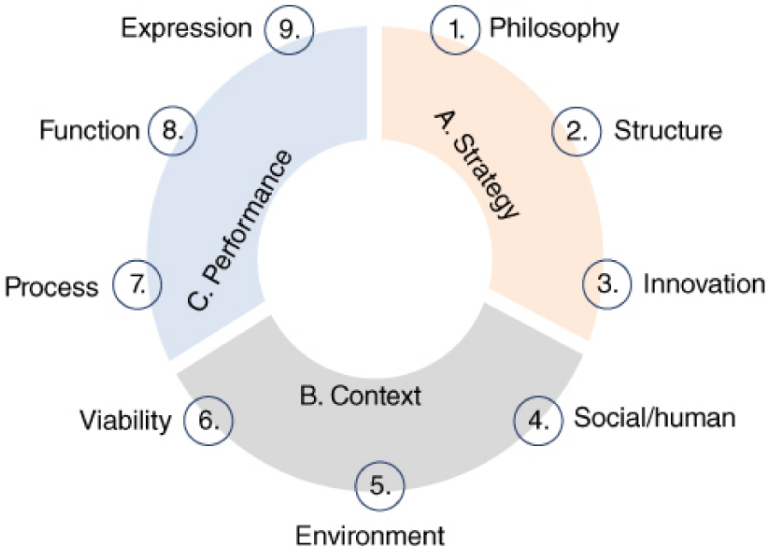

Figure 2.1 The nine criteria of an inspirational design brief.

Table 2.1 The Nine Criteria of an Inspirational Design Brief

Group	Criteria	Explanation	Questions to Answer	Conventional Metrics
A. Strategy	1. Philosophy	Design contributes by formulating, visualizing, and communicating the organization's philosophy	• What is the history of the company as well as its values, beliefs, vision, mission, and strategic intent? • How is the brand communicated?	• Achievement of strategic goal
	2. Structure	Design provides design-related knowledge to the Strength-Weakness-Opportunity-Threat (SWOT) portion of the Five-Forces analysis	• In which business and category does the firm operate? • What is the firm's business model and how is it vertically and horizontally integrated? • What are its competitive advantages?	Not identified
	3. Innovation	Design co-creates innovative concepts, visualizes, and communicates innovation opportunities	• What is the innovation area of the business (i.e., technology, finance, process, offering, or delivery)?	• Research and development budget • Number of patents, copyrights, and trademarks, cps

			• Is the innovation type breakthrough or incremental? • What is the organization's level of ambition?	• Percentage of revenues of new products
B. Context	4. Social/human	Design participates in user studies, tests conceptual ideas, and communicates findings	• What are the users and other stakeholder's cultural connection, identity, needs, behavior, and activities?	• Satisfaction (with product) • Satisfaction (with ease of use) • Employee satisfaction
	5. Environment	Design contributes to environment by exploring eco-friendly opportunities	• What are the requirements to meet the environmental concerns?	Not identified
	6. Viability	Design provides design-related knowledge for the development of business models, including positioning, value creation, and cost reduction	• What are the expectations regarding market share, earnings per share, and return on investment as related to the time horizon?	• Revenue/sales • Market share • Net income/profit • Percentage of sales (new customers) • Percentage of sales (repeat customers)
C. Performance	7. Process	Design co-creates the design brief, synthesizes concepts, refines them,	• What are the project's budget, schedule, and deliverables?	• Time to market • Number of design modifications

		and provides support in their subsequent development	• How are these aligned and coordinated with other projects?	• Cycle time with phase • Number of products completed
	8. Function	Design participates in integrating the provider and user aspects into functions and features		Not identified
	9. Expression	Design translates provider and user aspects into attributes, form, features, proportion, surface, and details; design creates a cohesive statement supported by a compelling story	• What are the brand's attributes, design language, and design principles (i.e., proportion, surface, and details)?	Not identified

Example of an Inspirational Design Brief in Product Design

Writing a design brief for an innovative product design project is an art as well as a science. Successful design brief writers elaborate their projects in detail using the DQC while keeping their final documents to a manageable length. Here, we introduce an example of an inspirational design brief for developing an innovative storage system project submitted to LEGO:

1. *Philosophy*: The name LEGO is an abbreviation of the two Danish words, *leg godt*, meaning “play well.” The ultimate purpose of LEGO is to inspire and develop children to think creatively, reason systematically, and release their potential to share their own future—experiencing the endless human possibility. The LEGO toys have become a staple in the homes of creative families. The imagination of a child is what LEGO emphasizes.

