DESIGN THINKING 101

FRAMING THE FUTURE

EXPLORING EMPATHY, SYSTEMS, AND INNOVATION IN COMPLEX CONTEXTS

VUYIWE MARAMBANA

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Exploring Empathy, Systems, and Innovation in Complex Contexts

Vuyiwe Marambana

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Foreword

In the rapidly evolving landscape of the 21st century, the challenges we face are multifaceted and complex. Traditional methods of problem-solving, while effective in certain contexts, often fall short in addressing the dynamic and interconnected issues that characterise our world today. It is against this backdrop that Design Thinking emerges as a beacon of innovation, offering a human-centred approach to problem-solving and creating value.

Today, Design Thinking is embraced by different fields - from business and education to healthcare and social innovation - demonstrating its versatility and transformative potential. What makes Design Thinking powerful is its emphasis on empathy, by placing the needs, desires, and experiences of people at the heart of the problem-solving process, thereby arriving at deeply relevant and impactful solutions.

A Few Words from the Author

Dear Student

It is a great pleasure to welcome you to 'Framing the Future: *Exploring Empathy, Systems, and Innovation in Complex Contexts'* book. To make sure that you share our passion for this area of study, we encourage you to read this overview thoroughly. Refer to it as often as you need to, since it will certainly make studying this module a lot easier. The intention is to develop both your confidence and proficiency in this module.

The field of Design Thinking is extremely dynamic and challenging. The learning content, activities, and self-study questions contained in this book will therefore provide you with opportunities to explore the latest developments in this field and help you to discover the field of Design Thinking as it is practised today.

In a world that is rapidly changing, with technological advancements and evolving societal needs, the way we approach problem-solving must also adapt. "Design Thinking" is a methodology that has emerged as a powerful tool for innovation and creativity in various fields, from business to education to social impact. This preface aims to introduce the concept of Design Thinking, highlight its significance, and provide a glimpse into the transformative potential that it holds.

At its core, Design Thinking is about understanding people's needs, reimagining possibilities, and creating solutions that have a profound impact on a deeply human level. It challenges us to question assumptions, embrace ambiguity, and approach problems with curiosity and empathy. By putting people at the centre of the design process, we can unlock new insights, uncover latent needs, and generate innovative solutions that have a meaningful impact on individuals, organisations, and society as a whole.

However, you will gain a lot from the experience as this book will contribute to your life skills, which will help you to succeed in all areas of life.

Introduction

Design Thinking is a powerful methodology that focuses on developing innovative solutions by prioritising the needs and experiences of people. At its core, Design Thinking emphasises a human-centred approach, aiming to cultivate a mindset that places users at the heart of problem-solving.

Design Thinking is more than just a set of tools - it's a mindset that fosters empathy, creativity, and iteration. This approach emerged from the practices of designers who began applying their methods to a broad range of challenges beyond traditional design. It has since evolved into a widely adopted methodology for addressing complex problems in various fields, including business, healthcare, and social innovation.

Design Thinking fosters a human-centred mindset by encouraging:

- **Empathy and Understanding**: Practitioners are urged to deeply engage with and understand users' perspectives, leading to solutions that genuinely address their needs.
- **Iteration and Learning**: The iterative nature of Design Thinking promotes continuous learning and improvement, valuing feedback and adapting solutions based on real-world insights.
- **Collaboration and Creativity**: The approach thrives on diverse perspectives and collaborative efforts, employing the collective creativity of teams to explore and develop innovative solutions.

Design Thinking is applied in various domains, from developing new products and services to addressing social issues and enhancing organisational processes. Its human-centred approach leads to more effective, user-friendly solutions and drives meaningful change by focusing on what matters most to people.

> "It is about them and for them. The closer the end-users' needs are analysed and answered, the more successful the

adoption or purchase of a solution. You iterate until you get it right from a customer perspective. This is the power of Human-Centred Design."

– *Olivier Delarue*,
UNHCR

"We spend a lot of time designing the bridge, but not enough time thinking about the people who are crossing it."

– *Dr. Prabhjot Singh*,
Director of Systems Design at the Earth Institute

Notional Learning Hours

Types of learning activities	Learning time %
Lecture/ Workshop (face-to-face / limited technologically mediated)	10
Independent self-study of standard text and references	50
Independent self-study of special prepared materials (case studies, multimedia etc.)	20
Other (online)	10
Syndicate groups	10
Tutorials	0
Total	**100**

Part One

Understanding the Steps and Principles of Design Thinking

Learning Outcomes

1. Explain the evolution and core principles of Design Thinking, including its human-centred philosophy, historical development, and relevance across diverse disciplines and sectors.
2. Differentiate between divergent and convergent thinking styles and demonstrate how both are applied at various steps of the Design Thinking and Double Diamond processes.
3. Apply the steps of the Design Thinking process such as Empathise, Define, Ideate, Prototype, and Test, to frame and solve complex, user-centred problems.
4. Evaluate the advantages and limitations of Design Thinking as an innovation methodology, particularly in complex systems and public sector contexts.
5. Critically analyse real-world case studies to identify how empathy, iteration, and collaboration contributed to successful design outcomes across industries such as healthcare, technology, and social innovation.

1. Understanding the Steps and Principles of Design Thinking

1.1 Introduction

In an era where innovation is the cornerstone of progress, "Design Thinking" emerges as a pivotal methodology that transcends traditional problem-solving techniques. The roots of Design Thinking can be traced back to the practices of leading design firms and academic institutions. Over the decades, pioneers like IDEO and the Stanford School have championed this approach, refining it into a structured yet flexible process. The methodology has since permeated various fields, from business and technology to healthcare and education, proving its versatility and effectiveness.

Design Thinking is often described as a non-linear, iterative process that teams use to understand users, challenge assumptions, redefine problems, and create innovative solutions to prototype and test. The process involves six distinct steps, namely, Empathise, Define, Ideate, Prototype, Test, and Implement. While the approach to teaching Design Thinking may differ, one can find similarities in how it is practised. It does not differ much from the scientific method taught and used in schools for various subjects. Like a science or a mathematics problem, Design Thinking begins by stating a hypothesis and then, through various inputs, suggestions, permutations, and combinations, moves towards forming a model or theory (Lugmayr et al., 2014).

The main difference is that inputs or suggestions in a Design Thinking process aim to solve the identified problem or fill the identified gap in a service or model, and so forth. It includes "building up" ideas, with few or no limits at a stretch during a brainstorming session. This helps to reduce the fear of failure in the participant(s) or students and encourages the process of input and participation from all. The outcome of such a brainstorming phase is what is commonly referred to as "thinking out of the box" (Kumar, 2019; Lugmayr et al., 2014; Magistretti et al., 2021).

Although championed by progressive companies and design consultancies, the methods and mindset of Design Thinking draw from a wide field of disciplines, including software development, engineering, anthropology, psychology, the arts, and business. As it exists today, Design Thinking has co-evolved across various disciplines and industries (Nakata, 2020). For over 50 years, and even longer, depending on the existing perspectives, the best and most generalisable methods and practices have emerged and converged in a quasi-Darwinian process of natural selection (Elsbach & Stigliani, 2018; Nakata, 2020).

Notwithstanding the above, a human-centred mindset is foundational to the practice of Design Thinking. It focuses on deeply understanding and prioritising the needs, experiences, and emotions of the people for whom solutions are being designed. Cultivating this mindset involves fostering empathy, embracing diversity, and maintaining an iterative approach to problem-solving.

1.1.1 What are the key strategies to develop and nurture a human-centred mindset?

1. Fostering Empathy

- **User Research***:* Engage in various forms of user research such as interviews, surveys, and observations to gain insights into users' lives, challenges, and aspirations.
- **Empathy Mapping***:* Create empathy maps to visually capture what users say, think, feel, and do. This helps in identifying unarticulated needs and emotions.
- **Immersion***:* Spend time in the users' environment. Experiencing their context first-hand can reveal deeper insights and foster a stronger connection to their experiences.

2. Embracing Diversity and Inclusion

- **Diverse Teams***:* Assemble teams with diverse backgrounds, perspectives, and skills. Diverse teams are better equipped to understand and address the varied needs of users.

- **Inclusive Design***:* Ensure that solutions are accessible and inclusive, considering the needs of people with different abilities, ages, genders, and cultural backgrounds.
- **Bias Awareness***:* Recognise and mitigate biases in the design process. Encourage an open and respectful dialogue about biases and their impact on design decisions.

3. Iterative Approach to Problem-Solving

- **Prototyping and Testing***:* Develop quick, low-fidelity prototypes to test ideas early and often with users. Gather feedback and iterate to refine solutions.
- **Fail Fast, Learn Fast***:* Embrace a mindset where failure is seen as a learning opportunity. Use failures to gain insights and improve subsequent iterations.
- **Feedback Loops***:* Establish continuous feedback loops with users. Regularly seek and integrate user feedback to ensure that solutions remain aligned with their needs.

4. Building a Culture of Collaboration

- **Cross-Functional Teams***:* Promote collaboration across different functions within the organisation. Cross-functional teams can bring varied expertise and perspectives to the design process.
- **Open Communication***:* Foster an environment where open communication and constructive feedback are encouraged. Ensure that all team members feel heard and valued.
- **Co-Creation***:* Involve users in the design process as co-creators. Engage them in workshops, brainstorming sessions, and prototype testing to ensure that their voices are integral to the development process.

5. Practicing Human-Centred Leadership

- **Lead by Example***:* Leaders should demonstrate a human-centred mindset in their actions and decisions. Their commitment sets the tone for the entire organisation.
- **Empowerment***:* Empower team members to take ownership of user research and design decisions. Encourage them to advocate for users' needs throughout the project lifecycle.

- **Recognition**: Acknowledge and celebrate efforts that contribute to understanding and addressing user needs. Recognise team members who exemplify empathy and user-centred thinking.

6. Continuous Learning and Adaptation

- **Learning Opportunities**: Provide training and resources on Design Thinking, empathy, and user-centred practices. Encourage ongoing learning and skills development.
- **Adaptability**: Stay responsive to changes in user needs and market trends. Regularly revisit and update assumptions based on new insights and feedback.
- **Reflective Practice**: Encourage team members to reflect on their experiences and learnings. Use retrospectives to identify areas for improvement and celebrate successes.

7. Utilising Design Thinking Tools and Techniques

- **Journey Mapping**: Create user journey maps to visualise the user's experience and identify pain points and opportunities for improvement.
- **Personas**: Develop detailed personas representing key user segments. Personas help to keep the focus on real user needs and guide design decisions.
- **Storytelling**: Use storytelling to communicate user insights and the impact of design solutions. Effective storytelling can build empathy and drive engagement across the organisation (Barré et. al., 2018).

1.2 The Evolution of Design Thinking

Design Thinking has evolved from a domain-specific practice in industrial design into a multidisciplinary approach to innovation, problem-solving, and human-centred development. Its evolution can be broadly categorised into the following phases:

1. Origins in Design Practice (1950s to 1970s)

The roots of Design Thinking lie in architecture and industrial design.

- **Herbert A. Simon (1969)** - In *The Sciences of the Artificial*, Simon introduced the concept of design as a science of the artificial world, where problem-solving was central.
- **Horst Rittel & Melvin Webber (1973)** - Introduced the notion of "wicked problems," emphasising that complex societal challenges required iterative and participatory approaches.

2. Expansion into Design Methodology (1980s to 1990s)

In this period, scholars began to formalise design methods, and Design Thinking emerged as a systematic approach.

- **Nigel Cross (1982)** - Proposed that designers possess a unique form of "designerly ways of knowing."
- **Buchanan (1992)** - Positioned Design Thinking as a new liberal art of technological culture, emphasising its role in problem-framing across disciplines.

3. Institutionalisation and Popularisation (2000s to Present)

Design Thinking became formalised in business, education, and government contexts, driven by institutions like IDEO and Stanford d. school.

- **Tim Brown (2009)** - CEO of IDEO, defined Design Thinking as a human-centred approach to innovation in *Change by Design*.
- **Roger Martin (2009)** - Emphasised the integration of analytical and intuitive thinking in business strategy.
- **Plattner, Meinel and Leifer (2011)** - Through the Hasso Plattner Institute and Stanford d. school, developed academic models of the Design Thinking process.

4. Contemporary Debates and Critical Perspectives (2010s to 2020s)

Recent literature critiques Design Thinking's commodification and calls for more context-specific, equity-driven, and decolonised approaches.

- **Lucy Kimbell (2011)** - Raised questions about what Design Thinking *is* and *does* in practice, particularly in public service.
- **Johanna Faerber and Von Busch (2016)** - Advocated for emancipatory and critical design practices.
- **Tania Anaissie (2020)** - Introduced the idea of Equity-Centred Design, emphasising inclusion, power, and justice.

This reflection aims to introduce you to the world of Design Thinking (DT), a human-centred approach that combines creativity and analytical processes to tackle complex challenges and drive meaningful innovation.

1.2.1 Design Thinking: A Paradigm Shift

DT is not merely a toolkit for designers; it is a mindset that prioritises empathy, experimentation, and collaboration. It represents a paradigm shift from conventional methods that often prioritise technical feasibility and economic viability over the human experience. By focusing on the needs, desires, and experiences of people, Design Thinking fosters solutions that are not only functional but also deeply resonant with users.

1.2.2 Impact of Design Thinking Across Industries

The impact of Design Thinking extends beyond the realm of product design. It has revolutionised business strategies, enhanced customer experiences, and addressed social issues by offering new ways to understand and solve problems. Companies like Apple, Google, and Airbnb have harnessed DT to achieve breakthrough innovations, while non-profit organisations and governments have used it to develop solutions for societal challenges.

1.3 A Call to Action

As you embark on this journey through the principles and practices of Design Thinking, I invite you to adopt this mindset and apply these techniques in your endeavours. Whether you are a designer, an entrepreneur, an educator, or a policymaker, Design

Thinking equips you with the tools to navigate complexity and create impactful solutions.

This book is an invitation to think differently, to question assumptions, and to design with empathy. Welcome to the world of Design Thinking, a world where innovation begins with understanding and ends with solutions that impact deeply with those whom they serve.

This book sets the stage for a comprehensive exploration of Design Thinking, highlighting its importance, evolution, core principles, and transformative impact across various domains. It aims to engage and inspire readers to delve deeper into the methodology and adopt its mindset for innovation and problem-solving.

Design Thinking is a human-centred approach to innovation and problem-solving that emphasises understanding users' needs, brainstorming creative solutions, and testing them iteratively. Rooted in the practices of designers, this methodology can be applied across various fields to address complex challenges and foster innovative outcomes.

1.4 Core Principles of Design Thinking Include

1. **Empathy***:* At the heart of Design Thinking is the emphasis on empathy. This means deeply understanding the needs, experiences, and emotions of the people for whom you're designing. By observing and engaging with users, designers can uncover insights that drive more meaningful solutions.
2. **Collaboration***:* Design Thinking thrives on collaboration across diverse teams. Bringing together different perspectives from engineers and marketers to end-users, enhances creativity and ensures that solutions are well-rounded and viable.
3. **Ideation***:* This step encourages brainstorming and the generation of a wide array of ideas without immediate judgement. The goal is to explore possibilities and push the boundaries of conventional thinking.
4. **Experimentation and Prototyping***:* Rather than striving for perfection, Design Thinking promotes creating simple

prototypes to test ideas quickly. These prototypes are tangible representations of concepts that can be refined based on feedback.

5. **Iterative Process***:* Design Thinking is inherently iterative. It involves continuously refining ideas and solutions based on user feedback and testing, ensuring that the final product or solution is well-aligned with users' needs.

Plattner et al. (2014), Garrette et al. (2018), Djordjevic (2019), and Smith and Nigro (2023), emphasise that the Design Thinking process consists of six process steps with iteration loops: understanding, observing, defining problems, finding ideas, developing prototypes, and testing. The initial three steps, known as the problem phase, according to Lindberg et al. (2010), argue that these further describe the problem and its causes (what is the problem and why is it there?). Although these authors have defined six steps above, this book will outline a five-step human-centred design process: Empathise, Define, Ideate, Prototype and Test. These will be elaborated on later.

The authors continue with the subsequent two phases, the solution phase, which describes which solutions are there and how these can be implemented, which forms the implementation phase. Design Thinking as a systematic and collaborative approach for identifying and creatively solving problems, includes two major process steps: *identifying problems and solving problems*. Both steps are critical, but in practice, most people and project teams within companies are more inclined to focus on the latter; that is, on solving problems.

The process steps are described briefly below and then explained in more detail step by step. Even if the following process representation is shown sequentially, the process is strongly iterative; namely, there is extensive feedback on each step and its previous steps. The individual process steps should be completed quickly to learn fast through iteration loops. It is helpful to define concrete time budgets for the individual steps (in agile project management, this is referred to as *time boxing*).

Figure 1 provides an understanding of what Design Thinking is.

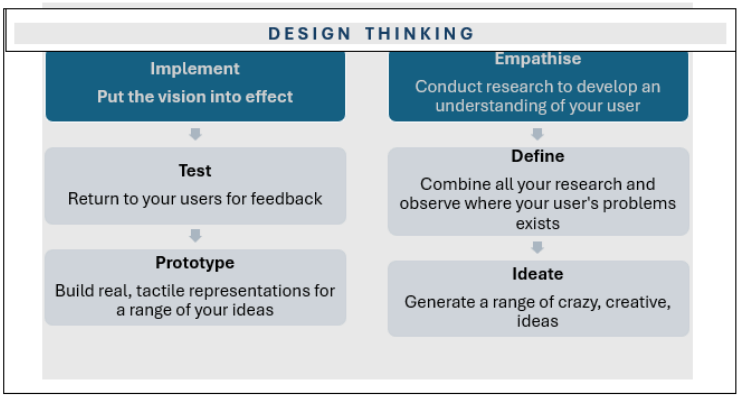


Figure 1: What is Design Thinking. Source: Plattner et al. (2014)

From Figure 1, the term Design Thinking simply means approaching problems and their solutions as a designer would. While this was subsequently elaborated on, an illustrative characteristic of the Design Thinking approach is that it is intentionally non-linear, meaning that designers, whether in the arts or industry, explore and solve problems through iteration. They quickly generate possible solutions, develop simple prototypes, and then iterate on these initial solutions informed by significant external feedback towards a final solution.

According to Robbins (2018) and Gwangava, (2021), Design Thinking can be applied in the following ways:

1. **Product Design**: Designing user-friendly products by understanding user needs and preferences;
2. **Service Design**: Creating and improving services by considering user experiences and interactions;
3. **Problem-Solving**: Addressing complex problems in various domains by applying a user-centric approach; and
4. **Innovation**: Fostering a culture of innovation within organisations by encouraging creative thinking and problem-solving.

Design Thinking is a versatile methodology applied across industries to solve diverse challenges. Its user-centric approach and its iterative nature make it a powerful tool for creating

meaningful and effective solutions that genuinely address user needs (Robbins, 2018).

1.5 The Design Thinking Process

The Design Thinking process typically follows five key steps:

1. **Empathise**: Engage with and observe users to understand their experiences and challenges. Techniques include interviews, shadowing, and empathy mapping.
2. **Define**: Synthesise the information gathered during the Empathise step to define the core problem. This step involves creating a clear problem statement that guides the rest of the process.
3. **Ideate**: Generate a broad range of ideas and potential solutions. Brainstorming sessions and creativity techniques like mind mapping are common in this step.
4. **Prototype**: Develop simple, cost-effective prototypes that embody different aspects of the solution. These prototypes can range from sketches and models to interactive simulations.
5. **Test**: Share prototypes with users and gather feedback. This step involves observing how users interact with the prototype and collecting their input to inform further iterations.

1.6 How to Implement Design Thinking.

Design Thinking is a versatile approach that can be applied in numerous fields, each benefiting from its user-centric focus and innovative potential. The following are examples:

- **Business**: Companies use Design Thinking to develop customer-centric products, enhance user experiences, and innovate business models. It helps in identifying market opportunities and creating solutions which customers can identify with.
- **Healthcare**: Design Thinking can lead to improved patient care by redesigning healthcare services and systems to be more responsive to patient needs. It has been used to

enhance everything from hospital processes to medical devices.

- **Education**: Educators and administrators use Design Thinking to innovate curricula, improve learning environments, and address diverse student needs. It fosters creative problem-solving and critical thinking amongst students.
- **Social Innovation**: Design Thinking is instrumental in tackling complex social issues such as poverty, sustainability, and public health. It brings together stakeholders to co-create solutions that are effective and sustainable.

The implementation of Design Thinking is demonstrated in Table 1.

1.7 The Advantages of Design Thinking

1. **Enhanced Creativity and Innovation**: By fostering an environment that encourages creative thinking, Design Thinking helps to generate innovative solutions that might not emerge through traditional methods;
2. **User-Centric Solutions**: Solutions developed through Design Thinking are deeply aligned with user needs, leading to higher satisfaction and engagement;
3. **Reduced Risk**: Early prototyping and testing help to identify potential issues early in the process, reducing the risk of failure at later steps;
4. **Improved Collaboration**: The multidisciplinary nature of Design Thinking promotes teamwork and harnesses the collective expertise of diverse teams; and
5. **Adaptability**: Design Thinking's iterative process makes it adaptable to changing requirements and new insights, ensuring that solutions remain relevant and effective.

Table 1: Implementation of Design Thinking steps

Empathise	Define	Ideate	Prototype	Test	Implement
Conducting interviews Observing behaviour Engaging in active listening Empathy-building exercises	Analysing and synthesising the gathered information Identifying patterns and defining the problem statement or opportunity	Ideation sessions Mind mapping Brainstorming exercises Crazy Eights (rapid idea generation)	Physical models Sketches Wireframes Mock-ups	Observing how users interact with the prototypes. Collecting feedback through interviews or surveys Iterating based on user feedback and refining the solutions	Developing the final product or service Deploying the solution Monitoring and evaluating its performance

Source: *Adapted from Gwangava (2021)*

1.8 Disadvantages of Design Thinking

1. Superficiality and Misapplication in Complex Systems

While Design Thinking promotes empathy and creativity, it is often misapplied in contexts requiring deep systemic understanding. In many public, development, or policy environments, applying Design Thinking without contextual depth risks reducing complex socio-political challenges to overly simplified solutions.

> "Design Thinking often fails to engage with systemic structures of power and inequality" — *Kimbell (2011).*

Key Critique: In institutional settings, DT may substitute complexity with linear process models (for example, Empathise → Define → Ideate) that fail to address historical, political, or infrastructural barriers.

2. Shallow Domain Knowledge

Design Thinking emphasises generalist approaches and cross-functional collaboration. However, when domain-specific expertise is undervalued, the outcome may lack technical feasibility or contextual appropriateness.

> "Designers may overlook deep-rooted cultural, technical, or institutional knowledge needed to implement viable solutions" — *Johansson-Sköldberg et al. (2013).*

Implication: Without sufficient involvement of experts across various fields, solutions may appear novel but be impractical or unsustainable.

3. Buzzword Effect and Commodification

With its mainstream adoption in business and academia, Design Thinking has increasingly become a branded process, often stripped of rigour or critical inquiry.

> "It has become a label applied to everything, often losing its original purpose or rigour" — *Tonkinwise (2011).*

Impact: Over-commercialisation leads to template-driven workshops that prioritise Post-it notes over impact. This may create a false sense of innovation without meaningful change.

4. Time and Resource Intensive

Design Thinking involves iterative prototyping, user testing, and reflection. While valuable, this is not always practical in resource-constrained or time-sensitive environments, such as emergency response or rural governance.

> "The time commitment for repeated prototyping and user testing may be seen as a luxury" — *Liedtka (2011).*

Challenge: Institutions with rigid timelines or limited funding may find DT inefficient, particularly without a culture of innovation or experimentation.

5. Inequity in Participation and Power Dynamics

Although Design Thinking promotes inclusivity and empathy, processes can still be dominated by designers or facilitators, unintentionally marginalising community voices.

> "The designer remains the 'hero', and users become instruments, not co-creators" — *Norman (2010).*

Concern: In marginalised communities, Design Thinking may fail to dismantle power hierarchies or integrate local knowledge meaningfully. This has led to calls for **equity-centred design** and decolonised methodologies.

6. Difficulty in Scaling Solutions

Design Thinking is highly effective for localised problem-solving and prototyping. However, many solutions do not scale well into broader systems, especially in public policy, infrastructure, or large institutions.

> "Prototype solutions rarely translate seamlessly into large-scale policies or infrastructures" — *Mulgan (2014).*

Barrier: Prototypes may work well in controlled settings but lack implementation mechanisms, policy alignment, or funding strategies for scaling.

Synthesis and Recommendations

Despite these critiques, Design Thinking remains valuable when integrated with systems thinking, participatory governance, and implementation science. To overcome limitations, practitioners may:

1. Complement Design Thinking with domain expertise (for example, engineers, economists, educators).
2. Apply Design Thinking in conjunction with policy and institutional frameworks.
3. Embed equity, ethics, and local knowledge into every step.
4. Avoid over-standardisation and tailor the approach to the context.
5. Bridge prototyping with systems change mechanisms for scalability.

1.9 The Creative Process

No human-centred design process is perfectly linear. You will converge and diverge several times, and you will continue to iterate and refine your prototypes until you are ready to present a final solution to the world. As you become closer to a market-ready solution, you will evaluate which solutions are most desirable, feasible, and viable, and importantly, which is most likely to have the greatest, lasting impact.

To provide more structure within the three general phases of innovation, as mentioned previously, we outline a five-step human-centred design process that will allow you to keep your design team on track and curb the human tendency to spend too long exploring a problem, or to impatiently skip ahead. These five steps are Empathise, Define, Ideate, Prototype and Test, and they also instil confidence in the design team and the stakeholders, ensuring shared responsibility and commitment to the design solution. Most of us are driven by a fear of failure or making mistakes, so we tend to focus more on preventing errors than

on seizing opportunities. We opt for inaction rather than action when there is decision risk failure. But there is no innovation without action; thus, psychological safety is an important aspect of facilitating a creative design process. The physical props and practical tools of Design Thinking deliver a sense of security, helping novice innovators move more assuredly through a human-centred design process.

1.10 What is Human-Centred Design: A Case-Study of People of Victoria, Australia

Human-centred design (HCD) is an approach to problem-solving that puts the people for whom we are designing at the heart of the process. Key benefits of human-centred design are explained below:

Table 2: Human-centred design benefits

Benefit	How It Helps
User Satisfaction and Relevance	Solutions are more likely to meet real needs and increase adoption
Innovation and Creativity	Empathy-driven ideation leads to novel, "out-of-the-box" solutions
Reduced Risk and Cost	Early testing avoids expensive late-stage failures
Social Equity and Inclusion	Amplifies marginalised voices and addresses systemic imbalances
Organisational Alignment	Teams work with shared understanding and user-centred goals
Better Policy and Service Delivery	Results in services that are intuitive, dignified, and context-appropriate
Emotional Engagement	Builds loyalty and positive emotional connections with products, services, or public programmes
Systems Awareness	Encourages mapping interdependencies and designing beyond silos

Source: Mulgan (2014)

The human-centred design process begins with empathy for the people for whom we are designing. The process:

1. generates a wide variety of ideas;
2. translates some of these ideas into prototypes;
3. shares these prototypes with the people we're designing for to gather feedback; and
4. builds the chosen solution direction for release.

While HCD offers numerous benefits, it is not without its **limitations**. Acknowledging these challenges is essential for improving practice and applying the methodology critically and effectively.

Table 3 presents limitations in HCD:

Table 3: Limitations in human-centred design

Limitation	Explanation
Time and Resource Intensive	HCD requires in-depth user research, co-creation, and iteration, which can be costly and slow in fast-paced environments.
Scalability Challenges	Solutions highly tailored to specific user contexts may not easily scale to broader populations or regions.
Risk of User Bias or Misrepresentation	Over-reliance on a few user voices can introduce bias or reinforce dominant narratives, ignoring structural inequities.
Power Dynamics in Co-Creation	Tokenistic participation or poorly facilitated workshops can silence marginal voices rather than empower them.
Limited Systems Thinking	Some HCD approaches overly focus on individual user needs and neglect deeper systemic or institutional root causes.
Not Always Suitable for Wicked Problems	In complex policy or governance settings, problems may be too ambiguous or politicised for HCD alone to resolve.
Overemphasis on "Desirability"	HCD may prioritise user wants (desirability) over feasibility (can it be executed?) and viability (should it be executed?).
Requires Skilled Facilitation	Success depends on the capabilities of facilitators to navigate cultural sensitivity, ethics, and group dynamics.
Underrepresents Ethical Trade-offs	Focusing on individual users may overlook collective ethics, long-term impacts, or sustainability concerns.

Limitation	Explanation
Not a Substitute for Policy or Structural Reform	HCD can improve experiences but is limited in addressing broader legislative or economic barriers to change.

Source: Abu-Akel and Webb (2020)

Human-centred design remains a powerful approach to designing with empathy and creativity. However, its effectiveness depends on how critically, inclusively, and ethically it is applied. It must be paired with systems thinking, political awareness, and institutional reform to achieve lasting, equitable change.

The goal of employing HCD was to develop solutions that meet the needs of those who live in Victoria. By continually validating, refining and improving their work, the people of Victoria were able to discover the root causes of knotty problems, generate more ideas, exercise their creativity and arrive more quickly at fitting solutions.

Figure 2: The design process. Source: Liedtka (2011)

1.10.1 Why use HCD?

When executed well, an HCD approach leads to the creation of government services that align with people's needs and desires.

Involving end-users in the overall design process leads to greater buy-in and impact.

1.10.2 Benefits for the people of Victoria

1. Improved policy, services and products that help to address the needs of Victorians;
2. Reduced transactional friction when using government products or services; and
3. Reduction of thought overload when determining how to use government services.

1.10.3 Benefits for the government of Victoria

1. Provides a citizen with perspective of the problem at hand (an outside-in approach);
2. Reduces the risks of a 'failed' policy, product or service through validation;
3. Paints a clearer picture of the wider context in which the problem lies;
4. Reduces costs by building more targeted systems and services that meet the needs of people;
5. Creates a positive reputation and increased trust in government through greater engagement;
6. Can increase productivity and improve operational efficiency;
7. Builds organisational resilience through an agile and iterative process; and
8. Helps to understand the Victorians affected by their decisions.

1.10.4 Understanding the complexity of challenges

Some of the things that make public sector challenges unique include:

1. Serving diverse, poorly resourced and vulnerable populations;
2. Engaging multiple stakeholders who share decision-making power but hold different or conflicting interests;
3. Delivering services more than products;

4. Delivering at scale from the beginning to reach a large population of beneficiaries;
5. Compliance to high degrees of privacy protections and safeguards; and
6. Creating long-term change within time-bound administrative periods and priorities.

With these considerations, there is a need to consider how HCD is employed differently in the public sector, taking greater care in the early steps of discovering and defining the problem. There are various frameworks that one can use during the act of 'problematising' that are aligned to HCD principles, such as those stated below.

1.10.4.1 The Adaptive Leadership model

One of these frameworks is Heifetz and Linskey's Adaptive Leadership model, which describes challenges as either adaptive or technical. A technical challenge can be resolved with subject matter knowledge and experts (such as building a bridge). Adaptive challenges are dynamic, unpredictable, seemingly irrational and require new learning and change in beliefs. Public sector challenges are more adaptive than technical, attributable in large part to the social dimensions mentioned above.

Design Thinking and Adaptive Leadership converge as complementary methodologies for navigating complex, uncertain, and human-centred challenges. While Design Thinking provides tools for co-creation and experimentation, Adaptive Leadership offers a framework for sensemaking, holding tensions, and systemic change. Integrating the two enhances the transformative capacity of leaders, teams, and organisations, especially in dynamic environments such as government, education, healthcare, and development (Kimbel, 2011).

1.10.4.2 Cynefin framework

Another framework is Cynefin (pronounced kuh-nev-in) by David Snowden. This framework helps to sort challenges into five categories: obvious, complicated, complex, chaotic, or disorderly, and outlines what response is best suited to each category. Many public sector challenges fall into the *complex*

Table 4: Intersection of Adaptive Leadership and Design Thinking

Theme	Adaptive Leadership	Design Thinking	Synergy
Nature of Challenge	Adaptive, systemic, complex, emergent	Wicked, ill-defined, human-centred	Both address complexity and ambiguity
Role of Leader	Mobiliser, facilitator, sense-maker	Co-creator, empathiser, design facilitator	Leadership as shared, distributed, and relational
Process Orientation	Iterative diagnosis, learning from disequilibrium	Iterative prototyping, learning from users	Embrace of iteration and experimentation
Stakeholder Engagement	Inclusive, taps into conflict and diverse perspectives	Deep user empathy, co-design with affected stakeholders	Both emphasise active engagement and empathy
Mindset	Adaptive, resilient, values-led	Creative, open, optimistic	Encourages cognitive and emotional flexibility

Source: Kimbel (2011)

category, particularly as they are multi-stakeholder, ever-changing, and need to account for human behaviour, emotions and habits. This makes them more dynamic than those that fall in the *complicated* category, where problems may be more technical and predictable. Like the Adaptive Leadership model, the Cynefin framework describes how complex challenges require a probe-sense-respond approach. What Adaptive Leadership, Cynefin and HCD approaches share is a belief that fully understanding and appreciating the problem is the most important part of the work, requiring a commitment to an experimental and learning mindset.

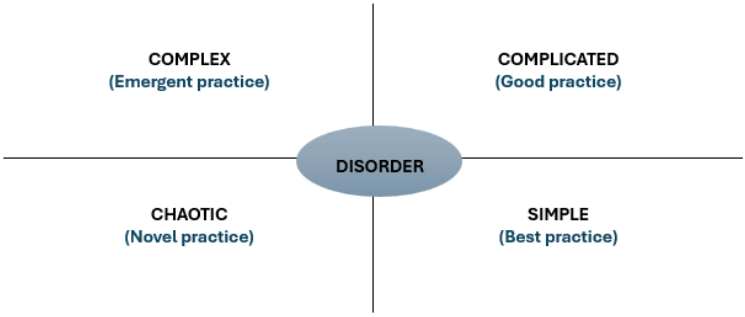


Figure 3: Cynefin Framework. Source: Magistretti et al. (2021)

The above framework is explained below:

1. Understanding the Terrain: The Cynefin Landscape

The Cynefin Framework, visualised through five distinct domains - **Obvious, Complicated, Complex, Chaotic,** and **Disorder** guides leaders in determining how to act based on the nature of the system they are operating in.

1. In the **Obvious domain**, where cause-and-effect is clear and outcomes are predictable, best practices suffice. Here, procedures and automation thrive;
2. The **Complicated domain** introduces nuance; there are multiple right answers, but expert analysis is required to find them. This is the realm of diagnostics and technical problem-solving;

3. Things shift in the **Complex domain**, where unpredictability rules. Causal relationships are only visible in retrospect, and patterns emerge through interaction. This is the space where HCD flourishes, through experimentation, iteration, and listening deeply to those affected;
4. In the **Chaotic domain**, immediate action is needed to stabilise a situation before understanding can even begin. Crisis management, disaster response, or conflict scenarios reside here. Quick, human-focused insights, often derived through rapid HCD tools, can assist in creating short-term interventions; and
5. The centre of the model, **Disorder**, represents ambiguity - a lack of clarity about which domain applies. It's here that leadership biases are most likely to misguide. Deconstructing problems using user-centred perspectives can help to reframe the challenge and distribute it to appropriate domains.

2. Where Human-Centred Design Meets Complexity

Human-Centred Design is inherently suited to the Complex domain. This is where standard operating procedures break down, and where involving users in co-creating solutions becomes not only helpful but necessary. Rather than imposing predefined solutions, HCD allows patterns and insights to emerge through empathy, storytelling, iterative prototyping, and reflection.

HCD thrives in contexts where:

1. Solutions cannot be engineered in advance;
2. Understanding comes from executing, sensing, and adapting;
3. Diverse stakeholders must be brought into the innovation process; and
4. Social, cultural, and emotional dimensions matter as much as technical ones.

Designers working in the complex and even chaotic domains understand that the path forward cannot be dictated; it must be discovered together with the people who the solution intends to serve.

3. Why This Matters for Leadership and Innovation

Too often, leaders treat adaptive challenges as if they were technical problems, applying tools of control in contexts that require engagement, experimentation, and learning. The Cynefin Framework offers a strategic lens to avoid this trap. HCD provides the tactical methodology to act creatively and compassionately within that complexity.

Together, they:

1. Equip leaders to discern what kind of problem they are facing;
2. Enable teams to apply appropriate design responses based on context;
3. Encourage the distribution of expertise, co-creation, and adaptive learning; and
4. Avoid the misuse of "best practices" in systems that require "emergent practices".

In sum, the Cynefin Framework helps us to understand where we are, while HCD guides how we can move forward, with people, context, and complexity in mind. Their convergence represents not just a methodological alliance but a philosophy of leadership, one rooted in humility, curiosity, and the conviction that meaningful change must be designed with and for the people who live it.

1.11 Design Thinking Case Studies

Design Thinking has been applied successfully across various industries to solve complex problems and foster innovation. Here are some notable case studies that highlight the impact and effectiveness of Design Thinking:

1.11.1 Airbnb: Redesigning the user experience

Challenge:

Airbnb was struggling with low user engagement and slow growth. Users found it difficult to navigate the website and trust the platform, which hindered the company's ability to scale.

Approach:

Empathise

The Airbnb founders immersed themselves in the user experience by travelling and staying in Airbnb listings. They also conducted extensive user interviews to understand the pain points of both hosts and guests.

Define

The key problems identified were the lack of trust in the platform and a cumbersome booking process.

Ideate

Brainstormed various ideas to enhance trust and simplify the user interface.

Prototype

Developed simple, clickable prototypes of the redesigned website.

Test:

Gathered feedback from users by observing their interactions with the prototypes and iterated based on the feedback.

Outcome:

The redesign led to a more intuitive interface, enhanced trust signals such as verified identities (IDs) and reviews, and an overall better user experience. This resulted in significant growth in user engagement and market share, transforming Airbnb into a global leader in the hospitality industry.

1.11.2 GE Healthcare: Improving the MRI experience for children

Challenge:

Children often found magnetic resonance imaging (MRI) machines intimidating and stressful, leading to a high rate of failed scans and the need for sedation.

Approach:

Empathise

GE Healthcare's team, led by designer Doug Dietz, observed the experiences of children undergoing MRI scans. They interviewed patients, parents, and medical staff to understand the emotional and psychological challenges.

Define

The core problem was the anxiety and fear experienced by children during the MRI process.

Ideate

Generated ideas to make the MRI experience more engaging and less frightening for children.

Prototype

Created themed environments and storylines, transforming MRI rooms into adventures such as pirate ships or space missions.

Test

Implemented the themed environments in hospitals and observed the reactions of children and feedback from medical staff.

Outcome:

The redesigned MRI experience significantly reduced the need for sedation and increased the success rate of scans. Children were more relaxed and cooperative, and parents reported higher satisfaction. This project demonstrated how Design Thinking could improve patient experiences in healthcare.

1.11.3 Bank of America: "Keep the Change®" Savings Programme

Challenge:

The Bank of America wanted to encourage customers to save more money but found that their target audience was not identifying with traditional savings methods.

Approach:

Empathise

The design team conducted in-depth research with customers to understand their financial behaviours and attitudes towards saving.

Define

The main barrier to saving was the perceived difficulty and lack of immediate rewards.

Ideate

Brainstormed various ideas to make saving effortless and rewarding.

Prototype

Developed the "Keep the Change®" Savings programme, where everyday purchases were rounded up to the nearest dollar, and the difference was automatically transferred to a savings account.

Test

Piloted the programme with a select group of customers and gathered feedback.

Outcome:

The "Keep the Change®" Savings programme was a huge success, with millions of customers enrolling. It significantly increased the amount saved by users without requiring major behavioural changes. The programme also helped the Bank of America to attract new customers and enhance customer loyalty.

1.11.4 SAP: Revamping internal processes with Design Thinking

Challenge:

SAP (stands for System Applications and Products in Data Processing), a global software company, faced internal inefficiencies and communication barriers that hindered innovation and product development.

Approach:

Empathise

SAP's Design Thinking initiative involved interviewing employees across various departments to understand their workflows, challenges, and pain points.

Define

Identified the key issues related to siloed departments, lack of collaboration, and inefficient processes.

Ideate

Conducted workshops and brainstorming sessions to generate ideas for improving internal processes.

Prototype

Developed prototypes of new workflows and collaboration tools.

Test: Implemented the prototypes in select teams and refined them based on feedback.

Outcome:

The adoption of Design Thinking principles led to improved collaboration and communication within SAP. This cultural shift enabled faster product development cycles and more innovative solutions, ultimately enhancing the company's competitive edge in the software industry.

1.11.5 Procter & Gamble: Reinventing product development

Challenge:

Procter & Gamble (P&G) needed to accelerate product development and stay ahead in the competitive consumer goods market.

Approach:

Empathise

P&G's Design Thinking initiative began with understanding consumer needs through interviews, ethnographic studies, and direct observations.

Define

Identified key insights about consumer behaviours and unmet needs.

Ideate

Brainstormed potential product ideas and improvements based on consumer insights.

Prototype

Created quick prototypes of new product concepts and packaging designs.

Test

Conducted consumer testing to gather feedback and refine products.

Outcome:

Design Thinking transformed P&G's product development process, leading to the successful launch of several innovative products. By focusing on consumer needs and iterative testing, P&G could bring products to market faster and more effectively, maintaining its leadership in the consumer goods industry.

1.11.6 African case studies in the health sector

Design Thinking has been effectively applied in various healthcare settings across Africa, including South Africa, to address complex challenges and improve patient outcomes.

a. Coach Mpilo Model

To address the underrepresentation of men in human immunodeficiency virus (HIV) care, the Coach Mpilo Model was developed using HCD principles. This peer-support initiative recruits men living with HIV who are stable on antiretroviral therapy to act as coaches for newly diagnosed individuals and those who have disengaged from care. By focusing on the specific needs and experiences of men, the programme has achieved over 90% linkage or return to care within the first month of support.

b. Health Innovation and Design Course at the University of Cape Town

The University of Cape Town offers a postgraduate course on Health Innovation and Design that employs a "learning by solving" approach. This pedagogical method encourages students to apply Design Thinking to real-world health challenges, fostering inclusive health innovation. Through this course, students collaborate with healthcare providers to develop practical solutions that can be implemented in hospital settings, thereby enhancing service delivery and patient care.

c. Operation Smile Malawi's Strategic Planning

Operation Smile Malawi utilised Design Thinking to collaboratively develop a five-year strategic plan. By engaging local staff and international partners in a human-centred design process, they co-created goals and activities tailored to the local context. This approach fostered team spirit, productivity, and inclusivity, ensuring that the strategy addressed the specific needs of the community.

d. Design Thinking for Health Platform

The "Design Thinking for Health" platform offers online resources to teach healthcare professionals, particularly nurses, how to apply Design Thinking to tackle complex challenges in their practice. While not specific to South Africa, this resource has been instrumental in guiding healthcare providers across Africa in implementing innovative solutions within hospital settings.

These case studies demonstrate the versatility and effectiveness of Design Thinking in addressing diverse healthcare challenges, from strategic planning to patient engagement and capacity development within the African context. They illustrate the versatility and effectiveness of Design Thinking across different industries. By prioritising empathy, collaboration, and iterative testing, organisations can solve complex problems, enhance user experiences, and drive innovation. Whether improving user interfaces, healthcare experiences, financial products, internal processes, or consumer goods, Design Thinking

provides a powerful framework for achieving impactful and user-centred outcomes

1.12 Limitations of Design Thinking

Design Thinking is a valuable problem-solving approach, but it has several limitations, especially in complex fields like healthcare. Here are some key limitations:

1. Lack of Deep Domain Expertise

Design Thinking emphasises empathy and rapid prototyping but may not fully incorporate the deep technical knowledge required in fields like medicine or engineering. In hospitals, clinical decisions require evidence-based approaches that Design Thinking alone may not provide.

2. Time and Resource Intensive

The iterative nature of Design Thinking (Empathise, Define, Ideate, Prototype, Test) can be time-consuming and resource-heavy. Healthcare settings often require quick decision-making, which may not align with the prolonged experimentation process of Design Thinking.

3. Difficulty in Scaling Solutions

Many Design Thinking solutions work well in small, controlled environments but struggle to scale across larger systems with complex regulatory and logistical constraints. For example, a human-centred hospital scheduling system may work well in one facility but face challenges when implemented across an entire national health network.

4. Subjectivity and Bias in Empathy

The process relies on user insights, but those insights can be subjective and influenced by personal biases. If the research phase does not include diverse stakeholders, the solution may not be truly inclusive.

5. Overemphasis on Creativity versus Feasibility

Design Thinking encourages “out-of-the-box” solutions, but some ideas may be impractical or too costly to implement in

real-world scenarios. In hospitals, budget constraints and strict regulations may limit the feasibility of innovative solutions.

6. Resistance to Change in Established Systems

Healthcare and corporate environments often have rigid hierarchies and resistance to new approaches. Design Thinking solutions may face pushback from stakeholders accustomed to traditional workflows and decision-making structures.

7. Ethical and Privacy Concerns

In sensitive sectors like healthcare, patient data privacy and ethical concerns may limit how much user-driven research can be conducted. Prototyping and testing ideas with real patients can raise ethical dilemmas regarding informed consent and safety.

Despite these limitations, Design Thinking remains a powerful tool when combined with other evidence-based methodologies. It works best as part of a broader strategy rather than a standalone solution.

1.13 Convergent and Divergent Thinking - Application During Ideation Step

J. P. Guilford, a psychologist, created the terms convergent and divergent thinking in 1956. Convergent thinking focuses on reaching one well-defined solution to a problem. According to Reddy et al. (2016), this type of thinking is best suited for tasks involving logic instead of creativity, such as answering multiple-choice tests or solving a problem where you know there are no other possible solutions. Divergent thinking is the opposite of convergent thinking and involves more creativity. With this thinking, you can generate ideas and develop multiple solutions to a problem. While divergent thinking often involves brainstorming for many possible answers to a question, the goal is the same as convergent thinking to arrive at the best solution (Reddy et al., 2016).

Organisations benefit from diverse ways of thinking. That statement is not just a platitude, it's backed by research, too. Research has found that teams that embrace diversity and diverse

thought, are smarter and tend to overcome stale thinking. By bringing diverse perspectives together, organisations can inspire collaboration, creative problem-solving, and brainstorming, and drive more engagement and loyalty amongst team members. It's a win-win for both culture and innovation.

That said, from a strategic perspective, it's important to channel different ways of thinking into actionable plans. The creative problem-solving process embraces two types of thinking: convergent and divergent. Generally speaking, divergent thinking is all about no-holds-barred, creative brainstorming around a problem, while convergent thinking considers other dependencies to come to a feasible solution. The project management process requires both types of thinking; however, there's a lot to gain from embracing divergent thinking before switching gears to a more pragmatic and practical convergent approach.

1.14 Defining Convergent and Divergent Thinking

Divergent thinking takes the handcuffs off traditional brainstorming with little concern about whether new ideas are feasible or practical; it's a free-rein approach to problem-solving where inspiration and creativity thrive. Big problems call for big ideas, and when you're approaching a new problem, it does not serve innovation to think small. In an ideal world, what would be the perfect solution? What would you build if you had the leeway (and plenty of time) to test the most ambitious ideas that come to mind?

Convergent thinking embraces those big ideas but channels them into possible solutions to be considered in the context of other realities, capabilities, and limitations. What contingencies and dependencies might derail that plan? Do you have the resources, time, and budget that you need? Will your proposed solution impact other parts of the product or system?

Some great ideas might face the chopping block if they're too time-, cost-, or resource-expensive to pull off. Convergent thinking takes an analytic look at the problem and considers every idea and outcome to arrive at the best possible and most feasible solution.

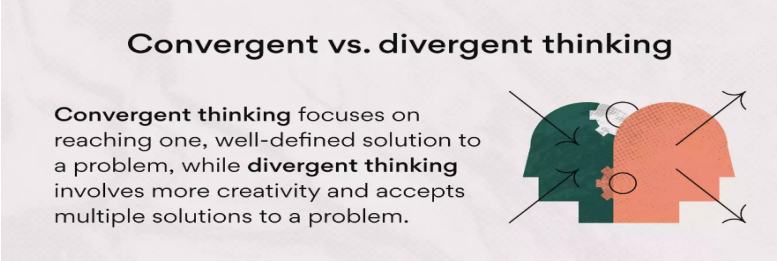


Figure 4: Defining convergent and divergent thinking. Source: Robbins (2018)

In practice, here is what these different types of thinking might look like:

1. Convergent thinking: If the copy machine breaks at work, a convergent thinker would immediately call a technician to fix the copy machine.
2. Divergent thinking: If the copy machine breaks at work, a divergent thinker will try to determine the cause of the copy machine's malfunction and assess various ways to fix the problem. One option may be to call a technician, while other options may include looking up a do-it-yourself (DIY) video on YouTube or sending a company-wide email to see if any team members have experience in fixing copy machines. They would then determine which solution is most suitable.

1.15 The Creative Cycle of Convergent and Divergent Thinking

According to Boot et al. (2017), combining convergent and divergent thinking can solve problems within the processes or projects. This idea was supported by Bourdeau et al. (2020) and Meinel and Leifer (2011), who further state that without using both types of thinking, it will be harder to get from point A to point B.

- **Discover: Divergent thinking:** The first stage of creative problem-solving is discovery, and in this stage, you'll need to use divergent thinking. When you have a problem at

work, the first step is to discover the cause of the problem by considering all the possibilities.

- **Define: Convergent thinking:** Use convergent thinking when narrowing down the potential causes of your problem. While it's possible that more than one cause led to your budget overruns, convergent thinking requires a focused approach to solving your problem, so you'll need to choose the cause that you think is most problematic.
- **Deduce: Divergent thinking:** In stage three, the divergent thinker will switch back to divergent thinking as they work to solve the problem.
- **Determine: Convergent thinking:** The last stage of creative problem-solving is when the divergent thinker will use convergent thinking to determine which solution will most effectively eliminate the problem. While all the solutions within stage three may solve the problem to some degree, the convergent thinker may begin with one action item to address. Sometimes, one may focus on more than one action item, but only if these items are related.

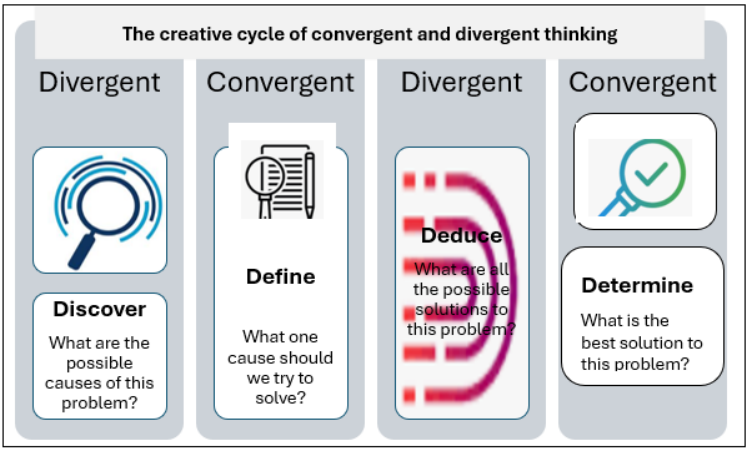


Figure 5: The creative cycle of convergent and divergent thinking. Source: Liedtka (2011)

1.16 The Pros and Cons of Convergent and Divergent Thinking

Not every situation requires the same type of thinking, and not every person thinks about problems in the same way. Some people are risk-takers, brainstormers, and empathetic thinkers; coming up with innovative, creative solutions to complex challenges comes naturally to them. Others excel at coming up with creative yet practical solutions to a problem. Both types of thinking have drawbacks and benefits.

Table 5: The pros and cons of divergent thinking

Divergent thinking	
Pros	Cons
Breaks down silos	Sometimes impractical
Avoids groupthink	Lacks focus
More "out of the box" ideas and innovative solutions	

Source: Liedtka (2011)

Table 6: The pros and cons of convergent thinking

Convergent thinking	
Pros	Cons
Focused solutions	Encourages "black and white" thinking
Reduces ambiguity	Does not consider diverse viewpoints

Source: Liedtka (2011)

1.17 Convergent and Divergent Thinking in Project Management

As a project manager, your goal is to keep work on track. Once you've established a project scope, deliverables, budget, and a schedule, new viewpoints and divergent ways of thinking serve to derail your well-laid plans or complicate the route to establish

them. Convergent thinking, meanwhile, embraces structure and solutions, it keeps teams aligned and focused on a singular goal.

As appealing as this convergent way of thinking may be, it inherently damages teams and innovative progress. It's also an enemy of agile ways of working. By relying on solution-focused ideas, convergent thinking pigeonholes teams and leaves them reliant on old ideas and old ways of thinking about new problems. When you put restrictions on more creative thinking, you risk hindering the adaptability and flexibility that helps you to learn and be innovative along the way. Success comes in the form of "getting things done" rather than innovation.

However, by embracing divergent thinking, particularly during the brainstorming and ideation phase of your project management process, you can tap into a wider pool of knowledge and encourage new solutions. Even if your team can not ultimately implement those ideas, you've taken the reins off your idea of what's possible.

1.18 How to Encourage Divergent Thinking

As leaders and project managers, it's easy to think of yourself as the keeper of the calendar or what is needed to help people to reach their goals. After all, projects need to become realities, and that's not going to happen by magic!

It's critical for leaders to shepherd projects along and produce viable outcomes. But seeing the role in that narrow way makes it more likely that you will overcommit to the details of a project (the planning and logistics) rather than focusing on the big picture. The best project managers help people to dream big and deliver. And by combining the power of divergent and convergent thinking, you can help your team to excel at both.

Make time for both types of thinking

Divergent and convergent thinking are both critical to the success of a project. To encourage people to maximise the benefits of both, start by separating the two processes. At the beginning of a project, get the creative juices flowing with a true brainstorm session. A true brainstorm is different from the quick, ad hoc

list-making activities that often pass for the name. In true brainstorming, there are no wrong answers, and there's enough time between the creative phase and the evaluation phase to let new ideas simmer.

Most companies mix brainstorming and evaluation into the same meeting with disastrous results. Most employees would not share their early ideas if they feel like they'll be shot down, which reduces creativity, morale, and does not always lead to the best solutions. So, educate your employees on the difference between convergent and divergent thinking, then create some meetings where the sole point is to come up with big ideas. After people have had some time to mull them over, bring your team back together to analyse the ideas according to specified project goals and existing limitations. That way you'll get fresh thinking alongside your deliverables.

Implement ways to collaborate

Sometimes, project managers worry that divergent thinking will result in endless ideation meetings that will bog down the process. But investing in smart collaboration tools and processes can help your team to stay nimble while cutting the logistical fat.

The first form of collaboration is human-centred. If you want to obtain the best results, create teams with people who think differently. While everyone is capable of both divergent and convergent thinking, pairing people who excel at one with people who excel at the other can help your team to nail both vision and execution. This is especially true if you've educated your employees on the benefits of both ways of thinking and clearly delineated which part of the process happens when.

You can also invest in project management software that allows people to communicate in real time about projects and ideas, automates busywork, and allows for flexibility on the organisation level. Collaborating in this way cuts down on unnecessary meetings, confusion, and over-planning that robs teams of the opportunity for divergent thinking.

1.19 Pain Points and Gains in Design Thinking

Design Thinking often involves the pains of working with complex and ambiguous problems that lack clear solutions. This ambiguity can be challenging for individuals who prefer clear guidelines and well-defined problems. Embracing uncertainty is a key aspect of Design Thinking. Iterative prototyping and testing can help to reduce ambiguity over time. The iterative nature of Design Thinking, emphasising Empathy, Ideation, and Prototyping, can be time-consuming. This may be perceived as a challenge, especially where quick solutions are needed. Design Thinking may require a mindset shift and a willingness to embrace change. Individuals or organisations that are resistant to change may find this challenging. Effective communication about the benefits of Design Thinking, along with providing success stories and tangible results, can help to overcome resistance (Wolcott & McLaughlin, 2020; Dobrigkeit et al., 2019; Lorusso et al., 2013).

In addition, some gains have been witnessed in the Design Thinking process, including the fact that Design Thinking strongly emphasises understanding the needs and perspectives of users. This results in solutions that are more empathetic and aligned with user requirements. The Ideation step encourages creative thinking and brainstorming, leading to various innovative solutions. This fosters a culture of creativity within teams. The other aspect involves the iterative nature of Design Thinking, which allows for continuous improvement. Based on user feedback, solutions are refined, leading to more effective and user-friendly outcomes. Design Thinking promotes collaboration amongst cross-functional teams. This collaborative culture enhances communication, brings diverse perspectives, and fosters a sense of ownership amongst team members. Design Thinking is a powerful tool for fostering innovation and solving complex problems. It encourages "thinking outside the box" and finding unconventional solutions to challenges (Wolcott & McLaughlin, 2020).

Table 7 provides for pain points and gains in Design Thinking:

Table 7: Pain Points and Gains in Design Thinking

Pain points	Gains
Ambiguity and Uncertainty	Empathy and User-Centric Solutions
Time-Consuming:	Adaptability and Flexibility
Resistance to change	Collaborative culture
Resources constraints	Innovation and problem solving

Source: Dobrigkeit et al. (2019)

1.20 Double Diamond model of Design Thinking

While the approach to teaching Design Thinking may differ, one can find similarities in how it is practised. It does not differ much from the scientific method that is taught and used in schools for various subjects. Like a science or a maths problem, Design Thinking begins by stating a hypothesis and then, through various inputs, suggestions, permutations, and combinations, moves towards forming a model or theory (Lugmayr et al., 2014). The main difference is that inputs or suggestions in a Design Thinking process aim to solve the identified problem or fill the identified gap in a service or product, and so forth. It includes "building up" ideas, with few or no limits at a stretch during a brainstorming session. This helps to reduce the fear of failure in the participant(s) or students and encourages the process of input and participation from all. The outcome of such a brainstorming phase is what is commonly referred to as "thinking out of the box" (Kumar, 2019; Lugmayr et al., 2014; Magistretti et al., 2021)

Although championed by progressive companies and design consultancies, the methods and mindset of Design Thinking draw from a wide field of disciplines, including software development, engineering, anthropology, psychology, the arts, and business. As it exists today, Design Thinking has co-evolved across various disciplines and industries (Nakata, 2020). For over 50 years, and even longer, depending on the existing perspectives, the best and most generalisable methods and practises have emerged and converged in a quasi-Darwinian process of natural selection (Elsbach & Stigliani, 2018; Nakata, 2020).

Various authors (Gero & Milovanovic, 2020; Hölsle & Rhinow, 2019; Foster, 2021) believe that, rather than becoming lost in the details from the start, a useful way to learn about Design Thinking methods is through the lens of an organising framework. While there is not a single organising framework for Design Thinking, it typically involves several phases that guide the process. One commonly used framework for Design Thinking is the "Double Diamond" model, developed by the British Design Council (Foster, 2021), which is elaborated on more in Figure 7.

At a high level, the steps involved in the Design Thinking approach are simple: firstly, fully understand the people and the problem that they experience (What and Why); secondly, explore a wide range of possible solutions, iterate extensively through prototyping and testing; and finally, implement (How). Different thinking styles used in Design Thinking, divergent to explore and convergent to synthesise, resulted in an alternative name for this framework - Double Diamond (Foster, 2021; Liedtka, 2011; Robbins, 2018). The stages are discussed below:

1.20.1 Discover

It is the first step in defining the scope of the problem. In this stage, the designer or design team explores the problems and challenges of the project. This aims to identify the project's needs, target audience, delivery methods, etc. In this step, we employ industry research strategies, and the design team sets out to explore them. This stage of the design process allows you to collect information regarding the challenge. At this time, all data collected should be documented and not discarded.

The Double Diamond method is not rigid in nature as most designers are led to believe; it is a guide for laying down your own process. As a designer, you can intend to start designing by laying out your thoughts and assumptions about the project during the discovery stage. In contrast, another designer may decide to start off the discovery stage by speaking to current users or targeting users before addressing their assumptions. The goal of this stage is to learn more about the problem, its effects, objectives, and output (solution). Other processes in this stage include market research, competitive analysis, and user research.

User-centred design is adopted by many companies. As the design lead, you need to be clear on how you decide to start this stage. Depending on the team members and processes involved, you are bound to collect a large number of data that will influence the following stages of this design process; it is important to also discuss how to manage this information during this stage so that you do not lose crucial data.

Example of the Discover stage

Objective:

To gain a deep understanding of the real transport challenges faced by rural residents in the Joe Gqabi District.

Table 8: Example of discover step

Activity	Description
User Interviews	Conduct face-to-face interviews with community members, including school learners, farm workers, and small business owners, to understand their transport needs.
Field Observations	Spend time at taxi ranks, bus stops, and major transport routes observing travel patterns, peak times, and difficulties in accessing transportation.
Stakeholder Consultations	Engage with local transport operators, municipal officials, and community leaders to gather multiple perspectives on the transport system.
Data Collection	Review existing transport usage statistics, service schedules, and geographic maps to identify service gaps and under-served areas.
Empathy Mapping	Develop Empathy Maps to visualise the feelings, needs, frustrations, and motivations of users when it comes to transport access.

Source: Author's conceptualisation

Key Outputs from Discover Stage:

1. *User pain points*: Long waiting times, unsafe transport, high costs, unreliable schedules.
2. *Emerging themes*: Lack of infrastructure, poor communication about schedules, affordability issues.

3. *Evidence base*: Quantitative data (usage stats) plus qualitative insights (user stories, observations).

1.20.2 Define

Define is the second stage in the Double Diamond process; it is convergent in nature, meaning that in this phase, you are focused on finding a solution, and your thoughts and ideas are fixed (unlike step one, which was divergent and allowed you to welcome new ideas that influenced your decision). In the Define stage, the design team will analyse the data obtained. You will filter all your research data, user interviews, and personal design assumptions here. This is because you collect all the data during the Discover Stage, and everything is important to you as a designer.

The Define stage allows you to decide which data is important to your design solution and which should be discarded. You will not be working on this alone; you and the team of designers at your organisation will discuss and decide which data is important to move into the solution phase.

In fact, at this stage, you have begun to work on your solutions. This teamwork can lead to identifying edge cases and unnecessary data. Since this process is flexible, you can always go back to the Discover stage to conduct more research if you are not satisfied with your present results.

The Define stage is also used to communicate the project goals and ensure that the design team is aligned and everyone understands the project internally and externally. In this phase, personas are created, affinity maps are drawn, etc. Additionally, we work on setting the context for product development, assessing what is realistic, and analysing how this project aligns with the corporate brand. The second stage of the Double Diamond model provides the foundation for product development.

1.20.2.1 Define stage activities in Design Thinking

The Define stage in the Double Diamond design process focuses on clarifying and framing the key problems or opportunities identified during the initial Discover stage. This stage involves synthesising research findings into clear and actionable insights,

setting the foundation for ideation and solution development. Here's a detailed breakdown of the Define stage:

1. **Synthesising Insights**

- **Activity**: Analysing Data and Identifying Patterns
- **Action**: Review and analyse the information gathered during the Discover stage, which might include user interviews, surveys, observations, and other research data. Look for recurring themes, pain points, and significant insights.
- **Outcome**: Develop a deep understanding of the problem space, user needs, and underlying issues. Summarise findings in a structured way, such as creating affinity diagrams or thematic maps.
- **Example**: If a research study on public transportation revealed that commuters find it hard to plan multi-modal trips, the team would note the frequency and context of this issue from their research data.

2. **Defining the Problem**

- **Activity**: Crafting Problem Statements and Defining Objectives
- **Action**: Formulate clear and concise problem statements that articulate the key challenges or opportunities. This involves focusing on specific user needs and business objectives that the solution should address.
- **Outcome**: Create problem statements or design challenges that guide the next stages of the design process. Use tools like "How Might We" (HMW) questions to reframe problems into opportunities for design.
- **Example**: A problem statement might be: "How might we simplify trip planning for commuters using multiple modes of transport to reduce confusion and improve their travel experience?"

3. **Creating User Personas and Journey Maps**

- **Activity:** Developing User Personas and Mapping User Journeys

- **Action**: Develop detailed user personas representing key segments of the target audience, including their needs, behaviours, and pain points. Create user journey maps that illustrate how users interact with the current system or experience their challenges over time.
- **Outcome**: Gain a user-centred perspective that helps in understanding different user types and their interactions with the problem space.
- **Example**: For a new application (app) aimed at commuters, personas might include "Alice, the Daily Commuter" who travels by bus and subway, and "Bob, the Occasional Traveller" who uses a combination of bike-sharing and ride-hailing services.

4. Defining Success Criteria

- **Activity:** Establishing Metrics and Goals
- **Action**: Define clear success criteria and metrics to evaluate potential solutions. These might include user satisfaction scores, usability benchmarks, or business key performance indicators (KPIs).
- **Outcome**: Set measurable goals that help to assess whether the final solution effectively addresses the problem and meets user needs.
- **Example**: Success criteria for the transportation app might include reducing average trip planning time by 50% and achieving a user satisfaction score of 4.5 out of 5.

5. Aligning with Stakeholders

- **Activity:** Engaging Stakeholders and Refining Scope
- **Action**: Present findings and problem definitions to stakeholders, including team members, clients, or business leaders. Incorporate their feedback to refine and validate the scope and direction of the project.
- **Outcome**: Ensure that all stakeholders have a shared understanding of the problem and agree on the project's focus and objectives.

- **Example**: Stakeholders might include city planners and transit authorities who provide insights into infrastructure and policies affecting the transportation app's feasibility.

Outcome of the Define Stage

- **Clear Problem Statements**: Well-defined challenges and opportunities that guide the ideation and development phases.
- **User-Centred Insights**: Deep understanding of user needs and pain points, represented through personas and journey maps.
- **Aligned Objectives**: Agreed-upon goals and success criteria that ensure that the solution will be effective and measurable.
- **Focused Scope**: A refined project scope that aligns with stakeholder expectations and project goals.

Key Tools and Techniques in the Define Stage

- **Affinity Mapping**: Organise and synthesise research data into themes and insights.
- **HMW Questions**: Reframe problem statements into design opportunities.
- **User Personas**: Create detailed profiles representing different user segments.
- **Journey Mapping**: Visualise user interactions and experiences over time.
- **SWOT Analysis**: Evaluate strengths, weaknesses, opportunities, and threats related to the identified problems.

In summary, the Define stage is about narrowing down the broad insights from the Discover stage into specific, actionable problems and objectives. It sets a focused direction for the design and development of solutions, ensuring that they are aligned with user needs and project goals.

1.20.3 Develop

We have now entered the second "diamond" or "kite" of the model, which is the solution phase. The first step in this process is the Develop step. In this step, we assume that the team not only understands the problem but has also conducted their research, filtered unnecessary data, and is now brainstorming and testing ideas.

In this step, all the research collected and sought has now been defined and put into visuals for clarity. This step allows you to use the personas created by the team to design sketches, wireframes (visual diagrams that outline the skeletal framework of a website, app, or other digital product), and prototypes of the solution. Some organisations may decide to develop the personas, journey maps, etc. In this step, the develop step. In this step, the solution is complete, and the product has been delivered to the public. Users can now download the final product and use it.

Sometimes users may use the product or solution in ways that the designer did not plan for. It is essential to receive feedback and monitor reviews and downloads, as this will affect your team's evaluation of the product's success. This feedback would be used to iterate on the product's next release, as some products progress to have newer versions or even feature updates. This step involves product sign-off, retrospective, product marketing, etc.

1.20.3.1 Develop step activities of Double Diamond:

1. Concept Development

- **Activity:** Ideation and Concept Sketching
- **Action**: The design team brainstorm various features and functionalities that could be included in the app. Ideas include personalised workout recommendations, progress tracking, social sharing, and integration with wearables.
- **Outcome**: Several concept sketches and low-fidelity wireframes are created, outlining different user flows and interface designs.

2. Prototyping

- **Activity:** Building Initial Prototypes

- **Action**: Using tools like *Figma* and *Adobe XD*, the team develops interactive prototypes based on the selected concepts. These prototypes allow users to navigate through different parts of the app, including setting goals, selecting workouts, and viewing their progress.
- **Outcome**: A functional prototype is produced, enabling users to experience the core features of the app.

3. **User Testing**

- **Activity:** Conducting Usability Tests
- **Action**: The team conducts usability testing sessions with a group of target users. Participants are asked to complete specific tasks within the app prototype, such as creating a fitness plan or sharing a workout with friends.
- **Outcome**: Feedback is gathered on user interactions, ease of navigation, and overall user satisfaction. This feedback highlights areas that require refinement, such as simplifying the user interface and improving the clarity of certain features.

4. **Iteration and Refinement**

- **Activity:** Addressing User Feedback and Improving the Design
- **Action**: The design team analyses the feedback from usability tests and make necessary changes to the prototype. This includes redesigning complex screens, enhancing the app's navigation, and refining the user experience for setting fitness goals.
- **Outcome**: The prototype is iteratively improved, incorporating user suggestions and fixing any identified issues. Each iteration brings the prototype closer to a final design.

5. **Collaboration and Review**

- **Activity:** Engaging Stakeholders and Reviewing Progress
- **Action**: Regular review meetings to be held with key stakeholders, including the client's product managers, developers, and marketing team. These sessions ensure

alignment on the app's direction and gather additional insights.

- **Outcome**: Stakeholder feedback is integrated into the development process, ensuring that the app met business goals and user needs. Collaboration between the design and development teams facilitates the technical feasibility of proposed features.

Outcome of the Develop Step

At the end of the Develop step, the team has a high-fidelity prototype of their fitness app that is user-tested and iteratively refined based on real feedback. The app includes features such as personalised workout plans, progress tracking, and social sharing capabilities, all designed with a user-centred approach.

The refined prototype is ready for the Deliver step, where it will undergo final testing, development, and launch preparation.

Key Learnings

- **User-Centred Design**: Regular user testing and feedback are crucial for refining the app's features and ensuring that it meets user needs.
- **Iterative Development**: The iterative approach allows for continuous improvement and adaptation of the prototype based on real-world feedback.
- **Stakeholder Engagement**: Collaboration with stakeholders throughout the Develop step ensures that the app aligns with business objectives and technical constraints.

1.20.4 Deliver

The Deliver step of the Double Diamond design process involves finalising and launching the solution. During this step, the focus is on implementing the most effective ideas that have been developed and refined through previous steps. Key activities in the Deliver step include:

1. **Prototyping**: Creating working models or prototypes to test the solution in real-world conditions. This helps to identify any final adjustments or improvements needed.

2. **Testing**: Conducting thorough testing with target users to ensure that the solution meets their needs and performs as expected. Gathering feedback during this phase is crucial for making necessary tweaks.
3. **Final Implementation**: Finalising the design and production of the solution, ensuring that it is ready for full-scale deployment. This might involve refining the product, developing detailed plans, or finalising all components.
4. **Launch**: Introducing the solution to the market or user base. This step includes planning and executing a launch strategy, marketing, and distributing the product or service.
5. **Evaluation**: Assessing the success of the solution post-launch by collecting user feedback, analysing performance data, and determining if it meets the initial objectives. Continuous improvement may be required based on this evaluation.

The Deliver step is about bringing the validated and refined solution to life and ensuring that it effectively addresses the identified problem.

1.21 What are the benefits of the Double Diamond design process?

The advantages of the Double Diamond design process are that it helps to generate creative thinking and gives a name and structure to the frameworks and methods used in the solution design. This ensures that designers never retrace their steps, eliminate good ideas, or lose focus. Here are a few more key benefits:

- **Flexibility**: The Double Diamond is flexible because it is also for exploring techniques, especially during the Discover step. Designers can explore options for research and still arrive at usable design solutions. The Double Diamond provides a clear and structured framework for Design Thinking, guiding teams through divergent and convergent thinking phases.
- **Iterative nature**: The iterative nature of the Double Diamond allows for continuous refinement, ensuring

that the final design is well-thought-out and meets user needs. This is why the Double Diamond is often referenced; designers can start with any diamond depending on how the problem statement is written. They can iterate on their early opinions, repeat after sketches, and test.

- **Clarity**: Often, clients are not sure of who their users are or all of the features that they want their product to have. It is not always about the users or product, but the Double Diamond can expose these lapses and reveal much deeper issues that affect both categories. The goal of the Define step is to understand the data gathered during discovery, and one common by-product of this process is the discovery of a new problem: the real problem. This enables your solutions to evolve into universal designs rather than just solutions for a single archetype.
- **Problem understanding**: The Double Diamond model emphasises a deep understanding of the problem before designing solutions. This helps in crafting more effective and user-centred designs.

1.22 Why does the Double Diamond still work?

So far, our definition of the Double Diamond barely touches on how we use it within a design process to facilitate Design Thinking. Each step employs additional activities, frameworks, methodologies, tools, and concepts.

In general, the Design Thinking process is very flexible and would not always follow all four steps for every client, project, or problem. Oftentimes, depending on the problem, you can use the Double Diamond from the last diamond moving forward to the first one. You create a solution first, then you iterate and improve on it. Other times, only one diamond is used; it all depends on what works for your client or team.