2. *Structure*: The LEGO Group is owned by the founding family and its ownership is handled by KIRKBI, the investment company, and the LEGO Foundation. KIRKBI not only owns 75 percent of the LEGO Group but also owns 38 percent of the Merlin Entertainments Group who runs the LEGOLAND theme parks. The LEGO Foundations holds the remaining 25 percent of the Group. LEGO is one of the largest toy manufacturers in the world.
3. *Innovation*: In 2004, LEGO (a) listened to consumers, (b) utilized new technologies, and (c) refocused its business to successfully save it from a steady decline in sales. After listening to consumers, LEGO recognized that consumers consistently bought the sets having a story with a good character and an evil one, suggesting that good-bad conflict appeals. LEGO also continuously adjusted to new technologies to cut the development process from two years to one year. It designed products according to feedback and recognized failure early in the production cycle, solidifying its integrity. Finally, it stripped down from a wide variety of businesses including clothing, theme parks, and video games to a core brick business.
4. *Social/human*: Children assemble blocks randomly when they are young. As they grow, their projects become more complex, until they eventually incorporate stories as well as engineering and aesthetic components. People constantly push the boundaries of what is possible with LEGO with others, being adult LEGO fanatics. Therefore, kids and their parents are their main markets as LEGO bricks evolve with them.
5. *Environment*: LEGO bricks and storages are sold in boxes. We should consider reducing the size of the box to reduce the consumption of cardboard coming from sustainable forests.
6. *Viability*: In order to maximize the return on investment of the steadily growing LEGO, we should consider material choice, ease of disposal/recycling, safety standards (both American and European), and feasibility.
7. *Process*: We should present artworks using a given PowerPoint template with a maximum of 12 slides and 5 MB. We can submit a video to go along with the presentation: maximum length of 3 minutes; maximum size of 50 MB; and allowed file types are mp4, avi, flv, mpg, swf, and wmv.
8. *Function*: We should explore a different concept that can potentially replace the current Bricks & More storage boxes while keeping the following requirements. It needs to convince parents and gift givers of delivering great functionality and permanent storage in store and at home, suggesting that it survives a child's play life. It must also be feasible; the project must show how we produce and integrate it into LEGO's current product line.
9. *Expression*: We should clearly communicate the ideas of LEGO such as imagination, creativity, fun, and learning. Specific expression languages of the concept must follow; its form is geometric and static, edges are rounded, and its primary colors are bright.

Example of an Inspirational Design Brief in a Research Project

Our suggested nine DQC are versatile and can be applied to a very different type of project, such as when business decision makers approach a conventional challenge in a more innovative fashion. Traditionally, they made decisions by considering the analyses and suggestions made by internal researchers and external economists. However, these inputs often stem from a worldview based on outdated assumptions and fail to nudge decision makers to see an issue in a fresh perspective.

Take an example of sustainability. According to "A New Era of Sustainability" (Lacy, Cooper, Hayward, & Neuberger, 2010), a report released by the United Nations Global Compact and Accenture, "… while the belief in the strategic importance of sustainability issues is widespread among CEOs, executives continue to struggle to approach them as part and parcel of [their] core business strategy." As a result, sustainability considerations often end up coming from random, ad hoc, or unrewarded contributions from passionate individuals, and seldom from strategically informed corporate policies. Although bottom-up processes are imperative for corporate culture to shift toward a more sustainable path, top-down initiatives are more influential in achieving significant change. Here, we introduced an example of inspirational design brief for proposing a research project submitted to corporate leaders. It aims to help them to reflect on the progress to date, the challenges ahead, and the impact of the journey toward a sustainable economy.