Sometimes, you're just conducting the research and then handing it over to the development team. Before designers start working on a project, there's a design brief or problem statement. This problem could be users saying that they find a feature hard to use, or that they expect a certain feature for ease of use, or that

they just want to make something better. The Double Diamond design process separates the times when the team figure out what the problem is from the times when they come up with ideas and make things happen. It's like first understanding the issue and then figuring out the solution.

Some may argue that it's a very linear process, and that great designers do not work that way. I believe that great designers are great because they have a structure and a process, not the Design Thinking model they use. Although it is true that some designers, when presented with a challenge, often start with some solution in mind, sometimes having a solution in mind before beginning the design process can lead to biases that can affect the output of the design.

Some designers espouse a "Reverse Double Diamond" design process that focuses on post-design research. People often misinterpret the Double Diamond design process, alleging that it takes away from the design concept and focuses primarily on design research. I would say that the reverse is the case. It understands the design concepts and breaks them down into researchable blocks while focusing primarily on user experience and product value:

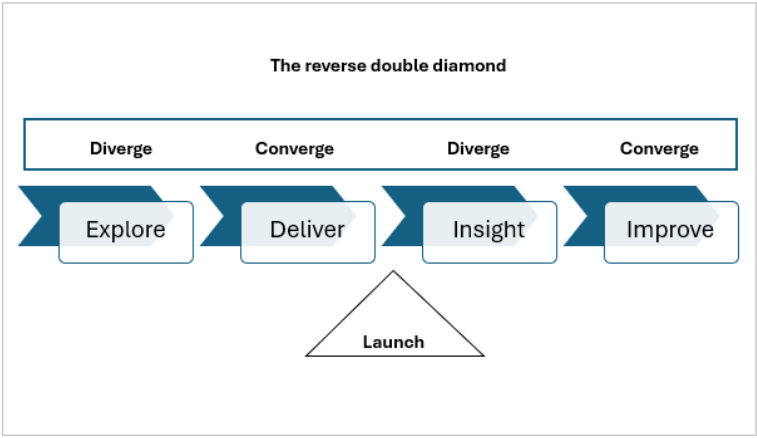


Figure 6: The Reverse Double Diamond. Source: Robbins (2018)

Oftentimes, while you solve a challenge based on the problem statement available, your solutions without proper understanding, brainstorming, and research create even bigger issues for another set of users that may interact with this problem. In this case, another set of users can be parents, teachers, nannies, etc., whereas a detailed examination into the problem statement following the Double Diamond method can give insights into what challenges may arise for a set of users as a result of the solution for another.

1.23 Four quadrants

In Design Thinking, the four quadrants typically refer to a framework known as the Double Diamond model. This model visualises the design process and is often used to guide teams through problem-solving and innovation. The four quadrants represent the key stages in the Design Thinking process (Zhang et al., 2019.)

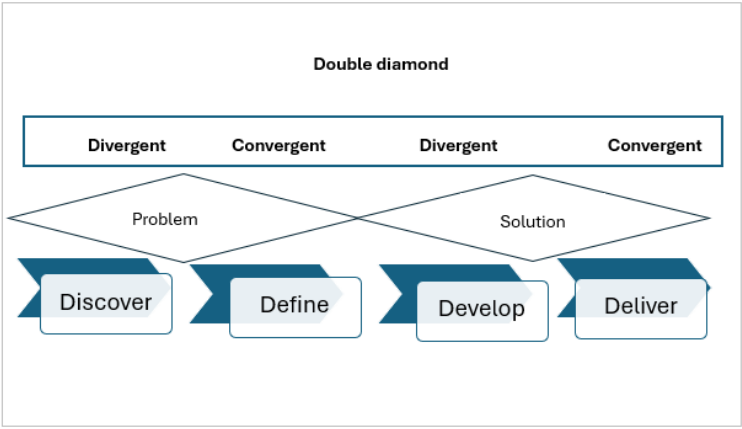


Figure 7: Double Diamond model. Source: Zhang et al. (2019)

As illustrated in Figure 7, each of the four phases in the model is characterised by either divergent or convergent thinking. Divergent thinking entails generating several creative and innovative ideas, whereas convergent thinking subsequently structures and narrows down the ideas (and information) into an

optimal solution to the problem. Figure 8 visualises the concept of divergent and convergent thinking:

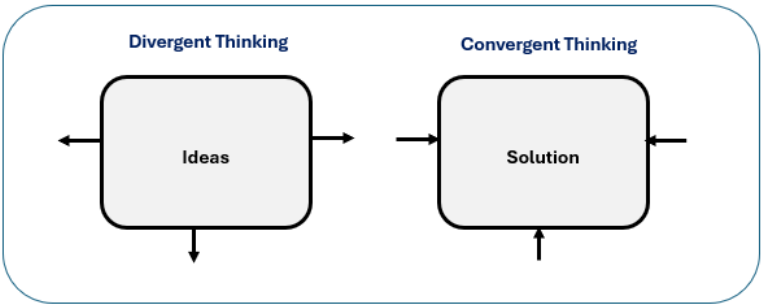


Figure 8: Divergent versus Convergent thinking. Source: Zhang et al. (2019)

The two diamonds represent a process of exploring an issue more widely or deeply (divergent thinking) and then taking focused action (convergent thinking). The Double Diamond model is thus clearly a sequential processing framework. While many different versions of the Double Diamond model exist, this book is concerned with the original model developed in 2019. The model was developed based on an extensive study, which resulted in an enormous amount of factual literature to carry out the research.

The Double Diamond model emphasises the iterative nature of the design process. The first diamond (Discover and Define) focuses on understanding and defining the problem, while the second diamond (Develop and Deliver) focuses on creating and implementing solutions. The divergent and convergent phases highlight the importance of exploring a broad range of ideas before narrowing down to the most viable solutions. This iterative approach helps to ensure that the final solution is well-informed and meets the needs of the end-users (Senapathi et al., 2021; Deitte & Omary, 2019; Bourdeau et al., 2020; Prestes et al., 2020).

1.24 What the Double Diamond is not

Another grave misconception about the Double Diamond is that it makes convergent and divergent thinking mutually

exclusive. Divergent thinking creates space for exploration, while convergence brings focus, clarity, and direction. The Double Diamond represents how designers can alternate between these two processes throughout the Design Thinking process, building on the ideas generated during each diamond to define, refine, and improve the problem.

At the start of the process, divergent thinking prevails, allowing us to explore the problem statement and be more open and aware of the challenges of the product, user, and market view. After gathering these insights, convergent thinking helps us to eliminate and structure potential solutions.

1.25 Summary

Design Thinking fundamentally reshapes how we approach problem-solving by placing human needs at the centre. Its iterative and collaborative nature not only fosters innovation but also ensures that solutions are practical, viable, and deeply aligned with user experiences. Whether applied to developing products, improving services, or addressing complex societal issues, Design Thinking offers a robust, adaptable framework for achieving meaningful, user-centred outcomes.

Cultivating a human-centred mindset is an ongoing journey; one that requires empathy, reflection, and a strong commitment to continuous learning. By embedding human-centred values into organisational culture, systems, and leadership, organisations can create more relevant and impactful solutions. This approach enhances user satisfaction, builds trust, and drives innovation and long-term success.

Across various industries, organisations that prioritise empathy, user-centricity, and iterative testing have seen measurable improvements in service quality, customer loyalty, and overall performance. Design Thinking equips them with a strategic and creative toolkit for navigating complex challenges and delivering value-driven solutions.

The **Double Diamond model** is one such methodology that supports this thinking. Widely used beyond the design field,

the model offers a structured yet flexible approach to problem-solving. It is a valuable tool for anyone tackling a challenge that requires thoughtful solutions. The Double Diamond divides the design process into two key phases, **problem** and **solution,** each of which includes both divergent and convergent thinking. This helps individuals and organisations to break down their processes, explore challenges broadly, and ultimately converge on solutions that are well-informed and user-driven. Whether you've developed your own process or work within a structured design framework, the Double Diamond helps to clarify and improve your approach to creating effective outcomes.

Supporting both the Design Thinking process and models like the Double Diamond are two essential cognitive strategies: **divergent** and **convergent thinking**. Divergent thinking encourages the generation of many ideas without immediate judgement, fostering creativity and innovation. Convergent thinking, by contrast, focuses on narrowing those ideas down to identify the most feasible and logical solution. Together, these approaches complement one another, enabling individuals and teams to explore a wide range of possibilities before refining and selecting the most effective path forward. This balance is critical to solving complex problems and driving progress across disciplines.

Activity Sheet

Understanding the Steps and Principles of Design Thinking

This activity sheet is designed to help students to explore and reflect on the core steps and principles of the Design Thinking process. Use this worksheet as a guide through individual or group exercises to deepen your understanding and develop practical insights.

1. The Steps of Design Thinking

Design Thinking typically follows five iterative steps: Empathise, Define, Ideate, Prototype, and Test.

Step	Description
Empathise	Understand the users and their needs through observation, engagement, and empathy.
Define	Clearly articulate the problem that you want to solve based on user needs and insights.
Ideate	Generate a wide range of creative ideas to solve the defined problem.
Prototype	Build simple, experimental models of the ideas to explore potential solutions.
Test	Try out the prototypes with users and gather feedback to refine the solutions.

2. Reflection and Practice

1. Which step of Design Thinking do you find most challenging, and why?
2. Describe a real-world problem that could be addressed using Design Thinking.
3. How does empathy influence the outcome of the design process?

4. In your opinion, which step of Design Thinking is most critical for innovation? Explain.
5. Identify one opportunity for using Design Thinking in your community or school.

3. Your Design Thinking Challenge

Select a common problem faced by students or your local community. Use the template below to work through each step of the Design Thinking process. Document your ideas and solutions.

Step	Your Input
Empathise	
Define	
Ideate	
Prototype	
Test	

Group Exercise: Applying Design Thinking

Objective:

To collaboratively apply the Design Thinking steps in a simulated or real-world challenge.

Instructions:

Form groups of 4 to 6 participants. Each group will select a problem area to address (for example, improving access to local services, redesigning the student experience, or innovating a community health initiative).

Work through the following Design Thinking steps as a group. Document your responses and prepare a short five-minute presentation.

Step	Key Questions	Group Response
Empathise	Who are the users? What are their needs, challenges, and emotions?	
Define	What is the core problem that you are solving?	
Ideate	What are some creative ideas or solutions?	
Prototype	What can you build or simulate quickly to demonstrate the idea?	
Test	How can you gather feedback to refine your solution?	

Part Two

The Psychology of Design Thinking

Learning outcomes

1. Explain the role of Empathy as a cognitive process and its importance in understanding user needs within the Design Thinking process.
2. Apply Empathy mapping techniques, including identifying what users say, do, think, and feel, to gain deeper user insights.
3. Develop user personas that represent key user groups and effectively inform design decisions.
4. Formulate clear and actionable problem statements, using tools like the "5 Whys" and point of view (POV) statements to define user-centred challenges.
5. Describe the process and importance of Ideation and Prototyping, highlighting how these steps help to translate user insights into innovative and testable solutions.

2. Empathising

2.1 Introduction

Empathy is the first and most crucial step in the Design Thinking process. It involves understanding the people who you are designing for and gaining deep insights into their needs, experiences, and challenges. This human-centred approach ensures that the solutions developed are relevant and impactful. Empathising involves actively engaging with users through various research methods to collect qualitative data and build a comprehensive understanding of their lives. Although empathy is most prominently associated with the first step of the Design Thinking process (Empathise step), it is not confined to that phase alone. Instead, empathy is a foundational principle that informs every phase of the process.

Table 9: Empathy across steps of Design Thinking

Step	How Empathy is Applied
Empathise	Understand users' experiences, emotions, and perspectives through observation and dialogue
Define	Frame the problem based on deep insight into users' true needs - not just symptoms
Ideate	Generate ideas with compassion, ensuring that solutions are meaningful to real people
Prototype	Build with users in mind - test assumptions that matter to their context
Test	Collect feedback empathetically; listen deeply, adjust with humility, and validate impact

Source: Brown (2009)

From Table 9, it is clear that empathy is not a "box to check" at the beginning of a design process, it's the **ethical and emotional lens** that permeates the entire journey. It ensures that solutions

are not only functional but also **respectful, relevant, and resonant** with the people who they're meant to serve.

2.1.1 Empathy as a cognitive process

Nakata (2020) introduced that there are three levels of empathy. First, the minimal level of empathy recognises others' existence. Secondly, the average level - trying to imagine how others feel in a given situation. Thirdly, the highest level - choosing to experience the world through others' basic assumptions and values, temporarily abandoning one's own.

Lugmayr et al. (2014), in turn, introduced different forms of empathy from which cognitive and affective empathy are helpful in a design process especially during the Understanding step. Cognitive empathy can be called 'perspective-taking'. It's an ability to observe someone without emotional charge and still deduce what others are feeling.

Cognitive empathy does not include compassion. It can be motivated by emotions but does not share another person's emotional experiences. Moreover, the ability to feel and respond to other people's emotions is called affective empathy. Affective empathy enables a lot but without the support of cognitive empathy it cannot reveal others' hidden intentions. It might be easy to feel emotions, but it might be hard to notice and understand the motivations behind emotions. Shortly, affective empathy means feeling what other people feel; for instance, if you see happiness, you feel happy. Whereas cognitive empathy is knowing what other people feel; if you see happiness, you know they are happy.

Empathy involves inclusion and inclusion ensures that all voices, especially those often excluded, are heard, valued, and integrated throughout the design process. It challenges systemic barriers and calls designers to proactively involve marginalised individuals and communities, not just as subjects of research, but as co-creators and decision-makers (Lugmayr et al., 2014). In this regard, empathy without inclusion risks superficial engagement or tokenism. Inclusion without empathy risks checklist diversity without understanding or impact. Together, they form the ethical

foundation of human-centred innovation, where dignity, equity, and justice are integral to problem-solving.

In the human-centred design process, understanding the customer is often highlighted. Empathy combines conscious understanding of another's situation and adopting their perspective, as well as the emotional ability to identify feelings and motives. Both abilities are needed. Thus, empathy towards other people is one of the most important elements of service design. Utilising empathy in a design process is a relatively low-cost and low-risk way to identify the customer's unarticulated needs (Gero & Milovanovic, 2020).

2.1.2 Three parts of empathy

Here's a short description of each part of empathy:

1. Cognitive empathy

Cognitive empathy is the ability to understand someone else's perspective and what they might be thinking and feeling. It's the thinking part of empathy, and as the name suggests, it happens on a cognitive level. You make an educated guess based on your own knowledge and past experiences. You put yourself in the other person's shoes, as the saying goes. This is a crucial first step of engaging with empathy.

2. Emotive empathy

Emotive empathy is feeling with someone - "your pain in my heart." It goes beyond just the cognitive and is not above or apart from them, but together with them. You stand shoulder-to-shoulder with that other person and feel with them. We're biologically wired for this, with mirror neurons that fire both when we experience an emotion and similarly when we see others experiencing an emotion. When we see someone being sad, for example, our mirror neurons fire and that allows us to experience the same sadness and to feel empathy. We do not need to "think" about the other person being sad - we actually experience it first-hand. These both happen automatically and it's a choice that we make to let ourselves experience that feeling with them, especially

since we're socialised to not let ourselves feel uncomfortable feelings. More on this socialisation below.

3. Empathic action

Empathic action is the execution part of empathy. It goes beyond simply understanding others and sharing their feelings: it actually moves us to take action, to help however we can. That comes in many forms, depending on the situation, ranging from direct help, to asking how you can help, to just sitting in silence with them and not "doing" anything, which is often exactly what that person needs us to "do."

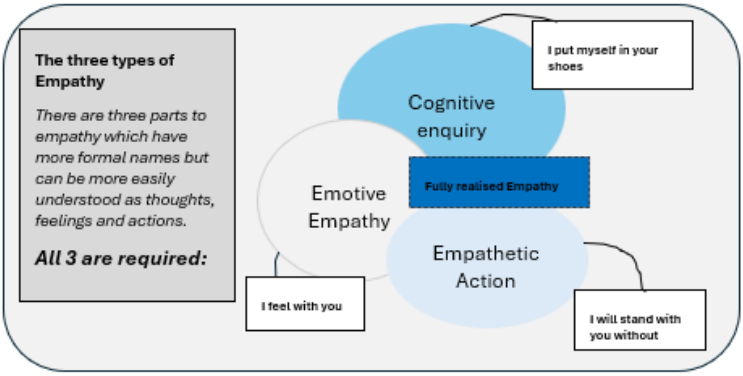


Figure 9: The three types of Empathy. Source: Meinel and Leifer (2011)

2.1.3 Key methods for Empathising

The following are key methods of Empathising.

1. User Interviews

- **Purpose:** To gather in-depth information about users' experiences, motivations, and pain points.
- **Approach:** Conduct one-on-one interviews with a diverse range of users to capture their perspectives.

Techniques:

- Open-ended questions to encourage detailed responses.

- Active listening to understand underlying emotions and motivations.
- Follow-up questions to delve deeper into specific topics.

Example Questions:

- Can you describe a typical day when you use our product or service?
- What are the biggest challenges that you face with [specific task]?
- How do you currently solve [specific problem]?

2. Observations

- **Purpose:** To understand user behaviour and context in their natural environment.
- **Approach:** Observe users as they interact with products or services in real-life settings.

Techniques:

- Unobtrusive observation to capture natural behaviours.
- Note-taking or video recording to document actions and interactions.
- Contextual inquiry to ask users about their actions during the observation.

Examples:

- Observing commuters at a train station to understand their navigation and ticket purchasing behaviours.
- Watching customers in a grocery store to see how they choose and purchase products.

3. Surveys and Questionnaires

- **Purpose**: To collect quantitative data and broad insights from a large group of users.
- **Approach**: Distribute surveys through online platforms, emails, or in-person.

Techniques:

- Structured questions for consistency and comparability.
- Mix of multiple-choice, rating scales, and open-ended questions for diverse data.

Example Questions:

- How satisfied are you with the current product or service? (Scale of 1-10)
- What features do you find most useful?
- What improvements would you like to see?

4. Empathy Mapping

- **Purpose**: To synthesise insights and create a visual representation of user experiences.
- **Approach:** Create Empathy maps based on user research findings to capture what users say, think, feel, and do.

Components:

- **Say**: Direct quotes from user interviews.
- **Think**: Insights into users' thoughts based on their statements and actions.
- **Feel**: Emotions that users express or imply.
- **Do**: Observed behaviours and actions.

Example:

An Empathy map for a public transit user might show:

- **Say**: "I never know if the bus will be on time."
- **Think**: "Will I be late for work again?"
- **Feel**: Anxious, frustrated.
- **Do**: Frequently check the time and the transit app.

5. Journey Mapping

- **Purpose**: To visualise users' end-to-end experience, identifying touchpoints and pain points.

- **Approach:** Create detailed journey maps that outline each step that a user takes when interacting with a product or service.

Components:

- Stages of the journey (for example, awareness, consideration, purchase, use, support).
- User actions, thoughts, and feelings at each stage.
- Pain points and opportunities for improvement.

Example:

A journey map for a healthcare service might include stages like appointment booking, waiting room experience, consultation, and follow-up.

6. Immersion

- **Purpose:** To gain first-hand experience of users' environments and challenges.
- **Approach:** Engage in activities or situations that users experience to understand their perspective.

Techniques:

- Role-playing scenarios to simulate user experiences.
- Spending time in users' environments to observe and participate in their daily activities.

Examples:

- Using a wheelchair to navigate a city to understand accessibility issues.
- Living a day in the life of a factory worker to grasp the physical demands and workflow.

Case Example: Improving Urban Public Transportation

A city transport authority wanted to redesign its bus services to better meet passenger needs.

2.2 How empathy is ensured - key insights

- **User Interviews:** Conducted interviews with a wide range of passengers, including daily commuters, occasional riders, elderly passengers, and people with disabilities. They learned about issues such as unreliable schedules, difficulty in finding seats, and challenges faced by disabled passengers.
- **Observations:** Observed passengers at bus stops and on buses during different times of the day. They noted how passengers interacted with ticket machines, how they navigated the bus system, and the bottlenecks during peak hours.
- **Surveys:** Distributed online surveys to gather data from thousands of passengers. The surveys revealed that cleanliness, safety, and real-time information were top priorities for improvement.
- **Empathy Mapping:** Created Empathy maps for different user personas, such as "The Daily Commuter" and "The Elderly Passenger." This helped to visualise their experiences and emotions, highlighting pain points like crowded buses and unclear signage.
- **Journey Mapping:** Mapped out the entire journey of a passenger, from planning their trip to reaching their destination. Identified key pain points such as long wait times, lack of real-time updates, and difficulties during transfers between buses.
- **Immersion:** Transport authority staff used buses exclusively for a week, experiencing first-hand the challenges faced by passengers. They observed the impact of delays, crowded conditions, and inadequate seating.

Insights Gained

Through these empathy-building methods, the transport authority identified several critical insights:

1. **Need for Real-Time Information**: Passengers valued accurate, real-time updates on bus schedules and delays.
2. **Accessibility Improvements**: There was a strong demand for better accessibility features, such as low-floor buses and clearer audio announcements.
3. **Comfort and Cleanliness**: Enhancing the cleanliness and comfort of buses was a priority for many users.
4. **Simplified Navigation**: Passengers wanted clearer signage and more intuitive route maps.

2.3 Key aspects of the Empathise step in Design Thinking

Table 10: Key aspects of the Empathise step of Design Thinking

User Research	This involves conducting thorough research to gather information about the target users. This can involve interviews, surveys, observations, and other methods to understand their behaviours, preferences, and pain points.
Observation	This involves observing users in their natural environment to understand their experiences first-hand. This can provide insights into daily routines, challenges, and opportunities for improvement.
Immersion	This involves immersing yourself in the users' context to better understand their world. This might involve spending time with users, participating in their activities, and experiencing things from their perspective.
Interviews	The important aspect is to conduct one-on-one interviews to elicit personal stories, experiences, and emotions. Open-ended questions and active listening are essential to uncover deeper insights.
Empathy Building	Fostering empathy within the design team by encouraging members to step into the users' shoes and see the world from their perspective. This emotional connection helps in developing a genuine understanding of users' needs.

Persona Development	Create user personas that represent archetypal users based on research findings. Personas help in humanising the design process and provide a reference point for decision-making.
Empathy Maps	Using Empathy maps to represent users' thoughts and feelings visually is important. These maps typically include sections for what users say, think, do, and feel, helping to synthesise and organise empathy-related insights.

Source: Haag and Marsden (2019); Wray et al. (2019); Jansen et al. (2021); Bittner and Shoury (2019)

2.4 Empathy maps

Empathy maps are a valuable tool in Design Thinking, which is a human-centred problem-solving approach. Empathy maps help design teams to better understand their users by visualising and organising their thoughts and observations. These maps are typically created collaboratively and involve collecting insights from user research and interviews.

2.4.1 What is Empathy Mapping?

1. Empathy mapping is the visual representation of users' thoughts, feelings and actions. User Experience (UX) designers use Empathy maps to organise user research data to gain a deeper, shared understanding of users' needs and make decisions.
2. An empathetic approach builds stronger connections with users and gives products a competitive edge.
3. It helps designers to uncover the underlying emotions and motivations that drive users' behaviour. By understanding what users genuinely want and need, designers can develop innovative solutions that meet users' expectations.
4. Teams create Empathy maps at the beginning of a project and use them throughout the design process; they help to uncover hidden insights and keep the user front and centre.
5. For example, a mobile productivity app team conducts user interviews and then creates Empathy maps for different user segments, such as students, remote workers, or busy

parents. Each Empathy map includes details like user thoughts, feelings, needs and pain points related to task management.

6. As the team assembles the map, they notice that students crave recognition and a sense of accomplishment. The team then works this need into their design ideation, testing ideas like leader boards and productivity streaks.

2.4.2 *Why is Empathy Mapping Important?*

Empathy mapping is an important tool in the designers' toolkit for several reasons:

1. In Design Thinking, empathy is a helpful catalyst for ideation and problem-solving. Empathy mapping ensures that designers focus both on functionality and the emotional aspects of user interactions. This understanding sparks creative ideas that go beyond surface-level solutions.
2. Teams develop a shared understanding of who the user is, and their needs and pain points. Empathy maps based on real quotes capture unfiltered perspectives and avoid the distortion of individual biases about the user.
3. Empathy maps help designers to easily communicate their user research findings to stakeholders.
4. Empathy map canvases offer a quick visual summary of qualitative research data. The team does not have to go through the entire research data to understand their users. Design teams can develop these insights and opportunities further to help identify potential opportunities in the product.
5. Empathy maps reveal gaps in user research. For example, does the research reveal what users truly feel?
6. An Empathy map is a simple but powerful tool that keeps users at the centre of the design process. Designers gain a profound understanding of users' needs and desires through the analysis of their thoughts, feelings and experiences. Teams use these insights to create products and experiences that users identified with on a deeper level.

2.4.3 Empathy Maps: What the User Said, Did, Thought, Felt?

The four quadrants of an Empathy map typically categorise different aspects of a user's experience. An Empathy map can have four sections: Said/Says, Thought/Thinks, Did/Does, and Felt/Feels. Empathy maps help designers to look at a user's experience through four distinct lenses: what they say, think, do, and feel.

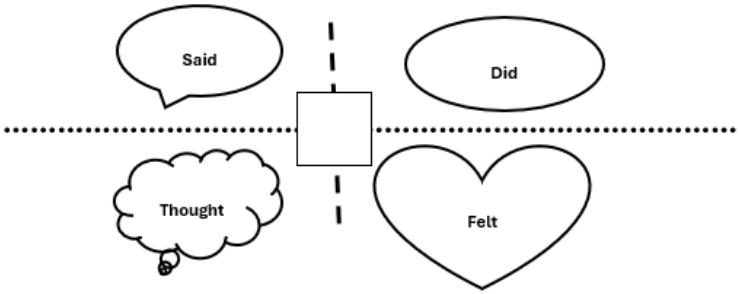


Figure 10: Empathy mapping. Source: Meinel and Leifer (2011)

2.4.4 The four quadrants of an Empathy map

1. **Said/Says**: The "Says" section represents what you hear your users say out loud, and it's usually the easiest section to complete. By listening to their words, you gain valuable insights into their expectations, concerns, needs and preferences.

For example, this section might include:

- "I feel super stressed trying to keep track of all the different due dates and things that I have to do."
- "I'm never able to keep up with everything during exams and it stresses me out."
- "I've barely got a moment to breathe once I've caught up with my assignments and projects. But it still feels as though I've got nothing to show for my efforts."

2. Did/Does: The "Does" section focuses on your users' actions and behaviours. It helps to understand how users interact with the brand, products or services. By analysing the users' actions, you

can identify pain points and opportunities for improvement. For example:

- "The user customises app interfaces with a preferred theme."
- "The user screenshots motivational quotes to share on their Instagram story."
- "The user lists the many different student societies that they belong to in their bio."

3. Thought/Thinks: The "Thinks" section represents your users' thoughts, beliefs and assumptions. This section uncovers the underlying motivations and aspirations that drive their behaviour. When you understand what your users think, you can align your product with their mental models. For example, the "Thinks" section might include:

- "The signup process is way too long."
- "I wish I had more free time, but there's just so much to do. Will this app help, or is it just another thing that will take up my time?"
- "The tuition fees are so high; I hope this app has a free option. I'm on such a tight budget."

4. Felt/Feels: The "Feels" section delves into the users' emotional state, and it can be the hardest section to complete. It uncovers their fears, frustrations and desires. Pay close attention to body language and tone of voice for cues about what the users are feeling. When you understand their emotions, you can create meaningful and engaging experiences that appeal to users on a deeper level. For example, this section might include:

- "Impatient with the amount of time it takes to complete an action in the app."
- "Overwhelmed by the amount of on-screen text."
- "Excited by the pop-up prompting them to connect with their friends on the app."

To fill out the "thinks" and "feels" sections, the team will need to interpret all available data, and rely on more observational notes, as people may not readily describe what they think and

feel. Additional sections: While many Empathy maps contain four quadrants, variations of the canvas include extra sections for further insights: Goals, Pains, Gains, Sees and Hears.

The "Goals" section details who the team empathises with and what they need to do. The "Pains" section lists the user's problems and pain points. The "Gains" section is where you'll organise the users' wants, needs and what they dream to achieve. The "Sees" section lists what the user sees in their immediate environment and relevant digital visual stimuli. The "Hears" section does the same for their auditory experience.

The pieces of Empathy

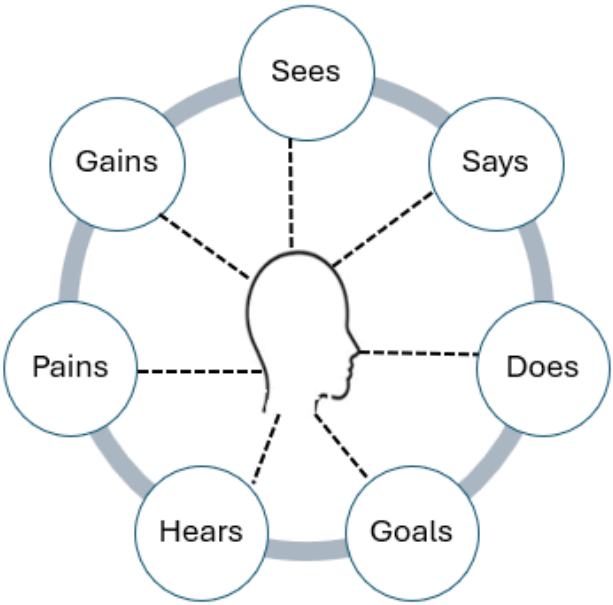


Figure 11: The pieces of an Empathy map. Source: Nakata (2020)

2.4.5 When to Use Empathy Maps

Design teams often create Empathy maps at the beginning of the design process. However, once created, teams should continue to refer to the maps to keep users at the centre of the design process. The design process is not linear, and it's likely that the team will conduct interviews even after a product launch. Designers should always update these maps with new insights.

Empathy maps play several important roles during the design process:

- **Research Phase:** Begin using Empathy maps at the outset of a project, during the research and exploration phase. Use Empathy maps to collect and organise data from user interviews, observations, and surveys. This early understanding lays the groundwork for informed design decisions later. For example, an Empathy map created during the research phase may reveal that users feel frustrated with or intimidated by complex apps. This insight directs the design team to focus on simplifying the user experience.
- **Idea Generation and Brainstorming**: Use Empathy maps during ideation and brainstorming as a springboard for creative thinking. By visually mapping out user experiences, UX designers can identify solutions that users identify with on a deeper level. This phase is about translating empathetic insights into tangible design ideas that can improve user satisfaction. For example, if an Empathy map shows that users are looking for quicker ways to complete tasks, designers might brainstorm features like shortcuts or predictive text.
- **Iterative Design and Prototyping:** Continuously use Empathy maps during the iterative design process. As prototypes evolve, Empathy maps ensure that the user's emotional journey is consistently considered. This phase is about bridging the gap between user needs and the product's functionality. For example, if an updated Empathy map indicates that users are annoyed by a lengthy

signup process, the design team can prioritise addressing this in the next iteration of the application.

2.4.6 *The Top 4 challenges that designers face during Empathy mapping and how to avoid them*

There are a few challenges to overcome when working on an Empathy map:

Mistake 1: Over-generalise user profiles

Often, designers create Empathy maps based on generic user profiles. This approach misses the subtleties of real user experiences and leads to a one-size-fits-all design that anyone does not truly identify with. To avoid this, designers should create different Empathy maps to capture insights from different groups.

For example, in an app for public transit users, if the team only looks at the perspective of a 9-to-5 office worker, they will miss the needs of night shift workers, students, or parents with school-age children. Designers can create a separate Empathy map for each user group to capture the range within a specific type of user. This will help the team to tailor their product to meet specific user needs.

Mistake 2: Ignore Emotional Undercurrents

When creating Empathy maps, some designers rely solely on what users do and say, without considering how they feel. Emotions drive behaviour, and overlooking this aspect leads to a superficial understanding of users. To avoid this misstep, designers should pay attention to the emotional responses during their user research. Designers should ask questions about how certain experiences make users feel and observe their emotional cues. This deeper emotional understanding will lead to more intuitive and user-centred designs.

For example, a user of a fitness app might say that they use it for exercise tracking. But delve deeper, and they might reveal that they're also seeking motivation and community. Recognising these emotional needs can transform your approach from

simply tracking metrics to creating an engaging, supportive user experience.

Mistake 3: Treat Empathy Mapping as a Once-Off Task

Designers who treat Empathy mapping as a box to check at the beginning of a project, never to revisit, are making a critical error. User needs and contexts evolve, and so should the designer's understanding of them. Designers should revisit and update their Empathy maps regularly. As the project progresses, they should keep in touch with users. This ongoing dialogue ensures that the design remains relevant and empathetic.

For example, a streaming service's initial Empathy map might focus on entertainment and ease of use. But, as competition grows and user preferences change, revisiting the map could reveal a new emphasis on unique content and personalised recommendations.

Mistake 4: Look to Prove Assumptions

Teams can fall victim to confirmation bias while analysing data; that is, they might selectively interpret data that reinforces assumptions and stereotypes, which defeats the purpose of Empathy maps.

2.5 Creating Effective Personas

Personas are deliverables in Design Thinking's Define step. As they're extremely helpful in ideation, they should feature early in design processes. To create them, you:

1. Collect extensive data on target users.
2. Determine the qualities of and differences between users.
3. Develop a hypothesis from the research, determining the qualities of and differences between users.
4. Ensure that stakeholders agree on the hypothesis about the users.
5. Determine a number of personas – more than one per project, but focus especially on one.
6. Name and describe each persona in one to two pages, including:

- A picture.
- User's values, interests, education, lifestyle, needs, attitudes, desires, limitations, goals and behaviour patterns.
- Extra details about the persona (for example, interests), anything to make them more real and relevant and help to build empathy. A written story is better than bullet points.
- Describe several situations or scenarios prompting the persona to use your product, put them in context with problems to overcome.
- Include everyone involved in the project so that they'll accept the persona or advise revisions.
- Send them the persona to use in their work.
- Ensure that everyone develops scenarios; these should expose the persona optimally to potential use cases.
- Make continuous adjustments – revisit the persona; add new features; add required new personas; discard outdated personas.

2.5.1 How to use personas in design projects

When you bring personas into projects, you help to prevent stakeholders from designing for themselves. It also keeps them from stretching generic users to fit designs. Personas help in quick prototype testing, too. You'll confirm that a persona works well when you ensure that they:

1. Stay in context - What specific points about their situation can you map to how they can use your product now?
2. Reflects a target user's real behaviour patterns, attitudes, skillset, motivations and goals within the product's domain.
3. Has an end-goal - What does the user want to achieve? What features would help them to do that best?
4. Faces realistic, relevant scenarios - written from the persona's perspective - to envision how users would find they'd use the product to attain a particular goal.

5. Occupies a clear setting - a day-in-the-life approach that shows what they encounter in what environment.
6. Has visible pain points - What's the hardest or most frustrating aspect of their situation or context?

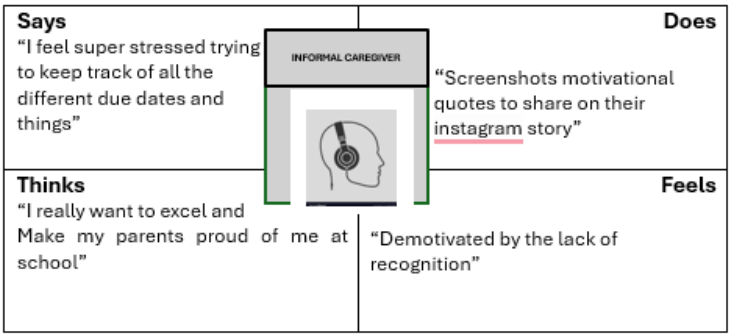


Figure 12: Empathy map example. Source: Nakata (2020)

How can personas be effectively used in Design Thinking?

Table 11: Using personas in Design Thinking

How personas can be effectively used in design thinking?						
Innovation and creativity	User-centred design	Risk mitigation	Empathy building	Targeted problem solving	Communication and alignment	Iterative design

Source: Liedtka (2015)

Table 11 can further be explained below -

- *Innovation and Creativity*: Designers can imagine innovative solutions by considering the unique characteristics and preferences of the personas. This human-centred approach

often leads to more creative and effective design solutions. By incorporating personas into the Design Thinking process, teams can create products and services that users truly identify with, resulting in better user experiences and increased chances of success in the market.