1. *Philosophy*: The underlying assumption of business is that growth is good. However, in the new market where the cost for food and energy increases, demographics change, and populations grow, the assumption that growth is good must be challenged. In order to explore new business models, new legal frameworks, and new economic systems that prosper in the contemporary market, the question we ask is, "How can we shift the current paradigm of corporate thought leadership into one that values innovative thinking for a sustainable future?"
2. *Structure*: The proposed project will consist of an autonomous team that makes decisions with the support of an expert advisory group. The outputs of the project will include an open research and thought leadership process, a collaborative content piece that looks at sustainable business practices, and a diverse community of co-authors.
3. *Innovation*: The proposed project will test open innovation techniques, such as crowdsourcing and crowd funding, in the context of corporate thought leadership research and development. The purpose of the project is to challenge and improve the current research paradigm of corporate thought leadership such that it invites more diverse thinking and problem-solving approaches.
4. *Social/human*: The proposed project aims to use social networks such as LinkedIn, Facebook, and Twitter as open research platforms from which we draw questions, ideas, and insights about sustainable business. We will tap into ongoing conversations, forums, and discussion boards from diverse

communities of interest. The communities include design, science, technology, agriculture, health, education, and transportation.

5. *Environment*: Business leaders and scholars tackle the world's most pressing issues such as climate, poverty, inequality, and population using the existing forums such as United Nations Global Compact, World Economic Forum, and World Council for Sustainable Business. Sustainability needs to be more highlighted.
6. *Viability*: The proposed project will be independently funded through corporate foundations, government organizations, and academic institutions.
7. *Process*: We will establish best practices by conducting consulting projects with in-house and external teams, while soliciting ideas using open research platforms. We aim to not just provide solutions, but also to explore the development of dynamic capabilities and address challenges more deeply.
8. *Function*: The proposed project will provide an open research framework that will help to identify underlying assumptions and offer a new research approach for corporate thought leadership. It will convene diverse communities of interest, thereby acting as a catalyst for connection, collaboration, and innovation.
9. *Expression*: All project communications, internal as well as external, will reflect the values and intentions of the project. The values of integrity, community, and openness will be honored throughout the process, which will be reflected in the final deliverable.

2.2 Writing the Inspirational Design Brief

The optimal approach to writing an inspirational design brief is through co-creation. Studies show that the act of writing a design brief improves the quality of concepts by 20 percent on average and 25 percent for top-performing designers. Writing a design brief also changes research behavior; when novice designers invest time in writing a high-quality design brief, they conduct research for a longer period of time as well as identify more impactful opportunities for ideation. Moreover, writing a design brief collaboratively reduces team members' perception of ambiguity while increasing their willingness to take risks in the subsequent concept exploration phase (Petersen & Ryu, 2015). Therefore, joint development of a design brief and treating brief writing as an important phase has the potential to add value to a project, curb risk, and increase creativity. Co-creating an inspirational design brief consists of the following three steps, as illustrated in Figure 2.2.

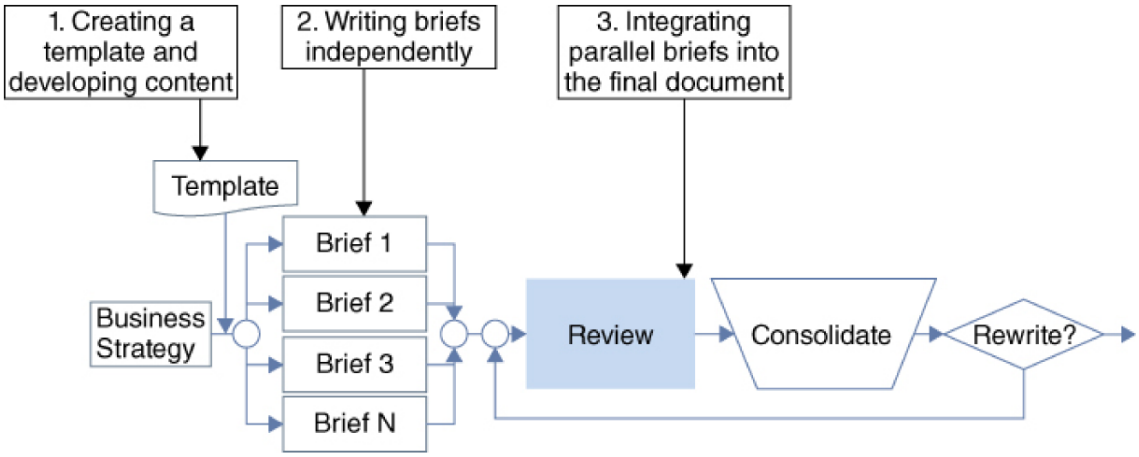

Figure 2.2 The three steps of co-creating an inspirational design brief.