- *User-Centred Design*: Personas keep the end-users at the forefront of the design process, ensuring that solutions are tailored to meet their specific requirements. Designers can reference personas during brainstorming sessions and decision-making processes to align design choices with user needs.
- *Risk Mitigation:* Personas can highlight potential risks and challenges early in the design process by anticipating how different user segments might react to a solution. By considering the personas, designers can proactively address potential issues, reducing the likelihood of problems arising later in development.
- *Empathy Building*: Personas help design teams to empathise with the users by providing a concrete and relatable representation of their needs, goals, and pain points. Designers can put themselves in the shoes of the persona, gaining a deeper understanding of user experiences and fostering a user-centric mindset.
- *Targeted Problem Solving:* Personas guide the design team in identifying and prioritising the most critical challenges faced by the users. Designers can focus on solving problems that are most relevant to the personas, leading to solutions that impact user satisfaction.
- *Communication and Alignment*: Personas provide a common language for the design team, stakeholders, and other collaborators. They create a shared understanding of the target audience. When everyone is involved in the project and understands the needs and characteristics of the personas, better communication and alignment throughout the design process is fostered.
- *Iterative Design*: Personas help to validate and refine design solutions through iterative testing. Designers can refer to personas to ensure that updates align with user expectations. By continuously checking the solutions

against the needs of the personas, designers can identify areas for improvement and adjust accordingly (Jansen et al., 2021; Ferreira et al., 2018; Mijač et al., 2018; Barré et al., 2018.)

2.6 Define Step of Design Thinking

In the Define step, you will organise the information that you have gathered during the Empathise step. You'll analyse your observations to define the core problems that you and your team have identified up to this point. Defining the problem and problem statement must be undertaken in a human-centred manner.

For example, you should not define the problem as your own wish or need of the company: "We need to increase our food-product market share amongst young teenage girls by 5%". You should pitch the problem statement from your perception of the users' needs: "Teenage girls need to eat nutritious food to thrive, be healthy, and grow."

The Define step will help the design team to collect great ideas to establish features, functions and other elements to solve the problem at hand or, at the very least, allow real users to resolve issues themselves with minimal difficulty. In this step, you will start to progress to the third step, the Ideation step, where you ask questions to help you look for solutions: for example, How might we encourage teenage girls to perform an action that benefits them and also involves your company's food-related product or service?

For instance:

Imagine your team meets together to solve the biggest marketing issue. However, someone has neglected to define what the biggest issue is, so your marketing team arrives with solutions to email marketing processes, social media marketing concepting problems, and ways to fix the quality of coffee in the break room.

The Define step of Design Thinking first identifies the problem that designers are trying to solve. This keeps everyone oriented to the same solution. This step also helps to define the problem in the most beneficial way: it should be broad but not too

obscure and narrow but not too limiting. It's best if you can distil your problem into a single statement.

2.6.1 Four fundamental questions for the Define step

Examining the problem from multiple angles is the best way to understand the core issue at play. But that's also a daunting task that can feel too obscure to be helpful. Luckily, there are guideposts to help you to get started. By answering a few fundamental questions, you can formulate a better definition of your problem.

1. **Who's having the problem?** This is your core user. Start by defining your core user, their desires and motivations, and how they interact with your product. Without knowing who you're trying to help, you'll be unable to actually deliver value to their life.
2. **What problem is your user actually having?** If you're designing a car buying platform, you may think that the problem that you're trying to solve is how to offer a greater array of car buying options. But your core user may not actually be suffering from options, but rather from indecision. Examine the pain points that you identified during the Empathise step and determine what the user ***really*** needs. Then you can also brainstorm different ways to solve this problem.
3. **Where is the issue?** This is important to UX designers because the issue may only be in one specific area (namely, the mobile app or the desktop version or within one portion of the product). This is a great step because it allows you to home in your focus on one specific space. Or, if the problem presents in multiple spaces, you'll better understand the contexts in which it must be remedied.
4. **What?** This question is perhaps the most profound of all four fundamental questions. It asks what it would mean to your user if the problem were solved. What value would be gained to the user? On a larger scale, how would solving the user's problem impact the entire business?

2.6.2 *Best practices for the Define step*

Just as there are questions to help you to complete the Define step, there are also several best practices that you should follow as you embrace this step of Design Thinking.

2.6.2.1Using a point of view (POV) statement

This single statement is the summation of your work. It defines who your user is, what their needs are, and any surprising elements or insights that you've gathered from your research. This point of view statement can follow a formula: (user) needs to (verb) because (surprising element or insight)

So, in a car buying scenario, the point of view statement could look like this: "Brian, the Indecisive Car Buyer, needs to be shown the perfect car for him because he lacks the confidence to make a large purchase." Keep your POV statement centred on the user.

Ask "how might we?"

Once you have your POV statement, you can determine opportunities for solving the user's problem within the Design step. Examine your POV statement and brainstorm topics that stem from the problem. Then turn those subtopics and issues into a question by adding "How might we..." before them. For instance, using the above POV statement, a few "How might we" questions could be:

- How might we determine the car that Brian actually wants?
- How might we boost Brian's confidence?
- How might we best present financing options?

Your "How might we" statements should allow you to come up with many possible solutions, including solutions that seem outlandish or not feasible. The point here is to generate a pool of solutions so that you can pick solutions that seem especially valid and prioritise them.

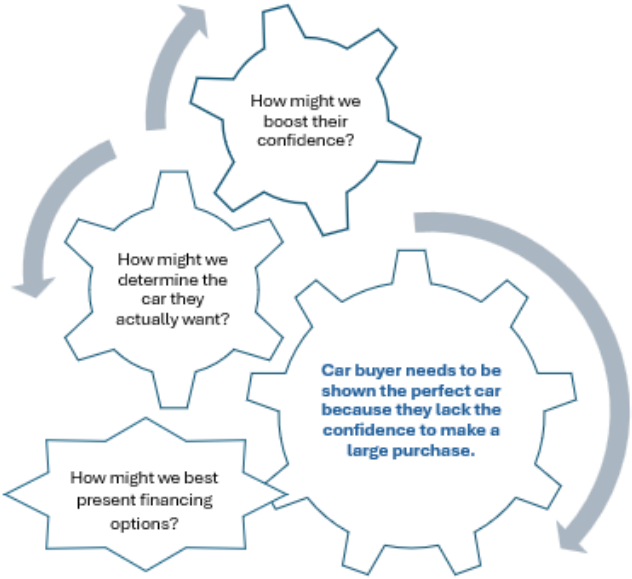


Figure 13: Using a POV statement. Source: Plattner et al. (2014)

Unlike narrow- or individual-focused design problems, complex social, institutional, or policy challenges involve multiple stakeholders, often with divergent values, power dynamics, and lived experiences. In such cases:

- One single POV is insufficient.
- Different stakeholders experience the "problem" differently.
- What is a solution for one may be a burden for another.
- For example, designing a local economic development policy affects:
- Small-scale farmers (access and equity)
- Municipal officials (budget and compliance)
- Commercial buyers (logistics and efficiency)
- Women's groups (gendered access and roles)

Each of these actors may require a separate POV statement, grounded in empathy and context-specific understanding.

In complex design spaces, a plurality of POVs is not a sign of confusion, it's a sign of integrity. Designing with multiple perspectives does not fragment the process; it grounds it in reality. Only through this empathetic multiplicity can we design solutions that are truly inclusive, systemic, and sustainable.

2.6.2.2 How do you define your POV?

Step 1

1. You define the type of persona that you are designing for your user. For instance, you can develop one or more personas, use affinity diagrams, Empathy maps and other methods, which help you to understand and crystallise your research results, observations, interviews, fieldwork, etc.
2. You extract and synthesise your users' most essential needs, which are the most important to fulfil. Remember that needs should be verbs.
3. You work to express insights that you developed through the synthesis of information that you gathered during your initial Empathise step. The insight should typically not simply be a reason for the need, but rather a synthesised statement that you can utilise in your design solution.

Step 2

Write your definitions into a point of view template like this one:

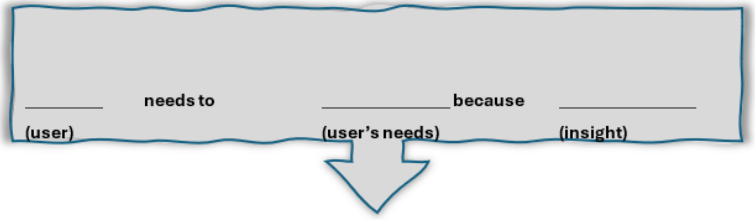


Figure 14: Point of view template. Source: Plattner et al. (2014)

Step 3 – POV Madlib

A "Madlib" is a word game that consists of one player prompting others for a list of words to substitute for blanks in a story before reading aloud. You can articulate a POV by combining these three

elements - user, need, and insight as an actionable problem statement that will drive the rest of your design work. It's surprisingly easy when you insert your findings in the POV Madlib below, inserting your information about your user, the needs, and your insights in the following sentence:

> [User . . . (descriptive)] needs [Need . . . (verb)] because [Insight . . . (compelling)]

Condense your point of view by using this POV Madlib

Example: An adult person who lives in the city needs access to a shared car one to four times for 10 to 60 minutes per week because he would rather share a car with more people as this is cheaper, and more environmentally friendly; however, it should still be easy for more people to share.

Step 4 – Make Sure That Your POV is One That:

1. Provides a narrow focus;
2. Frames the problem as a problem statement;
3. Inspires your team;
4. Guides your innovation efforts;
5. Informs criteria for evaluating competing ideas;
6. Is stimulating and captures people's attention; and
7. Is valid, insightful, actionable, unique, narrow, meaningful, and exciting.

2.7 What are Problem Statements?

Problem statements are concise descriptions of design problems. Design teams use them to define the current and ideal states, and to freely find user-centred solutions. Then, they use these statements, also called points of view (POVs) - as reference points throughout a project to measure the relevance of ideas that they produce.

2.7.1 How to Write a Problem Statement?

Well-constructed, valid and effective problem statements are vital for your design team to navigate the entire design process. Essential to Design Thinking, problem statements are what teams

produce in the Define step. To find the best solutions, your team must know what the exact problems are; namely, you first need to define a problem statement.

The goal is to articulate the problem so that everyone can see its dimensions and feel inspired to systematically hunt for suitable solutions. When you unite around a problem statement, your team will have a common view of how users see what they must tackle. From there, everyone in your team will know exactly what to look for and what to avoid. Therefore, you should make your problem statements:

Human-centred: Frame problem statements from insights about users and their needs.

Have the right scope:

1. Broad enough to permit creative freedom, so that you do not concentrate too narrowly on specific methods for implementing solutions or describing technical needs; but
2. Narrow enough to be practicable, so that you can eventually find specific solutions.
3. Based on an action-oriented verb (for example, "create" or "adapt").
4. Fully developed and assumption-free.

Design teams sometimes refer to a problem statement as a "point of view" (POV) because they should word problem statements from the users' perspective and not let bias influence them. Your team will have a POV when it comes up with a narrowly focused definition of the right challenge to pursue in the next step of the design process.

2.7.2 Using the "5 Whys" to problem solving

1. The beginning of the "5 Whys"

The "5 Whys" is a simple yet powerful root cause analysis tool used in problem-solving, particularly in Lean Thinking, Design Thinking, systems thinking, and quality management. It involves asking "why?" five times (or as many times as needed) to drill down into the underlying cause of a problem, rather than just addressing its symptoms. The goal is to uncover the root cause

of an issue in a structured, human-centred way, often revealing systemic flaws, process gaps, or human insights that are not obvious at the surface (Liedtka, 2011).

The "5 Whys" analysis was developed by Taiichi Ohno, the pioneer of the Toyota Production System in the 1950s. He details his method of problem-solving in his book, *Toyota Production System: Beyond Large-Scale Production* (Ohno, 1988). The technique that Ohno developed was so effective that Toyota uses it to this day. Ohno saw a problem not as a negative but as an opportunity in disguise.

When approaching a problem in this manner, it becomes an investigative journey and not a barrier. It's a way to find hope in circumstances that seem dire or overwhelming. Here's an example of a time that Ohno used the "5 Whys" to discover the reason for a robot stopping on the assembly plant floor:

- "Why did the robot stop?" The circuit has overloaded, causing a fuse to blow.
- "Why is the circuit overloaded?" There was insufficient lubrication on the bearings, so they locked up.
- "Why was there insufficient lubrication on the bearings?" The oil pump on the robot does not circulate sufficient oil.
- "Why does the pump not circulate sufficient oil?" The pump intake is clogged with metal shavings.
- "Why is the intake clogged with metal shavings?" Because there is no filter on the pump.

As you can see in this example, the "5 Whys" helped Ohno to reach the root cause of the issue: The team needed to add a filter to the oil pump on the robot. You can use the same process to reach the root cause and implement lasting change.

2. *When to use the "5 Whys"*

The "5 Whys" can be used for most problems, but it's most effective for simple to semi-difficult problems. If you're attempting to solve for complicated difficulties, you'll find that the root causes split into separate tracks of inquiry that have their own root causes.

In other words, do not try to solve the reasons for global poverty by asking five questions: it's much too complex an issue. Instead, whittle larger problems into smaller ones and solve the root causes of those problems. Use the "5 Whys" for manufacturing problems, product release problems, team issues, or organisational problems.

If you're unsure of whether the "5 Whys" are appropriate for the type of difficulty that you're experiencing, it's not unwise to try it. If the root causes for each "why" split into their own tracks of inquiry, you may be looking at a problem that is more difficult, and therefore, not well-suited to this kind of analysis. In this case, it might be worth switching to a cause-and-effect analysis.

Practical implementation of "5 Whys" to problem-solving

Though the core of "5 Whys" to problem-solving is only asking five questions, it is recommended that you take a few additional steps to bring the brainpower of your team members together and to take action on the root causes that you find. Use the following method for your "5 Whys" approach:

a. Gather your team

It's true that the "5 Whys" can be used to solve everyday problems, but you'll most likely use the "5 Whys" in a business setting, so assemble together everyone who is immediately affected by the problem. We're not talking about an all-hands meeting: Just include those who care most about the solution and who can help to brainstorm.

b. Define the issue

This step may be easier said than executed; sometimes, it's hard to narrow down exactly what the main problem is. Once you've determined the problem, write it down in a one-sentence statement that your team agrees on. Put this sentence in the problem statement at the top of the "5 Whys" Lucid chart template – see Figure 15.

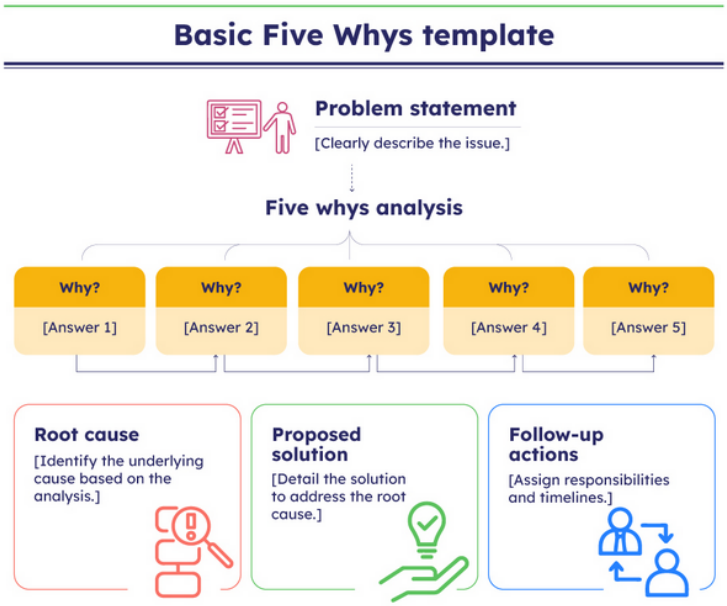


Figure 15: Basic "5 Whys" template. Source: Amoeboids (2025)

c. Ask "Why?"

This is where it gets tricky. With your team's help, ask what's causing the main problem. These questions need to address concrete problems, not just theories. If you use the Lucid chart template, write this first question in the left-most yellow block.

d. Ask "Why?" four more times

Following the approach above in the single lane across the top, ask "why" for each answer. Here's an example of what that could look like:

Problem: The website was not launched in time.

1. Why?

Answer 1: The developers did not have the content that they needed.

2. Why?

Answer 2: The copywriter did not provide the content.

3. Why?

Answer 3: The copywriter was waiting on approval from the VP of marketing.

4. Why?

Answer 4: The VP of marketing forgot to approve the content.

5. Why?

Answer 5: He was on a business trip.

6. Solution: A possible solution could be authorising someone else to approve the content or directing the VP of marketing to set aside time for content approval.

e. Stop at a good solution

In some instances, your team may need to keep asking more "whys." Sometimes you may need to split into more root causes. But knowing when to stop is a valuable part of the process; otherwise, you'll find yourself lost and without fixable root causes.

f. Fix the root cause of the problem

Once you know what the root cause of the problem is, you can implement solutions to it. Discuss the best solutions with your team and decide how to proceed.

g. See how it works!

After you've implemented your solutions to the root causes, see how it works. Sometimes it's perfect, and you've solved a major problem. Other times, you may need to tweak your "why" questions and their answers. In those instances, just rework the whys, find the root causes, and identify more solutions. The solutions should be targeted and measured and should directly impact the root causes of the whys.

The beauty of the "5 Whys" process is not that it's perfect: It's that it gives you a method to rationally find solutions to baffling problems. It's a way to find calm in a storm of issues. And, frankly, if it worked for Toyota and for a host of other massive companies, it could be the right path for your team.

2.8 Ideation in Design Thinking

Ideation is a creative process where designers generate ideas in sessions (for example, brainstorming, Worst Possible Idea). It is the third step in the Design Thinking process. Participants gather with open minds to produce as many ideas as they can to address a problem statement in a facilitated, judgement-free environment.

Ideation is the process where you generate ideas and solutions through sessions such as *Sketching, Prototyping, Brainstorming, Cheat storming, Brainstorming, Worst Possible Idea,* and a wealth of other ideation techniques. Ideation is also the third step in the Design Thinking process. Although many people might have experienced a "brainstorming" session before, it is not easy to facilitate a truly fruitful Ideation session. In this section, you will learn some processes and guidelines which will help you to facilitate and prepare for productive, effective, innovative and fun Ideation sessions.

Ideation is often the most exciting step in a Design Thinking project, because, during Ideation, the aim is to generate a large quantity of ideas that the team can then filter and cut down into the best, most practical or most innovative ones to inspire new and better design solutions and products.

Ideation is the mode of the design process in which you concentrate on idea generation. Mentally it represents a process of 'going wide' in terms of concepts and outcomes. Ideation provides both the fuel and also the source material for building prototypes and placing innovative solutions into the hands of your users.

Ideation will help you to:

1. Ask the right questions and innovate with a strong focus on your users, their needs, and your insights about them.
2. Step beyond the obvious solutions and therefore increase the innovation potential of your solution.
3. Bring together the perspectives and strengths of your team members.
4. Uncover unexpected areas of innovation.
5. Create volume and variety in your innovation options.

6. Get obvious solutions out of your heads and drive your team beyond them.

2.9 Why do we need Ideation in Design Thinking?

We'll let the Grand Old Man of User Experience, Don Norman, answer this important question in a down-to-earth and very relevant way. Don Norman helps us to take one step back and reflect upon why we need to challenge assumptions, ask "stupid" questions and provoke our current understanding, which is in fact what Ideation methods such as Challenge Assumptions, Substitute, Combine, Adapt, Modify, Put to other uses, Eliminate, and Reverse (SCAMPER), and Provocations help us to do.

"One of many concerns has been design education, where the focus has been centred too much upon craft skills and too little on gaining a deeper understanding of design principles, of human psychology, technology and society. As a result, designers often attempt to solve problems about which they know nothing. I have also come to believe that in such ignorance lies great power: The ability to ask stupid questions. What is a stupid question? It is one which questions the obvious. 'Duh,' thinks the audience, 'this person is clueless.' Well, guess what, the obvious is often not so obvious. Usually, it refers to some common belief or practice that has been around for so long that it has not been questioned. Once questioned, people stammer to explain; sometimes they fail. It is by questioning the obvious that we make great progress. This is where breakthroughs come from. We need to question the obvious, to reformulate our beliefs, and to redefine existing solutions, approaches, and beliefs. That is Design Thinking. Ask the stupid question. People who know a lot about a field seldom think to question the fundamentals of their knowledge. People from outside the discipline do question it. Many times, their questions simply reveal a lack of knowledge, but that is OK, that is how to acquire the knowledge. And every so often, the question sparks a basic and important reconsideration. Hurrah for Design Thinking" (Norman, 2013).

According to Don Norman, asking stupid questions is not stupid at all. However, Ideation and Design Thinking is not only

about challenging assumptions and asking so-called stupid questions. It's also about going from researching and defining your users and their needs in the Empathise and Define steps and moving on into starting to come up with the right solutions for the users via Ideation methods:

You ideate in order to transition from identifying problems to creating solutions for your users. Ideation is your chance to combine the understanding that you have of the problem space and people who you are designing for with your imagination to generate solution concepts. Particularly early in a design project, Ideation is about pushing for the widest possible range of ideas from which you can select, not simply finding a single, best solution.

2.10 Get started in applying Ideation methods

Ideation facilitation is a challenging and complex task. It requires experience in understanding and managing teams, people dynamics, adaptability and flexibility and a range of other soft skills, which in reality are really hard to master. Having said that, there's nothing like experience to help you to learn the ropes of any field. The best way to learn is to take the theory and techniques that you learn from the experts and then apply and test them in your own context and adapt them to your own needs.

2.10.1 Preparation before the storm

When we're about to venture into stormy territory, we know that we need to prepare for a bumpy ride and take extra provisions so that we come out on the other side and arrive at our destination unscathed. An Ideation process such as Brainstorming or Challenging Assumptions is no different. Wandering into a Brainstorm without preparation is asking for trouble. You may inadvertently damage your team's perception of Ideation and scar them for future creative activities. You could also damage team cohesion by going into a situation like this and causing team members to fall out with each other because of a brainstorming session gone wrong.

How to Prepare Before You Start Ideating

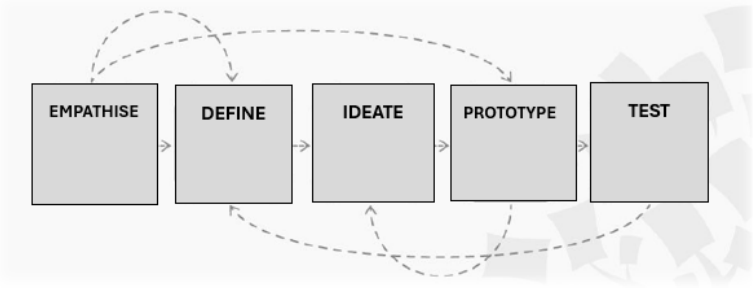


Figure 16: How to prepare before you start ideating. Source: Liedtka (2011)

Even though Design Thinking is not a linear process, it is crucial to take into account the first two steps or modes of Design Thinking before you start ideating. If you neglect to take these two modes and their guidelines into account before an Ideation session, you risk becoming lost. The Empathise and Define guidelines will help you to develop the sufficient background knowledge and set a clear goal for your Ideation sessions.

2.10.2 Ideation sessions are about finding new angles

It's challenging to gain the perspective to find design solutions. To have productive Ideation sessions, you'll need a dedicated environment for standing back to seek and see every angle. First, though, your team must define the right problem to address. Ideation, or "Ideate", is the third step in the Design Thinking process after "Empathise" (gaining user insights from research or observation) and "Define" (finding links or patterns within those insights to create a meaningful and workable problem statement or POV).

Before starting to look for ideas, your team needs a clearly defined problem to tackle - a focused problem statement or POV to inspire and guide everyone. "How might we...?" questions for example, "How might we design an app for finding cheap hotels in safe neighbourhoods?" help in reframing issues and prompting effective collaboration towards potential solutions. To bring people together to conjure ideas and bypass established frontiers,

you need a skilled facilitator and a creative environment, including a prepared space, featuring posters of personas, relevant information, etc. Your team also requires rules - for example, a two-hour time limit, quantity-over-quality focus, ban on distractions such as phones, and "There are no bad ideas" mindset. By being bold and curious, participants can challenge commonly held beliefs and explore possibilities past these obstacles. Team members should take each other's ideas and build on them, find ways to link concepts, recognise patterns and flip seemingly impossible notions over to reveal new insights.

> "It's not about coming up with the right idea, it's about generating the broadest range of possibilities".

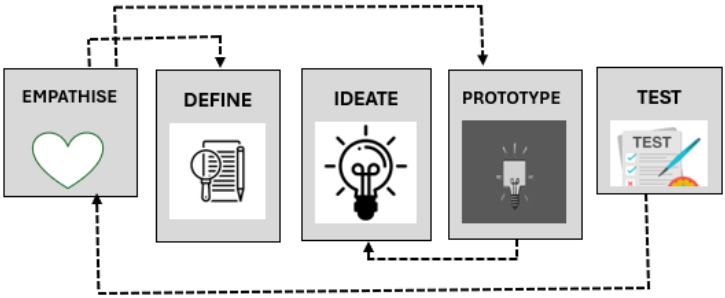


Figure 17: Design Thinking five-step process. Source: Dam (2025)

2.11 Practical implementation of ideation

1. Ideation Case Study: IDEO's Redesign of the Shopping Cart

IDEO, a global design and consulting firm, is renowned for its innovative approach to Design Thinking. One of the most famous examples of their ideation process is the redesign of the supermarket shopping cart. This project showcases how IDEO uses the Design Thinking process, particularly the Ideate step, to develop creative solutions.

Project Overview

The challenge was to redesign the traditional shopping cart to enhance the shopping experience by making it safer, more efficient, and user-friendly.

The Design Thinking Process at IDEO

Empathise

- **User Research**: IDEO's team conducted observations and interviews with shoppers, store employees, and other stakeholders. They identified pain points such as difficulty in manoeuvring carts, theft, child safety issues, and inefficiencies during checkout.

Define

- **Problem Statement**: The team synthesised their findings to frame the problem: "Shoppers need a safer and more efficient way to use shopping carts because the current design leads to theft, safety hazards, and inefficiencies in the shopping experience."

Ideate

- **Brainstorming Sessions**: The Ideation step was marked by a series of brainstorming sessions where team members were encouraged to generate as many ideas as possible, without judgement. This step made use of IDEO's "Seven Rules of Brainstorming," which include rules such as "Defer judgement," "Go for quantity," and "Build on the ideas of others."
- **Diverse Perspectives**: IDEO involved a multidisciplinary team, including engineers, designers, psychologists, and business experts, to bring diverse perspectives to the table.
- **Sketches and Models**: Ideas were rapidly sketched and discussed. Concepts ranged from minor tweaks to complete overhauls of the shopping cart design.
- **Focused Themes**: The team then grouped ideas into themes such as safety, efficiency, and user convenience. They refined these themes into potential features and solutions.

Prototype

- **Rapid Prototyping**: The team created rough prototypes of the most promising ideas. This included features like a child safety seat, a theft-proof basket, and a modular design that allowed carts to be more easily manoeuvred and stored.
- **Testing and Feedback**: Prototypes were tested in real shopping environments. Feedback from users was collected and used to iterate on the designs.

Test

- **User Testing**: Prototypes were tested with actual users in real-world scenarios. Shoppers provided feedback on the new designs, highlighting what worked well and what did not.
- **Iterations**: Based on user feedback, the team made further refinements. They tested multiple versions until they arrived at a final design that significantly improved the user experience.

Key Outcomes

- **Innovative Features**: The final design included several innovative features, such as a safer child seat with a safety belt, improved wheels for better manoeuvrability, a modular design for easy stacking and storage, and enhanced security features to reduce theft.
- **Enhanced User Experience**: The redesigned shopping cart addressed key pain points identified during the Empathise step, resulting in a safer, more efficient, and user-friendly product.
- **Impact on the Industry:** While the specific redesigned cart by IDEO did not become a standard, the approach and process influenced many in the industry, showcasing the power of Design Thinking in solving complex problems.

Lessons Learned

1. **Importance of User-Centred Design**: Focusing on real user needs and pain points is crucial for developing effective solutions.
2. **Diverse Perspectives Drive Innovation**: Involving a multidisciplinary team can lead to more creative and well-rounded solutions.
3. **Iterative Process**: Continuous prototyping, testing, and iteration are key to refining ideas and ensuring that they meet user needs.

The IDEO shopping cart project exemplifies how the Ideate step in Design Thinking can lead to innovative solutions by encouraging creativity, collaboration, and user-centred design.

2.11.1 Using ideation to build castles in the sky, then the bridges

There are hundreds of ideation techniques to help you in your ideation sessions. You want an ideation technique that combines your conscious and unconscious mind, fusing the rational with the creative. It must match the sorts of ideas that your team must generate and reflect their nature, needs and experience with ideation. Some crucial ones are:

2.11.1.1 Brainstorming

Brainstorming is a method that design teams use to generate ideas to solve clearly defined design problems. In controlled conditions and a free-thinking environment, teams approach a problem by such means as "How Might We" questions. They produce a vast array of ideas and draw links between them to find potential solutions.

2.11.1.2 How to use brainstorming best?

Brainstorming is part of Design Thinking. You use it in the Ideation step. It's extremely popular for design teams because they can expand in all directions. Although teams have rules and a facilitator to keep them on track, they are free to use "out-of-the-box" and lateral thinking to seek the most effective solutions to any design problem. By brainstorming, they can take a vast number of approaches, the more the better, instead of just

exploring conventional means and running into the associated obstacles. When teams work in a judgement-free atmosphere to find the real dimensions of a problem, they're more likely to produce rough answers which they'll refine into possible solutions later. Marketing CEO Alex Osborn, brainstorming's "inventor", captured the refined elements of creative problem-solving in his 1953 book, *Applied Imagination* (Osborn, 1953). In brainstorming, we aim squarely at a design problem and produce an arsenal of potential solutions. By not only harvesting our own ideas but also considering and building on colleagues' ideas, we cover the problem from every angle imaginable.

> "It is easier to tone down a wild idea than to think up a new one."
>
> — Alex Osborn (1953)

Everyone in a design team should have a clear definition of the target problem. They typically gather for a brainstorming session in a room with a large board or wall for pictures or Post-its. A good mix of participants will expand the experience pool and therefore broaden the idea space.

Figure 18: Brainstorming. Source: Liedtka (2011)

Brainstorming may seem to lack constraints, but everyone must observe the following eight house rules and have someone acting as a facilitator.

1. **Set a time limit**: Depending on the problem's complexity, 15 to 60 minutes is normal.
2. **Begin with a target problem or brief**: Members should approach this sharply defined question, plan, or goal and stay on topic.

3. **Refrain from judgement or criticism**: No one should be negative (including via body language) about any idea.
4. **Encourage weird and wacky ideas**: Further to the ban on killer phrases like "too expensive", keep the floodgates open so that everyone feels free to blurt out ideas (provided they're on topic).
5. **Aim for quantity**: Remember, "quantity breeds quality". The sifting-and-sorting process comes later.
6. **Build on others' ideas**: It's a process of association where members expand on others' notions and reach new insights, allowing these ideas to trigger their own. Say "and": rather than discourage with "but" - to get ideas closer to the problem.
7. **Stay visual**: Diagrams and Post-its help to bring ideas to life and help others to see things in different ways.
8. **Allow one conversation at a time**: To arrive at concrete results, it's essential to keep on track this way and show respect for everyone's ideas.

2.11.1.3 Take care with brainstorming

Brainstorming involves harnessing synergy - we utilise our collective thinking towards a variety of potential solutions. However, it's challenging to have boundless freedom. In groups, introverts may stay quiet while extroverts dominate. Whoever's leading the session must "police" the team to ensure a healthy, solution-focused atmosphere where even the shyest participants will speak up. A warm-up activity can cure brainstorming "constipation" - for example, ask participants to list ways that the world would be different if metal were like rubber.

Another risk is to let the team stray off topic and/or address other problems. As we may use brainstorming in any part of our design process, including areas related to a project's main scope, it's vital that participants stick to the problem relevant to that part (what Osborn called the "Point of View"). Similarly, by framing problems with "How Might We" questions, we remember that brainstorming is organic and free of boundaries. Overall, your team should stay fluid in the search for ways that you might resolve an issue - not chase a "holy grail" solution that someone

has developed elsewhere. The idea is to mine idea "ore" and refine "golden" solutions from it later.

2.12 Prototype creating, testing and implementation in Design Thinking

Prototyping is an integral part of Design Thinking and User Experience design in general because it allows design thinkers to test their ideas quickly and improve on them in an equally timely fashion. The Institute of Design at Stanford (d. school) encourages a "bias towards action", where building and testing is valued over thinking and meeting. However, why is Prototyping so important in the design process? Moreover, how does it help you to create human-centred design solutions? Before we start making prototypes to test our assumptions, let's get a closer understanding behind the what, how and why of Prototyping.

Imagine this situation: It's an exciting new project, something that your team had spent months brainstorming and planning, then building and crafting to perfection. You performed all you could to ensure that it was just right, with all the necessary features. You tried to ensure that you gave design more focus and that your message was crafted well. The website attracted attention and brought in many interested visitors looking for the products that you'd collected on the site, but somehow the product and service providers just were not interested in testing it out. They seemed comfortable just to keep carrying out business as usual, uninterested in the thousands of hits that your website was receiving from potential customers. It made no sense to you, but there you were months later, having sweated and spent valuable time, money, and resources and even attracting visitors, but no customers.

2.13 What normally goes wrong?

It's a story repeated time and time again - ideas being executed by people with an obsession for making a dent in the market, making big changes in society or just completely re-inventing the wheel, only to realise right at the end of their journey that they've been wasting their time or focusing on the wrong thing.

This is where prototyping comes in by providing a set of tools and approaches for properly testing and exploring ideas before too many resources are used. Many of us may recall the art of prototyping from our early childhood where we created mock-ups of real-world objects with the simplest of materials such as paper, card, and modelling clay or just about anything else that we could lay our hands on. There is not much difference between these types of prototypes and the early rough prototypes that we may develop at the earlier steps of testing out ideas.

Figure 19: What is prototyping? Source: Reddy et al. (2016)

Any finished product is just that, at the finishing line of a journey, a design journey involving a prototype or two (or more) with working titles such as 'Mark I', 'Mark II', 'Mark III', and so on.

A prototype is a simple experimental model of a proposed solution that is used to test or validate ideas, design assumptions and other aspects of its conceptualisation quickly and cheaply, so that the designer/s involved can make appropriate refinements or possible changes in direction.

Prototypes can take many forms, and just about the only thing in common that the various forms have is that they are all tangible forms of your ideas. They do not have to be primitive versions of an end product, either far from it. Simple sketches or storyboards used to illustrate a proposed experiential solution, rough paper prototypes of digital interfaces, and even role-playing to act out a service offering of an idea are examples of prototypes. In fact, prototypes do not need to be full products: you can prototype a part of a solution (like a proposed grip handle of a wheelchair) to test that specific part of your solution.

Prototypes can be quick and rough, useful for early-stage testing and learning, and can also be fully formed and detailed usually for testing or pilot trials near the end of the project. Prototyping is about bringing conceptual or theoretical ideas to life and exploring their real-world impact before finally executing them. All too often, design teams arrive at ideas without enough research or validation and expedite them to final execution before there is any certainty about their viability or possible effect on the target group.

2.14 Why we need to prototype

2.14.1 Early research is not everything

Research conducted during the early stages of your Design Thinking project does not tell you everything that you need to know in order to create the optimal solution. Regardless of whether you have researched thoroughly and gathered a large body of information, or whether your Ideation sessions have resulted in what many perceive as a world-changing solution, testing is still crucial for success. Design teams can easily become fixated on the research artefacts that they have gathered during the earlier steps of exploration, creating a bias towards their ideas. By prototyping and then testing those prototypes, you can reveal assumptions and biases that you have towards your ideas and uncover insights about your users that you can use to improve your solutions or create new ones.

You can use prototyping as a form of research even before other steps in Design Thinking, allowing you to explore problem areas in interfaces, products or services, and spot areas for improvement or innovation.

2.14.2 Prototype to Empathise, Define, Ideate, and Test

We can and should use prototyping as part of various stages of Design Thinking. You can use prototyping as an Ideation method, as it allows you, as well as users, to explore alternative solutions. This is possible because prototypes are physical representations of your solutions, and thus prototyping allows you to think by executing. Adopting a ‘thinking by doing’ mindset is extremely

helpful in letting you derive more value from researching, defining, ideating, and testing.

2.15 Some of the purposes that prototypes fulfil

Exploring and Experimentation

You can use prototypes to explore problems, ideas, and opportunities within a specific area of focus and test out the impact of incremental or radical changes.

Learning and Understanding

Use prototypes in order to better understand the dynamics of a problem, product, or system by physically engaging with them and picking apart what makes them work or fail.

Engaging, Testing, and Experiencing

Use prototyping to engage with end-users or stakeholders, in ways that reveal deeper insight and more valuable experiences, to inform design decisions going forward.