1. Creating a Template and Developing Content

Prior to creating an inspirational design brief, team members on the project (e.g., designers, marketers, and engineers) usually have little or no systematic documented information about the previous projects including their design briefs and their outcomes. To remedy this, they are provided with the DQC as a generic framework to organize previous information under the nine criteria as well as a general guideline for good balance of the DQC content. This assists brief writers to consider the whole aspects of the project, increase their emotional investment, and mentally prepare to address each issue in the later phase.

2. Writing Briefs Independently

Each member writes a 500- to 1,000-word brief independently using the structure of the inspirational design brief template, aided by the content from previous projects. Doing so helps each member empathize with other members by formulating other functions' contributions clearly. Following the sequential process of the DQC, moving from philosophy to expression, supports the creation of the logical top-down architecture for the design brief. This facilitates building cohesive and comprehensive design requirements while assisting the individual members in seeing the project broadly as well as understanding the interdependencies between the criteria.

3. Integrating Parallel Briefs into the Final Document

Team members collaboratively review multiple briefs by considering the final performance of each design brief. When the final performance data is unavailable, they may rely on the quality or quantity of insights obtained from each design brief. Then, they consolidate multiple design briefs into a well-balanced and more effective design brief. As the team gains experiences, performance evaluations can be updated accordingly.

Time for Writing a Design Brief

Engineers at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California, recommend investing 25 percent of a budget on writing a design brief, while design consultancies generally spend in the neighborhood of 10 to 15 percent. Even if one does not design a space mission, dedicating significant resources (comparable to a 15 percent cost of managing the subsequent project) makes sound business sense.

2.3 Research Findings about Inspirational Design Briefs

Going over budget is a serious issue for product developers. They can avoid this issue by carefully examining the amount of the content allocated for the two design quality criteria, *process* (how to make a product) and *expression* (how a product looks and feels), in a design brief. Petersen, Steinert, and Beckman (2011) reviewed 81 briefs including 51 briefs from the projects performed at Stanford University and 30 briefs from the projects performed at several companies. Their collected briefs covered a wide variety of fields, including automotive, consumer products, health care, construction, and aviation. Projects ranged in complexity from shavers to earthmoving equipment, and in size from cell phones to aircraft interiors.

Interestingly, the authors discovered that the amount of the content for *process* is negatively correlated with the amount of the content for *expression* (see Figure 2.3). This suggests that the less information a brief contains regarding the outcome of the project (*expression*), the more information it requires to describe how the project runs (*process*). Indeed, one group of automotive product developers who distributed the amount of the content for the two criteria in a more balanced way ran into fewer problems. However, the other groups of product developers who wrote too little about *expression* in their briefs lost control of their projects, leading to budget overruns and project failure.

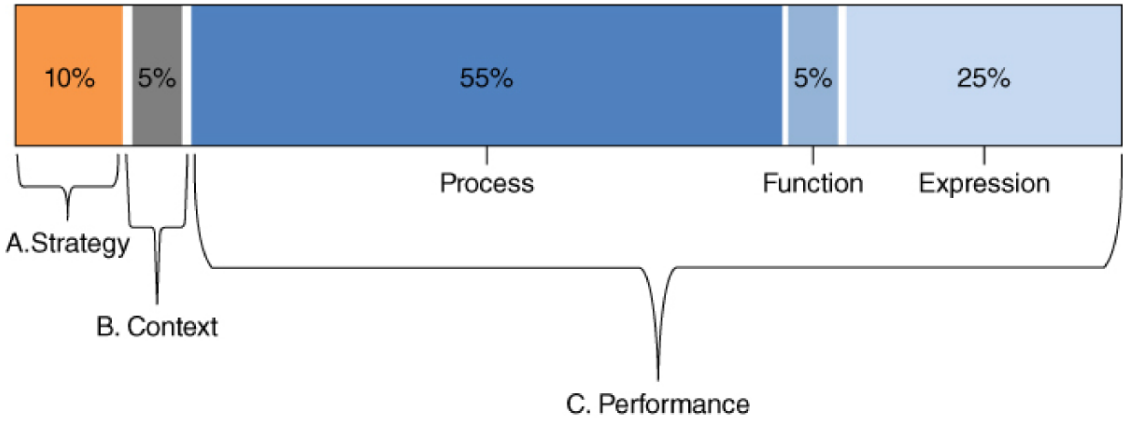

Figure 2.3 A suggested distribution of the DQC content in a design brief.

2.4 Three Pitfalls to Avoid

We suggest that brief writers avoid the following three pitfalls when writing briefs:

1. *Content distribution*: First, brief writers often undervalue the importance of communicating strategy (*philosophy, structure, and innovation*) with their team members. It is an outdated belief that design is an afterthought and should not be integrated with the rest of the business. We suggest that the content regarding strategy should occupy at least 10 percent of the design brief. Second, some brief writers intentionally hide the complete information about the expected specifications (*function*) or the expected shape (*expression*) of the final product in order to encourage the blue-sky thinking of their team members. However, team members can only benefit from possessing the full information available. We suggest that the content about *function* occupies at least 5 percent and that the content about *expression* occupies at least 25 percent in the design brief.
2. *Balancing between* ***process*** *and* ***expression****:* As illustrated earlier, balancing the amount of the content between the two criteria determines the success of project. When brief writers include too much content about *process* (>55 percent), they may neglect the other criteria, potentially hurting the quality of the project outcome. When they include too little content about *expression* (<25 percent), they may ask team members to explore extensively, which results in a high risk of going over budget.
3. *Length*: Brief writers should benchmark the number of words used for their design briefs. The length indicates an aircraft interior, when in fact the product intended for development was a shower stall. Most effective briefs are usually 500 to 1,500 words in length.

2.5 Conclusion: Keys to Success

The main purpose of writing a design brief is to communicate organizational capabilities, the business strategy, and the business model to the members of the design team so that they are well equipped to synthesize novel, useful, and marketable concepts. Creative ideas come from well-informed individuals and teams. Leaving the design team in the dark is self-defeating; it only results in a negative effect on the budget, schedule, and outcome. Each design brief should be unique and requires a concerted effort to create. Recycling old briefs, with minor updates and modifications, does not lead to an innovative concept. Team members recognize “the same old briefs” on their desks and pay no attention to them.

In this chapter, we introduce the inspirational design brief as an answer for designers seeking to improve the current situation of misaligned business opportunities and design execution. We introduced its nine criteria called design quality criteria (DQC) and illustrated two examples, one for a product design project and the other for research project. Then, we illustrated the three steps of how to write design briefs in a co-creative fashion. We also provided research findings and clarified three pitfalls. We believe our proposed brief-writing method

provides a unique opportunity for product developers in various industries to facilitate communication between their business managers and designers so that they can successfully leverage design in their new product development projects.

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About the Author

Dr. Søren Petersen is an international business consultant and design science researcher, author, and a regular contributor to *The Huffington Post* (The Creative Economy: www.huffingtonpost.com/soren-petersen). Throughout his 20-year career, he has worked with many top-tier international organizations, including Rambøll Group, BMW Group, Stanford University, Copenhagen Business School, and Hanyang University. He received his PhD from Stanford University in ME Design Research, MS ME from the Technical University of Denmark, and his BS in Transportation Design from Art Center College of Design. Over the past six years, he has published 24 scientific papers and over 150 articles on the Creative Economy, as well as authoring *Profit from Design*, a definitive book on design quantification. His areas of research include developing methods and metrics for bridging business and design. These include: Design Driven Start-ups, Design & Business Model Experimentation, Design-Driven Portfolio Management, Gamification in Concept Design, and Crowdsourcing Design Research.