Inspiring and Motivating

Use prototypes to sell new ideas, motivate buy-in from internal or external stakeholders, or inspire markets towards radical new ways of thinking and executing.

2.15.1 How do prototypes work?

Creative Serendipity

Do breakthrough ideas really just come from nowhere? A spark of genius in a rush of creativity? With the way that breakthrough inventions, start-ups, and other revolutionary ideas are "sold" to inspire and encourage creativity, one would think that all we need is flipping a switch to a success mindset.

David and Tom Kelley, founders of International Design Firm IDEO, discuss in their book *Creative Confidence* (Kelley & Kelley, 2013) the importance of cultivating creative serendipity. They encourage the adoption of approaches that lead to an epiphany-friendly environment within oneself. The idea is this: by deeply immersing yourself within your subject of interest,

you can open up opportunities for happy accidents. What this means is that the vast majority of people who "stumble" across breakthroughs do so along their journey of engaging with the subject area.

The Kelleys cite various examples of people who made breakthroughs not by thinking through solutions but by trying things and figuring them out. One of the best ways to learn about the positive and negative dynamics of your solutions is to take physical action, by experimenting with and exploring potential solutions. When you prototype, you bring your ideas onto a tangible plane, which will enable you and your team to see and discuss the pros and cons, to learn from users' feedback, and to create little opportunities for creative serendipity. So, stop thinking, and start enacting now.

2.15.2 Storyboards in prototyping

Storyboarding is a visual storytelling technique used during the Prototyping step of Design Thinking to represent how a user might interact with a product, service, or system over time. It originated in film-making and animation but has become a powerful tool in design and innovation processes to map out user experiences, touchpoints, and emotional journeys.

Prototyping is not just about building physical models - it's about exploring how ideas behave in context. Storyboarding helps teams to prototype experiences, especially in service design, policy innovation, or digital products, by mapping:

1. **Before**: What happens before the user encounters the solution?
2. **During**: How does the user interact with the product or service?
3. **After**: What is the user's outcome or takeaway?

Storyboarding in prototyping enables teams to humanise solutions, visualise impact, and fail early - cheaply and safely. It is a bridge between ideas and reality, allowing teams to test assumptions, sequence interactions, and keep the user's experience at the centre of design decisions.

2.15.3 *What is UX design and why are storyboards important in UX design?*

UX design stands for "user experience" design. It refers to the process of designing digital or physical products, services, and systems with the goal of creating meaningful, efficient, and enjoyable experiences for users.

At its core, UX design is about how a person feels when interacting with a product; it prioritises usability, accessibility, and emotional satisfaction over just visual appeal or technical function.

When designers use storyboards, they create a tangible and visual representation of target user interactions. This not only aids in the design and development process, it also ensures that teams keep user needs at the forefront of product development. Storyboards have served the film industry since the early days of cinema. However, they're also highly effective tools in UX design because of how they:

1. Predict User Experience

Storyboards allow designers to anticipate how users will interact with a product over time. When designers visualise these interactions, they can identify potential issues and user needs early in the design process.

2. Enhance Communication

These visual tools play a critical role as they communicate the user's journey to team members and stakeholders who may not be familiar with the intricacies of UX design. This makes it easier to align the team's vision and understand the user's perspective.

3. Facilitate Ideation and Iteration

Storyboarding is not just about prediction; it's also a method for Ideation. It provides a creative framework for brainstorming new solutions to user problems for design and development teams. Teams can rapidly modify storyboards to reflect changes in the design approach.

4. Integrate With Other UX Tools

While storyboards provide a narrative visual representation, teams often use them in conjunction with other UX tools like user journey maps. Storyboards add a visual layer to the textual information in journey maps. They enrich the overall understanding of the user experience and help guide design decisions.

2.15.3.1Step-by-step guide to create storyboards

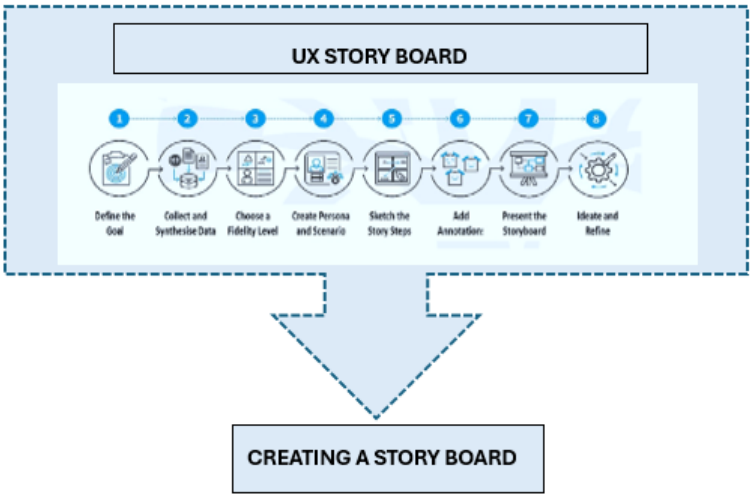


Figure 20: Step by step guide to UX storyboarding. Source: Reddy et al. (2016)

1. Define the Goal

Clearly define the purpose of the storyboard within the project's scope.

2. Collect and Synthesise Data

Collect relevant data through UX research methods like user interviews, field research, or other reliable sources to ensure that the storyboard has a grounding in real user experiences.

3. Choose a Fidelity Level

Decide whether to use a low-fidelity storyboard for quick internal discussions or a high-fidelity storyboard for presenting to stakeholders outside the design team. Low-fidelity storyboards focus on quick sketches that convey ideas. Meanwhile, high-fidelity storyboards include detailed scenes for deeper engagement.

4. Create a Persona and Scenario

Establish the main character (user persona) and specific scenario that the storyboard will address. This step crucially sets the context for the user interactions that the storyboard will depict.

4. Sketch the Story Steps

Organise the sequence of events in the user's journey. Prioritise the most relevant and impactful scenarios to ensure that the storyboard remains focused and manageable. Make the visuals from those that clearly represent each step of the user journey. Use simple shapes and lines to create characters and settings, or trace images for more detailed scenes.

5. Add Annotations

Accompany each visual with captions that explain the user's actions, emotions and any changes in the environment.

6. Present the Storyboard

Share the storyboard with team members, stakeholders and users. Collect feedback through methods like interviews and usability testing.

7. Iterate and Refine

Then iterate and refine the storyboard from insights that have come up.

2.16 How do designers use storyboards?

A storyboard is an effective tool at any stage in a design process. For example, early on, it can offer the big-picture perspective when design teams want to win support from stakeholders. A

close-up storyboard in UX design is a powerful tool for a design team later on, where they can examine the practicalities of the user flow in fine detail. In any case, here are the main uses of storyboards:

Research and Ideation

UX designers use storyboards primarily during the initial stages of the design process. After designers conduct user research, storyboards help to visualise the information gathered. They also help to set the stage to define problems and ideate potential solutions. This visual representation lets designers prioritise user needs and facilitate collaborative brainstorming sessions.

Usability Testing and Feedback

Storyboards are also instrumental during useability testing and feedback sessions. As they pre-visualise a sequence of interactions, they allow designers and product managers to test and validate ideas with users, gather feedback and make necessary adjustments. This iterative process is crucial to refine the user experience and enhance the product's useability.

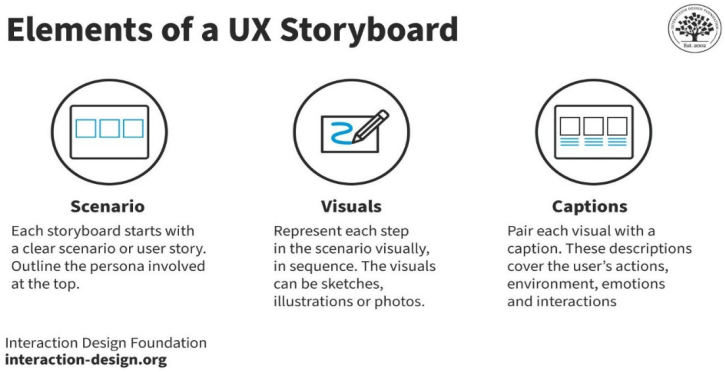


Figure 21: What does a storyboard look like? Source: Liedtka (2015)

2.17 Prototyping case studies

2.17.1 IDEO's Shopping Cart Project

Context:

IDEO, a global design and innovation company, was tasked with redesigning the traditional supermarket shopping cart to improve safety, convenience, and functionality.

Prototyping Process:

Research and Observation:

The team began by observing shoppers and store employees to identify pain points and opportunities for improvement.

Brainstorming:

A diverse group of team members brainstormed ideas, making use of their varied expertise.

Rapid Prototyping:

Multiple prototypes were quickly developed using simple materials like foam core, cardboard, and plastic.

User Testing:

Prototypes were tested in real-world environments to gather feedback.

Iterative Design:

Feedback was used to refine the prototypes through several iterations.

Outcome:

The final design featured several innovative elements, such as a child seat with a safety belt, a detachable shopping basket, and improved ergonomics for easier manoeuvrability. The project demonstrated how rapid prototyping and iterative design could lead to innovative solutions.

2.17.2. Airbnb's Website and Mobile App

Context:

Airbnb aimed to create a platform that facilitated seamless interactions between hosts and guests, ensuring ease of use and a positive user experience.

Prototyping Process:

Wireframing:

Initial wireframes were created to outline the basic structure and flow of the website and app.

Interactive Prototypes:

Using tools like *Sketch* and *In Vision*, interactive prototypes were developed to simulate user interactions.

User Testing:

Prototypes were tested with real users to identify usability issues and gather feedback on design and functionality.

A/B Testing:

Different versions of the prototypes were tested to determine which design elements worked best.

Outcome:

Airbnb's prototyping process helped to identify critical features and user interface elements that improved user satisfaction and engagement. The iterative process ensured that the final product was user-friendly and aligned with customer needs.

2.18 Summary

Design Thinking is a human-centred, solution-oriented approach that empowers organisations to address complex challenges by deeply understanding the people who they are designing for. Rooted in empathy and iterative learning, this methodology places users at the heart of every solution and fosters innovation through a structured yet flexible process.

At the foundation of Design Thinking lies the **Empathise** step. This step is about immersing oneself in the user's world to understand their needs, motivations, pain points, and behaviours. It involves active listening, observation, interviews, and other empathy-building techniques that generate deep insights into the user experience. By connecting with users at this level, design teams ensure that their solutions are relevant, inclusive, and truly meaningful.

Building on these insights, the **Define** step focuses on clearly articulating the core problem to be solved. This is achieved by synthesising the data gathered during the Empathise step and framing a focused problem statement - often referred to as a *point of view* (POV). The Define step translates raw observations into a well-scoped challenge that provides direction for the design process. It ensures that the team addresses the right problem rather than just symptoms.

Once the problem is well defined, the process moves into the **Ideate** step, where creative thinking takes centre stage. Here, the goal is to explore a wide range of potential solutions without judgement or limitation. This step relies on **divergent thinking** to generate multiple ideas and possibilities. Techniques such as brainstorming, mind mapping, and SCAMPER help teams to break conventional thinking patterns and unlock innovation.

From this pool of ideas, the team selects the most promising concepts and transitions into the **Prototype** step. Prototyping involves creating low-fidelity, tangible representations of solutions such as sketches, models, wireframes, or mock-ups. These prototypes allow teams to explore how ideas might function in practice and provide a foundation for rapid learning and iteration.

The **Test** step involves engaging users with these prototypes to gather feedback, observe behaviours, and assess whether the solutions meet real needs. Testing is not the end; it is a learning loop that may lead back to refining the problem, generating new ideas, or adjusting prototypes based on user input.

Finally, **Implementation** is where refined solutions are translated into real-world action. This step involves scaling the

validated solution, aligning resources, and integrating it into organisational or community systems. Successful implementation depends on maintaining user focus, iterating based on ongoing feedback, and ensuring long-term viability.

The Double Diamond model complements this journey by visually representing the process in two steps: discovering and defining the problem, followed by developing and delivering the solution. By combining divergent thinking (exploring broadly) and convergent thinking (narrowing with purpose), the Double Diamond helps teams to navigate complexity and arrive at well-informed, user-centred outcomes.

Together, these steps form a powerful framework that not only enhances user satisfaction but also drives creativity, collaboration, and sustainable innovation.

Activity Sheet: Part Two

The Psychology of Design Thinking

Section A: Reflective Understanding of Empathy (20 minutes)

Instructions: Read the definitions and categories of Empathy from your notes (Cognitive, Emotive, Empathic Action).

Activity A1 – Match the Concept (Individual)

Match each definition below with the type of empathy that it represents.

Definition	Empathy Type
The ability to intellectually understand someone's perspective.	
Feeling what another person is feeling; experiencing their emotions.	
Taking action based on shared understanding and feelings.	

Activity A2 – Empathy in Action (Group Discussion)

Think of a recent design or social innovation that succeeded because it understood people deeply. Discuss:

How was empathy applied?

Which type of empathy (cognitive, emotive, or action) was most evident?

How could this example inspire your own practice?

Facilitator Note: Encourage students to connect empathy to inclusion and power dynamics.

Section B: Empathy Mapping Workshop (30–45 minutes)

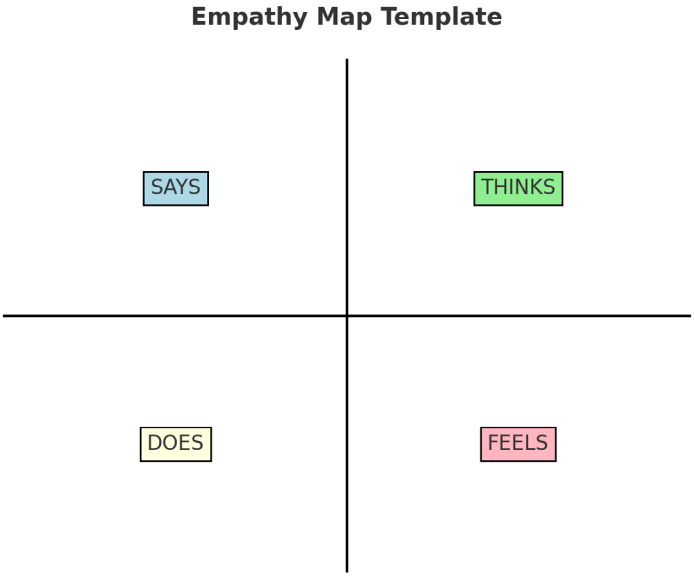
Activity B1 – Create an Empathy Map (Group Work)

Scenario: You are designing a mobile app to support rural women entrepreneurs in selling their handmade crafts.

Step 1: Interview a peer (role-play as the entrepreneur). **Step 2:** Fill in the Empathy map using the quadrants:

- What does she **Say**?
- What does she **Think**?
- What does she **Do**?
- What does she **Feel**?

Empathy Map Template:



Part Three

Understanding and Applying Design Thinking Styles

Learning Outcomes

1. Identify and describe the ten core Design Thinking styles, including their characteristics, contexts of use, and associated competencies.
2. Apply appropriate Design Thinking styles to real-world problem-solving scenarios across diverse industries and disciplines.
3. Demonstrate the ability to integrate multiple Design Thinking styles in a fluid and context-sensitive manner to enhance innovation and decision-making.
4. Analyse case studies to evaluate the effectiveness of specific Design Thinking styles in addressing complex challenges and achieving user-centred solutions.
5. Reflect on personal thinking preferences and develop strategies to build versatility across different Design Thinking styles for collaborative and adaptive innovation.

3. Understanding and Applying Design Thinking Styles

3.1 Introduction to DT styles and the required skills

Design Thinking has emerged as a transformative methodology that fosters human-centred innovation across disciplines. While the process is often associated with steps such as Empathising, Ideating, Prototyping, and Testing, the cognitive styles that inform these activities are equally critical to success. This chapter introduces and explores ten core Design Thinking styles that support effective problem-solving and creative development.

Understanding these styles equips students, practitioners, and leaders with the flexibility to navigate complex challenges by making use of appropriate modes of thinking. Each style offers a distinctive lens through which problems can be framed, explored, and addressed, ranging from analytical precision to imaginative creativity, from systemic awareness to intuitive iteration.

Design Thinking styles refer to different approaches or mindsets that individuals may adopt when engaging in the Design Thinking process. While there can be various categorisations of Design Thinking styles, here are ten styles covered by this handbook. While individuals may naturally gravitate towards one or more of these Design Thinking styles, effective Design Thinking often involves a combination of multiple styles, depending on the context and the nature of the problem being addressed. By understanding and using different Design Thinking styles, individuals and teams can approach challenges with greater flexibility, creativity, and effectiveness.

These Design Thinking styles are not mutually exclusive, and individuals often exhibit a combination of these traits based on their strengths, preferences, and roles within a design team. Embracing diverse styles can enhance collaboration and bring complementary perspectives to problem-solving processes. Ultimately, the goal is to utilise these styles collectively to

drive innovation, foster creativity, and deliver human-centred solutions that address real-world needs. Figure 22 presents the ten Design Thinking styles proposed in this handbook.

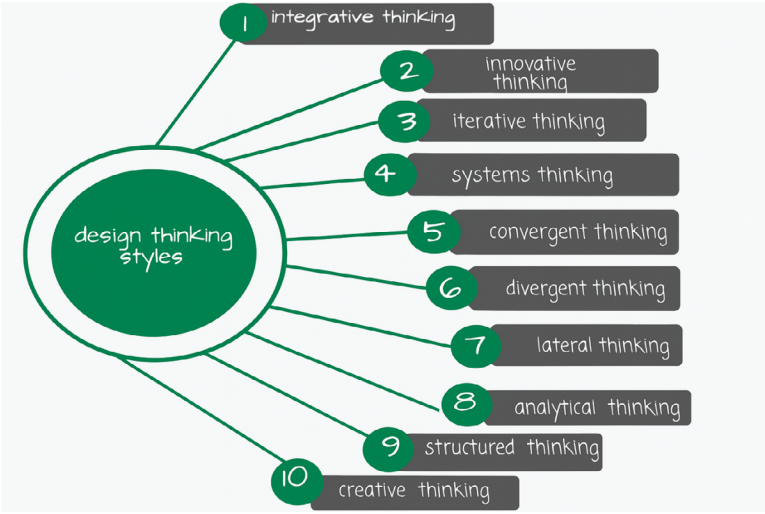


Figure 22: Design Thinking styles. Source: Marambana (2024)

3.2 Overview of the Ten Design Thinking Styles

1. Integrative Thinking

This style involves holding opposing ideas in tension to arrive at creative resolutions that integrate elements of both. It enables designers to move beyond either/or choices and embrace complexity.

2. Innovative Thinking

Focused on originality and breakthrough ideas, this style encourages challenging the status quo and pushing boundaries to generate novel and impactful solutions.

3. Iterative Thinking

Emphasising cycles of prototyping, testing, and refining, iterative thinking supports continuous improvement and learning through action.

4. Systems Thinking

A holistic approach that considers how different components of a system interact. Systems thinkers map relationships and anticipate consequences within broader ecosystems.

5. Convergent Thinking

Used to analyse and refine ideas, this style involves narrowing options to select the most practical, feasible, and desirable solutions.

6. Divergent Thinking

The foundation of idea generation, divergent thinking expands the range of possibilities by encouraging open-ended exploration and creative freedom.

7. Lateral Thinking

Characterised by non-linear thinking, this style helps to identify unexpected connections and alternatives, often breaking through conceptual blocks.

8. Analytical Thinking

Focused on logical reasoning, data interpretation, and structured evaluation, analytical thinking brings rigour and validation to design processes.

9. Structured Thinking

Supports clarity and order by organising complex problems into manageable parts, often using frameworks or step-by-step approaches.

10. Creative Thinking

This intuitive and imaginative style fuels inspiration and expression, enabling designers to conceive ideas that are both original and meaningful.

These ten styles are not mutually exclusive. Effective design thinkers often switch fluidly between them depending on the context and stage of the process. For instance, systems thinking may be used to understand a challenge in its broader context, followed by divergent thinking to ideate solutions, and convergent

thinking to refine them. Iterative thinking supports continuous testing and improvement, while integrative and lateral thinking help to unlock new paradigms.

By becoming aware of these different cognitive styles and practicing when to apply them, designers enhance their creative agility, decision-making capacity, and empathy-driven problem-solving. The ability to integrate these styles leads to more robust, user-centred, and innovative solutions.

3.3 Design Thinking styles and the relevant competencies

Associating Design Thinking styles with competencies can help educators, teams, and organisations to identify strengths, guide personal development, and foster collaborative innovation. Table 12 shows a structured association between common Design Thinking styles and the core competencies that they often demonstrate:

Table 12: Design Thinking styles and competencies

Thinking style	Relevancy	Competencies
Integrative thinking	A problem-solving approach that involves synthesising seemingly opposing or contradictory ideas, perspectives, or solutions to create innovative and harmonious outcomes.	Curiosity Open mindedness Critical thinking Comfort with ambiguity Innovation Emotional intelligence
Innovative thinking	It's about fostering a mindset that encourages creativity, originality, and forward thinking	Creativity Problem-solving Open mindedness Adaptability Curiosity Collaborative mindset Vision and future orientation Resilience perseverance Risk taking

Thinking style	Relevancy	Competencies
Iterative thinking	It is a methodical approach where feedback, adjustments, and improvements occur through repetitive cycles, leading to continuous refinement and enhancement of concepts or processes.	Problem solving Collaborative mindset Resilience Creativity Analytical skills Adaptability Open mindedness
Systems thinking	Is an approach that views systems as interconnected entities, where components work together to achieve a common purpose	Analytical skills Big picture thinking / holistic thinking Relationship understanding Problem-solving Critical thinking Collaborative mindset
Convergent thinking	A cognitive process that involves narrowing down multiple solutions or possibilities to arrive at a single, optimal solution or conclusion for a specific problem or task.	Problem definition Information gathering Critical analysis Idea generation Decision-making Implementation planning Evaluation and selection
Divergent thinking	A cognitive process that involves generating multiple, creative, and diverse solutions or ideas in response to a problem or challenge.	Creativity Innovation Idea generation Open mindedness Brainstorming Adaptability Communication Problem-solving Visualisation

Thinking style	Relevancy	Competencies
Lateral thinking	A non-linear and creative approach to problem-solving and idea generation.	Creativity Curiosity Strategic thinking Innovation Communication Resilience Problem-solving Flexibility in thinking
Analytical thinking	The ability to analyse information, break down complex problems into manageable components, and derive conclusions or solutions based on evidence and reasoning systematically and logically.	Critical analysis Logical reasoning Data interpretation Problem-solving Attention to detail. Strategic thinking Analytical skills
Structured thinking	Involves a methodical and organised approach to problem-solving, decision-making, and analysis.	Problem decomposition Planning Organisation Information handling Sequential reasoning Communication Decision-making
Creative thinking	Involves generating original ideas, concepts, or solutions by exploring novel perspectives, making unique connections, and breaking away from conventional patterns	Analytical thinking Open mindedness Problem-solving Communication Organising Creativity Divergent skills

Source: Marambana (2024)

3.4 The importance of Design Thinking styles in context

Design Thinking is a powerful methodology that has transformed how organisations approach problem-solving and innovation. At its core, Design Thinking is about understanding and addressing

the needs of users through a human-centred approach. However, the way that Design Thinking is applied can vary greatly depending on the context, the problem at hand, and the individuals involved. This variation gives rise to different Design Thinking styles, each bringing unique strengths and perspectives to the innovation process.

The "Application of Design Thinking Styles" aims to explore these diverse styles, providing insights into how they can be effectively utilised to address a wide range of challenges. Whether you are working in a start-up, a large corporation, a non-profit organisation, or a public sector institution, understanding and applying different Design Thinking styles can significantly enhance your ability to innovate and create value.

The choice of Design Thinking style often depends on the specific context and challenges being addressed. For instance, a healthcare project aimed at improving patient experiences may benefit from an empathetic style, while a technology start-up developing a cutting-edge product might lean more on the creative and iterative styles. Understanding the nuances of each style enables teams to select and adapt the most appropriate approach for their unique situation.

3.4.1 Integrating Multiple Styles

In practice, successful Design Thinking often involves integrating multiple styles. A project might start with an empathetic approach to deeply understand user needs, move into a creative phase to generate ideas, and then adopt an iterative style to refine and test solutions. This fluidity allows teams to be more flexible and responsive to emerging insights and changing conditions.

3.4.2 Enhancing Organisational Capability

By embracing and applying different Design Thinking styles, organisations can enhance their overall capability to innovate. Teams become more versatile, better equipped to handle a variety of challenges, and more adept at creating solutions that are both effective and meaningful. This adaptability is crucial in today's

fast-paced and complex world, where the ability to innovate can be a key differentiator.

3.4.3 Thinking styles and their impact in different industries

Table 13: Thinking styles and their impact in different industries

Thinking style	Impact
Business strategy	Helps to create innovative solutions, fosters customer-centricity and drive sustainable growth.
Leadership decision-making	Leaders gain a deeper understanding of stakeholder needs, foster creativity and innovation, and develop solutions that are more human-centred and effective.
Product development and innovation	Lead to more customer-centric, impactful, and successful products.
Policy development	Results in effective, inclusive, and sustainable policies that better address the needs and aspirations of citizens.
Social initiatives	Impactful, sustainable, and human-centred solutions that address societal challenges.
Conflict resolution	A human-centred approach to understanding and addressing the underlying causes of conflicts and fostering constructive solutions.
Design and art	Results in innovative, meaningful, and impactful creative work.
Science and Research	More innovative, interdisciplinary, and impactful discoveries and solutions.
Technology and engineering	More user-centred, innovative, and effective solutions.
Marketing and advertising	Innovative, customer-centric campaigns and strategies.
Project management	Teams develop innovative solutions, enhance stakeholder engagement, and increase project success rates.
Process improvement	Using human-centred design principles to identify, analyse, and optimise existing processes.
Science and research	Researchers can foster creativity, collaboration, and innovation, leading to more impactful and transformative research outcomes.

Thinking style	Impact
Technology and innovation	Using human-centred approach to develop products, services, and solutions that meet users' needs and create value.
Government and policy	More citizen-centric services, effective policymaking, and innovative solutions to complex societal challenges.
Personal development	Individuals gain clarity on their goals, overcome challenges, and cultivate a growth-oriented mindset.
Environmental sustainability	Using creative problem-solving techniques to address environmental challenges, develop innovative solutions, and promote sustainable practices.
Healthcare systems	Using a human-centred approach to understand patients' needs, improve healthcare delivery, and innovate solutions to complex healthcare challenges
Cross-industry collaborations	Organisations can harness the collective intelligence, creativity, and resources of diverse stakeholders to tackle complex challenges, drive innovation, and create positive social and economic impact across multiple industries.
Education system	Using the principles of empathy, collaboration, and iteration to improve teaching and learning experiences, address challenges, and foster innovation in education.

Source: Marambana (2024)

3.4.4 Design Thinking styles in practice - key case studies

Design Thinking has emerged as a transformative approach to innovation, blending creative and analytical methodologies to solve complex problems. This human-centred process prioritises understanding users' needs and iteratively developing solutions that are both effective and meaningful. However, the application of Design Thinking is not uniform. Different situations call for different styles of Design Thinking, each bringing its unique strengths and perspectives to the table.

This section, "Design Thinking styles in practice", explores these diverse styles, providing practical insights into how they can

be effectively applied across various contexts. By understanding and utilising different Design Thinking styles, individuals and teams can enhance their ability to innovate and create impactful solutions tailored to their specific challenges.

Embracing and applying different Design Thinking styles can significantly enhance an organisation's innovation capability. Teams become more versatile, better equipped to handle a variety of challenges, and more adept at creating solutions that are both effective and meaningful. This adaptability is crucial in today's dynamic and complex environment, where the ability to innovate can be a key differentiator.

1. Integrative Thinking

Integrative thinking, a concept popularised by Roger Martin (2009), involves solving complex problems by integrating opposing ideas and constraints to create innovative solutions. This approach is crucial in Design Thinking, where the goal is to balance desirability (human needs), feasibility (technical constraints), and viability (business needs). The following case study demonstrates the application of integrative thinking in Design Thinking:

3.4.4.1 Case Study: Procter & Gamble's Swiffer - Integrative Thinking

Background

In the late 1990s, Procter & Gamble (P&G) faced a stagnating market in their home care division, particularly in the floor cleaning segment. Traditional mops and buckets were cumbersome and messy, leading to dissatisfaction amongst consumers. P&G sought to revolutionise this market by creating a more efficient and user-friendly cleaning solution.

Challenge

The challenge was to develop a product that provided:

- **Desirability**: Met consumer needs for ease of use, efficiency, and cleanliness.
- **Feasibility**: Could be manufactured using existing or easily adaptable technologies.

- **Viability**: Provided a sustainable business model with the potential for recurring revenue.

2. Integrative Thinking in Action

P&G's approach to developing the *Swiffer* involved several key steps:

Empathy and User Research

P&G's team conducted extensive ethnographic research to understand the pain points associated with traditional floor cleaning. By observing consumers in their homes, they identified key issues:

- Traditional mops were difficult to use and clean.
- Consumers desired a quick and convenient cleaning solution.
- There was a need for disposable cleaning tools to avoid the hassle of maintaining a mop.

Ideation and Prototyping

The team brainstormed a range of potential solutions, integrating the insights from their user research. They created numerous prototypes; iterating based on user feedback. The breakthrough came when they combined elements of a mop and a disposable cleaning cloth, leading to the concept of the *Swiffer*.

Balancing Opposing Ideas

Integrative thinking played a crucial role in resolving conflicting requirements:

1. **Desirability versus Feasibility**: The idea of a disposable cleaning cloth was highly desirable but posed manufacturing challenges. P&G collaborated with material scientists to develop a non-woven fabric that could effectively trap dirt and be produced cost-effectively.
2. **Convenience versus Environmental Concerns**: The disposable nature of the cloth raised environmental concerns. P&G addressed this by ensuring that the cloths

were lightweight and used minimal materials, reducing waste compared to traditional mops.

3. **Initial Cost ersus Recurring Revenue**: While a disposable system required consumers to continuously purchase refills, P&G ensured that the initial product was affordable, encouraging adoption. The recurring revenue from refills then provided long-term profitability.

Testing and Refinement

Extensive testing with consumers helped to refine the product. P&G iterated on the design of the *Swiffer* based on feedback, ensuring that it met user needs for ease of use, efficiency, and cleaning effectiveness.

Outcome

The *Swiffer* was launched in 1999 and quickly became a market success. It revolutionised the floor cleaning market by providing a convenient, efficient, and effective solution that consumers identified with. The product's success can be attributed to the integrative thinking approach, which balanced multiple constraints and opposing ideas to create a ground-breaking solution.

Key Takeaways

- **User-Centred Design**: Deep empathy and understanding of user needs are crucial for developing successful products.
- **Iterative Prototyping**: Rapid prototyping and iterative testing help to refine ideas and ensure that they meet user expectations.
    - **Balancing Constraints**: Integrative thinking helps to resolve conflicting requirements, leading to innovative and viable solutions.
    - **Sustainable Business Model**: Designing for recurring revenue can ensure long-term business viability.

The *Swiffer* case study demonstrates how integrative thinking within the Design Thinking framework can lead to the creation of innovative products that meet user needs, are technically feasible, and provide a sustainable business model.

3.4.4.2 Case Study: Airbnb's Transformation of the Hospitality Industry – Innovative Thinking

Background

Airbnb, founded in 2008, transformed the hospitality industry by offering an alternative to traditional hotels and vacation rentals. The company's founders, Brian Chesky, Joe Gebbia, and Nathan Blecharczyk utilised innovative thinking within the Design Thinking framework to address unmet needs in the travel and lodging market.

Challenge

The founders faced several significant challenges:

1. **Desirability**: Creating a platform that travellers would trust and prefer over traditional lodging options.
2. **Feasibility**: Building a scalable and user-friendly platform for listing and booking accommodations.
3. **Viability**: Developing a profitable business model that could sustain rapid growth and expansion.

Innovative Thinking in Action

Airbnb's success can be attributed to several key innovative thinking strategies within the Design Thinking process:

Empathy and Deep User Understanding

Airbnb's founders began by empathising with both hosts and guests. They lived the experience by renting out their own apartments, interacting with guests, and understanding their needs and pain points first hand. This deep empathy was crucial in designing a platform that addressed the concerns of both parties:

- **Hosts' Needs**: Easy listing process, assurance of safety, and potential for income.
- **Guests' Needs**: Trust, safety, affordability, and unique travel experiences.

Reframing the Problem

Instead of viewing lodging as merely a place to stay, Airbnb reframed the problem by focusing on unique, local experiences.

They identified an opportunity to offer travellers the chance to live like locals, which traditional hotels could not provide. This shift in perspective was a cornerstone of Airbnb's innovative approach.

Rapid Prototyping and Iteration

The initial version of Airbnb's website was simple, but it allowed the founders to quickly test their concept. They iterated based on user feedback, continuously improving the platform's functionality and user experience. Key innovations included:

- **Verification Systems**: To build trust, Airbnb introduced host and guest verification systems, reviews, and secure payment methods.
- **Professional Photography**: Offering free professional photography services for listings to enhance the visual appeal and trustworthiness of properties.

Integrative Thinking

Airbnb integrated multiple perspectives to create a balanced solution:

1. **Hosts versus Guests**: By understanding the needs of both hosts and guests, Airbnb designed features that catered to both sides of the marketplace. This included flexible cancellation policies, detailed profiles, and transparent communication channels.
2. **Technology versus Human Touch**: While using technology to scale their platform, Airbnb maintained a human touch through personalised customer service and community-building initiatives.

Airbnb used "blue ocean strategy" principles (Chan Kim & Mauborgne, 2005), creating a new market space by targeting untapped customer segments. They appealed to:

1. **Budget Travellers**: Offering affordable alternatives to hotels.
2. **Cultural Seekers**: Providing unique, local experiences.
3. **Homeowners**: Allowing them to monetise their extra space.

Outcome

Airbnb's innovative approach within the Design Thinking framework led to several notable outcomes:

1. **Market Disruption**: Airbnb disrupted the traditional hospitality industry, offering more than seven million listings worldwide by 2020.
2. **Rapid Growth**: The platform quickly scaled, achieving profitability and becoming a household name.
3. **Community Impact**: Airbnb built a global community of hosts and guests, fostering trust and connection through shared experiences.

Key Takeaways

1. **Empathy Drives Innovation**: Deep understanding of user needs is essential for designing impactful solutions.
2. **Reframing Problems**: Innovative thinking involves looking at problems from new angles to identify unique opportunities.
3. **Iterative Development**: Rapid prototyping and continuous iteration based on user feedback led to better products being developed.
4. **Balanced Solutions**: Integrative thinking helps to balance the needs of different stakeholders to create cohesive solutions.
5. **Creating New Markets**: Innovative thinking can lead to the creation of entirely new market spaces and customer segments.

The case of Airbnb illustrates how innovative thinking within the Design Thinking process can revolutionise industries, create new market opportunities, and deliver solutions that users deeply identified with.

3.4.4.3 Case Study: IDEO's Design of the Apple Mouse - Iterative thinking

Background

In the early 1980s, Apple sought to create a user-friendly input device for its upcoming *Lisa* computer. The company partnered

with IDEO, a design and innovation consulting firm known for its user-centred approach and iterative design process, to develop what would become the first commercially successful computer mouse.

Challenge

Apple and IDEO faced several key challenges:

1. **Desirability**: Creating a device that users would find intuitive and easy to use.
2. **Feasibility**: Designing a product that could be manufactured at a reasonable cost with available technology.
3. **Viability**: Ensuring that the mouse would be reliable and durable for everyday use.

Iterative Thinking in Action

IDEO's iterative design process was crucial in developing the Apple mouse. This approach involved multiple cycles of prototyping, testing, and refining the design based on user feedback.

Empathise and Define

IDEO began by understanding the users' needs and the context in which the mouse would be used. They conducted observations and interviews to gather insights into how people interacted with computers and what kind of input device would be most intuitive.

Ideate

With a deep understanding of user needs, IDEO brainstormed various concepts for the mouse. They generated numerous ideas and explored different shapes, sizes, and mechanisms.

Prototype

1. IDEO built several prototypes, each varying in design and functionality. These prototypes ranged from simple foam models to more complex working versions. The goal was to quickly visualise and test different ideas.
2. Initial Prototypes: Basic models to explore ergonomics and general form factors.

3. Functional Prototypes: More detailed versions that incorporated ball-and-socket mechanisms and buttons to simulate actual use.

Test and Iterate

1. Testing was a critical part of IDEO's process. They conducted useability tests with real users to gather feedback on each prototype. This iterative cycle of testing and refining helped IDEO to identify what worked and what needed improvement.
2. Useability Testing: Users were observed interacting with the prototypes, and their feedback was used to refine the design.
3. Technical Testing: Prototypes were tested for durability, reliability, and ease of manufacturing.