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Chapter 3
Personas: Powerful Tool for Designers

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Introduction

During the past decade, personas in product design have received much attention from academicians and innovative companies (Blomquist & Arvola, 2002; Chapman & Milham, 2006; Faily & Flechais, 2011), an interest that is part of a positive trend toward building user-centric products. Personas provide designers with a user-centric reference tool that depicts an ideal user (Cooper, Reimann, & Cronin, 2014). This tool allows designers to maintain focus on the ideal user as they explore and develop solutions. This chapter explores personas as a practical tool for design. Many of the examples are software and technology oriented, but personas apply similarly to other product categories. We organize this chapter into several sections:

1. Defining personas—practical descriptions, underlying bases, and common types
2. Importance of personas—exploring the power of using personas during product development:
    a. During design
    b. During development
    c. As a communication tool
3. Creating personas—an overview of creating personas from ethnographic research

4. Illustrative application of personas—an example from three areas during product development
5. Limitations of personas—constraints and mitigation

In this chapter, we define designers broadly as cross-functional members of a team tasked with developing user-facing product solutions. We define user-facing solutions as product features with which users interact and experience. Personas are particularly useful for designers who work on user-facing solutions.

3.1 Defining Personas

Personas are a representation of ideal or prototypical end users, based on behaviors and motivations of real people (Cooper, Reimann, & Cronin, 2014). Personas represent clusters of users from research and are not derived from stereotypical assumptions (Cooper, Reimann, Cronin, & Noessel, 2014). Personas allow designers to relate to and empathize with users, and encourage them to view product problems from a user's perspective. Personas are created at the beginning of the design process. As representations of users, personas define both the target user and the problem for a design team. Minor iterations can be made to personas, but major revisions reset design to the beginning.

Two nonuser personas are often considered during design: the buyer persona (Scott, 2013) and the anti-persona (Cooper et al., 2014). In this context, we refer to buyer personas to signify those who make purchase decisions but do not necessarily use the product. For example, when an airline purchases a plane, pilots represent one user persona and passengers another. Pilots might be consulted during purchasing, but the buyer is usually a business decision maker at the airline—another persona. The buyer persona has disparate considerations for the purchase of an airplane. For example, a buyer considers financing, passenger capacity, maintenance costs, flying range, and fuel economy. Another example of differences between buyers and users can be found in children's products. Parents are buyers, concerned with child safety, purchase cost, and the ability to return a product. Modeling a buyer ensures

that a product solves their concerns. Depending on the product, buyer and user personas can be the same person or different people.

Anti-personas illustrate actors who are not the intended users of a product (Cooper et al., 2014). Consumer product designers often create both user and anti-personas to differentiate targeted users from others. For example, a high-end, digital, single-lens reflex (SLR) camera targets expert users and photographers; the expert consumer is the user persona and the anti-persona is the casual consumer, focusing designers on designing a product for an expert. Labeling, memory storage, carrying cases, user manuals, and so on are designed for the expert consumer. Any infrequent or edge cases for the user persona that are common use cases for the anti-persona are ignored. Edge cases are experiences that influence some or all users, but occur infrequently (Cooper et al., 2014). One example of how anti-personas are used for a camera product asks, “What if the user does not understand the basics of operating a camera?” The issue is an edge case for the user persona but is a common-use case for the anti-persona. Since this applies to the anti-persona, design would ignore this issue.

3.2 The Importance of Personas

Personas during Design

Personas form the basis of problem definition for a designer; they define users and set parameters for design solutions, keeping designers from falling into a common design pitfall: designing for oneself (Cooper et al., 2014). Consciously or not, designers often infer and assume about users based on work experience and industry knowledge. Consequently, personas can be useful to avoid self-referencing, frame design problems from a user's perspective, and focus designers. Design teams often use brainstorming and storyboarding as tools for generating and exploring ideas. Brainstorming is the freeform generation of ideas, with minimal constraints or thought to feasibility. During ideation or concept phases, brainstorming facilitates conversation. Combined with appropriate personas, brainstorming allows designers to engage and express ideas for subsequent reflection. Storyboarding is a second

example of when personas combine with another design tool during design. A storyboard is the visual telling of the story. Designers often storyboard ideas early during a concept phase to visualize either a problem or a solution, and sometimes both. The storyboard's protagonist is the persona, allowing a design team to form deeper empathy for users.