Each round of testing provided valuable insights that informed the next iteration of the design. For example, early prototypes revealed issues with the ball-and-socket mechanism's smoothness and the button placement's ergonomics, leading to several refinements.

Refinement and Final Design

Through multiple iterations, IDEO refined the mouse design to address all user feedback and technical challenges. The final design featured:

1. A comfortable, easy-to-hold shape.
2. A smooth, reliable ball mechanism for precise movement.
3. A single button that was easy to press without causing fatigue.

Outcome

The iterative design process led to the successful creation of the Apple mouse, which became a key feature of the Apple *Lisa* and later the *Macintosh* computers. The mouse was not only user-friendly but also set a new standard for computer input devices.

- **Market Impact**: The Apple mouse played a crucial role in popularising graphical user interfaces (GUIs), making computers more accessible to the general public.

- **Innovation Recognition**: The mouse design was widely praised for its simplicity and effectiveness, solidifying Apple's reputation as an innovator in user-centred design.

Key Takeaways

1. **User-Centred Design**: Understanding user needs and behaviours is essential for creating intuitive products.
2. **Prototyping and Testing**: Rapid prototyping and continuous user testing are critical for identifying and resolving design issues.
3. **Iterative Process**: Iterative thinking allows for continual improvement and refinement, leading to more effective and user-friendly solutions.
4. **Collaboration**: Close collaboration between designers, engineers, and users is vital for balancing desirability, feasibility, and viability.

The case of IDEO's design of the Apple mouse demonstrates the power of iterative thinking within the Design Thinking framework. By continuously testing and refining their prototypes, IDEO was able to create a ground-breaking product that significantly enhanced the user experience and set new standards in the technology industry.

3.4.4.4 Case Study: Redesigning the Healthcare System at Kaiser Permanente – Systems Thinking

Background

Kaiser Permanente, one of the largest integrated healthcare systems in the United States, faced challenges in providing coordinated and efficient care to its patients. The complexity of healthcare delivery, involving multiple stakeholders and processes, required a comprehensive approach to improve patient outcomes and operational efficiency.

Challenges

The main challenges included:

1. **Desirability**: Enhancing patient experience and satisfaction by providing seamless and coordinated care.

2. **Feasibility**: Implementing changes that could be effectively integrated into existing systems and processes.
3. **Viability**: Ensuring that improvements were cost-effective and sustainable over the long term.

Systems Thinking in Action

To tackle these challenges, Kaiser Permanente adopted a systems thinking approach within the Design Thinking framework. Systems thinking involves understanding and addressing the interconnected components of a complex system, recognising the relationships and interactions between them.

Empathise and Define

Kaiser Permanente began by understanding the needs and pain points of patients, healthcare providers, and administrative staff. They conducted in-depth research, including:

1. **Patient Interviews and Observations**: To understand the patient journey and identify areas of frustration and inefficiency.
2. **Staff Workshops**: To gather insights from healthcare providers and administrative staff about the challenges that they faced in delivering care.

The insights gathered helped to define the key problem areas:

1. Fragmented patient journeys with disjointed care experiences.
2. Inefficient communication and coordination between different departments.
3. Long wait times and delays in care delivery.

Ideate

With a comprehensive understanding of the system's complexities, Kaiser Permanente's team brainstormed potential solutions that could address the root causes of the identified problems. They generated ideas focusing on improving coordination, communication, and efficiency.

Prototyping and Pilot Testing

Several initiatives were prototyped and tested in pilot programmes:

1. **Integrated Care Teams**: Forming multidisciplinary care teams that included doctors, nurses, and administrative staff to provide coordinated care.
2. **Electronic Health Records (EHR)**: Implementing and optimising EHR systems to ensure that all patient information was accessible and up-to-date across all departments.
3. **Patient-Centred Medical Homes (PCMH)**: Creating PCMHs where patients could receive comprehensive care in one location, reducing the need for multiple appointments and improving care continuity.

Systems Thinking Implementation

Using systems thinking, Kaiser Permanente addressed the interconnected nature of healthcare delivery:

1. **Mapping the Patient Journey**: Detailed mapping of patient journeys to identify touchpoints and interactions between different parts of the system.
2. **Identifying Key Advantage Points**: Recognising key advantage points where interventions could have the most significant impact, such as improving EHR systems and communication protocols.
3. **Feedback Loops**: Establishing mechanisms to continuously gather feedback from patients and staff to iteratively improve the system.

Continuous Improvement and Scaling

The pilot programmes were continuously monitored and refined based on feedback and performance metrics. Successful initiatives were scaled across the entire organisation, leading to widespread improvements in patient care and operational efficiency.

Outcome

The systems thinking approach led to significant improvements in Kaiser Permanente's healthcare delivery:

1. **Improved Patient Experience**: Patients experienced more seamless and coordinated care, with reduced wait times and fewer unnecessary appointments.
2. **Enhanced Care Coordination**: Integrated care teams and optimised EHR systems improved communication and coordination between different departments.
3. **Operational Efficiency**: Streamlined processes and better resource utilisation led to cost savings and more efficient care delivery.

Key Takeaways

1. **Holistic Understanding**: Systems thinking helps in understanding the entire system and its interdependencies, leading to more effective and comprehensive solutions.
2. **Collaborative Approach**: Involving all stakeholders, including patients and staff, ensures that solutions are well-rounded and address real-world challenges.
3. **Iterative Improvement**: Continuous feedback and iterative refinement are essential for adapting and scaling successful initiatives.
4. **Advantage Points**: Identifying and addressing key advantage points can lead to significant improvements across the system.

The case of Kaiser Permanente demonstrates how systems thinking within the Design Thinking framework can lead to transformative changes in complex systems like healthcare. By understanding and addressing the interconnected components of the system, Kaiser Permanente was able to enhance patient experience, improve care coordination, and achieve operational efficiencies.

3.4.4.5 Case Study: Development of the Dyson Vacuum Cleaner – Convergent Thinking

Background

In the late 1970s, James Dyson, a British inventor, became frustrated with the inefficiency of traditional vacuum cleaners, which quickly lost suction because of clogged bags and filters. He envisioned creating a more effective vacuum cleaner that

maintained consistent suction power. This case study illustrates how convergent thinking played a crucial role in the Design Thinking process that led to the development of the *Dyson* vacuum cleaner.

Challenge

Dyson faced several key challenges:

1. **Desirability**: Creating a vacuum cleaner that consumers would find more effective and reliable.
2. **Feasibility**: Developing a new technology that could be manufactured and marketed successfully.
3. **Viability**: Ensuring that the product would be profitable in a competitive market.

Convergent Thinking in Action

Convergent thinking involves narrowing down multiple ideas into a single, feasible solution. It focuses on refining and selecting the best option through systematic analysis and evaluation. Here's how Dyson applied convergent thinking within the Design Thinking process:

Empathise and Define

Dyson began by deeply understanding the user problem:

1. **User Pain Points**: Traditional vacuum cleaners lost suction caused by clogging, were difficult to clean, and often required frequent bag replacements.
2. **Problem Definition**: The core issue was the loss of suction power, which compromised cleaning efficiency.

Ideate

Dyson explored various ideas to solve the suction loss problem. He experimented with multiple concepts, including:

1. Different types of filters and bags.
2. Various airflow mechanisms.

Prototype

Dyson created numerous prototypes to test different solutions. Over five years, he built more than 5,000 prototypes. This step

involved a lot of divergent thinking, exploring various possibilities before converging on a feasible solution.

Convergent Thinking: Cyclonic Separation

Through his experimentation, Dyson discovered that cyclonic separation, a method used in industrial dust collection, could be applied to vacuum cleaners. This technology uses centrifugal force to separate dust and debris from the air, preventing clogs and maintaining suction power.

1. **Technical Feasibility**: Dyson focused on refining the cyclonic technology to fit into a consumer-friendly vacuum cleaner. He conducted rigorous testing to ensure that the technology was reliable and effective.
2. **Design Refinement**: Dyson iteratively improved the design, focusing on useability, durability, and manufacturing feasibility. He streamlined the number of cyclones, adjusted their size, and optimised the airflow paths.

Testing and Validation

Dyson's final prototypes underwent extensive testing to validate their performance:

- **User Testing**: Feedback from real users helped to refine the design and functionality.
- **Performance Testing**: The vacuum cleaners were tested under various conditions to ensure consistent suction and durability.

Implementation and Scaling

After refining the design through convergent thinking, Dyson was ready to bring the product to market:

1. **Manufacturing**: Dyson established manufacturing processes to produce the vacuum cleaners efficiently.
2. **Marketing**: He positioned the *Dyson* vacuum cleaner as a premium, high-performance product, emphasising its unique technology and benefits.

Outcome

The *Dyson* vacuum cleaner revolutionised the market, offering superior performance and reliability:

1. **Market Success**: The *Dyson* vacuum cleaner quickly gained popularity, capturing significant market share and establishing Dyson as a leading brand in home appliances.
2. **Innovation Recognition**: Dyson's use of cyclonic separation technology set a new standard in the vacuum cleaner industry, leading to numerous awards and accolades.
3. **Business Growth**: The success of the vacuum cleaner enabled Dyson to expand its product line and invest in further innovations.

Key Takeaways

1. **Focused Problem-Solving**: Convergent thinking is essential for refining and selecting the best solution from multiple ideas.
2. **Iterative Improvement**: The combination of divergent and convergent thinking allows for thorough exploration and refinement of ideas.
3. **User-Centred Design**: Understanding user needs and pain points is crucial for developing effective solutions.
4. **Persistence**: Dyson's persistence and willingness to iterate through thousands of prototypes exemplify the importance of perseverance in innovation.

The case of the *Dyson* vacuum cleaner illustrates how convergent thinking, within the Design Thinking framework, can lead to ground-breaking innovations. By systematically refining and selecting the best solution, Dyson was able to create a product that met user needs, was technically feasible, and achieved commercial success.

3.5 Design Thinking competencies

In today's rapidly evolving landscape, the ability to innovate and solve complex problems is crucial for organisations and individuals alike. Design Thinking, a human-centred approach

to innovation, has proven to be an effective method for tackling such challenges. However, to utilise the full potential of Design Thinking, it was essential to develop a set of core competencies that enable practitioners to navigate the process effectively and create meaningful solutions.

This section delves into the essential skills and mindsets that support successful Design Thinking. By understanding and cultivating these competencies, individuals and teams can enhance their problem-solving abilities, foster innovation, and create products and services that users truly identify with.

Developing these competencies requires both theoretical understanding and practical application. This section provides a blend of conceptual knowledge and hands-on exercises designed to help participants to internalise and apply these skills in real-world scenarios. Through case studies, interactive activities, and reflective practices, individuals will learn how to effectively integrate these competencies into their Design Thinking processes.

Organisations that cultivate these Design Thinking competencies amongst their teams are better positioned to drive innovation and adapt to changing market demands. By fostering a culture that values empathy, creativity, collaboration, prototyping, and iterative learning, organisations can enhance their ability to develop user-centred solutions and maintain a competitive edge.

3.5.1 Competencies dictionary for Design Thinking

Table 14: Competencies dictionary for Design Thinking

Competency	Explanation
Analytical skills	The ability to collect, analyse, interpret, and evaluate information or data to make informed decisions, solve problems, and draw conclusions.
Attention to detail	The ability to notice and focus on the small and specific aspects of a task, project, or information, ensuring accuracy and thoroughness in execution

Competency	Explanation
Big picture thinking / holistic thinking	The ability to see and understand the broader context, connections, and implications of a situation rather than focusing solely on specific details
Brainstorming	The ability to generate many ideas within a group setting.
Collaborative mindset	The ability to influence individuals or groups working together towards a common goal, sharing responsibilities, resources, and ideas to achieve mutual success
Comfort with ambiguity	The ability to tolerate, navigate, and thrive in situations or circumstances that lack clarity, structure, or clear direction
Communication	The ability to exchange information, thoughts, ideas, or messages through various channels between individuals or groups.
Confidence	A belief in oneself, abilities, or judgements, expressing assurance and self-assuredness in one's actions or decisions
Contextual intelligence	The ability to comprehend, interpret, and respond effectively to the situational factors, nuances, and dynamics within a given context
Creativity	The ability to generate novel ideas, solutions, or concepts that are original, valuable, and useful.
Critical analysis	A thorough and systematic examination, evaluation, and interpretation of a subject, idea, argument, or piece of information
Critical thinking	The ability to analyse information, assess its credibility, make reasoned judgements, and solve problems effectively.
Curiosity	An innate desire to explore, learn, understand, and seek knowledge about the world
Data interpretation	The ability to analyse, make sense of, and draw conclusions from data
Decisiveness / decision-making	The ability to make prompt and firm decisions, often in challenging or uncertain situations
Divergent skills	The ability to generate multiple creative solutions, ideas, or possibilities in response to a problem or challenge

Competency	Explanation
Emotional intelligence	The ability to recognise, understand, manage, and effectively navigate one's own emotions and the emotions of others
Evaluation and selection	The ability to systematically assess and choose the most suitable solution or option amongst various alternatives
Experimentation	Systematic and purposeful testing of hypotheses or ideas to gather empirical evidence, gain insights, and make informed decisions
Exploration	The ability to seek, discover, and investigate new territories, ideas, opportunities, or experiences
Flexibility in thinking	The ability to adapt, adjust, and approach problems or situations from various perspectives
Foresight / futures' thinking	The ability to predict, envision, and prepare for future possibilities or developments
Generative dialogue	A type of conversation or discourse that is focused on creating new ideas, fostering innovation, and generating shared understanding amongst participants.
Idea generation	The ability to create new concepts, solutions, or possibilities through creative thinking and brainstorming
Implementation planning	The ability to develop comprehensive strategies and action plans for effectively executing projects, initiatives, or solutions
Information handling	The ability to manage, organise, store, retrieve, and use information efficiently and effectively.
Information gathering	The ability to effectively collect, analyse, and synthesise information from various sources to support decision-making, problem-solving, and strategic planning
Innovation	The ability to transform novel concepts into tangible and valuable outcomes that benefit individuals, organisations, or society as a whole
Logical reasoning	The ability to think rationally, systematically, and methodically to draw conclusions based on premises or evidence
Open mindedness	Willingness to consider and accept new ideas, perspectives, or information, even if they differ from one's own beliefs, opinions, or preconceptions

Competency	Explanation
Organising	The ability to arrange resources, people, and activities in a structured and coordinated manner to achieve organisational goals efficiently
Planning	The ability to set goals, determine the actions needed to achieve those goals, and outline the steps to execute those actions efficiently
Problem decomposition	Problem decomposition is a problem-solving technique that involves breaking down complex problems into smaller, more manageable components or sub-problems
Problem definition	Problem definition competency involves the ability to clearly identify and articulate complex issues or challenges, understand their underlying causes and implications, and define them in a way that enables effective problem-solving and decision-making
Problem-solving	The critical skill involving the ability to identify, analyse, and find effective solutions to challenges or obstacles
Reflective practice	A process of self-examination, contemplation, and thoughtful consideration of one's own experiences, actions, and beliefs.
Relationship understanding	The ability to grasp the dynamics, communication styles, emotions, and mutual interactions between individuals
Resilience	The ability to adapt and bounce back in the face of adversity, trauma, stress, or significant challenges
Resilience perseverance	Ability to overcome challenges, bounce back from setbacks, and persist and continuously striving in the pursuit of goals despite difficulties.
Risk-taking	Making decisions or undertaking actions with the potential for uncertain or unfavourable outcomes in pursuit of opportunities or goals.
Sequential reasoning	The ability to think logically and methodically, following a sequence of steps or actions to reach a conclusion or solve a problem

Competency	Explanation
Strategic thinking	The ability to analyse complex situations, identify patterns, making connections between disparate pieces of information, and formulate innovative and effective strategies to achieve long-term goals or solve problems
Strategic intelligence	The capability of an individual or organisation to gather, analyse, and interpret information in a way that informs strategic decision-making and planning
Vision and future orientation	The ability to have a clear idea of future possibilities, goals, or aspirations and aligning actions to achieve them.
Visualisation/ Mental imaginary	The cognitive technique involves the ability to create mental images to simulate experiences, scenarios, or outcomes in the mind.

Source: Marambana (2024)

3.6 Summary

In practice, the application of Design Thinking styles, empathy-driven, collaborative, experimental, integrative, and visual thinking, proves invaluable across various sectors. These styles enable organisations to deeply understand user needs, foster diverse and inclusive teamwork, rapidly prototype and test ideas, balance multiple considerations, and clearly communicate concepts. Implementing these styles in real-world scenarios leads to innovative, user-centred solutions that are not only effective but also sustainable. Embracing these Design Thinking styles transforms how problems are approached and solved, driving meaningful impact and fostering a culture of continuous improvement and creativity.

Design Thinking is a powerful approach to problem-solving that emphasises empathy, collaboration, and iterative development. The various styles of Design Thinking such as empathy-driven, collaborative, experimental, integrative, and visual thinking offer, amongst others, diverse pathways to innovation, each contributing unique strengths to the process.

Competencies such as empathy, creative problem-solving, collaboration, iterative design, user-centricity, communication, and adaptability are essential for effectively applying Design Thinking in different contexts.

By integrating these styles and competencies, individuals and organisations can develop solutions that are not only innovative but also deeply aligned with user needs and business goals. Design Thinking fosters a culture of creativity, continuous learning, and user-centred innovation, ultimately leading to more impactful and sustainable outcomes across various industries and sectors. Together, these styles and competencies enable individuals and organisations to develop user-centred, innovative solutions that address real-world problems effectively. Embracing Design Thinking styles in different contexts leads to more impactful outcomes and a stronger alignment with user and stakeholder needs, ultimately creating a competitive advantage in today's complex and dynamic environment.

Activity Sheet

Understanding and Applying Design Thinking Styles

Section A:

Instructions: Read each statement and tick the style(s) that best describe how you typically approach challenges.

Statement	Write Your Style(s)	Suggested Style
I like to find completely new and original ways to solve problems.		Creative Thinking / Innovative Thinking
I prefer to plan my process step by step and follow a structure.		Structured Thinking
I often return to earlier ideas or prototypes to refine them.		Iterative Thinking
I enjoy connecting unexpected ideas from different areas.		Lateral Thinking
I think about how changes will affect the whole system.		Systems Thinking
I rely on data and logic when making decisions.		Analytical Thinking
I look for ways to combine conflicting ideas into something new.		Integrative Thinking
I generate as many ideas as possible before deciding.		Divergent Thinking

Statement	Write Your Style(s)	Suggested Style
I critically evaluate options to choose the most feasible solution.		Convergent Thinking

Reflect:

1. Which two thinking styles do you use most often?
2. Which styles do you want to develop more, and why?

Section B: Application Task – Style-to-Scenario Matching

Instructions: Match each scenario below with the most appropriate Design Thinking style. Write your reasoning in one or two sentences.

Scenario	Best Fit Style	Why? (Brief explanation)
You are building a prototype for a new water filter and testing it weekly with users.		
You are creating a community programme and want to understand how transportation, employment, and childcare interact.		
You have ten ideas for a new mobile app and need to select the top two.		
You notice a conflict between what the user wants and what the budget allows, but want a solution that satisfies both.		

Scenario	Best Fit Style	Why? (Brief explanation)
You brainstorm ideas using unrelated objects and wild prompts to think differently.		

Section C: Group Activity – Team Thinking Style Audit

Instructions: Form a group of 3 to 5 classmates. As a team, complete the following:

1. Identify the dominant Design Thinking style of each member.
2. Create a "Team Thinking Wheel" using a circle diagram with each member's style(s) represented.
3. As a team, choose a challenge (for example, "Improve food delivery for rural schools") and brainstorm:
   - Which styles will be most useful at the beginning, middle, and end of your process?
   - Which styles are missing in your team? How will you compensate for this?

Present: Summarise your findings and create a short visual (poster or slide) explaining your group's thinking diversity and strategy.

Section D: Critical Reflection Journal

Prompt: In 250 to 300 words, reflect on the following:

How can understanding and intentionally using different Design Thinking styles improve the outcomes of innovation projects in real-world settings?

Provide an example from a past experience or case study.

Submission Checklist

[ ] Completed Self-Reflection Table

[ ] Style-to-Scenario Matching Table

[ ] Team Thinking Style Poster or Slide

[ ] Reflection Journal Entry

Part Four

Tools that may be used in Design Thinking Projects

Learning Outcomes

1. Identify and describe key creative tools used in Design Thinking projects.
2. Apply the SCAMPER technique to generate and refine ideas.
3. Demonstrate the use of Crazy Eights and Six Thinking Hats for ideation and decision-making.
4. Incorporate storytelling and visualisation techniques to enhance user engagement.
5. Apply reverse brainstorming and other facilitation tools to solve complex problems creatively.

4. Tools that may be used in Design Thinking Projects

4.1 Introduction

Design Thinking is a human-centred, iterative process used to understand users, redefine problems, and develop innovative solutions. A critical component of this approach is the use of creative thinking techniques that stimulate ideation, improve problem-framing, and promote collaborative exploration. This section introduces five widely used techniques: SCAMPER, Crazy Eights, Six Thinking Hats, Storytelling, and Reverse Brainstorming. Each of these techniques provides a structured method to encourage divergent thinking and challenge conventional assumptions. They are applied at various steps of the Design Thinking process, particularly during Ideation, Prototyping, and Testing and support teams in generating a wide range of ideas, exploring perspectives, and refining concepts based on user needs.

These tools also serve to unlock creativity in multidisciplinary teams, foster empathy, and enable quick experimentation. Whether working independently or in groups, these tools allow design thinkers to expand the solution space, think laterally, and embrace a mindset of curiosity and exploration. By learning and applying these techniques, students and practitioners of Design Thinking gain valuable creative confidence, improve collaboration, and enhance their ability to generate and communicate compelling solutions.

4.2 SCAMPER Technique

4.2.1 An introduction to SCAMPER technique

SCAMPER is a tool designed to stimulate effective creative thinking. It operates on the idea that originality stems from slight modifications and alterations to existing concepts. In essence, creativity involves reimagining the old in new ways. SCAMPER,

an acronym, stands for seven techniques that rejuvenate the old: Substitute, Combine, Adapt, Modify, Put To Another Use, Eliminate, and Reverse. Creativity is essential for innovation. Without the ability to alter, or improve processes, technologies, products, and artistic forms, progress stalls. Simply telling someone to 'think creatively' is not enough; they need specific questions and techniques to guide them. That's where SCAMPER comes in. There are several techniques to enhance divergent thinking, and SCAMPER is one of them. Developed by De Bono in 2000, SCAMPER is an acronym where each letter represents a specific thinking process, such as:

4.2.2 Substitute

What can be replaced? These could be materials, people, or rules that can be swapped to alter the function of a product or process. We might also consider if the product's use can be substituted. The substitute component of SCAMPER resembles a trial-and-error process, where different parts are replaced and the outcomes evaluated.

Example: Innovative food items frequently use the substitute technique. In 2016, the sushi burrito trend emerged by applying this method. Restaurants, recognising the popularity of burritos, thought about which ingredients could be substituted while keeping the concept intact, resulting in the sushi burrito. Substitute involves replacing parts of a product, process, or idea with alternatives. This strategy encourages exploration of how changes in materials, components, methods, or contexts can lead to innovative solutions or improvements.

Key Questions for 'Substitute'

- **Materials**: Are there alternative materials that can be used?
- Components: Which elements can be replaced or exchanged?
- **People**: Can roles or responsibilities be reassigned?
- **Methods**: Are there different processes or techniques that can be applied?
- **Resources**: What other tools or resources are available?

- **Ideas**: Can the idea be utilised in a different context or aimed at a different audience?

Steps to Apply 'Substitute'

Step 1: Identify the Target: Specify the particular aspect of the product, process, or idea that requires attention.

Example: Identify the need to improve the packaging material for a product.

Step 2 Explore Alternatives. Generate ideas for potential replacements for the identified element.

Example: Consider using recycled paper instead of plastic for packaging.

Step 3 Evaluate Potential. Assess the practicality, advantages, and potential disadvantages of each alternative.

Example: Evaluate the cost, environmental impact, and customer acceptance of recycled paper.

Step 4 Implement and Test. Incorporate the chosen substitute into the product or process and evaluate its effectiveness.

Example: Conduct a pilot test with the new packaging and gather customer feedback.

Step 5 Refine and Iterate. Based on feedback and results, refine the substitution and make necessary adjustments.

Example: Modify the design or material of the recycled paper packaging based on durability and customer input.

4.2.3 Combine

What features, uses or components can be combined? Are there features of products that could be synthesised to provide a better, more holistic product? If looking at a project rather than a product, are there different team members who can combine their work?

Example: One of the most successful examples of combining different features is the innovation of smartphones. While originally, people had different devices for taking pictures,

listening to music, accessing the Internet and making phone calls, smartphones combine all these different functions into one efficient product.

4.2.3.1 Steps to Apply 'Combine'

1. Define Target Elements:

Specify the components, features, or concepts that can be merged.

Example: Define the educational content and interactive tools that are needed for a new training programme.

2. Explore Combination Options:

Generate ideas on how to integrate these elements effectively.

Example: Brainstorm integrating video tutorials with interactive simulations for the training programme.

3. Assess Feasibility and Advantages:

Evaluate how the integration will function and the benefits that it will provide.

Example: Determine how video tutorials and simulations will improve learning outcomes and retention.

4. Prototype and Test:

Develop a prototype or initial version of the integrated solution and conduct testing.

Example: Create a sample module of the training programme and gather participant feedback.

5. Refine and Implement:

Refine the integrated solution based on feedback and implement it on a larger scale.

Example: Finalise the training programme and launch it across the entire organisation.

4.2.3.2 Examples of 'combine' in SCAMPER applied to various contexts

1. Combine in-technology

Example: Designing a versatile smart device.

Current Technologies: Smartphones and smart home devices.

Combine: Develop a smartphone that includes built-in smart home control capabilities, enabling users to manage household devices from their phone.

Benefits:

1. Simplifies user experience by integrating device functionalities.
2. Improves convenience and connectivity in daily routines.

2. Combine in-service design

Example: Improving a fitness programme.

Current Offerings: Gym memberships and virtual fitness classes.

Combine: Introduce a hybrid fitness programme that integrates both on-site gym access and virtual classes, offering flexibility to users.

Benefits:

1. Addresses varied user preferences by providing physical and virtual fitness options.
2. Enhances engagement and retention with a comprehensive service package.

3. Combine in-product packaging

Example: Revamping packaging for a food product.

Current Packaging: Conventional cardboard boxes and plastic containers.

Combine: Create eco-friendly packaging that merges recyclable materials with resealable functionality, enhancing sustainability and usability.

Benefits:

1. Improves environmental sustainability.
2. Offers a user-friendly packaging solution that preserves product freshness.

The Combine technique in the SCAMPER framework fosters innovation by merging different elements to create new and enhanced solutions. This approach encourages creative thinking by integrating features, ideas, and processes, leading to more comprehensive and effective outcomes.

4.2.4 Adapt

Adaptation, the third component of the SCAMPER framework, involves modifying a product, process, or idea to fit a new context, purpose, or environment. This approach encourages exploring how existing solutions can be altered or repurposed to meet emerging needs or address different challenges. How can we make slight adjustments to enhance the product or process? Can solutions that are used for one issue be adapted to address another? In what ways does the product or process need to evolve to align with changing lifestyles?

Netflix exemplifies a company that successfully adapted to evolving norms, leading to significant success. Initially launched in 1999 as a DVD (digital versatile disc) rental service, Netflix executives recognised the rising popularity of streaming and adjusted their business model accordingly. In contrast, Blockbuster failed to adapt, resulting in its closure in 2013, a clear illustration of the importance of adaptation for sustained success. For further insights into the differences between Blockbuster and Netflix, explore Olivier Sibony's thinker profile (Sibony, 2025), where he examines the mistakes that led to Blockbuster's downfall.

4.2.4.1 Understanding 'Adapt' in SCAMPER

Adaptation involves modifying or customising existing elements to optimise their effectiveness or adapt them to new environments. This approach may include altering features, redefining uses, or making adjustments to better meet updated needs or conditions.

Key Questions for 'Adapt':

1. What modifications or adjustments can enhance performance?

2. In what ways can existing products or ideas be utilised in alternative contexts?
3. What enhancements can increase the flexibility or versatility of the current solution?
4. How can a product or process be tailored to accommodate diverse users or scenarios?
5. Can design or functionality adjustments overcome existing limitations or challenges?

4.2.4.2 Applying 'Adapt' in Practice

Here are examples illustrating how the Adapt technique can be implemented in different settings:

1. Product Development

1. Example: A company specialising in office furniture.
2. Current Product: Standard office chair.
3. Adapt: Redesign the chair to develop an ergonomic version featuring adjustable elements such as lumbar support, height and recline, aiming to accommodate various user requirements and encourage improved posture.

Key Benefits:

1. Enhances user comfort and well-being.
2. Boosts market attractiveness by providing a more adaptable product option.

2. Business Processes

Example: Enhancing a customer feedback system.

Current Process: Conventional feedback forms.

Adapt: Introduce an online feedback platform equipped with real-time analytics and personalised response capabilities, tailored for technology-savvy customers to deliver faster, more actionable insights.

Key Benefits:

- Enhances responsiveness and quality of feedback.
- Boosts customer engagement with modern, intuitive interfaces.

4.2.4.3 Steps in adapt

Step 1: Identify the Element for Adaptation:

1. Specify the particular product, process, or idea requiring adaptation.
2. Example: Identify a software application that needs adaptation for a new industry.

Step 2: Analyse the New Context:

1. Understand the requirements, challenges, and opportunities presented in the new context.
2. Example: Research how the software can be applied in the healthcare industry, considering unique needs and regulatory requirements.

Step 3: Explore Modifications:

1. Brainstorm ways to adjust or modify the element to align with the new context.
2. Example: Customise the software to incorporate features specific to healthcare, such as patient data management and regulatory compliance tracking.

Step: 4: Evaluate Feasibility and Benefits:

1. Assess the practicality and advantages of the proposed modifications.
2. Example: Determine how the adapted software will enhance operational efficiency and compliance within healthcare settings.

Step 5: Prototype and Test:

1. Develop a prototype or initial version of the adapted solution and conduct testing.
2. Example: Create a beta version of the healthcare-specific software and pilot it with a select group of healthcare providers.

Step 6: Refine and Implement:

1. Refine the adapted solution based on feedback and implement it on a broader scale.

2. Example: Finalise the software and deploy it across healthcare organisations.

4.2.5 Modify (or sometimes, minify/magnify)

How can adjustments to the process lead to different outcomes? What aspects can be amplified to highlight specific parts of the process, or minimised to enhance overall efficiency? Is it possible to alter the shape, colour, or size?

Example: If you're sceptical about the impact of changing a product or brand's colour on a company's success, consider some iconic logos. Take IKEA and Muji, for instance, both household goods retailers. IKEA's blue and yellow logo emphasises its Swedish roots, while Muji's red logo emphasises its Japanese identity and the minimalism of its products. The 'modify' technique can be applied to shape logos, significantly influencing how the public perceives a company.

4.2.6 Put to another use

What benefits could be derived from utilising the process or product in a different field? Is there another industry where the product could thrive? How can this product be repurposed in a way that diverges from its initial purpose?

Example: In response to mounting concerns over climate change, the 'put to another use' technique sparks innovative approaches to support environmental causes through creative repurposing or upcycling. This method inspires applying something originally without purpose to serve a functional role. For instance, companies like Adidas have adopted this approach by repurposing ocean waste into shoes. They have begun manufacturing footwear using recycled materials from the ocean, creating a stylish new product while contributing to environmental conservation.

The 'put to another use technique' prompt fosters inventive thinking about how a product, service, or idea can be applied in novel ways beyond its original intent. This technique involves examining existing elements and exploring fresh contexts, markets, or applications for them.

4.2.6.1 How to Use 'Put to Another Use' in SCAMPER

Identify the Current Use: Start by understanding the current purpose and use of the product or idea.

Explore Alternative Uses:

1. **Different Market Segments**: Evaluate potential new user demographics for the product.
2. **New Contexts or Scenarios**: Explore alternative situations where the product could offer value.
3. **Seasonal or Temporal Adaptations**: Consider if the product can be utilised during different seasons or specific occasions.
4. **Complementary Applications**: Investigate additional functions that the product could fulfil alongside its primary use.
5. **Utilise Emerging Technologies**: Examine how upcoming technologies could facilitate innovative applications for the product.

4.2.6.2 Examples of 'Put to Another Use'

1. **Product-Based Example**

Post-it Notes: Initially designed for temporarily attaching notes to documents or surfaces, Post-it Notes have been creatively adapted for various purposes such as:

1. **Bookmarks**: Their adhesive quality and ability to be written on make them perfect for marking pages in books.
2. **Wall Art**: Used innovatively to create murals or message boards.

2. **Service-Based Example**

Uber: Initially launched as a ride-sharing service, Uber expanded its platform to include:

1. **Uber Eats**: Utilising its network to provide food delivery services.
2. **Freight**: Offering logistics and freight services to businesses.

3. **Process-Based Example**

Virtual Reality (VR): Initially focused on gaming and entertainment, VR has evolved to be applied in:

1. **Education**: Developing immersive learning experiences.
2. **Therapy**: Supporting mental health treatments through simulated environments.

4.2.6.3 Steps for Applying 'Put to Another Use'

1. **Analyse the Fundamental Characteristics**: Identify the essential properties and functionalities of the product.
2. **Explore Alternative Applications**: Generate concepts for how these characteristics could provide value in diverse environments.
3. **Evaluate Viability**: Determine if the proposed new applications are feasible and meet market demands or technological requirements.
4. **Prototype and Validate**: Create prototypes or pilot implementations to assess the effectiveness of the new applications in practical situations

4.2.7 Eliminate

Sometimes, improving a product involves removing unnecessary components to streamline and enhance its functionality. This approach aims to simplify the user experience and potentially reduce costs, while focusing on core functionalities. For instance, Bluetooth earphones eliminated the wires found in traditional earphones, making them more user-friendly. Another example is Apple's decision to remove the CD (compact disc) drive from laptops, which enabled them to create thinner and lighter models.

Eliminate involves reducing or removing elements, features, components, or processes to simplify, streamline, or enhance a product, service, or idea. This can lead to cost savings, increased efficiency, improved user experience, or even the creation of entirely new offerings by focusing on core functionalities.

4.2.7.1 How to Use 'Eliminate' in SCAMPER?

1. **Identify Unnecessary Elements**: Examine the product or service to pinpoint components or features that do not directly contribute to its core function or value.
2. **Assess the Effects of Removal**:
   - Evaluate the impact of eliminating each component on utility, cost, and user experience.
   - Consider the advantages of reducing complexity or eliminating redundancies.
3. **Focus on Key Functions**: Prioritise retaining elements that deliver substantial value or are essential to fulfilling the product's primary purpose.
4. **Streamline Processes**: Review workflows or process steps to identify opportunities for consolidation or removal, aiming to enhance efficiency.

4.2.7.2 Examples of Eliminate

1. **Product-Based Example**

1. **Smartphones**: Over the years, manufacturers have removed features such as physical keyboards and home buttons to enhance design simplicity and functionality, resulting in:
2. **Larger Screen Real Estate**: Expanding display areas by eliminating physical buttons.
3. **Sleeker Aesthetics**: Achieving streamlined and contemporary designs.

2. **Service-Based Example**

Banking Apps: Financial institutions have streamlined their services by:

1. **Phasing Out In-Person Transactions**: Promoting online banking to minimise reliance on physical branches.
2. **Simplifying Features**: Removing less frequently used functionalities to prioritise essential banking services, thereby improving user satisfaction.

3. Process-Based Example

Software Development: Development teams have optimised workflows by:

1. **Eliminating Redundant Code**: Removing outdated or duplicated code to improve software performance.
2. **Simplifying Testing Procedures**: Focusing on automated testing to reduce manual intervention and speed up the process.

4.2.7.3 Steps for Applying Eliminate

1. **Analyse Components**: Break down the product or process into its components or steps.
2. **Identify Redundancies**: Find elements that are redundant or add little value.
3. **Consider the Core Function**: Determine what is truly essential for the product to perform its primary function.
4. **Test the Impact**: Remove or reduce elements and test to see how it affects performance, user satisfaction, and overall functionality.
5. **Iterate and Refine**: Use feedback to iteratively refine the product, ensuring that the eliminated features do not compromise essential functionality.

4.2.7.4 Questions to Guide Eliminate

1. Which aspects of the product or process are seldom used or are not valued by customers?
2. What elements can be eliminated without compromising the product's core function?
3. Are there any components that introduce unnecessary complexity?
4. How can we simplify this product or process to enhance user-friendliness or reduce costs?
5. What steps can be removed to streamline a workflow or process?