Personas during Development

During development, personas get an engineering team up to speed quickly. A clearly defined persona makes it easier for designers and engineers to achieve a common understanding about a user and the scope of a solution. It is critical that engineers understand the target persona so they can make the right decisions and trade-offs. For a flexible, iterative process, it is impossible and inadvisable to document every detail during design. To compensate, personas provide contextual understanding to an engineering team so it can interpret design documents.

Another benefit of personas is managing edge-case discussions between engineering and design (Cooper et al., 2014). A common design challenge is determining whether an edge case is important. Personas provide a reference point from which communication can be more efficient between designers and engineers. If an edge case is important to the persona, it should be part of the design. For example, the cockpit of a commercial airplane is designed for highly skilled and experienced pilots and crews. The cabin crew and passengers are not expected to be able to operate the controls in the cockpit. Consequently, a designer's persona is the pilot. The edge case of what happens when all capable pilots are unavailable is not a viable use case.

For a typical smartphone app, one edge case asks, “What happens if the user does not have an Internet connection?” The answer depends on personas defined for the app. Internet browsers on smartphones offer limited functionality without an Internet connection because designers determined that their personas understand how browsers behave without an Internet connection. Personas are useful to a development team so engineering can understand the scope of its

work, and the quality assurance (QA) team will not waste time testing irrelevant edge cases.

Personas as a Communication Tool

Personas are useful when it comes to communicating with other business functions such as marketing, management, and sales. Personas provide a clear definition of a target market and assist a marketing team with aligning a product from inception through promotion. Buyer personas provide sales and marketing a method of collaborating with the design team. Pitching a product concept to executive managers in a corporation or potential investors (e.g., in a start-up company) involves communicating abstract, contextual information. Personas help decision makers understand a problem from a user's perspective and provide a context for evaluating the product concept. Therefore, personas are useful for obtaining corporate support or financial investment for a start-up.

3.3 Creating Personas

When creating personas, the first step is to identify and select a group of users to research. Choosing users who belong to an appropriate market segment is key to yielding useful insights, often requiring a product manager to possess intimate knowledge of a market and various market segments in the industry. In practice, product managers often rely on secondary research and internal records or conduct a small-scale study to define various personas.

The next step is to collect data. Ideally, personas are created by clustering or consolidating real-life people and experiences from primary research that includes ethnographic studies and user interviews (Cooper et al., 2014). Ethnographic research is the deep, qualitative study of users in the context of their environment when using a product. There are various methods for collecting data during an ethnographic study. We often conduct user interviews, conduct observational studies, and (if possible) use video recordings of users using a product and photos of their environment. Interviews uncover user problems and their underlying causes. Interviews help designers understand user motivation and a user's state of mind while using a

product. However, user responses alone are unreliable since users are often unaware of their own needs (Rosenthal & Capper, 2006). Mixed methods may explore user needs more fully. Observational studies and video recordings capture users performing tasks, techniques that are effective when conducting efficiency studies. Using these methods, ethnographic research is a reliable source for uncovering behavioral responses and user problems. When capturing a user with video, audio, or photos, researchers must always ask permission from the user before recording and guard the user's privacy.

The third step is consolidating data from the studies and grouping insights based on common user problems. Often, this is done with a broader design team so all designers have the opportunity to learn directly from the researchers. This also offers the advantage of building personas with the designers so they can internalize user models. Researchers typically look for patterns in responses and organize them into clusters, which are then grouped based on common user problems. Researchers sometimes find that users from multiple market segments share similar problems.

Finally, the team examines the notes and merges various clusters to create a series of personas. The team looks for a dominant profile or common demographics within the cluster. The profile becomes the basis for a persona as long as it does not focus on a single, real person. The team also looks for attributes of its subjects that are impacted by the user problems, and build these same attributes into the persona. For example, a busy, active lifestyle might be an important attribute in the cluster of test subjects. The persona built from this cluster must have this same trait. Although we discuss user personas, the same reasoning extends to nonuser personas, which must also be based on data. Various clusters of problems coalesce into personas, and prioritization of these personas determines which represent personas and anti-personas. Buyer personas can be different people from users, and separate ethnographic interviews might be needed to study them.

3.4 Illustrative Application of Personas