4.2.7.5 Benefits of Eliminate

1. **Cost Reduction**: By eliminating unnecessary features or components, costs associated with production, maintenance, and support can be reduced.
2. **Improved Efficiency**: Simplifying processes or workflows can lead to faster and more efficient operations.
3. **Enhanced User Experience**: A streamlined product is often easier to use and understand, leading to better user satisfaction.
4. **Focus on Core Value**: Removing non-essential elements allows focus on what truly adds value, potentially leading to more innovative and impactful solutions.

4.2.8 Reverse

Would altering the sequence of effects lead to a different outcome? What aspects can be rearranged, flipped, or swapped?

Reversing techniques can be particularly effective in altering decision-making strategies. For instance, if a company typically employs a top-down approach, focusing on the big picture rather than specific components, they could reverse this pattern by adopting a bottom-up approach, emphasising detailed aspects. This shift may uncover new solutions that were previously unseen.

Reverse involves considering a product, process, or idea by inverting or flipping its usual sequence, roles, assumptions, or direction. This approach can foster innovative insights and unexpected solutions by challenging conventional patterns and exploring the consequences of reversing elements.

4.2.8.1 How to Use Reverse in SCAMPER

1. Understand the typical flow or sequence of the product or process.
2. Explore opportunities for reversal:
    - **Reverse Sequence**: Change the order of steps or components.
    - **Swap Roles**: Exchange roles or functions amongst components or participants.

- **Challenge Assumptions**: Question and invert common assumptions about operations.

3. Evaluate the impact and feasibility: Analyse how reversing elements could generate fresh value or solutions, taking into account practicality and potential advantages.

4.2.8.2 Examples of Reverse

1. Product-Based Example

Reversible Clothing: By flipping the concept of conventional garments, clothing designers have introduced reversible jackets. This innovation allows users to wear the same jacket inside out for a different appearance, enhancing both functionality and versatility.

2. Service-Based Example

Freemium Models: Traditional models typically involve selling a product upfront with additional services offered later. The freemium model reverses this approach by providing basic services for free and charging for premium features, leading to widespread adoption and scalability.

3. Process-Based Example

Reverse Mentoring: Instead of the traditional model where senior employees mentor juniors, reverse mentoring involves younger employees mentoring older colleagues on new technologies, social media, and current trends. This practice enriches organisational knowledge and stimulates innovation.

4.2.8.3 Steps for Applying Reverse

1. **Map the Current Flow**: Lay out the current process, sequence, or structure of the product.
2. **Identify Elements to Reverse**: Look for key components, roles, or assumptions that can be inverted.
3. **Develop Reverse Scenarios**: Create scenarios where these elements are reversed and explore how they might function differently.
4. **Assess and Iterate**: Evaluate the potential of these reversed scenarios for practical application and iterate based on feedback.

4.2.8.4 Questions to guide Reverse

1. What outcomes result from reversing the sequence of steps?
2. How can we exchange the roles of various participants or components?
3. What assumptions can be challenged to uncover fresh perspectives?
4. Can reversing the process enhance efficiency or foster innovation?
5. How would the product perform if utilised inversely?

4.3 An introduction to Crazy Eights technique in Design Thinking

Crazy Eights is a fundamental Design Sprint method, particularly effective during the ideation step when ideas need to flow rapidly using existing insights. The goal is to generate numerous diverse ideas swiftly. Ultimately, the aim is to refine these into a single or select few ideas for prototyping. Testing these ideas with real users is crucial for determining the optimal solution to the initial question or problem.

4.3.1 What is the Crazy Eights method?

Crazy Eights is an ideation technique designed to bypass overthinking and tap into your subconscious creativity. It's an engaging group activity known for its lively pace, hence the 'crazy' name. Participants sketch eight solutions in eight minutes, allowing just one minute per iteration. There's little room for hesitation or second-guessing, and no artistic skills are required, just clarity in communicating ideas.

This method is a key part of the Design Sprint process, typically executed on Day Two when brainstorming is intense. It's efficient, preventing the team from spinning in circles without progress by day's end.

In those brief minutes, participants have complete freedom to interpret solutions however they wish. While more time might lead to more refined ideas, the sprint emphasises that an untested idea is merely that; an idea amongst many. Crazy Eights aims to

rapidly generate numerous ideas, allowing for the elimination of weaker ones, voting on stronger ones, combining concepts, and ultimately refining them into the best possible solution.

Individuals sketch ideas independently, diverging from the group, and then converge as a team to vote and synthesise the most promising concepts into a cohesive solution.

4.3.2 *How does the Crazy Eights technique work?*

Step 1: Assess the need for a brainstorming session. Determine where your team is in the design process and whether rapid idea generation would be beneficial.

Step 2: Once decided, distribute paper and pens to team members. For a virtual approach, use platforms like *Miro* or *Canva* for digital sketching. However, using physical materials is recommended to prevent overthinking and to encourage rapid idea generation. Teams can then photograph their sketches and upload them to a shared digital board, such as *Miro*, for collaboration.

Figure 23: Virtual Method of Crazy Eights. Source: Adapted from Boby Haryanto (2019)

Step 3: Each team member should divide their paper or canvas into eight sections, one for each round. While fewer than eight rounds are possible, generating unique ideas beyond the sixth or seventh round can become challenging, so I recommend sticking to eight rounds.

Step 4: Assign one team member as the timer. Their role is to set a one-minute alarm per round and signal when time is up. They

should participate in the activity while managing time. Limiting each round to one minute helps to maintain a brisk pace and prevents second-guessing.

Step 5: When the timer starts, each participant begins sketching an idea in one section of their paper or canvas. The sketch should be rough but clear enough to convey the concept visually. In virtual settings, icons and shapes can aid in visual communication. There's only one minute per idea, so avoid being caught up in details. If unsure about a drawing, use captions, as there will be an opportunity to explain ideas verbally later. Stop drawing when the minute ends.

Step 6: Repeat this process for all rounds. The final rounds may be more challenging, but continue pushing through, even if ideas seem unconventional. Remember, every idea has value; what seems impractical might spark something unexpected.

Step 7: Share ideas. There are different ways to share ideas. One approach is to post everyone's completed papers and use a 'dot method' to indicate favoured ideas. Another option is to share photos of individual worksheets and have team members verbally present their eight ideas in turn. My team found the latter method more beneficial as it allowed for verbal pitching, immediate discussion, and feedback.

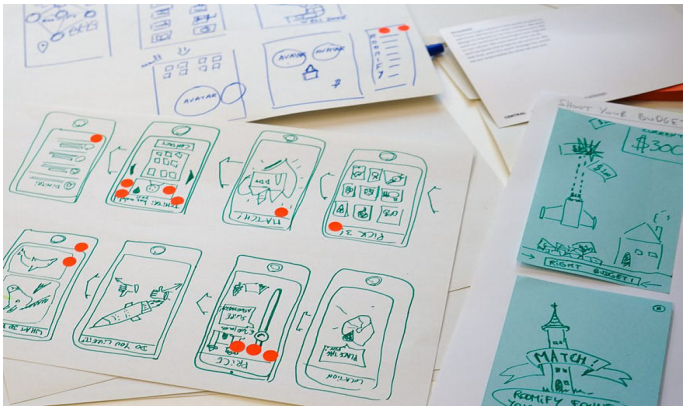


Figure 24: The Dot Method of providing feedback. Source: Adapted from Marie van Boxel (2016)

Every team member typically takes their own colour dot and this session is typically conducted in silence simultaneously. Then, after a set time once everyone has placed their dots, the team can elaborate further on ideas that have the most dots. This could also be performed virtually by posting all the ideas on a board like *Miro*.

For the team, focusing on designs that share similarities is more beneficial than prioritising the most popular or heavily dotted designs. Our aim is to consolidate a range of diverse ideas into cohesive solutions. If we only pursue the most popular ideas, we risk overlooking opportunities to integrate elements from other concepts. This unintentional exclusion of valuable ideas often becomes a drawback of brainstorming, especially when the sharing and development process does not allow all ideas to be fully explored.

Depending on the time available, another round of eight sketches can be conducted, with team members building upon each other's ideas. Subsequently, the team reconvenes to select the most compelling ideas that effectively address the design challenge. These chosen concepts are then refined and potentially developed into prototypes for testing.

In the design realm, Crazy Eights transcends its origins as a card game - it is a rapid ideation method. Often integrated into 'design sprints,' Crazy Eights aims to generate and sketch eight innovative solutions to a problem within eight minutes. While challenging, this process yields a diverse set of rough sketches, each representing a different idea. In team contexts, this approach proves particularly valuable, fostering the creation of numerous unique concepts that can be further developed in subsequent brainstorming sessions.

4.3.3 Using Crazy Eights in Design Thinking

4.3.3.1 Ideate Step

- **Objective**: Generate a broad range of ideas quickly to solve the design challenge.
- **Divergent Thinking**: Crazy Eights encourages participants to engage in divergent thinking by exploring a broad spectrum of ideas without inhibitions or overthinking.

- **Rapid Ideation**: The time constraint prompts quick thinking and encourages participants to explore unconventional ideas that they might not otherwise consider.
- **Example**: When redesigning a mobile app interface, participants can generate ideas for different layouts, navigation methods, or interactive features, exploring a wide range of possibilities within just eight minutes.

4.3.3.2 Empathise and Define Steps

- **Objective**: Crazy Eights can also be utilised to explore various perspectives on problems or user needs that were identified earlier in the process.
- **Problem Exploration**: Employ Crazy Eights to examine different facets of the problem statement or user needs identified during the Empathise step.
- **Synthesis**: Creating multiple sketches of the problem can aid in synthesising insights and clarifying the problem statement.
- **Example**: When defining user needs for a new educational tool, use Crazy Eights to brainstorm different approaches that the tool could take to accommodate various learning styles and environments.

4.3.3.3 Prototype Step

- **Objective**: Quickly generate different versions or features of a prototype.
- **Feature Exploration**: Explore multiple ways to implement a specific feature or interaction in a prototype.
- **Variant Development**: Create different variants of a prototype component to test which best meets user needs.
- **Example**: For prototyping a new website feature, use Crazy Eights to sketch various layouts or interaction patterns for the feature to determine the most effective design.

4.3.4 An introduction to Six Thinking Hats technique in Design Thinking

The Six Thinking Hats approach was developed by Edward de Bono, a Maltese physician, psychologist, and philosopher. Initially used to advise government agencies, de Bono intended it to also serve as a practical tool for everyday problem-solving. First introduced in his 1985 book of the same name, it has since undergone several revisions (De Bono, 1985). The technique involves six metaphorical hats, each representing a different style of thinking, colour-coded to aid in remembering each type. Participants switch hats to explore various perspectives, enhancing decision-making and problem-solving processes. 'Six Thinking Hats' facilitates thorough exploration of issues in a structured and conflict-free manner, suitable for both individuals and groups aiming to break free from conventional thinking patterns and approach challenges constructively.

Regardless of the innovation activity undertaken, idea generation always marks the beginning. It is often regarded as the most engaging and relatively straightforward step in the ideation and innovation process. During idea generation, employees participate in a creative and enjoyable manner, contributing numerous ideas. The challenge lies in identifying the most promising ideas for implementation, a task facilitated by various ideation techniques used at the outset of the process.

In idea generation, close collaboration amongst employees is crucial to explore and refine ideas sufficiently for consideration in subsequent ideation phases. To assess an idea's potential, De Bono's Six Thinking Hats method proves invaluable in determining its viability. This approach also effectively engages innovation teams in collaborative idea refinement.

4.3.4.1 Benefits of Six Thinking Hats

The Six Thinking Hats method offers several advantages that enhance individual and group thinking, decision-making, and problem-solving processes:

1. **Structured Thinking and Clarity**

1. **Organised Thought Process**: Each hat represents a distinct mode of thinking, bringing structure and clarity to the exploration of all aspects of a problem or idea.
2. **Focused Discussions**: By focusing on one type of thinking at a time (for example, facts with the White Hat, emotions with the Red Hat), it minimises confusion and enhances productivity in discussions.

Example: During a business meeting, employing the hats can prevent switching between critical evaluation and creative thinking, facilitating thorough exploration of each aspect.

2. **Enhanced Creativity and Innovation**

1. **Promotes Creativity**: The Green Hat specifically encourages creative thinking and idea generation, fostering innovative solutions without immediate critique.
2. **Diverse Ideas**: It encourages the consideration of a wide range of ideas and alternatives that may not arise in traditional brainstorming sessions.

Example: In a brainstorming session for an advertising campaign, the Green Hat can inspire unconventional and impactful marketing strategies.

3. **Efficient Decision-Making**

1. **Rapid Problem Identification**: By methodically addressing different facets (for example, risks with the Black Hat, benefits with the Yellow Hat), it accelerates the identification of issues and solutions.
2. **Clearer Decisions**: It facilitates clearer and more comprehensive decisions by systematically considering all relevant factors.

Example: In a crisis management scenario, utilising the hats can swiftly gather facts, explore solutions, and make informed decisions under pressure.

4. **Facilitates Innovative Problem-Solving**

1. **Encourages Alternative Thinking**: The Green Hat stimulates thinking beyond conventional solutions, nurturing a culture of innovation and continuous improvement.
2. **Reduces Idea Rejection**: By separating idea generation from evaluation, it prevents premature dismissal of potentially valuable ideas.

Example: In the context of software development, applying the Green Hat can lead to ground-breaking features that distinguish the product from competitors.

4.3.4.2 How to use the Six Thinking Hats

The essence of the Six Thinking Hats is to facilitate a shift in individuals' thinking processes. When providing feedback, people often exhibit bias - being overly positive or negative - and may overlook various aspects of a situation. In applying this method, the group assumes six distinct roles, each represented by a different 'thinking hat':

1. **White Hat**: Focuses on facts and seeks clarity. Example: 'This information is not clear to me.'
2. **Yellow Hat**: Emphasises positivity and benefits. Example: 'Finding the search field was very easy.'
3. **Black Hat**: Acts as the devil's advocate, highlighting risks and weaknesses. Example: 'The lack of colour contrast makes the text on these graphs hard to read.'
4. **Red Hat**: Provides emotional feedback based on intuition. Example: 'I feel distracted by the animations.'
5. **Green Hat**: Introduces new alternatives and explores uncharted concepts. Example: 'What if we use tooltips to explain abbreviations in this table?'
6. **Blue Hat**: Directs the process, ensuring adherence to guidelines and focusing the team's efforts.

The Black Hat plays a crucial role in this process. To achieve optimal design, rigorous self-critique is essential. However, identifying one's own shortcomings can be challenging when approaching design alone. The Black Hat ensures that risks,

weaknesses, and critical issues are openly and safely addressed within the group environment.

Running the session

1. The session is intended for gathering user feedback to validate design ideas, involve the team in the design process, or make decisions - essentially, it's suitable for regular use. The session should be time-limited to 60 to 90 minutes. You'll need Post-it notes, pencils, paper hats or tags, and printed versions of the interfaces requiring feedback, displayed visibly on a wall for close inspection.
2. To add an element of fun, colourful paper hats or labelled tags can designate each person's role during the session. Distribute these roles, explain their meanings, and allocate 15 minutes for the team to review the designs. Participants can provide feedback using Post-it notes, limited to one piece of feedback per note. Afterwards, group the notes around the designs or help to categorise them.
3. Next, everyone presents their feedback to the group. In larger groups, pairs can present together if multiple people share the same role.
4. By the session's end, you'll have gathered extensive feedback from diverse perspectives, enabling prioritisation of issues and confirmation of the project's design direction. An additional benefit is fostering a collaborative environment where everyone shares responsibility for user experience. Such open sessions involving your team, real users, and stakeholders create a balanced environment that considers user needs, business objectives, and appropriate technology for creating excellent products.

What methods and tools do you typically use to gather meaningful feedback and foster discussion around design?

4.4.4.3 Applying the Six Thinking Hats in idea generation

The Six Thinking Hats method can be used early in the idea generation process. By organising the thinking process using the Six Thinking Hats method, an organisation can ensure the idea analysis from different standpoints. This leads us to the

conclusion that each participant of the idea generation process needs to have the opportunity to "wear" each hat in order to achieve a better understanding of the idea potential.

Let's understand this through an example. Your organisation organises an ideation activity to collect ideas for new product design. It is beneficial for each participant to individually express their thoughts for each idea and to finally consolidate all the ideas. Wearing the White Hat, they will analyse the data that they have. They can discuss the facts around a proposed idea such as "do we have required resources?", "do we have the technology for this design?" Then, Yellow Hat will assist in identifying the advantages and positive impact of the idea.

The Black Hat is here to remind us of the potential disadvantages, risks and difficulties that can have a bad impact on sales and production. With the Red Hat, you will easily understand the feelings and emotions of the team about the idea, or whether they like it or not. Then the Green Hat will bring thinking of the idea for a new design from a creative and innovative perspective. This hat helps you to bring and connect new ideas to improve the original one. Finally, the Blue Hat will summarise everything, ensuring that the idea has been analysed sufficiently. Applying the Six Thinking Hats in Design Thinking can enhance the process by providing structured ways to explore various aspects of the problem, ideation, and solution steps. Here's how you can integrate each hat into the steps of Design Thinking:

4.4 An introduction to storytelling and visualisation technique

In Design Thinking, storytelling goes beyond conventional engagement tools to serve as a strategic framework that imbues user data with meaning, transforming it into impactful experiences and emotions. This integration of storytelling and visualisation acts as a bridge, linking abstract design concepts with the concrete experiences of users, thereby enhancing understanding and fostering emotional connection. Storytelling is a powerful tool that animates human-centred design. By

harnessing narratives, emotions, and user experiences, designers can forge meaningful bonds with their audience.

In Design Thinking, storytelling is not just about narrating; it's a deliberate practice that weaves together user experiences, emotions, and aspirations within the narrative structure of design solutions. Recent advancements in cognitive neuroscience highlight the profound impact of storytelling on the human brain. Research, such as studies published in the *Journal of Cognitive Neuroscience*, indicates that narratives can significantly improve memory retention and decision-making processes. For instance, a narrative that intertwines users' emotions with a product can create a stronger and more memorable connection compared to presenting the same product solely through factual data. This effect stems from the brain's natural tendency to organise information in narrative forms, a phenomenon referred to as 'narrative transport.'

4.4.1 Benefits of incorporating storytelling in Design Thinking

Storytelling within Design Thinking goes beyond mere narration; it's a strategic approach that integrates user experiences, emotions, and aspirations into the narrative framework of design solutions. Recent advancements in cognitive neuroscience highlight the profound impact that storytelling has on the human brain. Studies, such as those published in the *Journal of Cognitive Neuroscience*, demonstrate that narratives can significantly enhance memory retention and decision-making. For instance, a narrative that links users' emotions with a product can create a stronger and more memorable association compared to presenting the same product solely through factual data. This effect is attributed to the brain's natural inclination to organise information in story formats, known as 'narrative transport.'

Furthermore, incorporating storytelling into Design Thinking offers additional benefits:

1. **Engaging and Empathetic**: Storytelling captures users' attention, evokes emotions, and cultivates empathy, making design solutions more relatable and user-centred.

2. **Communicating Complex Ideas**: Stories simplify intricate concepts, enhancing understanding and retention for stakeholders and users alike.
3. **Inspiring Collaboration**: Storytelling fosters teamwork and alignment across diverse teams, facilitating the co-creation of innovative solutions.
4. **Driving Innovation**: Stories ignite creativity, spur new ideas, and challenge conventional thinking, leading to innovative design solutions.

4.4.2 Crafting Compelling Narratives

While storytelling brings user data and design concepts to life, visualisation complements these narratives by offering a clear and intuitive understanding of the story. A notable example of this approach is seen in Airbnb's 2014 redesign, which centred on property listings told through compelling stories. This strategy not only humanised the user experience but also significantly increased engagement and bookings, illustrating the transformative influence of well-crafted narratives in design. Similarly, in the automotive sector, Tesla showcases customer stories that emphasise the environmental benefits and cutting-edge technology of their vehicles, creating a compelling narrative that environmentally conscious consumers identify with.

Creating such narratives typically begins with developing user personas, which involve crafting detailed profiles representing key user segments. These personas serve as the foundation for storytelling workshops, where teams collaborate to create narratives that address the specific needs, challenges, and aspirations of these personas. This approach ensures that the resulting stories are grounded in real user experiences, enhancing their authenticity and impact.

4.4.3 Step-by-Step Guide: How to Incorporate Storytelling in Design Thinking

Step 1: Identify the Audience and Purpose

Begin by understanding your target audience and clarifying the purpose of your narrative. Define the key messages and objectives that you aim to convey through your storytelling.

Step 2: Define the Story Elements

Outline the essential components of your narrative, including characters, setting, plot, and conflicts. Align these elements closely with your design goals and the specific needs of your users.

Step 3: Craft a Compelling Narrative

Develop a well-structured story that captivates the audience throughout its entirety. Integrate elements such as a clear beginning, middle, and end, along with elements of tension and resolution.

Step 4: Visualise the Story

Utilise visual aids such as sketches, storyboards, or prototypes to animate your narrative. Visual elements enhance the impact of storytelling, aiding stakeholders and users in visualising the design concepts.

Step 5: Test and Iterate

Share your narrative with users and gather feedback to refine it further. Iteratively adjust the story based on insights gained, ensuring that it effectively communicates the intended message and the audience deeply identifies with it.

4.4.4 Tips for effective storytelling in Design Thinking

1. **Understand Your Audience**: Customise your narrative to align with the particular needs, preferences, and values of your target audience.
2. **Evoke Emotions**: Inject emotions into your storytelling to forge a stronger bond with users and stakeholders.

3. **Simplify Your Message**: Employ straightforward and succinct language, avoiding technical jargon that might impede comprehension.
4. **Listen Actively**: Collect user stories and experiences to integrate genuine and relatable elements into your narrative.
5. **Respect Time Constraints**: Adhere to allocated time frames to ensure audience engagement and willingness to hear more.

4.4.5 Storytelling significance in Design Thinking

Storytelling is of utmost importance in Design Thinking in the following ways:

Human Connection

Stories have the power to connect with people on an emotional level. By incorporating storytelling in Design Thinking, designers can create narratives that users identify with, making them feel understood and valued. This emotional connection fosters empathy, allowing designers to gain deeper insights into users' needs, desires, and aspirations.

Enhancing User Engagement

Stories have the ability to engage and captivate an audience. When design solutions are presented in the form of compelling narratives, users become active participants in the story, envisioning themselves as part of the design journey. This heightened engagement leads to a better understanding of how users interact with the design and elicits valuable feedback.

Communicating Complex Ideas

Design Thinking often deals with complex problems that can be difficult to convey effectively. Through storytelling, designers can simplify and communicate complex ideas in a relatable and digestible manner. Stories help to bridge the gap between designers and stakeholders by presenting information in a coherent and engaging way, making it easier for everyone involved to understand the vision and goals of the design.

Inspiring Creativity

Stories have the power to inspire and ignite creativity. By weaving narratives into the Design Thinking process, designers can tap into their imagination and push boundaries, resulting in innovative and "out-of-the-box" solutions. Stories provide a context and a sense of purpose, allowing designers to explore different perspectives, imagine possibilities, and think beyond conventional constraints.

Driving Collaboration

Storytelling encourages collaboration and teamwork within Design Thinking. When designers and stakeholders share stories, they create a common language and understanding, fostering a collaborative environment where diverse perspectives can be embraced. Stories serve as a catalyst for discussions, generating new ideas, and promoting a collective ownership of the design process.

4.4.6 Storytelling techniques

By incorporating storytelling techniques in Empathy and user stories, designers can cultivate a deeper sense of understanding and empathy towards users. This, in turn, leads to more user-centric and impactful design solutions that the intended audience truly identifies with.

Incorporating storytelling techniques into Empathy and user stories allows designers to foster a deeper understanding and empathy towards users, leading to more impactful and user-centred design solutions that the intended audience identifies with.

1. User Stories

User stories are fundamental elements of Design Thinking, and integrating storytelling techniques can significantly enhance their effectiveness. They enable designers to adopt a human-centred perspective and ensure that design solutions are tailored to meet users' actual needs. User stories typically follow a basic format, such as 'As a [type of user], I want [a specific need or goal], so that [benefit or outcome].'

2. Narrative

Narrative plays a crucial role in framing the context, scope, and direction of the design challenge. Designers can develop a compelling narrative that effectively outlines the problem. A narrative refers to the storyline or plot that integrates various aspects of the design challenge, creating a cohesive and engaging narrative that captures the essence of the problem, user motivations, and desired impact. A well-crafted narrative facilitates clear communication of the problem, inspires creativity, and aligns stakeholders around a shared vision.

3. Visual Storytelling

Visual storytelling utilises visual elements like images, sketches, diagrams, or storyboards to convey a narrative. Visuals have the ability to convey complex ideas and evoke emotions in a concise and powerful manner. By creating visual narratives, designers can enhance comprehension, engage stakeholders, and generate fresh insights. User stories serve as narratives that succinctly describe a specific user's experiences, needs, and goals. Visual storytelling is particularly valuable during Ideation, concept communication, and user testing phases, enabling designers to visually present their ideas and designs, making them compelling and understandable.

4. Journey Mapping

Journey mapping is a storytelling technique focused on visually mapping the user's experience over time. It involves visually depicting the user's interactions, emotions, and touchpoints throughout their journey with a product, service, or experience. Journey maps help designers to comprehend the user's perspective, uncover pain points, and identify opportunities for enhancement. By visualising the user's story and interactions, designers can develop empathy, identify critical moments of engagement or frustration, and devise solutions that address the user's needs at each stage of their journey.

4.5 Visualisation techniques in Design Thinking

Visualisation plays a crucial role in giving shape to ideas and narratives, encompassing various techniques that enhance understanding, facilitate communication amongst team members and stakeholders, and make abstract concepts tangible. Key visualisation techniques and their roles in the Design Thinking process include:

- **Sketches and Doodles**: These basic forms of visualisation offer a quick and accessible way to propose, explore, refine, and convey design ideas. They allow designers to rapidly visualise multiple concepts with minimal detail.
- **Wireframes**: More structured than sketches, wireframes outline the layout and functionality of digital interfaces. They provide a clear framework for understanding how users will interact with a product, translating the narrative into a concrete visual representation.
- **Prototypes**: Ranging from low to high fidelity, prototypes are essential for testing and refining design concepts. They provide interactive representations of the final product, crucial for making informed design decisions and iterating effectively.
- **Storyboards**: Combining storytelling with visualisation, storyboards detail user journeys and emotional experiences. They offer a comprehensive view of user interactions, fostering Empathy within design teams and highlighting critical moments in the narrative.
- **Journey Maps**: Visualising the user's journey through a service or product, journey maps depict key touchpoints and opportunities for design improvement. They emphasise the narrative flow and areas where design interventions can enhance user experience.
- **Infographics**: Using graphic design to convey information and data clearly, infographics are effective in presenting complex statistics and concepts within the narrative. They simplify information, making it accessible and engaging for stakeholders.
- **Digital Models and Simulations**: Advanced visualisation techniques involve creating digital models and simulations

that provide dynamic representations of design concepts. These simulations allow for in-depth exploration of the narrative in virtual environments, facilitating comprehensive understanding and exploration.

These techniques ensure that narratives are not only told but also visually represented, enhancing accessibility and engagement for all stakeholders involved in the design process.

4.5.1 How to use storytelling in a design process?

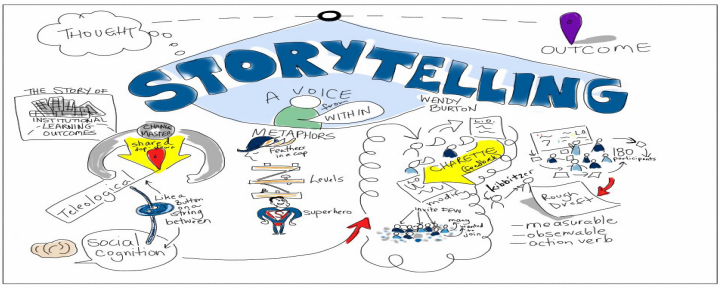


Figure 25: Using storytelling technique. Source: Williams and Watson (2017)

As Design Thinking is a human-centric process, it makes sure that the user evolves at every step of the process to provide a customised solution. That's when storytelling comes into the picture at every step with a different way of being implemented. In general, storytelling can be found in three segments: problem framing, solution framing, and solution implementation.

1. Problem Framing

Early in the design process, problem framing aims to identify and understand the core issue that needs addressing. Storytelling plays a crucial role in this step by engaging the design team with users to gain qualitative insights from research. Through multiple storytelling sessions with users who fit specific persona characteristics, data is collected and analysed to develop a comprehensive understanding of the problem. Storytelling tools enable customers to articulate their experiences and pain points,

fostering empathy and creating Empathy maps that depict customer sentiments and experiences.

2. Solution Framing

During solution definition and prototyping steps, the design team generates multiple alternative ideas that require testing and evaluation to determine the best option from the user's perspective. Storytelling is utilised in this step but with a different objective: to establish a dialogue with customers to validate the efficacy of proposed solutions. Customer feedback gathered through storytelling sessions during prototyping is crucial, as it provides insights into how users interact with the prototype solutions, aiding in refining and selecting the most suitable option.

3. Solution Implementation

One practical aspect of the Design Thinking process is the ability to gather user input on a product or service for future enhancements. Storytelling becomes valuable in this step to investigate real-world usage scenarios and how customers engage with the final product on a daily basis. Feedback gathered from storytelling sessions informs improvements for future iterations of the product.

Storytelling proves beneficial at various steps of the design process, particularly for capturing individualised customer experiences. While these experiences are unique and may not easily translate into standardised data, storytelling excels in providing insights into the empathetic experiences that users have with a product or service. This unique capability enhances the Design Thinking process, especially in addressing specialised challenges such as medical procedures or individualised use cases.

4.5.2 Connecting with your users through stories

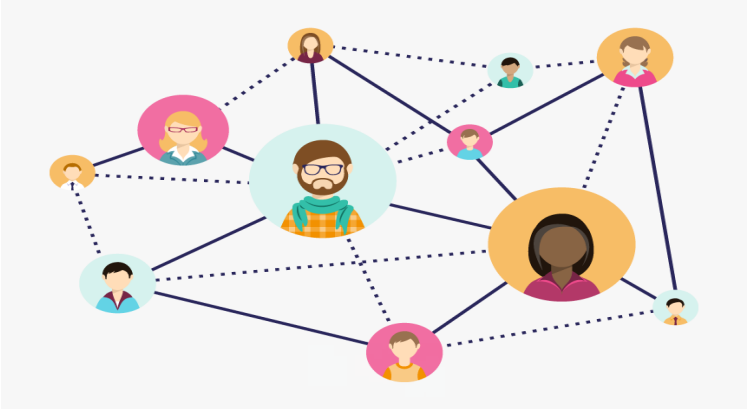


Figure 26: Connecting users through stories. Source: Beckman (2020)

The best way to use storytelling to share the research results with the users is by implementing an engaging way to create empathy. It helps to keep the design process user-centric and you can do it by:

Defining personas for your users

Personas contemplate a story about your insights that are based on user research. By defining the personas, you can visualise the experiences of your user and can gain insights into empathy. For example, Nisha, a 48-year-old Corporate Manager, is struggling to find a work-life balance. She barely takes time off from her work, feels worn out and wants to steer her life in a different direction.

Examples of Effective Storytelling

- **Nike**: Inspirational stories about athletes overcoming challenges.
- **Airbnb**: Stories from hosts and travellers about their experiences.
- **Dove**: Campaigns like *Real Beauty* showcasing real women and their stories.

4.6 An introduction to reverse brainstorming technique

To achieve creative outcomes, the process itself must be innovative and creative. However, traditional brainstorming may sometimes lack the creativity needed to yield desired results from a meeting session. Reverse brainstorming offers an alternative approach by reversing the typical flow of problem-solving. This method utilises the human mind's ability to generate better ideas and solutions by focusing on causing or exacerbating problems instead of directly solving them (Bosman, 2019).

Reverse brainstorming combines brainstorming with reversal techniques to stimulate creativity. Instead of immediately seeking direct solutions, the process begins by identifying ways to cause or exacerbate a problem. These ideas are then flipped or reversed to uncover novel solutions that may not have been considered before. This technique proves valuable when conventional problem-solving approaches prove challenging, as it engages participants and reveals underlying issues in processes or products.

4.6.1 Using reverse brainstorming as a Design Thinking tool

Instead of asking how to solve a problem, reverse brainstorming shifts focus to understanding what causes the problem or how to achieve an opposite outcome from what is expected. This approach helps teams to gain deeper insights into the problem and distinguishes potential solutions from other ideas discussed during the session. For instance, rather than brainstorming ways to reduce costs, the team explores how to increase costs, leading to innovative perspectives.

To implement reverse brainstorming, start by framing one of two "reverse" questions:

1. Instead of asking, "How do I solve or prevent this problem?" ask, "How could I possibly cause this problem?"
2. Instead of asking, "How do I achieve these results?" ask, "How could I possibly achieve the opposite effect?

Then, brainstorm answers to generate reverse solution ideas. Allow the ideas to flow freely – do not reject anything at this stage.

1. Once you have brainstormed all the ideas to create the problem, now reverse these into solution ideas for the original problem or challenge.
2. Finally, evaluate these solution ideas. Can you see a potential solution? Can you see attributes of a potential solution?
3. Like normal brainstorming, you can reverse brainstorm on your own, but you will likely generate more varied ideas as part of a team.

4.6.2 The objectives of applying reverse brainstorming

Reverse brainstorming introduces unconventional thinking methods to achieve solutions that traditional approaches may overlook. As creative thinking requires a unique flow of ideas, reverse brainstorming enables teams to generate innovative solutions using distinct methods. This technique can be applied directly in discussion meetings or employed when conventional brainstorming fails to yield the desired solution or creative approach.

4.6.3 Steps of reverse brainstorming

A reverse brainstorming session follows a structured approach to achieve its objectives through five main steps. The team collaborates through each step, fostering group discussion and exploration:

- **Step 1**: Clearly define the problem that needs resolution by the end of the group meeting.
- **Step 2**: Reverse the expected process by asking questions like "How can we exacerbate the problem?" instead of "How can we solve it?"
- **Step 3**: Gather all the reversed solutions without criticism; all ideas are accepted.
- **Step 4**: Once potential ways to worsen the problem are identified, reverse these ideas to find potential fixes or improvements.
- **Step 5**: Evaluate and judge the results to determine the best solution.

While the overall structure of reverse brainstorming mirrors traditional brainstorming, the sequence of steps is reversed to explore solutions by first understanding how the problem can be worsened. These steps are facilitated during stakeholder meetings using basic tools such as a whiteboard, coloured erasable markers, and sticky notes.

4.6.4 An example for applying reverse brainstorming

An example of applying reverse brainstorming involves a design company tasked with enhancing the website design for a specific client. The issue identified is that visitors to the website do not stay on the site for sufficient time or engage adequately with its content. The reverse brainstorming session proceeds as follows:

Firstly, the team identifies the core problem to be addressed: the lack of engagement and interaction from website users.

Next, the team reverses the problem perspective. For instance, they explore how they could actively discourage users from staying on the website or reduce their interaction with the content.

In the third step, the team considers strategies to deter users from visiting and interacting with the website. For instance, the team manager instructed designers to brainstorm methods to achieve this objective. Some of the ideas generated include:

1. Implementing complex navigation structures that make it difficult for users to find desired content.
2. Selecting a disruptive colour scheme and using difficult-to-read fonts.
3. Hosting the website on a slow server to increase loading times.
4. Incorporating large file sizes that are challenging to load quickly.

After brainstorming methods to deter users from the website, the fourth step involves reversing these strategies to arrive at potential solutions for the problem, such as:

1. Simplifying navigation and ensuring a clear website structure.
2. Opting for a pleasing colour scheme and using easily readable fonts.
3. Selecting a dependable hosting service to ensure fast website loading.
4. Optimising website content for proper viewing by users.

The fifth step determines which of these methods are not applicable to the website and how to apply the needed methods in order to solve the user interaction problem.

4.6.5 Lego® Serious Play®: A case study

Using LEGO® Serious Play® to enable strategic innovation and systems thinking in design.

Background

In the mid-1990s, the LEGO® Group faced the challenge of reinventing traditional strategic planning approaches. Recognising the limits of linear, top-down methods, LEGO® partnered with academics Johan Roos and Bart Victor to develop a more engaging, creative, and inclusive tool for navigating business complexity. This led to the creation of LEGO® Serious Play® (LSP) - a method that blends hands-on model building with facilitated group dialogue, grounded in constructivist and constructionist learning theories (Burton, 2018).

Purpose and Context

This case study examines the application of LSP in complex problem-solving and team-based innovation, with a focus on its integration into Design Thinking, systems thinking, and positive psychology. The method has been employed across sectors - public institutions, corporate strategy sessions, educational contexts - to support strategic alignment, ideation, and participatory engagement.

Implementation: Methodology and Practice

1. **Engagement Format**

1. **Participants**: Typically, four to eight per group to ensure inclusive dialogue
2. **Facilitation**: A trained facilitator presents challenges framed as open-ended questions
3. **Process**:
   - Participants build LEGO® models in response to the challenge.
   - Each shares the story behind their model.
   - Others ask questions for clarification and deeper understanding.
   - Insights are documented, refined, and iteratively expanded.

2. **Techniques Used**

1. **Hands-On Thinking**: Developed by Mads Bab, this approach encourages embodied cognition - thinking through building.
2. **Scenario Planning**: Participants create "future states" of systems or strategy visions through iterative modelling.
3. **Feedback Loop Mapping**: Used to visualise causal relationships and system behaviours in organisational contexts.

Application in Strategic and Systems Design

Case Application 1: Systems Thinking in Healthcare

In a regional healthcare planning workshop, participants used LSP to model the healthcare ecosystem, including providers, patients, regulatory entities, and resource flows. This visual mapping:

1. Uncovered feedback loops between community health and policy
2. Identified under-utilised intervention points
3. Enabled stakeholders to articulate system-wide effects of small changes

Case Application 2: Educational Transformation in Rural Schools

In a session focused on digital inclusion for under-resourced schools, educators and community leaders used LSP to:

1. Model barriers to access (infrastructure, teacher training, policy).
2. Envision inclusive digital classrooms.
3. Develop a multi-stakeholder roadmap by aligning physical models with policy intentions.

Outcomes and Impact

Table 15: Outcomes and impact

Impact Area	Observed Benefits
Inclusive Engagement	Equal opportunity for all voices to contribute, especially introverted participants
Systemic Understanding	Enhanced ability to see interconnections and long-term dynamics in complex problems
Innovation and Ideation	Creative metaphors stimulated breakthrough thinking and deeper exploration
Psychological Safety	Participants reported higher comfort in expressing sensitive or ambiguous insights
Tangible Problem-Solving	Model iterations led to actionable strategies and clearer shared understanding

Source: Author's conceptualisation

Integration with Design Thinking and Positive Psychology

Table 16: LSP alignment with the steps of Design Thinking:

Design Thinking Step	LSP Contribution
Empathise	Models reveal user emotions, needs, and perspectives
Define	Shared models clarify problem framing and stakeholder values
Ideate	Physical ideation allows rapid prototyping and divergent thinking
Prototype	Visual metaphors become low-fidelity prototypes for discussion

Design Thinking Step	LSP Contribution
Test	Model feedback guides refinement and co-ownership of solutions

Source: Author's conceptualisation

Furthermore, LSP's alignment with positive psychology fosters emotional safety, resilience, and reflection. It supports narrative coaching, where participants explore identity and transformation through the act of model storytelling - particularly impactful amongst youth and emerging leaders navigating change.

Lessons Learned

1. **Not Just Play**: Despite its playful form, LSP is a rigorous methodology requiring skilled facilitation and intentional question framing.
2. **Beyond the Model**: The value lies not in the physical structure but in the shared meaning and reflective dialogue that it enables.
3. **Cultural Sensitivity Matters**: Successful LSP deployment adapts metaphors and language to local cultural contexts.
4. **Scales Across Domains**: From strategy workshops to crisis simulations, LSP demonstrates flexibility across sectors.

Conclusion

LEGO® Serious Play® transcends its origins as a toy to become a transformative design tool. Its ability to unlock creative, systemic, and human-centred insights makes it particularly powerful in contexts where traditional tools fail to surface deep understanding or shared ownership. By integrating principles of Design Thinking, systems thinking, and positive psychology, LSP offers a scalable, inclusive, and emotionally intelligent framework for co-creating meaningful solutions in a complex world.

4.6.6 Summary

This chapter introduced a suite of creative and analytical tools designed to enhance the implementation of Design Thinking, particularly in ideation, prototyping, and user testing steps. The focus was on methods that encourage divergent thinking,

empathy, collaboration, and rapid experimentation - key attributes of the Design Thinking mindset.

The chapter opened with an overview of **SCAMPER**, a structured technique built on the principles of modification and innovation. Each letter - Substitute, Combine, Adapt, Modify, Put to Another Use, Eliminate, and Reverse - serves as a prompt to rethink existing products, services, or processes. Through real-world examples and step-by-step applications, SCAMPER was positioned as a vital tool for reimagining possibilities and stimulating breakthrough thinking.

Following this, the **Crazy Eights** technique was presented as a rapid ideation method that encourages participants to sketch eight distinct ideas in eight minutes. This high-paced exercise reduces overthinking and supports creative risk-taking, while also enabling teams to collaboratively evaluate and iterate on emerging concepts.

The chapter then explored **Edward de Bono's Six Thinking Hats**, a cognitive framework that structures thinking into six modes - facts, emotions, caution, optimism, creativity, and process control. This tool is particularly useful for facilitating balanced and inclusive discussions, allowing individuals and teams to evaluate ideas from multiple perspectives.

Storytelling and visualisation were introduced as tools to deepen empathy, enhance engagement, and improve the communication of user needs and design intentions. Storytelling helps designers to humanise abstract data, create emotional connections, and frame design challenges in relatable narratives. Complementary visual techniques such as journey maps, storyboards, and wireframes - were used to bring these narratives to life and support user-centred prototyping.

The chapter concluded with **Reverse Brainstorming**, an inversion of traditional problem-solving where participants first explore ways to cause or worsen a problem, then reverse those ideas to identify innovative solutions. This technique is particularly valuable when conventional brainstorming has failed to yield results, as it fosters a fresh perspective on systemic challenges.

A case application of **LEGO® Serious Play® (LSP)** highlighted its role in strategic innovation and systems thinking. LSP uses hands-on model building to explore complex ideas and stakeholder relationships, promoting deep reflection, shared understanding, and collaborative solution development.

Overall, the chapter emphasised that these tools are not standalone techniques but integral components of a Design Thinking process that values empathy, iteration, and co-creation. By mastering these tools, individuals and teams enhance their capacity to generate user-centred solutions and drive meaningful innovation in diverse contexts.

Design Thinking Tools – Activity and Assessment Sheet

This activity and assessment sheet is designed to support learners in applying Design Thinking tools individually and in groups. It includes practical exercises, reflection questions, and a space to assess learning outcomes. Use the table below to guide activities during class or workshops, ensuring engagement with SCAMPER, Crazy Eights, Six Thinking Hats, Storytelling, and Reverse Brainstorming.

1. Individual Activities

Tool	**Activity Description**	**Your Response / Sketch**	**Self-Assessment (✓ or ✗)**
SCAMPER	Choose a household item and apply any 3 SCAMPER techniques to redesign it.	[Space for response or sketch]	[✓ or ✗]
Crazy Eights	Draw 8 different ideas for solving a given design problem in 8 minutes.	[Space for response or sketch]	[✓ or ✗]
Six Thinking Hats	Reflect on a recent decision and write down your thoughts wearing each of the six hats.	[Space for response or sketch]	[✓ or ✗]
Storytelling	Write a short user story that captures a pain point and proposed solution.	[Space for response or sketch]	[✓ or ✗]
Reverse Brainstorming	Think of how to make a product worse, then reverse the ideas into solutions.	[Space for response or sketch]	[✓ or ✗]

2. Group Activities

Activity Title	Instructions	Group Output / Sketch	Facilitator Comments
SCAMPER Challenge	Work in groups of 3 to 4. Select a problem and use all 7 SCAMPER steps to ideate a solution.	[Paste sketch or summary here]	[Facilitator notes]
Crazy Eights Sprint	Each group member creates 8 ideas. Choose the best 2 to 3 as a team and combine them.	[Paste sketch or summary here]	[Facilitator notes]
Six Hats Debate	Assign each member a Thinking Hat. Debate a proposed idea from all six perspectives.	[Paste sketch or summary here]	[Facilitator notes]
User Journey Storyboard	Create a storyboard of a user's experience from discovery to solution.	[Paste sketch or summary here]	[Facilitator notes]
Reverse Innovation	Reverse brainstorm on a failed project and suggest revised ideas based on group consensus.	[Paste sketch or summary here]	[Facilitator notes]

1. Reflection and Feedback

Answer the following questions individually or as a group:

- Which tool helped you to generate the most creative ideas? Why?
- What challenges did you face while applying any of the tools?
- How did collaboration impact the quality of the group ideas?
- Which activity did you enjoy the most, and why?
- How might you use these tools in real-life problem-solving scenarios?

5. Conclusion

This book set out to explore the transformative power of Design Thinking as both a methodology and a mindset for addressing persistent challenges in governance, policy, economic development, and public service innovation. In traversing the theoretical, conceptual, and practical dimensions of design-led approaches, it has provided a compelling framework for rethinking how institutions can respond more adaptively, empathetically, and inclusively to the needs of their constituents, especially within emerging and resource-constrained contexts like those found in many parts of Africa.

From Rigid Bureaucracy to Adaptive Systems

One of the book's key contributions is its critique of traditional bureaucratic paradigms that prioritise linear planning, control, and compliance at the expense of flexibility, innovation, and user-centricity. Through detailed exposition and practical case studies, it has been demonstrated that such legacy systems are ill-equipped to address "wicked problems" - issues characterised by complexity, stakeholder conflict, and systemic inertia.

In contrast, the Design Thinking framework with its emphasis on Empathy, Ideation, Prototyping, and iteration offers a more agile, exploratory, and participatory model of governance and policy design. The book has argued persuasively that applying this mindset does not diminish rigour or strategic discipline; instead, it enhances legitimacy, responsiveness, and sustainable impact.

Local Relevance, Global Resonance

A central strength of this work is its situatedness within the African public sector context, particularly within the Joe Gqabi District and other underdeveloped municipalities. It offers a grounded approach to contextual adaptation of global innovation practices. Rather than the wholesale importing of foreign design models, the text shows how Design Thinking

can be indigenised, infused with local values, languages, and development imperatives.

At the same time, the principles elaborated throughout, empathy, co-creation, experimentation, systems awareness, are universally relevant. The work thus provides a valuable bridge between global design scholarship and local governance reform.

Integrating Multidisciplinary Frameworks

Another major intellectual contribution is the book's integration of multiple theoretical models, such as adaptive leadership, public value theory, the Cynefin framework, and equity-centred design. Rather than treating Design Thinking as a siloed technique, the book presents it as a transdisciplinary platform for navigating complexity, power dynamics, and institutional change.

These frameworks have been harmonised not only to enrich conceptual clarity but also to equip practitioners with pragmatic tools that enable deep listening, stakeholder alignment, and experimentation in uncertain environments.

Voice, Inclusion, and Empowerment

Throughout the chapters, one theme consistently emerges: the centrality of people, especially marginalised voices, in the design and delivery of solutions. The emphasis on empathy and inclusion is not rhetorical; it is substantiated by methodological innovations such as multiple POV statements, Empathy maps, participatory journey mapping, and stakeholder co-design labs.

This foregrounding of human dignity and lived experience represents a profound shift from top-down governance to co-produced development, where solutions are not brought to people but with them.

Towards a New Practice of Public Imagination

Ultimately, this book is a call to action. It invites policymakers, public managers, development practitioners, and scholars to reimagine their roles - not as administrators of static programmes, but as facilitators of discovery, learning, and transformation.

To institutionalise Design Thinking in governance requires more than tools. It requires a culture of curiosity, courage, and care. This culture must be embedded in leadership, resourcing, education, and policymaking processes at every level.

Final Reflection

As this book has shown, Design Thinking is not a silver bullet - but it is a powerful compass. In a world marked by volatility, inequality, and rapid change, the ability to listen deeply, design inclusively, and adapt collaboratively is not optional, it is essential. Through rigorous exploration and passionate advocacy, this work affirms that design is not just how we make things better - it's how we make things possible.

6. References

Abu-Akel, A. & Webb, M. (2020). Autistic and positive schizotypal traits respectively predict better convergent and divergent thinking performance. *Thinking Skills and Creativity, 36*(1), 100-656. https://doi.org/10.1016/j.tsc.2020.100656

Amoeboids. (2025). *What is a five whys template?* Amoeboids.com. [Online]. Available at: https://amoeboids.com/blog/5-why-root-cause-analysis-guide/

Anaissie, T. (2020). *Equity-centred community design framework.* Creative Reaction Lab. [Online]. Available at: https://crxlab.org/our-approach

Barré, J., Buisine, S. & Aoussat, A. (2018). Persona logical thinking: improving requirements elicitation for multidisciplinary teams. *CoDesign: International Journal of CoCreation in Design and the Arts, 14*(2), 218-237. https://doi.org/10.1080/15710882.2017.1301959

Beckman, S. (2020). To frame or reframe: Where might design thinking research go next? *California Management Review, 62*(2), 144-162. https://doi.org/10.1177/0008125620906620

Bittner, E. & Shoury, O. (2019). *Designing Automated Facilitation for Design Thinking: A Chatbot for Supporting Teams in the Empathy Map Method*. Proceedings of the 52nd Hawaii International Conference on System Sciences. https://doi.org/10.24251/HICSS.2019.029

Boot, N., Baas, M., Mühlfeld, E., Dreu, C. & Gaal, S. (2017). Widespread neural oscillations in the delta band dissociate rule convergence from rule divergence during creative idea generation. *Neuropsychologia, 104*(2017), 8-17. https://doi.org/10.1016/j.neuropsychologia.2017.07.033

Bosman, L. (2019). From doing to thinking: Developing the entrepreneurial mindset through scaffold assignments and self-regulated learning reflection. *Open Education Studies, 1*(2019), 106-121. https://doi.org/10.1515/edu-2019-0007

Bourdeau, S., Lesage, A., Caron, B. & Léger, P. (2020). *When design novices and LEGO meet: Stimulating creative thinking for interface design*. Proceedings of the CHI Conference on Human Factors in Computing Systems, Australia. https://doi.org/10.1145/3313831.3376495

Brown, T. (2009). *Change by design: How design thinking transforms organizations and inspires innovation*. Brighton, MA: Harvard Business Press.

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, *8*(2), 5–21. https://doi.org/10.2307/1511637

Burton, R. M. (2018). *Organisation design: A step-by-step approach.* (3rd ed.) Cambridge: Cambridge University Press.

Chan Kim, W. & Mauborgne, R. (2005). *Blue ocean strategy: How to create uncontested market space and make competition irrelevant*. Brighton, MA: Harvard Business Review Press.

Cross, N. (1982). Designerly ways of knowing. *Design Studies*, *3*(4), 221–227. https://doi.org/10.1016/0142-694X(82)90040-0

Dam, R. F. (2025). *The 5 Stages in the Design Thinking Process*. Interaction Design Foundation - IxDF, 13 March 2025. [Online]. Available at: https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process

De Bono, E. (1985). *Six Thinking Hats: An essential approach to business management*. New York: Little Brown & Co.

Deitte, L. & Omary, R. (2019). The power of design thinking in medical education. *Academic Radiology*, *26*(10), 1417-1420. https://doi.org/10.1016/j.acra.2019.02.012

Djordjevic, M. (2019). *Design thinking in programming labs.* Paper presentation at 11th International Conference on Education and New Learning Technologies, Palma, Spain. https://doi.org/10.21125/EDULEARN.2019.2559

Dobrigkeit, F., Pajak, P., Paula, D. & Uflacker, M. (2019). DT@IT toolbox: Design thinking tools to support everyday software development. In: Meinel, C., Leifer, L. (eds.) *Design thinking research: Investigating design team performance*. Cham: Springer. https://doi.org/10.1007/978-3-030-28960-7_13

Elsbach, K. & Stigliani, I. (2018). Design thinking and organisational culture: A review and framework for future research. *Journal of Management*, *44*(1), 2274–2306. https://doi.org/10.1177/0149206317744252

Ferreira, B., Silva, W., Barbosa, S. & Conte, T. (2018). Technique for representing requirements using personas: A controlled experiment. *IET Software*, *12*(1), 280–290. https://doi.org/10.1049/iet-sen.2017.0313

Foster, M. K. (2021). Design thinking: A creative approach to problem-solving. *Management Teaching Review*, *6*(2), 123–140. https://doi.org/10.1177/2379298119871468

Garrette, B., Phelps, C. & Sibony, O. (2018). Structure and solve the problem using design thinking. In: Garrette, B., Phelps, C. & Sibony, O. (eds.) *Cracked it!* Cham: Springer Nature. https://doi.org/10.1007/978-3-319-89375-4_9

Gero, J. & Milovanovic, J. (2020). A framework for studying design thinking through measuring designers' minds, bodies, and brains. *Design Science*, *6*(1), 234–245. https://doi.org/10.1017/dsj.2020.15

Gwangwava, N. (2021). Learning design thinking through a hands-on learning model. *International Journal of Innovative Teaching and Learning in Higher Education*, *2*(1), 1-19. https://doi.org/10.4018/IJITLHE.20210101.OA4

Haag, M. & Marsden, N. (2019). Exploring personas as a method to foster empathy in student IT design teams. *International Journal of Technology and Design Education*, *29*(2), 565–582. https://doi.org/10.1007/S10798-018-9452-5

Haryanto, B. (2019). *Revamping the Qiscus website — a UX case study*. Medium, 12 Feb 2019. [Online]. Available at: https://uxdesign.cc/revamping-the-qiscus-website-a-ux-case-study-e3810ac22a98

Victoria State Government. (n.d.). *Human-centred design case studies*. Victoria State Government. http://www.vic.gov.au

Hölsle, K. & Rhinow, H. (2019). The dilemmas of design thinking in innovation projects. *Project Management Journal*, *50*(1), 418–430. https://doi.org/10.1177/8756972819853129

Jansen, B., Salminen, J., Jung, S. & Guan, K. (2021). Data-driven personas. *Synthesis Lectures on Human-Centered Informatics, 25*(3), 1–7. https://doi.org/10.2200/S01072ED1V01Y202101HCI048

Johansson-Sköldberg, U., Woodilla, J. & Çetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and Innovation Management, 22*(2), 121–146. https://doi.org/10.1111/caim.12023

Kelley, T. & Kelley, D. (2013). *Creative confidence: Unleash the creative potential within us all*. New York: Crown Currency.

Kimbell, L. (2011). Rethinking design thinking: Part I. *Design and Culture, 3*(3), 285–306. https://doi.org/10.2752/175470811X13071166525216

Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners* (5th ed.) Thousand Oaks, CA: Sage.

Liedtka, J. (2011). Learning to use design thinking tools for successful innovation. *Strategy & Leadership, 39*(5), 13–19. https://doi.org/10.1108/10878571111161480

Liedtka, J. (2015). Linking design thinking with innovation outcomes through cognitive bias reduction. *Journal of Product Innovation Management, 32*(6), 925–938. https://doi.org/10.1111/jpim.12163

Lindberg, T., Meinel, C. & Wagner, R. (2010). Design thinking: A fruitful concept for IT development? In: Meinel, C., Leifer, L. & Plattner, H. (eds.) *Design thinking: Understand-improve-apply*, pp. 3–18. Heidelberg: Springer Berlin. https://doi.org/10.1007/978-3-642-13757-0_1

Lorusso, L., Lee, J. & Worden, E. (2013). Design thinking for healthcare: Transliterating the creative problem-solving method into architectural practice. *HERD: Health Environments Research and Design Journal, 14*(1), 16–29. https://doi.org/10.1177/1937586721994228

Lugmayr, A., Stockleben, B., Zou, Y., Anzenhofer, S. & Jalonen, M. (2014). Applying "design thinking" in the context of media management education. *Multimedia Tools and Applications, 71*(2014), 119–157. https://doi.org/10.1007/s11042-013-1361-8

Magistretti, S., Ardito, L. & Petrusselli, A. (2021). Framing the micro foundations of design thinking as a dynamic capability for innovation: Reconciling theory and practice. *Journal of Product Innovation Management, 38*(6), 645-667. https://doi.org/10.1111/JPIM.12586

Marambana, V. P. (2024). *Design thinking competency handbook: A professional guide for cultivating a human-centred mindset*. South Africa: Self-published.

Martin, R. (2009). *The design of business: Why design thinking is the next competitive advantage*. Brighton, MA: Harvard Business Press.

Meinel, C. & Leifer, L. (2011). Design thinking research. In: Plattner, H., Meinel, C. & Leifer, L. (eds.) *Design thinking research: Studying co-creation in practice,* pp. 1–11. Heidelberg: Springer Berlin. https://doi.org/10.1007/978-3-642-21643-5_1

Mijač, T., Jadrić, M. & Ćukušić, M. (2018). *The potential and issues in data-driven development of web personas*. Proceedings of 2018 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), pp. 1237-1242. https://doi.org/10.23919/MIPRO.2018.8400224

Mulgan, G. (2014). *Design in public and social innovation: What works and what could work better*. Nesta Discussion Paper.

Nakata, C. (2020). Design thinking for innovation: Considering distinctions, fit, and use in firms. *Business Horizons, 63*(1), 763–772. https://doi.org/10.1016/j.bushor.2020.07.008

Norman, D. (2013). *The design of everyday things*. Revised and expanded edition. New Yok: Basic Books.

Norman, D. A. (2010). The research-practice gap: The need for translational developers. *Interactions, 17*(4), 9–12. https://doi.org/10.1145/1806491.1806494

Ohno, T. (1988). *Toyota production system: Beyond large-scale production*. New Yok: Productivity Press.

Osborn, A. (1953). *Applied imagination: Principles and procedures of creative problem-solving*. New York: Scribner.

Plattner, H., Meinel, C. & Leifer, L. (eds.) (2011). *Design thinking: Understand - improve - apply*. Cham: Springer. https://doi.org/10.1007/978-3-642-31991-4

Plattner, H., Meinel, C. & Leifer, L. (eds.) (2014). *Design thinking research: Building innovation eco-systems*. Cham: Springer. https://doi.org/10.1007/978-3-319-06823-7

Prestes, M., Parisi, R., Marcsak, S. & Conte, T. (2020). On the use of design thinking: A survey of the Brazilian agile software development community. *Agile Processes in Software Engineering and Extreme Programming, 383*(1), 73–86. https://doi.org/10.1007/978-3-030-49392-9_5

Reddy, P. D., Iyer, S. & Sasikumar, M. (2016). *Teaching and learning of divergent and convergent thinking through open-problem solving in a data structures course*. Proceedings of the 2016 International Conference on Learning and Teaching in Computing and Engineering (LaTICE). pp. 178–185. IEEE. https://doi.org/10.1109/LaTiCE.2016.13

Rittel, H. W. J. & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*(2), 155–169. https://doi.org/10.1007/BF01405730

Robbins, P. (2018). From design thinking to art thinking with an open innovation perspective-A case study of how art thinking rescued a cultural institution in Dublin. *Journal of Open Innovation: Technology, Market, and Complexity, 4*(4), Article 57. https://doi.org/10.3390/joitmc4040057

Senapathi, M. & Drury-Grogan, M. L. (2021). Systems thinking approach to implementing Kanban: A case study. *Journal of Software: Evolution and Process, 33*(4), e2322. https://doi.org/10.1002/smr.2322

Sibony, O. (2025). *Oliver Sibony*. [Online]. Available at: https://oliviersibony.com/about/

Simon, H. A. (1969). *The sciences of the artificial*. Cambridge, MA: MIT Press.

Smith, M. & Nigro, S. (2023). Applying design-thinking principles to practice-based pharmacy research. *The Annals of Pharmacotherapy, 44*(1), 23–25. https://doi.org/10.1177/10600280221147014

Tonkinwise, C. (2011). A taste for practices: Unrepressing style in design thinking. *Design Studies, 32*(6), 533–545. https://doi.org/10.1016/j.destud.2011.07.001

Van Boxel, M. (2016). *Speeding up projects with design sprints*. Central, 17 Oct 2016. [Online]. Available at: https://blog.central.team/speeding-up-projects-with-design-sprints-4d46d53c0651

Von Busch, O. & Faerber, J. (2016). *Designing socially: The ethics of design in a global context*.

Williams, A. & Watson, G. T. (2017). *Design thinking: Exploring the effect of appropriability and capabilities on innovation performance in knowledge-intensive business services.* Doctoral dissertation, University of Maryland University College. https://doi.org/10.2139/ssrn.3241695

Wolcott, M. & McLaughlin, J. (2020). Promoting creative problem-solving in schools of pharmacy with the use of design thinking. *American Journal of Pharmaceutical Education*, *84*(1), 34–36. https://doi.org/10.5688/ajpe8065

Wray, T. B., Kahler, C. W., Simpanen, E. M. & Operario, D. (2019). User-centred, interaction design research approaches to inform the development of health risk behaviour intervention technologies. *Internet Interventions*, *15*(2019), 1–9. https://doi.org/10.1016/j.invent.2018.10.002

Zhang, X., Shang, H., Shang, L., Shu, Y. & Hu, F. (2019). Double-diamond model-based orientation guidance in wearable human–machine navigation systems for blind and visually impaired people. *Sensors*, *19*(21), 4670. https://doi.org/10.3390/s19214670

Appendix A

Part One Memorandum

Subject: Understanding the stages and principles of Design Thinking

This memo captures the responses and reflections from the activity sheet titled 'Understanding the Stages and Principles of Design Thinking'. It includes individual reflections, a Design Thinking challenge, and a summary of the group exercise applying the six stages of the design process.

Reflection and Practice

1. The most challenging step is 'Define' because narrowing down broad user insights into a clear and actionable problem statement requires precision and focus.
2. A real-world problem that could be addressed is: 'High dropout rates in rural high schools attributable to lack of motivation and learning support.'
3. Empathy allows us to truly understand user needs and motivations, leading to more relevant and impactful solutions. It fosters human-centred design outcomes.
4. The most critical stage is 'Empathise,' because without a deep understanding of users, any solution risks being irrelevant or ineffective.
5. An opportunity to use Design Thinking is to improve recycling habits in local schools by designing a more intuitive waste-sorting system.

2. Your Design Thinking Challenge

Problem Selected: Limited access to mental health support amongst students.

Step	Your Input
Empathise	Conducted interviews with students to understand their emotional challenges and barriers to accessing support.
Define	Students experience anxiety and academic stress but lack confidential and immediate support channels.
Ideate	Developed ideas such as peer-support chat, a digital stress journal, and pop-up mental wellness booths.
Prototype	Created mock-ups of a student-led mental health app with daily check-ins and anonymous support options.
Test	Shared the prototype with a small group of students and gathered feedback on usability and trust factors.

3. Group Exercise – Applying Design Thinking

Group Challenge: Improving access to healthy meals for school learners.

Step	Key Questions	Group Response
Empathise	Who are the users? What are their needs, challenges, and emotions?	Primary school learners; face hunger, low energy, and rely on school meals for nutrition.
Define	What is the core problem that you are solving?	Inconsistent access to nutritious school meals caused by supply and logistical issues.
Ideate	What are some creative ideas or solutions?	Mobile food carts, community-run kitchens, digital pre-order systems.
Prototype	What can you build or simulate quickly to demonstrate the idea?	Created a visual model of a solar-powered mobile food unit with modular storage.
Test	How can you gather feedback to refine your solution?	Presented model to teachers and parents for input; adjusted meal variety and delivery process.

Appendix B

Part Two Memorandum

Subject: The Psychology of Design Thinking

This memo documents responses from the activity sheet titled 'The Psychology of Design Thinking.' It includes reflective insights, group activities, Empathy exercises, and Ideation outcomes based on Design Thinking psychology principles.

Section A: Reflective Understanding of Empathy

Activity A1 – Match the Concept

1. The ability to intellectually understand someone's perspective - Cognitive Empathy
2. Feeling what another person is feeling - Emotive Empathy
3. Taking action based on shared understanding - Empathic Action

Activity A2 – Empathy in Action

Example: The redesign of public transport in Bogotá, Colombia, used deep user insights to improve bus access for low-income commuters.

Empathy Type: Empathic Action - The redesign included safer bus stops and simplified ticketing systems.

Inspiration: This shows how inclusive listening and equity thinking can shape service innovations rooted in real needs.

Section B: Empathy Mapping Workshop

Scenario: Designing a mobile app for rural women entrepreneurs.

What does she SAY?

"I want to sell my crafts, but no one outside my village knows about them."

What does she THINK?

"If I could use a phone app, I could reach more buyers."

What does she DO?

She hand-makes items daily but relies on local markets only.

What does she FEEL?

Frustrated by lack of visibility, but hopeful when shown digital options.

Section C: Ideation Techniques Lab

Activity C1 – SCAMPER applied to a community library

- **Substitute**: Replace physical books with QR-coded mobile-access versions.
- **Combine**: Merge reading zones with digital maker spaces.
- **Adapt**: Adapt library for community events and micro-workshops.
- **Modify**: Make furniture modular for different age groups.
- **Put to another use**: Use space as a co-working venue after hours.
- **Eliminate**: Remove late return fines to improve access.
- **Rearrange**: Redesign entrance for better accessibility and display impact stories.

Activity C2 – Crazy Eights Prompt: Safer commuting for school children

- **One Idea Shared**: A buddy-tracking bracelet that connects school children with a peer and alerts guardians on location.
- **Feedback**: Positive reception on simplicity and safety feature, suggestions to integrate GPS with public transport.
- **Section D**: Ideation with Perspective.
- **Idea Evaluated**: "Community-led bicycle escort programme."
- **White Hat**: Students walk over 3 kilometres to school. Parents fear for their safety. No public transport.
- **Red Hat**: Parents feel anxious and disempowered; students feel tired and unsafe.
- **Black Hat**: Lack of helmets, unsafe roads, and community supervision.

- **Yellow Hat**: Builds trust, encourages fitness, increases school attendance.
- **Green Hat**: Incorporate reflective gear and incentive system for volunteers.
- **Blue Hat**: Next steps include testing in one school and evaluating parent engagement.

Section E: Storytelling and Reverse Brainstorming

Storytelling - User Journey:

Nolitha is a 35-year-old basket weaver from Cala. She walks 6 kilometres to sell crafts at the taxi rank. After using the new app, she now receives orders online and ships baskets via a rural courier hub. Her biggest challenge was learning how to price and describe her products digitally. After initial frustration, she received training from a youth volunteer and now inspires others in her community.

Reverse Brainstorming – 'How might we make user experience worse?'

Flipped Solutions:

- **Problem**: Make the app only in English and require fast Internet.
- **Solution**: Add local language options and offline functionality.
- **Problem**: Ask for too much information during registration.
- **Solution**: Simplify registration to basic information only.
- **Problem**: Hide customer support features.
- **Solution**: Include a help chatbot and feedback button.
- **Problem**: Ignore user feedback.
- **Solution**: Implement a feedback response dashboard for users.

Reflection Questions

1. The empathy map exercise revealed hidden emotional barriers that surveys alone would not have captured.

2. SCAMPER and Crazy Eights allowed me to think expansively and without judgement. It removed the pressure to be 'right'.
3. I'll carry forward the idea of using diverse thinking modes and involving users early, especially in prototyping.

Appendix C

Part Three Memorandum

Subject: Understanding and Applying Design Thinking Styles

This memo outlines the responses, insights, and reflections based on the completion of the activity sheet 'Understanding and Applying Design Thinking Styles.' The exercise enabled individual and group reflection on personal thinking preferences, collaborative thinking dynamics, and practical application of design styles.

Section A: Self-Reflection – Design Thinking Style Profile

- **Most Frequently Used Styles**: Divergent Thinking, Analytical Thinking
- **Styles to Develop**: Systems Thinking - to better understand and anticipate broader impact across ecosystems.

Section B: Application Task – Style-to-Scenario Matching

Scenario	Best Fit Style	Why? (Brief Explanation)
Prototyping a new water filter and testing weekly	Iterative Thinking	Repeated testing and refinement define iterative approaches.
Understanding how transportation, employment, and childcare interact	Systems Thinking	Multiple systems interacting require holistic systems awareness.
Selecting top two mobile app ideas from ten	Convergent Thinking	Convergent thinking helps filter and select viable options.
Balancing user needs with budget constraints	Integrative Thinking	Integrative thinking seeks harmony in conflicting needs.
Using unrelated objects and prompts for ideation	Lateral Thinking	Involves connecting unrelated concepts to spark innovation.

Section C: Group Activity – Team Thinking Style Audit

Group Members: 4

Dominant Styles:

- Member 1: Divergent Thinking
- Member 2: Structured Thinking
- Member 3: Creative Thinking
- Member 4: Analytical Thinking

Team Thinking Wheel: Created using coloured segments to represent each member's dominant style.

Challenge Chosen: Improve food delivery for rural schools.

Styles Used at Stages:

- Beginning: Systems Thinking, Creative Thinking.
- Middle: Analytical and Structured Thinking.
- End: Convergent and Integrative Thinking

Missing Styles: Emotional or Empathy-based Thinking. Plan to use journey maps and interviews to compensate.

Section D: Critical Reflection Summary

Understanding and applying diverse Design Thinking styles enriches collaboration, fosters deeper innovation, and improves problem-solving. For example, during a community housing project, using both Systems and Integrative Thinking helped us to align stakeholder expectations while ensuring long-term sustainability. Each style brings a unique lens - analytical thinking ensures feasibility, while creative thinking opens up new possibilities. Teams that intentionally use diverse styles are more adaptable, user-centric, and successful in achieving inclusive innovation outcomes.

- ✓ Submission Checklist
- ✓ Completed Self-Reflection Table
- ✓ Style-to-Scenario Matching Table
- ✓ Team Thinking Style Poster or Slide
- ✓ Reflection Journal Entry

Appendix D

Part Four Memorandum

Subject: Tools that may be used in Design Thinking projects

This memo outlines the responses and reflections based on the completion of the Design Thinking Tools Activity and Assessment Sheet. The sheet was used to engage with key Design Thinking techniques individually and collaboratively, and to reflect on learning outcomes.

1. Individual Activities Summary

Tool	Response Summary	Sketch/Notes	Self-Assessment
SCAMPER	Redesigned a plastic water bottle using Substitute (bamboo cap), Combine (handle + strap), and Eliminate (label) principles.	Sketch of modified bottle	✓
Crazy Eights	Generated 8 ideas for a school lunch delivery app. Ideas included gamification, reward points, and parent feedback.	8 panel sketch grids	✓
Six Thinking Hats	Applied hats to a decision on remote work policy. White Hat used for facts; Black Hat showed staff fatigue risks; Green Hat offered hybrid options.	Color-coded notes	✓

Tool	Response Summary	Sketch/Notes	Self-Assessment
Storytelling	Shared a story of an elderly commuter using a bus app, highlighting accessibility pain points and an intuitive redesign.	Persona + journey sketch	✓
Reverse Brainstorming	Listed ways to frustrate users during registration. Reversed them into simplified forms, fewer steps, helpful tooltips.	Reverse list & revised flow	✓

2. Group Activities Summary

Activity Title	Group Output / Summary	Sketch/Visual Aid	Facilitator Comments
SCAMPER Challenge	Group redesigned the community clinic visit experience using all 7 SCAMPER steps.	SCAMPER grid with ideas	Well-structured and user-centred.
Crazy Eights Sprint	Each member contributed 8 ideas for a student wellness app. Selected top 3 and merged into one concept.	Group poster sketch	Good synthesis of ideas.
Six Hats Debate	Debated feasibility of solar-powered community hubs. Strong insights from Black and Yellow Hats.	Colour-coded discussion notes	Excellent team participation.
User Journey Storyboard	Mapped journey of a rural farmer accessing crop insurance via mobile platform.	6-frame storyboard	Strong empathy and clarity.

Activity Title	Group Output / Summary	Sketch/Visual Aid	Facilitator Comments
Reverse Innovation	Reimagined an underused library space by reversing issues into collaborative study areas.	Before/After model	Creative and well explained.

3. Reflection and Feedback

- The most creative ideas came from Crazy Eights because of the fast-paced ideation without overthinking.
- SCAMPER was initially challenging because of the abstract prompts but became easier with team discussion.
- Collaboration enriched the group output by blending different viewpoints and enhancing solution quality.
- The most enjoyable activity was Storytelling, as it allowed emotional connection and real-world relevance.
- These tools will be used in real life for project design, team workshops, and service improvements.

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Design Thinking is a powerful methodology that focuses on developing innovative solutions by prioritising the needs and experiences of people. At its core, Design Thinking emphasises a human-centred approach, aiming to cultivate a mindset that places users at the heart of problem-solving. Design Thinking is more than just a set of tools – it's a mindset that fosters empathy, creativity, and iteration. This approach emerged from the practices of designers who began applying their methods to a broad range of challenges beyond traditional design. It has since evolved into a widely adopted methodology for addressing complex problems in various fields, including business, healthcare, and social innovation.

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